



**Coimisiún na Scrúduithe Stáit**  
**State Examinations Commission**

**Leaving Certificate 2026**

**Marking Scheme**

**Biology**

**Higher Level**

## **Note to teachers and students on the use of published marking schemes**

Marking schemes published by the State Examinations Commission are not intended to be standalone documents. They are an essential resource for examiners who receive training in the correct interpretation and application of the scheme. This training involves, among other things, marking samples of student work and discussing the marks awarded, so as to clarify the correct application of the scheme. The work of examiners is subsequently monitored by Advising Examiners to ensure consistent and accurate application of the marking scheme. This process is overseen by the Chief Examiner, usually assisted by a Chief Advising Examiner. The Chief Examiner is the final authority regarding whether or not the marking scheme has been correctly applied to any piece of candidate work.

Marking schemes are working documents. While a draft marking scheme is prepared in advance of the examination, the scheme is not finalised until examiners have applied it to candidates' work and the feedback from all examiners has been collated and considered in light of the full range of responses of candidates, the overall level of difficulty of the examination and the need to maintain consistency in standards from year to year. This published document contains the finalised scheme, as it was applied to all candidates' work.

In the case of marking schemes that include model solutions or answers, it should be noted that these are not intended to be exhaustive. Variations and alternatives may also be acceptable. Examiners must consider all answers on their merits, and will have consulted with their Advising Examiners when in doubt.

### **Future Marking Schemes**

Assumptions about future marking schemes on the basis of past schemes should be avoided. While the underlying assessment principles remain the same, the details of the marking of a particular type of question may change in the context of the contribution of that question to the overall examination in a given year. The Chief Examiner in any given year has the responsibility to determine how best to ensure the fair and accurate assessment of candidates' work and to ensure consistency in the standard of the assessment from year to year. Accordingly, aspects of the structure, detail and application of the marking scheme for a particular examination are subject to change from one year to the next without notice.

## Introduction

The marking scheme is a guide to awarding marks to candidates' answers. It is a concise and summarised guide and is constructed so as to minimise its word content. Examiners must conform to this scheme and may not allow marks for answering outside this scheme. The scheme contains key words, terms and phrases for which candidates may be awarded marks. This does not preclude synonyms or terms or phrases which convey the same meaning as the answer in the marking scheme. Although synonyms are generally acceptable, there may be instances where the scheme demands an exact scientific term or unequivocal response and will not accept alternatives. The descriptions, methods and definitions in the scheme are not exhaustive and alternative valid answers are acceptable. If it comes to the attention of an examiner that a candidate has presented a valid answer and there is no provision in the scheme for accepting this answer, then the examiner must first consult with his/ her advising examiner before awarding marks. As a general rule, if in doubt about any answer, examiners should consult their advising examiner before awarding marks.

## How to use the marking scheme

- (a) Where only one answer is required alternative answers are separated by 'or'.
- (b) Where multiple answers are required each word, term or phrase for which marks are allocated is separated by a solidus ( / ) from the next word, term or phrase.
- (c) The mark awarded for an answer appears in **bold** next to the answer, e.g. **3**.
- (d) Where there are several parts in the answer to a question, the mark awarded for each part appears in brackets, e.g. **5(4)** means that there are five parts to the answer, each part allocated **4 marks**.
- (e) The answers to subsections of a question may not necessarily be allocated a specific mark; e.g. there may be six parts to a question – (a), (b), (c), (d), (e), (f) and a total of **20 marks** allocated to the question. The marking scheme might be as follows, **2(4) + 4(3)**. This means that the first two correct answers encountered are awarded **4 marks** each and each subsequent correct answer is awarded **3 marks**.
- (f) A word or term that appears in brackets ( ) is not a requirement of the answer, but is used to contextualise the answer or may be an alternative valid answer.

## Some examples of the marking process

1. **Key words or terms or phrases may be awarded marks, only if presented in the correct context.**

**Sample question:** *Outline how water from the soil reaches the leaf.*  
**Marking scheme states:** Concentration gradient / osmosis / root hair / root pressure / cell to cell / xylem / transpiration or evaporation / cohesion (or explained) or adhesion (or capillarity or explained) or tension (or explained). **Any six 6(3)**

**Sample answer:** *Water is drawn up the xylem by osmosis.*

Although the candidate has presented two key terms (xylem, osmosis), the statement is incorrect and the candidate can only be awarded **3 marks** for referring to the movement of water through the xylem.

2. **Cancelled answers**

The following is an extract from **S.63 Instructions to Examiners, 2026 (for subjects being marked online)** (section 5.4, p.18):

*“Where a candidate answers a question or part of a question once only and then cancels the answer, you should ignore the cancelling and treat the answer as if the candidate had not cancelled it.”*

**Sample question:** *What is pollination?*  
**Marking scheme states:** Transfer of pollen / from anther / to stigma. **3(3)**  
**Sample answer:** ~~*Transfer of pollen by insect to stigma.*~~

The candidate has cancelled the answer and has not made another attempt to answer the question and may be awarded **2(3)** marks.

If an answer is cancelled and an alternative version given, the cancellation should be accepted and marks awarded, where merited, for the un-cancelled version only.

If two (or more) un-cancelled versions of an answer are given to the same question or part of a question, both (or all) should be marked and the answer accepted that yields the greater (greatest) number of marks. Points may not, however, be combined from multiple versions to arrive at a manufactured total.

3. **Surplus answers: [only in Section A] - A surplus wrong answer cancels the marks awarded for a correct answer.**

1. **Sample question 1:** *The walls of xylem vessels are reinforced with.....*  
**Marking scheme states:** Lignin **4 marks**  
**Sample answer:** *Chitin, lignin*

There is a surplus incorrect answer, therefore the candidate scores **4 – 4 = 0 marks**.

**Sample answer:** *~~Lignin~~*

The answer, which is correct, has been cancelled by the candidate, but there is no additional or surplus answer, therefore the candidate may be awarded **4 marks**.

**Sample answer:** *Lignin, ~~chitin~~*

There is a surplus answer, which is incorrect, but it has been cancelled and as the candidate has given more than one answer (i.e. the candidate is answering the question more than once only), the cancelling can be accepted and s/he may be awarded **4 marks**.

2. **Sample question 2:** *Name the four elements that are always present in protein.*

**Marking scheme states:** Carbon / hydrogen / oxygen / nitrogen **4(3)**

**Sample answer:** *Carbon, hydrogen, oxygen, nitrogen, calcium*

There is a surplus answer, which is incorrect, which cancels one of the correct answers, therefore the candidate is awarded **3(3)** marks.

**Sample answer:** *Carbon, hydrogen, oxygen, calcium*

There is no surplus answer – there are three correct answers, and therefore the candidate is awarded **3(3)** marks.

**Sample answer:** *Carbon, hydrogen, oxygen, calcium, aluminium*

There is a surplus answer, which is incorrect, and cancels one of the three correct answers, therefore the candidate is awarded **2(3)** marks.

**Sample answer:** *Carbon, hydrogen, oxygen, calcium, ~~aluminium~~*

There is a surplus answer, which is incorrect, but it has been cancelled so the candidate may be awarded **3(3)** marks.

In the other sections of the paper (Sections B and C), there may be instances where a correct answer is nullified by the addition of an incorrect answer. This happens when the only acceptable answer is a specific word or term. Each such instance is indicated in the scheme by an asterisk \*.

## Annotations used in the marking

The scripts were marked by examiners using an online marking platform. The following table illustrates the various annotations (symbols) applied by the examiners when marking the scripts. The meaning and use of each of the annotations applied are also explained in the table. These annotations will be seen on a script if viewed as part of the appeal process. Annotations applied by an examiner will be viewed in red. Scripts that were also marked by an advising examiner will show annotations in a green colour.

| Annotation                                                                          | Meaning                                                                                                |
|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|
|    | 'n' marks awarded; e.g. 1 – 6                                                                          |
|    | This symbol indicates an incorrect response /answer.                                                   |
|    | Surplus incorrect answer. A surplus incorrect answer has cancelled a correct answer.                   |
|    | This symbol is placed on all blank pages or part of page to indicate it has been seen by the examiner. |
|  | This symbol can be used by an examiner to indicate a part of a question answer of significance.        |
|  | This symbol is used to indicate a missing word or phrase.                                              |

**Grading Table**

| Mark      | Grade |
|-----------|-------|
| 360 – 400 | 1     |
| 320 – 359 | 2     |
| 280 – 319 | 3     |
| 240 – 279 | 4     |
| 200 – 239 | 5     |
| 160 – 199 | 6     |
| 120 – 159 | 7     |
| 0 – 119   | 8     |

## Bonus marks for answering through the medium of Irish

Bonus marks at the rate of 10% of the marks obtained will be given to a candidate who answers entirely through Irish and who obtains 75% or less of the total mark available in (i.e. 300 marks or less). In calculating the bonus to be applied, decimals are always rounded down, not up – e.g., 4.5 becomes 4; 4.9 becomes 4, etc. See below for when a candidate is awarded more than 300 marks.

### *Marcanna Breise as ucht freagairt trí Ghaeilge*

Léiríonn an tábla thíos an méid marcanna breise ba chóir a bhronnadh ar iarrthóirí a ghnóthaíonn níos mó ná 75% d'iomlán na marcanna.

N.B. Ba chóir marcanna de réir an ghnáthrata a bhronnadh ar iarrthóirí nach ghnóthaíonn níos mó ná 75% d'iomlán na marcanna don scrúdú. Ba chóir freisin an marc bónais sin **a shlánú síos**.

#### *Tábla 400 @ 10%*

Bain úsáid as an tábla seo i gcás na n-ábhar a bhfuil 400 marc san iomlán ag gabháil leo agus inarb é 10% gnáthrata an bhónais.

Bain úsáid as an ghnáthrata i gcás 300 marc agus faoina bhun sin. Os cionn an mharc sin, féach an tábla thíos.

| Bunmharc  | Marc Bónais |
|-----------|-------------|
| 301 - 303 | 29          |
| 304 - 306 | 28          |
| 307 - 310 | 27          |
| 311 - 313 | 26          |
| 314 - 316 | 25          |
| 317 - 320 | 24          |
| 321 - 323 | 23          |
| 324 - 326 | 22          |
| 327 - 330 | 21          |
| 331 - 333 | 20          |
| 334 - 336 | 19          |
| 337 - 340 | 18          |
| 341 - 343 | 17          |
| 344 - 346 | 16          |
| 347 - 350 | 15          |

| Bunmharc  | Marc Bónais |
|-----------|-------------|
| 351 - 353 | 14          |
| 354 - 356 | 13          |
| 357 - 360 | 12          |
| 361 - 363 | 11          |
| 364 - 366 | 10          |
| 367 - 370 | 9           |
| 371 - 373 | 8           |
| 374 - 376 | 7           |
| 377 - 380 | 6           |
| 381 - 383 | 5           |
| 384 - 386 | 4           |
| 387 - 390 | 3           |
| 391 - 393 | 2           |
| 394 - 396 | 1           |
| 397 - 400 | 0           |

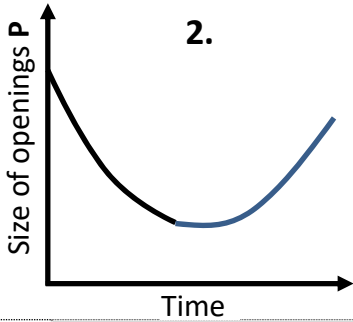
|                  |               |            |
|------------------|---------------|------------|
| <b>Section A</b> | <b>Best 5</b> | <b>100</b> |
|------------------|---------------|------------|

| <b>Question 1</b>                                           | <b>Best five answers from (a) – (f)</b>                                                                                 | <b>20</b>           |
|-------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|---------------------|
| <b>(a)</b>                                                  | State <b>two</b> reasons why organisms require food.                                                                    |                     |
|                                                             | For energy /<br>(Provide raw materials) for growth /<br>(Provide raw materials) for repair                              | <b>Any two 2(2)</b> |
| <b>(b)</b>                                                  | Name the chemical elements that are present in <b>all</b> lipids.                                                       |                     |
|                                                             | Carbon (C) <b>and</b> Hydrogen (H) <b>and</b> Oxygen (O)                                                                | <b>4</b>            |
| <b>(c)</b>                                                  | Name the basic unit of a lipid.                                                                                         |                     |
|                                                             | Triglyceride (glycerol <b>and</b> three fatty acids)                                                                    | <b>4</b>            |
| <b>(d)</b>                                                  | State <b>one</b> metabolic role of lipids in cells.                                                                     |                     |
|                                                             | Provide energy <b>or</b> hormone production <b>or</b> other correct                                                     | <b>4</b>            |
| <b>(e)</b>                                                  | Identify <b>one</b> vitamin that is soluble in lipids                                                                   |                     |
|                                                             | A <b>or</b> D <b>or</b> E <b>or</b> K                                                                                   | <b>4</b>            |
| <b>(f)</b>                                                  | State <b>one</b> deficiency disorder of the vitamin identified in part (e) <b>or</b> of any other <b>named</b> vitamin. |                     |
|                                                             | Any correct vitamin deficiency to match named vitamin                                                                   | <b>4</b>            |
| <b>2 ✓<sub>2</sub> + 4 ✓<sub>4</sub> or 5 ✓<sub>4</sub></b> |                                                                                                                         |                     |

| <b>Question 2</b>                        |                                                                                                                                                                               | <b>20</b>           |
|------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|
| <b>(a)</b>                               | Name a structure visible in the image that shows that the cheek cells are eukaryotic <b>and</b> draw an arrow from the box to the named structure.                            |                     |
|                                          | Nucleus <b>and</b> arrow to nucleus                                                                                                                                           | <b>2</b>            |
| <b>(b)</b>                               | What term describes cells that are <b>not</b> eukaryotic?                                                                                                                     |                     |
|                                          | Prokaryotic                                                                                                                                                                   | <b>3</b>            |
| <b>(c)</b>                               | Explain the term <i>tissue culture</i> .                                                                                                                                      |                     |
|                                          | Growth of cells outside the body                                                                                                                                              | <b>3</b>            |
| <b>(d)</b>                               | State <b>two</b> conditions necessary for successful tissue culture.                                                                                                          |                     |
|                                          | Sterility / suitable temperature / nutrient availability / sufficient oxygen / suitable pH / water availability / sufficient carbon dioxide / suitable medium / other correct | <b>Any two 2(3)</b> |
| <b>(e)</b>                               | State <b>two</b> applications (or uses) of tissue culture.                                                                                                                    |                     |
|                                          | Cancer research / analysis of karyotype / skin grafts / plant breeding / other correct                                                                                        | <b>Any two 2(3)</b> |
| <b>1 ✓<sub>2</sub> + 6 ✓<sub>3</sub></b> |                                                                                                                                                                               |                     |



| Question 3                                                                                                                                                                    |                                                                                          | 20 |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|----|
| (a)                                                                                                                                                                           | Name the body cavity in which the breathing system is located.                           |    |
|                                                                                                                                                                               | Thoracic <b>or</b> chest (cavity)                                                        | 3  |
| (b)                                                                                                                                                                           | State the function of the epiglottis.                                                    |    |
|                                                                                                                                                                               | Prevent food entering the trachea                                                        | 3  |
| (c)                                                                                                                                                                           | What is the function of these rings of cartilage?                                        |    |
|                                                                                                                                                                               | To keep (the trachea) open                                                               | 3  |
| (d)                                                                                                                                                                           | (i) Sketch <b>and</b> label the diaphragm muscle in its correct location.                |    |
|                                                                                                                                                                               | Diaphragm muscle drawn correctly just under the lungs <b>and</b> labelled.               | 3  |
|                                                                                                                                                                               | (ii) Draw an arrow to show the direction of movement of the diaphragm during inhalation. |    |
|                                                                                                                                                                               | Down arrow                                                                               | 2  |
| (e)                                                                                                                                                                           | Name <b>one</b> other muscle involved in inhalation.                                     |    |
|                                                                                                                                                                               | Intercostal (muscle)                                                                     | 3  |
| (f)                                                                                                                                                                           | Briefly describe what happens to the rib cage during inhalation.                         |    |
|                                                                                                                                                                               | Moves up <b>and</b> out                                                                  | 3  |
| 6  + 1  |                                                                                          |    |

| Question 4                          |                                                                                                                                                      | 20 |
|-------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| (a)                                 | Name the openings <b>P</b> which allow gas exchange to occur.                                                                                        |    |
|                                     | Stomata                                                                                                                                              | 3  |
| (b)                                 | Identify gas <b>X</b> .                                                                                                                              |    |
|                                     | Carbon dioxide (CO <sub>2</sub> )                                                                                                                    | 3  |
| (c)                                 | State the relationship between the concentration of gas <b>X</b> and the size of openings <b>P</b> .                                                 |    |
|                                     | As <b>X</b> increases, <b>P</b> decreases.                                                                                                           | 3  |
| (d)                                 | On graph 2., continue the curve to show what would happen to the size of openings <b>P</b> if the concentration of gas <b>X</b> in the leaf reduced. |    |
|                                     |                                                                     | 2  |
| (e)                                 | (i) To which tissue type do these cells belong?                                                                                                      |    |
|                                     | Dermal                                                                                                                                               | 3  |
|                                     | (ii) Other than gas exchange, state <b>one</b> function of the tissue type you named at (e) (i) above.                                               |    |
|                                     | Protection                                                                                                                                           | 3  |
| (f)                                 | Name the openings in the stems of plants that also are involved in gas exchange.                                                                     |    |
|                                     | Lenticels                                                                                                                                            | 3  |
| 6 ✓ <sub>3</sub> + 1 ✓ <sub>2</sub> |                                                                                                                                                      |    |

| Question 5                                                                                                                                                                    |                                                                                                                                                                         | 20 |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| (a)                                                                                                                                                                           | The first stage in protein synthesis involves copying the DNA code to messenger RNA (mRNA). What name is used to describe this stage?                                   |    |
|                                                                                                                                                                               | Transcription                                                                                                                                                           | 3  |
| (b)                                                                                                                                                                           | Where in the cell does the stage you named above occur?                                                                                                                 |    |
|                                                                                                                                                                               | Nucleus                                                                                                                                                                 | 3  |
| (c)                                                                                                                                                                           | Name structure <b>A</b> , where this stage occurs in the cell.                                                                                                          |    |
|                                                                                                                                                                               | Ribosome                                                                                                                                                                | 3  |
| (d)                                                                                                                                                                           | The part labelled <b>B</b> is another type of RNA. Name this type of RNA.                                                                                               |    |
|                                                                                                                                                                               | Transfer <b>or</b> t                                                                                                                                                    | 3  |
| (e)                                                                                                                                                                           | Part <b>B</b> attaches to the mRNA at matching three base sequences (such as <b>G A G</b> or <b>G U C</b> ). What name is given to these three-bases sequences of mRNA? |    |
|                                                                                                                                                                               | Codon <b>or</b> triplet                                                                                                                                                 | 3  |
| (f)                                                                                                                                                                           | Part of the mRNA sequence above is <b>C U A G U A A C A</b> .<br>Write the corresponding sequence of the gene ( <b>DNA</b> ) for this mRNA sequence.                    |    |
|                                                                                                                                                                               | G A T C A T T G T                                                                                                                                                       | 3  |
| (g)                                                                                                                                                                           | What happens to the fully translated amino acid sequence to allow the formation of a functional protein?                                                                |    |
|                                                                                                                                                                               | It folds (into the correct shape) <b>or</b> described                                                                                                                   | 2  |
| 6  + 1  |                                                                                                                                                                         |    |

| Question 6                                        |                                                                                                                                                  | 20 |
|---------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|----|
| (a)                                               | Complete the cycle by drawing an arrow <b>on the diagram and</b> writing the name of the missing process in the box provided                     |    |
|                                                   | Denitrification                                                                                                                                  | 2  |
|                                                   | Arrow from nitrate to nitrogen gas <b>or</b> arrow from molecule <b>X</b> to nitrogen gas <b>or</b> arrow from molecule <b>Y</b> to nitrogen gas | 2  |
| (b)                                               | Write down the names of processes <b>A, B and C</b> that are indicated on the diagram.                                                           |    |
|                                                   | <b>A:</b> Nitrogen fixation                                                                                                                      | 2  |
|                                                   | <b>B:</b> Assimilation <b>or</b> nutrition                                                                                                       | 2  |
|                                                   | <b>C:</b> Nitrification                                                                                                                          | 2  |
| (c)                                               | (i) Outline <b>one</b> way in which process <b>A</b> occurs.                                                                                     |    |
|                                                   | Action of (nitrogen fixing) bacteria <b>or</b> lightning                                                                                         | 3  |
|                                                   | (ii) Suggest an advantage to plants of process <b>A</b> .                                                                                        |    |
|                                                   | Make nitrogen easier to absorb <b>or</b> make nitrogen available to use                                                                          | 3  |
| (d)                                               | Name molecule <b>X and Y</b> .                                                                                                                   |    |
|                                                   | <b>X:</b> Ammonium <b>or</b> ammonia                                                                                                             | 2  |
|                                                   | <b>Y:</b> Nitrite                                                                                                                                | 2  |
| <b>2</b> ✓ <sub>3</sub> + <b>7</b> ✓ <sub>2</sub> |                                                                                                                                                  |    |

| Question 7                                                                                               |                                                                                                                                                                                     |  | 20 |
|----------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|----|
| For <b>each</b> of the following structures, identify its precise location <b>and</b> its main function. |                                                                                                                                                                                     |  |    |
| <b>(a)</b>                                                                                               | Retina                                                                                                                                                                              |  |    |
|                                                                                                          | Precise location: At the back of the eye                                                                                                                                            |  | 2  |
|                                                                                                          | Main function: Converts light into nerve impulse                                                                                                                                    |  | 2  |
| <b>(b)</b>                                                                                               | Sino-atrial node                                                                                                                                                                    |  |    |
|                                                                                                          | Precise location: Wall of the right atrium (of the heart)                                                                                                                           |  | 2  |
|                                                                                                          | Main function: Sends impulse to the atria <b>or</b> sends impulse to AV node <b>or</b> controls the rate of contractions (of atria) <b>or</b> pacemaker                             |  | 2  |
| <b>(c)</b>                                                                                               | Gall bladder                                                                                                                                                                        |  |    |
|                                                                                                          | Precise location: Underneath liver                                                                                                                                                  |  | 2  |
|                                                                                                          | Main function: Storage of bile                                                                                                                                                      |  | 2  |
| <b>(d)</b>                                                                                               | Adrenal gland                                                                                                                                                                       |  |    |
|                                                                                                          | Precise location: On top of the kidneys                                                                                                                                             |  | 2  |
|                                                                                                          | Main function: Produce adrenaline                                                                                                                                                   |  | 2  |
| <b>(e)</b>                                                                                               | Cerebellum                                                                                                                                                                          |  |    |
|                                                                                                          | Precise location: Back of the brain                                                                                                                                                 |  | 2  |
|                                                                                                          | Main function: Coordination (control) of muscular movement <b>or</b> balance <b>or</b> posture <b>or</b> walking <b>or</b> writing <b>or</b> fine muscle movements <b>or</b> speech |  | 2  |
| <b>10</b>                                                                                                |                                                                                                  |  |    |

| Section B                                                                             |                                                                                                                                                                    | Best 2                                                                                            | 60 |
|---------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|----|
| Question 8                                                                            |                                                                                                                                                                    |                                                                                                   | 30 |
| (a)                                                                                   | In relation to scientific investigations, distinguish between the terms, <i>qualitative</i> and <i>quantitative</i> , by writing a brief sentence on <b>each</b> . |                                                                                                   |    |
|                                                                                       | <i>Qualitative:</i>                                                                                                                                                | the presence (or absence) of a substance (or an organism)<br><b>or</b> data that is not numerical | 3  |
|                                                                                       | <i>Quantitative:</i>                                                                                                                                               | the amount of a substance (or number of organisms)<br><b>or</b> data that is numerical            | 3  |
| 2    |                                                                                                                                                                    |                                                                                                   |    |
| (b)                                                                                   | (i)                                                                                                                                                                | Outline a qualitative test for a reducing sugar.                                                  |    |
|                                                                                       |                                                                                                                                                                    | Add Benedict's solution <b>and</b> heat                                                           | 3  |
|                                                                                       |                                                                                                                                                                    | A (brick) red (or orange) colour forms                                                            | 3  |
|                                                                                       | (ii)                                                                                                                                                               | Describe how you prepared a sample of stained plant cells to view under a light microscope.       |    |
|                                                                                       |                                                                                                                                                                    | Cut (or peel) a thin layer                                                                        | 3  |
|                                                                                       |                                                                                                                                                                    | Place sample on a (microscope) slide                                                              | 3  |
|                                                                                       |                                                                                                                                                                    | Add a <b>named</b> stain (e.g. iodine)                                                            | 3  |
|                                                                                       |                                                                                                                                                                    | Add a coverslip at an angle (or gently or slowly) <b>or</b> place slide on microscope stage       | 3  |
|                                                                                       | (iii)                                                                                                                                                              | When isolating DNA from plant tissue, state a reason for using the following:                     |    |
|                                                                                       | 1.                                                                                                                                                                 | Washing up liquid or detergent                                                                    |    |
|                                                                                       |                                                                                                                                                                    | To break the membranes <b>or</b> release DNA                                                      | 3  |
|                                                                                       | 2.                                                                                                                                                                 | Ice cold ethanol                                                                                  |    |
|                                                                                       |                                                                                                                                                                    | To precipitate the DNA <b>or</b> make the DNA insoluble (visible)                                 | 3  |
| 8  |                                                                                                                                                                    |                                                                                                   |    |

| Question 9                                                                                   |      |                                                                                                                                                                                                                                                  | 30 |
|----------------------------------------------------------------------------------------------|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| (a)                                                                                          | (i)  | What is an enzyme?                                                                                                                                                                                                                               |    |
|                                                                                              |      | A biological catalyst <b>or</b> described                                                                                                                                                                                                        | 3  |
|                                                                                              | (ii) | What happens to an enzyme when it becomes denatured?                                                                                                                                                                                             |    |
|                                                                                              |      | Loses its shape <b>or</b> can no longer function                                                                                                                                                                                                 | 3  |
| <b>2</b>    |      |                                                                                                                                                                                                                                                  |    |
| (b)                                                                                          |      | During your practical studies, you investigated the effect of pH on the rate of enzyme activity. Describe how you carried out this investigation. Include the results and one safety precaution. You may include a labelled diagram if you wish. |    |
|                                                                                              |      | Preparation of enzyme (or source) described                                                                                                                                                                                                      | 3  |
|                                                                                              |      | Name of enzyme <b>and</b> named matching substrate                                                                                                                                                                                               | 3  |
|                                                                                              |      | Addition of different pH buffers                                                                                                                                                                                                                 | 3  |
|                                                                                              |      | Fair test described                                                                                                                                                                                                                              | 3  |
|                                                                                              |      | How rate of reaction was measured<br><b>(must match named enzyme or substrate or source)</b>                                                                                                                                                     | 3  |
|                                                                                              |      | Named piece of apparatus                                                                                                                                                                                                                         | 3  |
|                                                                                              |      | Results described<br><b>(must match named enzyme or substrate or source)</b>                                                                                                                                                                     | 3  |
|                                                                                              |      | Safety precaution described                                                                                                                                                                                                                      | 3  |
| Points may be obtained from an appropriately labelled diagram                                |      |                                                                                                                                                                                                                                                  |    |
| <b>8</b>  |      |                                                                                                                                                                                                                                                  |    |

| Question 10                                                                           |      |                                                                                                                                                                                                                                                           | 30 |
|---------------------------------------------------------------------------------------|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| (a)                                                                                   | (i)  | In Biology, what is meant by the term <i>geotropism</i> ?                                                                                                                                                                                                 |    |
|                                                                                       |      | Growth response of a plant to gravity                                                                                                                                                                                                                     | 3  |
|                                                                                       | (ii) | State <b>one</b> location in plants where growth regulators are produced.                                                                                                                                                                                 |    |
|                                                                                       |      | Meristem <b>or</b> named location of meristem                                                                                                                                                                                                             | 3  |
| 2    |      |                                                                                                                                                                                                                                                           |    |
| (b)                                                                                   | (i)  | During your practical studies, you investigated the effect of IAA (indole acetic acid) growth regulator on plant tissue.<br>Describe how you set up this investigation. Include one safety precaution.<br>You may include a labelled diagram if you wish. |    |
|                                                                                       |      | Seeds or named tissue added to a <b>named</b> container or vessel                                                                                                                                                                                         | 3  |
|                                                                                       |      | Addition of different concentrations of IAA                                                                                                                                                                                                               | 3  |
|                                                                                       |      | Control named <b>and</b> described                                                                                                                                                                                                                        | 3  |
|                                                                                       |      | Stored at a suitable temperature                                                                                                                                                                                                                          | 3  |
|                                                                                       |      | (Another) fair test described                                                                                                                                                                                                                             | 3  |
|                                                                                       |      | Left for a suitable length of time                                                                                                                                                                                                                        | 3  |
|                                                                                       |      | Safety precaution described                                                                                                                                                                                                                               | 3  |
|                                                                                       |      | <b>Points may be obtained from an appropriately labelled diagram</b>                                                                                                                                                                                      |    |
|                                                                                       | (ii) | State <b>one</b> result of your investigation.                                                                                                                                                                                                            |    |
|                                                                                       |      | Root growth best at lower concentrations <b>or</b> shoot growth best at higher concentrations <b>or</b> poor growth at very high concentrations                                                                                                           | 3  |
| 8  |      |                                                                                                                                                                                                                                                           |    |

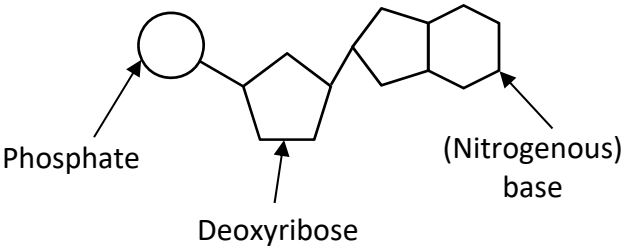


| Section C   |       | Best 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 4(60)         |
|-------------|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| Question 11 |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 60            |
| (a)         | (i)   | What is meant by the term <i>metabolism</i> ?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |               |
|             |       | (All) the chemical reactions in a cell (or in an organism or in the body)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 3             |
|             | (ii)  | What do the letters ATP stand for?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |               |
|             |       | *Adenosine triphosphate                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 3             |
|             | (iii) | What is the role of ATP in metabolism?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |               |
|             |       | To carry energy <b>or</b> to supply energy                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 3             |
| 3           |       | ✓ <sub>3</sub>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |               |
| (b)         | (i)   | What name is given to the first stage of aerobic respiration?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |               |
|             |       | *Glycolysis                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 3             |
|             | (ii)  | Describe the events of the first stage of aerobic respiration.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |               |
|             |       | Glucose converted to pyruvate (pyruvic acid)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 3             |
|             |       | ATP produced (or released) from ADP and P<br><b>or</b> NADH produced from NAD <sup>+</sup> and electrons (e <sup>-</sup> ) and protons (H <sup>+</sup> )                                                                                                                                                                                                                                                                                                                                                                                                       | 3             |
|             | (iii) | 1. What small gaseous molecule must be present for the second stage of aerobic respiration to occur?                                                                                                                                                                                                                                                                                                                                                                                                                                                           |               |
|             |       | *Oxygen                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 3             |
|             |       | 2. Where in the cell does the second stage of aerobic respiration occur?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |               |
|             |       | *Mitochondrion                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 3             |
|             |       | 3. Describe the events of the second stage of aerobic respiration.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |               |
|             |       | Pyruvate (pyruvic acid) to acetyl (co-enzyme A) /<br>(Acetyl) enters Krebs' cycle /<br>CO <sub>2</sub> released /<br>ATP produced from ADP + P /<br>NADH produced from NAD <sup>+</sup> and electrons (or e <sup>-</sup> ) and proton (or H <sup>+</sup> ) /<br>NADH breaks down to electrons (or e <sup>-</sup> ) <b>and</b> proton (or H <sup>+</sup> ) /<br>Electrons (or e <sup>-</sup> ) enter (or pass along) the electron transport chain /<br>Electrons (or e <sup>-</sup> ) <b>and</b> protons (or H <sup>+</sup> ) combine with oxygen to form water |               |
|             |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Any four 4(3) |
| 9           |       | ✓ <sub>3</sub>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |               |

| Question 11 continued                                                                 |       |                                                                                                                                                                     |              |
|---------------------------------------------------------------------------------------|-------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|
| (c)                                                                                   | (i)   | Why is this stage called the light-dependent stage?                                                                                                                 |              |
|                                                                                       |       | Uses (or requires) light (energy)                                                                                                                                   | 3            |
|                                                                                       | (ii)  | 1. Name the molecule that releases these energised electrons.                                                                                                       |              |
|                                                                                       |       | *Chlorophyll                                                                                                                                                        | 3            |
|                                                                                       |       | 2. At the end of this pathway, what happens to these electrons?                                                                                                     |              |
|                                                                                       |       | Return to chlorophyll                                                                                                                                               | 3            |
|                                                                                       | (iii) | 1. What name is given to <b>this</b> splitting of water?                                                                                                            |              |
|                                                                                       |       | *Photolysis                                                                                                                                                         | 3            |
|                                                                                       |       | 2. Name the cell organelle where water is split.                                                                                                                    |              |
|                                                                                       |       | *Chloroplast                                                                                                                                                        | 3            |
|                                                                                       | (iv)  | Describe what happens to these protons to allow for carbohydrate production.                                                                                        |              |
|                                                                                       |       | Form a (proton) pool /<br>(Protons) combine with NADP <sup>+</sup> to form NADPH /<br>(Protons) and electrons (e <sup>-</sup> ) reduce CO <sub>2</sub> (to glucose) | Any two 2(3) |
|                                                                                       | (v)   | State <b>one</b> method that horticulturists can use to promote crop growth in greenhouses.                                                                         |              |
|                                                                                       |       | Increase carbon dioxide levels <b>or</b> have a suitable temperature                                                                                                | 3            |
| 8  |       |                                                                                                                                                                     |              |

| Question 12                                                                 |        |                                                                                                                      | 60 |
|-----------------------------------------------------------------------------|--------|----------------------------------------------------------------------------------------------------------------------|----|
| (a)                                                                         | (i)    | In ecology, what is meant by the term <i>competition</i> ?                                                           |    |
|                                                                             |        | Struggle between organisms for a resource that is in short supply                                                    | 3  |
|                                                                             | (ii)   | Name <b>and</b> describe <b>one</b> type of competition in ecology.                                                  |    |
|                                                                             |        | Name: Contest <b>or</b> scramble (allow interspecific and intra specific)                                            | 3  |
|                                                                             |        | Description: Matching description or example                                                                         | 3  |
| <b>3</b> ✓ <sub>3</sub>                                                     |        |                                                                                                                      |    |
| (b)                                                                         | (i)    | Identify <b>one</b> behavioural adaptation of the vine weevil from the passage above.                                |    |
|                                                                             |        | Correct behavioural adaptation from passage                                                                          | 3  |
|                                                                             | (ii)   | Explain how this adaptation benefits the vine weevil.                                                                |    |
|                                                                             |        | Valid explanation of benefit of adaptation given                                                                     | 3  |
|                                                                             | (iii)  | Suggest a reason why the vine weevil numbers can easily increase again.                                              |    |
|                                                                             |        | Not all are killed <b>or</b> food available <b>or</b> predator population is low <b>or</b> other correct suggestion  | 3  |
|                                                                             | (iv)   | Using organisms named in the passage above, write out a food chain with three trophic levels.                        |    |
|                                                                             |        | Correct food chain with three trophic levels beginning with producer                                                 | 3  |
|                                                                             | (v)    | Construct a pyramid of numbers based on the food chain you wrote above                                               |    |
|                                                                             |        | Matching pyramid with producer at the bottom                                                                         | 3  |
|                                                                             | (vi)   | Which line, <b>A</b> or <b>B</b> , represents the vine weevil? Explain your answer.                                  |    |
|                                                                             |        | *A                                                                                                                   | 2  |
|                                                                             |        | Explain: higher peaks <b>or</b> A peaks before (B or predator) <b>or</b> higher (population)                         | 1  |
|                                                                             | (vii)  | Suggest a reason for the population of the vine weevil and the shrew peaking at different times.                     |    |
|                                                                             |        | Takes time for reproduction (breeding)                                                                               | 3  |
|                                                                             | (viii) | Other than predation and competition, state <b>two</b> biological factors that have an effect on population numbers. |    |
|                                                                             |        | Parasitism                                                                                                           | 3  |
|                                                                             |        | Symbiosis                                                                                                            | 3  |
| <b>8</b> ✓ <sub>3</sub> + <b>1</b> ✓ <sub>2</sub> + <b>1</b> ✓ <sub>1</sub> |        |                                                                                                                      |    |

| Question 12 continued |                                                                                     |                                                                                                                                                                                                                    |
|-----------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| (c)                   | (i)                                                                                 | In ecology, explain the term <i>conservation</i> .                                                                                                                                                                 |
|                       |                                                                                     | Management of organisms <b>or</b> the environment                                                                                                                                                                  |
|                       |                                                                                     | 3                                                                                                                                                                                                                  |
|                       | (ii)                                                                                | Outline <b>one</b> conservation practice, including its benefit, from <b>one</b> of the following areas: agriculture <b>or</b> fisheries <b>or</b> forestry.<br>Indicate clearly to which area your answer refers. |
|                       |                                                                                     | Outline of named conservation practice                                                                                                                                                                             |
|                       |                                                                                     | 3                                                                                                                                                                                                                  |
|                       |                                                                                     | Matching benefit outlined                                                                                                                                                                                          |
|                       |                                                                                     | 3                                                                                                                                                                                                                  |
|                       | (iii)                                                                               | State <b>one</b> example of waste management from <b>one</b> of the following areas: agriculture <b>or</b> fisheries <b>or</b> forestry.<br>Indicate clearly to which area your answer refers.                     |
|                       |                                                                                     | Correct example given                                                                                                                                                                                              |
|                       |                                                                                     | 3                                                                                                                                                                                                                  |
|                       | (iv)                                                                                | Explain the term <i>pollution</i> .                                                                                                                                                                                |
|                       |                                                                                     | A harmful addition to the environment                                                                                                                                                                              |
|                       |                                                                                     | 3                                                                                                                                                                                                                  |
|                       | (v)                                                                                 | Name any <b>one</b> pollutant <b>and</b> state its effect.                                                                                                                                                         |
|                       |                                                                                     | Named pollutant                                                                                                                                                                                                    |
|                       |                                                                                     | 3                                                                                                                                                                                                                  |
|                       |                                                                                     | Effect of named pollutant                                                                                                                                                                                          |
|                       |                                                                                     | 3                                                                                                                                                                                                                  |
|                       | (vi)                                                                                | State <b>one</b> problem associated with waste disposal other than pollution.                                                                                                                                      |
|                       |                                                                                     | Unightly <b>or</b> smell <b>or</b> attracts vermin <b>or</b> impacts organisms <b>or</b> lack of landfill sites <b>or</b> other correct problem stated                                                             |
|                       |                                                                                     | 3                                                                                                                                                                                                                  |
| 8                     |  |                                                                                                                                                                                                                    |

| Question 13                                                                                                                     |                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 60                                                                                                      |   |                                |   |                                                                                                         |   |                      |   |                                                                                                                                 |   |                              |   |                                                                                                                                 |   |                    |   |  |
|---------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|---|--------------------------------|---|---------------------------------------------------------------------------------------------------------|---|----------------------|---|---------------------------------------------------------------------------------------------------------------------------------|---|------------------------------|---|---------------------------------------------------------------------------------------------------------------------------------|---|--------------------|---|--|
| (a)                                                                                                                             | Draw a labelled diagram of <b>one</b> nucleotide of DNA. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                         |   |                                |   |                                                                                                         |   |                      |   |                                                                                                                                 |   |                              |   |                                                                                                                                 |   |                    |   |  |
|                                                                                                                                 | Diagram: Three shapes connected<br>Angle<br>Labels       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 3<br>3<br>3(1)                                                                                          |   |                                |   |                                                                                                         |   |                      |   |                                                                                                                                 |   |                              |   |                                                                                                                                 |   |                    |   |  |
| 2 ✓ <sub>3</sub> + 3 ✓ <sub>1</sub>                                                                                             |                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                         |   |                                |   |                                                                                                         |   |                      |   |                                                                                                                                 |   |                              |   |                                                                                                                                 |   |                    |   |  |
| (b)                                                                                                                             | (i)                                                      | Explain the underlined terms                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                         |   |                                |   |                                                                                                         |   |                      |   |                                                                                                                                 |   |                              |   |                                                                                                                                 |   |                    |   |  |
|                                                                                                                                 |                                                          | Sex linked: gene (or allele) located on sex chromosome (or on X chromosome or on Y chromosome).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 3                                                                                                       |   |                                |   |                                                                                                         |   |                      |   |                                                                                                                                 |   |                              |   |                                                                                                                                 |   |                    |   |  |
|                                                                                                                                 |                                                          | Recessive: (effect of allele) masked by a dominant allele.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 3                                                                                                       |   |                                |   |                                                                                                         |   |                      |   |                                                                                                                                 |   |                              |   |                                                                                                                                 |   |                    |   |  |
|                                                                                                                                 | (ii)                                                     | State the <b>full</b> genotype of a heterozygous female.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                         |   |                                |   |                                                                                                         |   |                      |   |                                                                                                                                 |   |                              |   |                                                                                                                                 |   |                    |   |  |
|                                                                                                                                 |                                                          | *XXNn <b>or</b> *XNXn <b>or</b> *X <sub>N</sub> X <sub>n</sub> <b>or</b> *X <sup>N</sup> X <sup>n</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 3                                                                                                       |   |                                |   |                                                                                                         |   |                      |   |                                                                                                                                 |   |                              |   |                                                                                                                                 |   |                    |   |  |
|                                                                                                                                 | (iii)                                                    | State the <b>full</b> genotype of a colour-blind male.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                         |   |                                |   |                                                                                                         |   |                      |   |                                                                                                                                 |   |                              |   |                                                                                                                                 |   |                    |   |  |
|                                                                                                                                 |                                                          | *XYn <sup>-</sup> <b>or</b> *XnY <sup>-</sup> <b>or</b> *X <sub>n</sub> Y <sup>-</sup> <b>or</b> *X <sup>n</sup> Y <sup>-</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 3                                                                                                       |   |                                |   |                                                                                                         |   |                      |   |                                                                                                                                 |   |                              |   |                                                                                                                                 |   |                    |   |  |
|                                                                                                                                 | (iv)                                                     | State all the genotypes <b>and</b> matching phenotypes of the possible offspring of the two parents described in (ii) and (iii) above.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                         |   |                                |   |                                                                                                         |   |                      |   |                                                                                                                                 |   |                              |   |                                                                                                                                 |   |                    |   |  |
|                                                                                                                                 |                                                          | <table><tr><td>*XXNn <b>or</b> *XNXn <b>or</b> *X<sub>N</sub>X<sub>n</sub> <b>or</b> *X<sup>N</sup>X<sup>n</sup></td><td>2</td><td>*female normal (colour vision)</td><td>1</td></tr><tr><td>*XXnn <b>or</b> *XnXn <b>or</b> *X<sub>n</sub>X<sub>n</sub> <b>or</b> *X<sup>n</sup>X<sup>n</sup></td><td>2</td><td>*female colour-blind</td><td>1</td></tr><tr><td>*XYN<sup>-</sup> <b>or</b> *XNY<sup>-</sup> <b>or</b> *X<sub>N</sub>Y<sup>-</sup> <b>or</b> *X<sup>N</sup>Y<sup>-</sup></td><td>2</td><td>*male normal (colour vision)</td><td>1</td></tr><tr><td>*XYn<sup>-</sup> <b>or</b> *XnY<sup>-</sup> <b>or</b> *X<sub>n</sub>Y<sup>-</sup> <b>or</b> *X<sup>n</sup>Y<sup>-</sup></td><td>2</td><td>*male colour-blind</td><td>1</td></tr></table> | *XXNn <b>or</b> *XNXn <b>or</b> *X <sub>N</sub> X <sub>n</sub> <b>or</b> *X <sup>N</sup> X <sup>n</sup> | 2 | *female normal (colour vision) | 1 | *XXnn <b>or</b> *XnXn <b>or</b> *X <sub>n</sub> X <sub>n</sub> <b>or</b> *X <sup>n</sup> X <sup>n</sup> | 2 | *female colour-blind | 1 | *XYN <sup>-</sup> <b>or</b> *XNY <sup>-</sup> <b>or</b> *X <sub>N</sub> Y <sup>-</sup> <b>or</b> *X <sup>N</sup> Y <sup>-</sup> | 2 | *male normal (colour vision) | 1 | *XYn <sup>-</sup> <b>or</b> *XnY <sup>-</sup> <b>or</b> *X <sub>n</sub> Y <sup>-</sup> <b>or</b> *X <sup>n</sup> Y <sup>-</sup> | 2 | *male colour-blind | 1 |  |
| *XXNn <b>or</b> *XNXn <b>or</b> *X <sub>N</sub> X <sub>n</sub> <b>or</b> *X <sup>N</sup> X <sup>n</sup>                         | 2                                                        | *female normal (colour vision)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 1                                                                                                       |   |                                |   |                                                                                                         |   |                      |   |                                                                                                                                 |   |                              |   |                                                                                                                                 |   |                    |   |  |
| *XXnn <b>or</b> *XnXn <b>or</b> *X <sub>n</sub> X <sub>n</sub> <b>or</b> *X <sup>n</sup> X <sup>n</sup>                         | 2                                                        | *female colour-blind                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 1                                                                                                       |   |                                |   |                                                                                                         |   |                      |   |                                                                                                                                 |   |                              |   |                                                                                                                                 |   |                    |   |  |
| *XYN <sup>-</sup> <b>or</b> *XNY <sup>-</sup> <b>or</b> *X <sub>N</sub> Y <sup>-</sup> <b>or</b> *X <sup>N</sup> Y <sup>-</sup> | 2                                                        | *male normal (colour vision)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 1                                                                                                       |   |                                |   |                                                                                                         |   |                      |   |                                                                                                                                 |   |                              |   |                                                                                                                                 |   |                    |   |  |
| *XYn <sup>-</sup> <b>or</b> *XnY <sup>-</sup> <b>or</b> *X <sub>n</sub> Y <sup>-</sup> <b>or</b> *X <sup>n</sup> Y <sup>-</sup> | 2                                                        | *male colour-blind                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 1                                                                                                       |   |                                |   |                                                                                                         |   |                      |   |                                                                                                                                 |   |                              |   |                                                                                                                                 |   |                    |   |  |
|                                                                                                                                 |                                                          | <b>Phenotype must match correct genotype to get the phenotype mark.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                         |   |                                |   |                                                                                                         |   |                      |   |                                                                                                                                 |   |                              |   |                                                                                                                                 |   |                    |   |  |
|                                                                                                                                 | (v)                                                      | Explain why males are more likely than females to be colour-blind.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                         |   |                                |   |                                                                                                         |   |                      |   |                                                                                                                                 |   |                              |   |                                                                                                                                 |   |                    |   |  |
|                                                                                                                                 |                                                          | Males only inherit one copy of the gene <b>or</b> described                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 3                                                                                                       |   |                                |   |                                                                                                         |   |                      |   |                                                                                                                                 |   |                              |   |                                                                                                                                 |   |                    |   |  |
| 5 ✓ <sub>3</sub> + 4 ✓ <sub>2</sub> + 4 ✓ <sub>1</sub>                                                                          |                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                         |   |                                |   |                                                                                                         |   |                      |   |                                                                                                                                 |   |                              |   |                                                                                                                                 |   |                    |   |  |

| Question 13 continued                                                                                                                                                                                                                                                                                                 |       |                                                                                                                                                                                     |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| (c)                                                                                                                                                                                                                                                                                                                   | (i)   | Explain the underlined terms.                                                                                                                                                       |
|                                                                                                                                                                                                                                                                                                                       |       | Evolution: Genetic changes in a species over time <b>or</b> genetic changes in a species due to the environment. <b>3</b>                                                           |
|                                                                                                                                                                                                                                                                                                                       |       | Variation: The differences between members of the same species. <b>3</b>                                                                                                            |
|                                                                                                                                                                                                                                                                                                                       | (ii)  | Name <b>two</b> types of mutation.                                                                                                                                                  |
|                                                                                                                                                                                                                                                                                                                       |       | Chromosome <b>3</b>                                                                                                                                                                 |
|                                                                                                                                                                                                                                                                                                                       |       | Gene <b>3</b>                                                                                                                                                                       |
|                                                                                                                                                                                                                                                                                                                       | (iii) | Name <b>both</b> of the naturalists who proposed this theory.                                                                                                                       |
|                                                                                                                                                                                                                                                                                                                       |       | *(Charles) Darwin<br>*(Alfred Russell-)Wallace <b>(first correct name = 2 marks)</b> <b>2+1</b>                                                                                     |
|                                                                                                                                                                                                                                                                                                                       | (iv)  | Suggest a benefit to species of producing large numbers of offspring.                                                                                                               |
|                                                                                                                                                                                                                                                                                                                       |       | (There is a high death rate) so at least some will survive <b>3</b>                                                                                                                 |
|                                                                                                                                                                                                                                                                                                                       | (v)   | Explain how the accumulation of favourable traits in a population contributes to natural selection.                                                                                 |
|                                                                                                                                                                                                                                                                                                                       |       | Those organisms (with these traits) are more likely to survive (in the environment) <b>or</b> pass the genes for these traits on to future generations <b>or</b> explained <b>3</b> |
|                                                                                                                                                                                                                                                                                                                       | (vi)  | State <b>one</b> piece of evidence for natural selection.                                                                                                                           |
|                                                                                                                                                                                                                                                                                                                       |       | Fossils <b>or</b> comparative anatomy <b>or</b> comparative embryology <b>or</b> other correct <b>3</b>                                                                             |
| <b>7</b>  <b>3</b> + <b>1</b>  <b>2</b> + <b>1</b>  <b>1</b> |       |                                                                                                                                                                                     |

| Question 14                                |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 60             |  |              |                                          |     |                                                   |                     |     |                |                                            |     |                                                   |                             |     |                            |                                      |     |                                               |               |     |           |                      |     |                          |  |
|--------------------------------------------|-------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|--|--------------|------------------------------------------|-----|---------------------------------------------------|---------------------|-----|----------------|--------------------------------------------|-----|---------------------------------------------------|-----------------------------|-----|----------------------------|--------------------------------------|-----|-----------------------------------------------|---------------|-----|-----------|----------------------|-----|--------------------------|--|
| (a)                                        | (i)   | What is a cotyledon?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                |  |              |                                          |     |                                                   |                     |     |                |                                            |     |                                                   |                             |     |                            |                                      |     |                                               |               |     |           |                      |     |                          |  |
|                                            |       | A seed leaf                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 3              |  |              |                                          |     |                                                   |                     |     |                |                                            |     |                                                   |                             |     |                            |                                      |     |                                               |               |     |           |                      |     |                          |  |
|                                            | (ii)  | Other than the number of cotyledons, state <b>two</b> structural differences between a monocotyledonous plant <b>and</b> a dicotyledonous plant.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                |  |              |                                          |     |                                                   |                     |     |                |                                            |     |                                                   |                             |     |                            |                                      |     |                                               |               |     |           |                      |     |                          |  |
|                                            |       | <table><thead><tr><th><i>Monocot</i></th><th></th><th><i>Dicot</i></th></tr></thead><tbody><tr><td>Vascular bundles are scattered (in stem)</td><td>and</td><td>Vascular bundles are arranged in a ring (in stem)</td></tr><tr><td>(Mostly) herbaceous</td><td>and</td><td>(Mostly) woody</td></tr><tr><td>Flower parts usually in multiples of three</td><td>and</td><td>Flower parts usually in multiples of four or five</td></tr><tr><td>(Mostly have) narrow leaves</td><td>and</td><td>(Mostly have) broad leaves</td></tr><tr><td>(Mostly) have parallel leaf venation</td><td>and</td><td>(Mostly) have net or reticulate leaf venation</td></tr><tr><td>Fibrous roots</td><td>and</td><td>Tap roots</td></tr><tr><td>(Mostly) endospermic</td><td>and</td><td>(Mostly) non-endospermic</td></tr></tbody></table> | <i>Monocot</i> |  | <i>Dicot</i> | Vascular bundles are scattered (in stem) | and | Vascular bundles are arranged in a ring (in stem) | (Mostly) herbaceous | and | (Mostly) woody | Flower parts usually in multiples of three | and | Flower parts usually in multiples of four or five | (Mostly have) narrow leaves | and | (Mostly have) broad leaves | (Mostly) have parallel leaf venation | and | (Mostly) have net or reticulate leaf venation | Fibrous roots | and | Tap roots | (Mostly) endospermic | and | (Mostly) non-endospermic |  |
| <i>Monocot</i>                             |       | <i>Dicot</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                |  |              |                                          |     |                                                   |                     |     |                |                                            |     |                                                   |                             |     |                            |                                      |     |                                               |               |     |           |                      |     |                          |  |
| Vascular bundles are scattered (in stem)   | and   | Vascular bundles are arranged in a ring (in stem)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                |  |              |                                          |     |                                                   |                     |     |                |                                            |     |                                                   |                             |     |                            |                                      |     |                                               |               |     |           |                      |     |                          |  |
| (Mostly) herbaceous                        | and   | (Mostly) woody                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                |  |              |                                          |     |                                                   |                     |     |                |                                            |     |                                                   |                             |     |                            |                                      |     |                                               |               |     |           |                      |     |                          |  |
| Flower parts usually in multiples of three | and   | Flower parts usually in multiples of four or five                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                |  |              |                                          |     |                                                   |                     |     |                |                                            |     |                                                   |                             |     |                            |                                      |     |                                               |               |     |           |                      |     |                          |  |
| (Mostly have) narrow leaves                | and   | (Mostly have) broad leaves                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                |  |              |                                          |     |                                                   |                     |     |                |                                            |     |                                                   |                             |     |                            |                                      |     |                                               |               |     |           |                      |     |                          |  |
| (Mostly) have parallel leaf venation       | and   | (Mostly) have net or reticulate leaf venation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                |  |              |                                          |     |                                                   |                     |     |                |                                            |     |                                                   |                             |     |                            |                                      |     |                                               |               |     |           |                      |     |                          |  |
| Fibrous roots                              | and   | Tap roots                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                |  |              |                                          |     |                                                   |                     |     |                |                                            |     |                                                   |                             |     |                            |                                      |     |                                               |               |     |           |                      |     |                          |  |
| (Mostly) endospermic                       | and   | (Mostly) non-endospermic                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                |  |              |                                          |     |                                                   |                     |     |                |                                            |     |                                                   |                             |     |                            |                                      |     |                                               |               |     |           |                      |     |                          |  |
|                                            |       | Any two                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 2(3)           |  |              |                                          |     |                                                   |                     |     |                |                                            |     |                                                   |                             |     |                            |                                      |     |                                               |               |     |           |                      |     |                          |  |
| 3 ✓ <sub>3</sub>                           |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                |  |              |                                          |     |                                                   |                     |     |                |                                            |     |                                                   |                             |     |                            |                                      |     |                                               |               |     |           |                      |     |                          |  |
| (b)                                        | (i)   | Name the part of the flower which develops into the seed.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                |  |              |                                          |     |                                                   |                     |     |                |                                            |     |                                                   |                             |     |                            |                                      |     |                                               |               |     |           |                      |     |                          |  |
|                                            |       | *Ovule                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 3              |  |              |                                          |     |                                                   |                     |     |                |                                            |     |                                                   |                             |     |                            |                                      |     |                                               |               |     |           |                      |     |                          |  |
|                                            | (ii)  | State any <b>one</b> method of seed dispersal.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                |  |              |                                          |     |                                                   |                     |     |                |                                            |     |                                                   |                             |     |                            |                                      |     |                                               |               |     |           |                      |     |                          |  |
|                                            |       | Wind <b>or</b> animal <b>or</b> self <b>or</b> water                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 3              |  |              |                                          |     |                                                   |                     |     |                |                                            |     |                                                   |                             |     |                            |                                      |     |                                               |               |     |           |                      |     |                          |  |
|                                            | (iii) | State <b>one</b> advantage to the plant of seed dispersal.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                |  |              |                                          |     |                                                   |                     |     |                |                                            |     |                                                   |                             |     |                            |                                      |     |                                               |               |     |           |                      |     |                          |  |
|                                            |       | Reduce competition <b>or</b> colonise new habitats <b>or</b> better chance of survival                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 3              |  |              |                                          |     |                                                   |                     |     |                |                                            |     |                                                   |                             |     |                            |                                      |     |                                               |               |     |           |                      |     |                          |  |
|                                            | (iv)  | State <b>one</b> advantage to the plant of dormancy.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                |  |              |                                          |     |                                                   |                     |     |                |                                            |     |                                                   |                             |     |                            |                                      |     |                                               |               |     |           |                      |     |                          |  |
|                                            |       | Allows time for dispersal <b>or</b> allows survival in unfavourable conditions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 3              |  |              |                                          |     |                                                   |                     |     |                |                                            |     |                                                   |                             |     |                            |                                      |     |                                               |               |     |           |                      |     |                          |  |
|                                            | (v)   | 1. What is meant by the term <i>germination</i> ?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                |  |              |                                          |     |                                                   |                     |     |                |                                            |     |                                                   |                             |     |                            |                                      |     |                                               |               |     |           |                      |     |                          |  |
|                                            |       | The growth of a seed into a (new) plant                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 3              |  |              |                                          |     |                                                   |                     |     |                |                                            |     |                                                   |                             |     |                            |                                      |     |                                               |               |     |           |                      |     |                          |  |
|                                            |       | 2. What name is given to the outer covering of a seed, labelled <b>A</b> ?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                |  |              |                                          |     |                                                   |                     |     |                |                                            |     |                                                   |                             |     |                            |                                      |     |                                               |               |     |           |                      |     |                          |  |
|                                            |       | *Testa                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 2              |  |              |                                          |     |                                                   |                     |     |                |                                            |     |                                                   |                             |     |                            |                                      |     |                                               |               |     |           |                      |     |                          |  |
|                                            |       | 3. Name the parts labelled <b>B</b> and <b>C</b> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                |  |              |                                          |     |                                                   |                     |     |                |                                            |     |                                                   |                             |     |                            |                                      |     |                                               |               |     |           |                      |     |                          |  |
|                                            |       | B: *Root <b>or</b> *radicle                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 2              |  |              |                                          |     |                                                   |                     |     |                |                                            |     |                                                   |                             |     |                            |                                      |     |                                               |               |     |           |                      |     |                          |  |
|                                            |       | C: *Shoot <b>or</b> *plumule                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 2              |  |              |                                          |     |                                                   |                     |     |                |                                            |     |                                                   |                             |     |                            |                                      |     |                                               |               |     |           |                      |     |                          |  |
|                                            | (vi)  | Describe the role of water during the process of germination.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                |  |              |                                          |     |                                                   |                     |     |                |                                            |     |                                                   |                             |     |                            |                                      |     |                                               |               |     |           |                      |     |                          |  |
|                                            |       | Soften <b>or</b> bursting the testa <b>or</b> takes part in chemical reactions (or metabolism) <b>or</b> acts as a solvent <b>or</b> transports materials                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 3              |  |              |                                          |     |                                                   |                     |     |                |                                            |     |                                                   |                             |     |                            |                                      |     |                                               |               |     |           |                      |     |                          |  |
|                                            | (vii) | Outline the role of a suitable temperature during the process of germination.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                |  |              |                                          |     |                                                   |                     |     |                |                                            |     |                                                   |                             |     |                            |                                      |     |                                               |               |     |           |                      |     |                          |  |
|                                            |       | Allows for optimum (or most efficient) enzyme action                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 3              |  |              |                                          |     |                                                   |                     |     |                |                                            |     |                                                   |                             |     |                            |                                      |     |                                               |               |     |           |                      |     |                          |  |
| 7 ✓ <sub>3</sub> + 3 ✓ <sub>2</sub>        |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                |  |              |                                          |     |                                                   |                     |     |                |                                            |     |                                                   |                             |     |                            |                                      |     |                                               |               |     |           |                      |     |                          |  |

| Question 14 continued                                                       |       |                                                                                                                                                                                                                                      |             |
|-----------------------------------------------------------------------------|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| (c)                                                                         | (i)   | Name <b>one other</b> substance transported by xylem.                                                                                                                                                                                |             |
|                                                                             |       | Minerals <b>or</b> named mineral                                                                                                                                                                                                     | <b>3</b>    |
|                                                                             | (ii)  | Describe <b>two</b> structural features of xylem that allows it to transport water efficiently.                                                                                                                                      |             |
|                                                                             |       | Vessels are tubular / vessels are narrow (to allow for capillary action) / continuous (or long) (throughout the plant) / pits present (to allow water movement) / lignin present (to keep vessel open) / tapered ends <b>Any two</b> | <b>2(3)</b> |
|                                                                             | (iii) | 1. Name the <b>two</b> Irish scientists who proposed this model.                                                                                                                                                                     |             |
|                                                                             |       | *(Henry) Dixon<br>*(John) Joly <b>(first correct name = 2 marks)</b>                                                                                                                                                                 | <b>2+1</b>  |
|                                                                             |       | 2. Describe the process of the cohesion-tension model of water movement in xylem.                                                                                                                                                    |             |
|                                                                             |       | Water molecules are attracted together (due to hydrogen bonding)                                                                                                                                                                     | <b>3</b>    |
|                                                                             |       | Water molecules are attracted to sides of xylem <b>or</b> adhesion of water molecules to the walls of xylem                                                                                                                          | <b>3</b>    |
|                                                                             |       | Water evaporates at the leaves <b>or</b> transpiration occurs                                                                                                                                                                        | <b>3</b>    |
|                                                                             |       | Water is pulled upwards (in a continuous column)                                                                                                                                                                                     | <b>3</b>    |
| <b>7</b> ✓ <sub>3</sub> + <b>1</b> ✓ <sub>2</sub> + <b>1</b> ✓ <sub>1</sub> |       |                                                                                                                                                                                                                                      |             |



| Question 15                         |                                               |                                                                                                                                                                                                                                                | 60           |                                               |     |                     |    |                      |      |
|-------------------------------------|-----------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|-----------------------------------------------|-----|---------------------|----|----------------------|------|
| (a)                                 | (i)                                           | What is meant by the term <i>contraception</i> ?                                                                                                                                                                                               |              |                                               |     |                     |    |                      |      |
|                                     |                                               | Prevention of fertilisation <b>or</b> prevention of pregnancy                                                                                                                                                                                  | 3            |                                               |     |                     |    |                      |      |
|                                     | (ii)                                          | State any <b>three</b> methods of contraception.                                                                                                                                                                                               |              |                                               |     |                     |    |                      |      |
|                                     |                                               | Any three correct examples                                                                                                                                                                                                                     | 3(2)         |                                               |     |                     |    |                      |      |
| 1 ✓ <sub>3</sub> + 3 ✓ <sub>2</sub> |                                               |                                                                                                                                                                                                                                                |              |                                               |     |                     |    |                      |      |
| (b)                                 | (i)                                           | Draw a large diagram of the human female reproductive system <b>and</b> label the following parts: <b>Ovary, Fallopian tube, Uterus, Endometrium, Cervix, Vagina.</b>                                                                          |              |                                               |     |                     |    |                      |      |
|                                     |                                               | Diagram: Ovary <b>and</b> Fallopian tube <b>and</b> Uterus <b>and</b> vagina all in correct locations<br><b>Any one missing = 3; two missing = 0</b>                                                                                           | 2(3)         |                                               |     |                     |    |                      |      |
|                                     |                                               | Labels: Ovary / Fallopian tube / Uterus / Endometrium / Cervix / Vagina                                                                                                                                                                        | 6(1)         |                                               |     |                     |    |                      |      |
|                                     | (ii)                                          | State any <b>one</b> role of oestrogen during the menstrual cycle.                                                                                                                                                                             |              |                                               |     |                     |    |                      |      |
|                                     |                                               | To build up (or repair) the endometrium <b>or</b> inhibit FSH production <b>or</b> stimulate LH production                                                                                                                                     | 3            |                                               |     |                     |    |                      |      |
|                                     | (iii)                                         | Name <b>one other</b> female sex hormone that is active during the menstrual cycle <b>and</b> state its precise function.                                                                                                                      |              |                                               |     |                     |    |                      |      |
|                                     |                                               | <table><tr><td>Progesterone</td><td>Maintains endometrium <b>or</b> other correct</td></tr><tr><td>FSH</td><td>Stimulate follicles</td></tr><tr><td>LH</td><td>Stimulates ovulation</td></tr></table><br><b>Name = 3; Precise function = 3</b> | Progesterone | Maintains endometrium <b>or</b> other correct | FSH | Stimulate follicles | LH | Stimulates ovulation | 2(3) |
| Progesterone                        | Maintains endometrium <b>or</b> other correct |                                                                                                                                                                                                                                                |              |                                               |     |                     |    |                      |      |
| FSH                                 | Stimulate follicles                           |                                                                                                                                                                                                                                                |              |                                               |     |                     |    |                      |      |
| LH                                  | Stimulates ovulation                          |                                                                                                                                                                                                                                                |              |                                               |     |                     |    |                      |      |
|                                     | (iv)                                          | State <b>one</b> cause of a <b>named</b> menstrual disorder.                                                                                                                                                                                   |              |                                               |     |                     |    |                      |      |
|                                     |                                               | Correctly named menstrual disorder                                                                                                                                                                                                             | 3            |                                               |     |                     |    |                      |      |
|                                     |                                               | Matching cause                                                                                                                                                                                                                                 | 3            |                                               |     |                     |    |                      |      |
| 7 ✓ <sub>3</sub> + 6 ✓ <sub>1</sub> |                                               |                                                                                                                                                                                                                                                |              |                                               |     |                     |    |                      |      |

| Question 15 (continued)                                                     |       |                                                                                                                         |                     |
|-----------------------------------------------------------------------------|-------|-------------------------------------------------------------------------------------------------------------------------|---------------------|
| (c)                                                                         | (i)   | Identify structures <b>A, B and C</b> .                                                                                 |                     |
|                                                                             |       | A: *Zygote                                                                                                              | 1                   |
|                                                                             |       | B: *Morula                                                                                                              | 1                   |
|                                                                             |       | C: *Blastocyst                                                                                                          | 1                   |
|                                                                             | (ii)  | Where in the female reproductive tract does structure <b>B</b> usually develop?                                         |                     |
|                                                                             |       | *Fallopian tube (or *oviduct)                                                                                           | 3                   |
|                                                                             | (iii) | What must happen to structure <b>C</b> to allow for further development and growth?                                     |                     |
|                                                                             |       | Implantation or described <b>or</b> (part) develops into placenta or described                                          | 3                   |
|                                                                             | (iv)  | Name the <b>three</b> germ layers <b>and</b> state <b>one</b> structure that develops from <b>each</b> layer you named. |                     |
|                                                                             |       | Ectoderm                                                                                                                | 2                   |
|                                                                             |       | Matching structure: skin <b>or</b> other correct                                                                        | 1                   |
|                                                                             |       | Mesoderm                                                                                                                | 2                   |
|                                                                             |       | Matching structure: liver <b>or</b> other correct                                                                       | 1                   |
|                                                                             |       | Endoderm                                                                                                                | 2                   |
|                                                                             |       | Matching structure: internal lining of the digestive system <b>or</b> other correct                                     | 1                   |
|                                                                             | (v)   | Infertility is the inability to produce offspring.<br>State <b>two</b> possible corrective measures for infertility.    |                     |
|                                                                             |       | In vitro fertilisation (IVF) / hormone treatment / other correct                                                        | <b>Any two</b> 2(3) |
| <b>4</b> ✓ <sub>3</sub> + <b>3</b> ✓ <sub>2</sub> + <b>6</b> ✓ <sub>1</sub> |       |                                                                                                                         |                     |

| Question 16                                                                                                                                                                                               |                                                                                                                                                     | Any two of (a), (b), (c), (d)                                                                        | 30, 30      |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|-------------|
| <b>Question 16 (a)</b>                                                                                                                                                                                    |                                                                                                                                                     |                                                                                                      | <b>30</b>   |
| <b>(i)</b>                                                                                                                                                                                                | Using diagrams <b>A</b> and <b>B</b> as an aid, explain in detail the following terms:                                                              |                                                                                                      |             |
|                                                                                                                                                                                                           | <b>1.</b>                                                                                                                                           | <i>Mitosis</i>                                                                                       |             |
|                                                                                                                                                                                                           |                                                                                                                                                     | One nucleus divides to produce two genetically identical nuclei                                      | <b>3</b>    |
|                                                                                                                                                                                                           | <b>2.</b>                                                                                                                                           | <i>Meiosis</i>                                                                                       |             |
|                                                                                                                                                                                                           |                                                                                                                                                     | One diploid (or 2n) nucleus divides to produce four haploid (or n) (or genetically different) nuclei | <b>3</b>    |
| <b>(ii)</b>                                                                                                                                                                                               | <b>1.</b>                                                                                                                                           | State a role of mitosis in multicellular organisms.                                                  |             |
|                                                                                                                                                                                                           |                                                                                                                                                     | Growth <b>or</b> repair tissues (or named tissues)                                                   | <b>3</b>    |
|                                                                                                                                                                                                           | <b>2.</b>                                                                                                                                           | State a role of meiosis in multicellular organisms.                                                  |             |
|                                                                                                                                                                                                           |                                                                                                                                                     | (Allows for) sexual reproduction <b>or</b> production of gametes                                     | <b>3</b>    |
| Due to the error in the labelling of Diagram <b>B</b> , students who attempted any part of question <b>16 (a)</b> are to be awarded the full marks for parts <b>(i)</b> and <b>(ii)</b> of this question. |                                                                                                                                                     |                                                                                                      |             |
| <b>(iii)</b>                                                                                                                                                                                              | Explain the terms <i>haploid</i> and <i>diploid</i> .                                                                                               |                                                                                                      |             |
|                                                                                                                                                                                                           |                                                                                                                                                     | Haploid: Having one copy of every chromosome.                                                        | <b>3</b>    |
|                                                                                                                                                                                                           |                                                                                                                                                     | Diploid: Having two copies of every chromosome (in the nucleus).                                     | <b>3</b>    |
| <b>(iv)</b>                                                                                                                                                                                               | Draw a diagram of a cell with a diploid number of 4, during anaphase of mitosis. Label any <b>three</b> parts that are only visible during mitosis. |                                                                                                      |             |
|                                                                                                                                                                                                           |                                                                                                                                                     | Diagram: Four pairs of chromosomes not connected                                                     | <b>3</b>    |
|                                                                                                                                                                                                           |                                                                                                                                                     | being pulled apart by spindle fibres                                                                 | <b>3</b>    |
|                                                                                                                                                                                                           |                                                                                                                                                     | Labels: Spindle (fibres) / chromosome (chromatid) / centromere / pole <b>Any three</b>               | <b>3(1)</b> |
| <b>(v)</b>                                                                                                                                                                                                | What terms describes uncontrolled mitosis and cell division?                                                                                        |                                                                                                      |             |
|                                                                                                                                                                                                           |                                                                                                                                                     | *Cancer                                                                                              | <b>3</b>    |
| <b>9</b>                                                                                                                                                                                                  |                                                                                                                                                     | <b>✓<sub>3</sub> + 3 ✓<sub>1</sub></b>                                                               |             |

| Question 16 (b)                                                             |                                                                                                                                                                                                                                                                                                                                        | 30   |
|-----------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| (i)                                                                         | Name the types of biomolecules <b>X and Y</b> shown in diagram 1 of this virus.                                                                                                                                                                                                                                                        |      |
|                                                                             | X: *Protein<br>Y: *DNA <b>or</b> *RNA <b>or</b> *nucleic acid (first correct name = 2 marks)                                                                                                                                                                                                                                           | 2+1  |
| (ii)                                                                        | State any <b>other</b> possible shape of a virus.                                                                                                                                                                                                                                                                                      |      |
|                                                                             | Rod <b>or</b> complex                                                                                                                                                                                                                                                                                                                  | 3    |
| (iii)                                                                       | Describe how the virus uses this host cell to produce a large number of viruses.                                                                                                                                                                                                                                                       |      |
|                                                                             | DNA or RNA or nucleic acid enters (the host cell) /<br>Uses host cell's nucleic acid (or DNA or RNA) <b>or</b> uses cell organelles /<br>To make viral nucleic acid (or DNA or RNA) <b>or</b> to make (viral) protein /<br>(Virus) particles assemble /<br>Viruses are released from the cell <b>or</b> (host) cell bursts<br>Any four | 4(3) |
| (iv)                                                                        | Suggest a reason why a red blood cell is not a suitable host cell for viruses.                                                                                                                                                                                                                                                         |      |
|                                                                             | (RBCs) do not contain a nucleus <b>or</b> do not contain organelles <b>or</b> explained                                                                                                                                                                                                                                                | 3    |
| (v)                                                                         | State <b>two</b> examples of harmful viruses.                                                                                                                                                                                                                                                                                          |      |
|                                                                             | Any two harmful viruses                                                                                                                                                                                                                                                                                                                | 2(3) |
| (vi)                                                                        | State <b>one</b> example of the beneficial use of viruses.                                                                                                                                                                                                                                                                             |      |
|                                                                             | Any one beneficial use of viruses                                                                                                                                                                                                                                                                                                      | 3    |
| <b>9</b> ✓ <sub>3</sub> + <b>1</b> ✓ <sub>2</sub> + <b>1</b> ✓ <sub>1</sub> |                                                                                                                                                                                                                                                                                                                                        |      |

| Question 16 (c)                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                 | 30                                          |  |            |                                            |            |                                             |                            |            |                           |  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|--|------------|--------------------------------------------|------------|---------------------------------------------|----------------------------|------------|---------------------------|--|
| (i)                                                                                                                                                                                                                                                                   | What has happened to the cell in solution A?                                                                                                                                                                                                                                                                                                                    |                                             |  |            |                                            |            |                                             |                            |            |                           |  |
|                                                                                                                                                                                                                                                                       | Lost water (by osmosis) <b>or</b> cell membrane has moved away from the cell wall                                                                                                                                                                                                                                                                               | 3                                           |  |            |                                            |            |                                             |                            |            |                           |  |
| (ii)                                                                                                                                                                                                                                                                  | Name the condition that describes the cell in solution B.                                                                                                                                                                                                                                                                                                       |                                             |  |            |                                            |            |                                             |                            |            |                           |  |
|                                                                                                                                                                                                                                                                       | *Turgid                                                                                                                                                                                                                                                                                                                                                         | 3                                           |  |            |                                            |            |                                             |                            |            |                           |  |
| (iii)                                                                                                                                                                                                                                                                 | 1. What is meant by the term <i>diffusion</i> ?                                                                                                                                                                                                                                                                                                                 |                                             |  |            |                                            |            |                                             |                            |            |                           |  |
|                                                                                                                                                                                                                                                                       | Movement of molecules from a region of high concentration to a region of low concentration <b>or</b> movement of molecules down a concentration gradient.                                                                                                                                                                                                       | 3                                           |  |            |                                            |            |                                             |                            |            |                           |  |
|                                                                                                                                                                                                                                                                       | 2. Explain in detail why osmosis is referred to as a special form of diffusion.                                                                                                                                                                                                                                                                                 |                                             |  |            |                                            |            |                                             |                            |            |                           |  |
|                                                                                                                                                                                                                                                                       | It is the movement of water across a selectively permeable membrane                                                                                                                                                                                                                                                                                             | 3                                           |  |            |                                            |            |                                             |                            |            |                           |  |
|                                                                                                                                                                                                                                                                       | 3. Why is diffusion described as passive transport?                                                                                                                                                                                                                                                                                                             |                                             |  |            |                                            |            |                                             |                            |            |                           |  |
|                                                                                                                                                                                                                                                                       | No energy is required                                                                                                                                                                                                                                                                                                                                           | 3                                           |  |            |                                            |            |                                             |                            |            |                           |  |
| (iv)                                                                                                                                                                                                                                                                  | Outline how a <b>named</b> structure in the cell in solution B helps to maintain the shape of the cell.                                                                                                                                                                                                                                                         |                                             |  |            |                                            |            |                                             |                            |            |                           |  |
|                                                                                                                                                                                                                                                                       | Named structure: Vacuole <b>or</b> cell wall                                                                                                                                                                                                                                                                                                                    | 3                                           |  |            |                                            |            |                                             |                            |            |                           |  |
|                                                                                                                                                                                                                                                                       | Vacuole fills with water <b>or</b> cell wall prevent bursting                                                                                                                                                                                                                                                                                                   | 3                                           |  |            |                                            |            |                                             |                            |            |                           |  |
| (v)                                                                                                                                                                                                                                                                   | Explain how solution B differs from solution A.                                                                                                                                                                                                                                                                                                                 |                                             |  |            |                                            |            |                                             |                            |            |                           |  |
|                                                                                                                                                                                                                                                                       | <table border="1"> <thead> <tr> <th>Solution B</th><th></th><th>Solution A</th></tr> </thead> <tbody> <tr> <td>Low solute (or named solute) concentration</td><td><b>and</b></td><td>High solute (or named solute) concentration</td></tr> <tr> <td>Higher water concentration</td><td><b>and</b></td><td>Lower water concentration</td></tr> </tbody> </table> | Solution B                                  |  | Solution A | Low solute (or named solute) concentration | <b>and</b> | High solute (or named solute) concentration | Higher water concentration | <b>and</b> | Lower water concentration |  |
| Solution B                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                 | Solution A                                  |  |            |                                            |            |                                             |                            |            |                           |  |
| Low solute (or named solute) concentration                                                                                                                                                                                                                            | <b>and</b>                                                                                                                                                                                                                                                                                                                                                      | High solute (or named solute) concentration |  |            |                                            |            |                                             |                            |            |                           |  |
| Higher water concentration                                                                                                                                                                                                                                            | <b>and</b>                                                                                                                                                                                                                                                                                                                                                      | Lower water concentration                   |  |            |                                            |            |                                             |                            |            |                           |  |
|                                                                                                                                                                                                                                                                       | Any one                                                                                                                                                                                                                                                                                                                                                         | 3                                           |  |            |                                            |            |                                             |                            |            |                           |  |
| (vi)                                                                                                                                                                                                                                                                  | Suggest what might happen to an animal cell if it was placed in solution B.                                                                                                                                                                                                                                                                                     |                                             |  |            |                                            |            |                                             |                            |            |                           |  |
|                                                                                                                                                                                                                                                                       | Swell <b>or</b> burst                                                                                                                                                                                                                                                                                                                                           | 3                                           |  |            |                                            |            |                                             |                            |            |                           |  |
| (vii)                                                                                                                                                                                                                                                                 | Foods can be preserved using different solutions. Which solution (A <b>or</b> B) is most suitable to be used in food preservation? Explain your answer.                                                                                                                                                                                                         |                                             |  |            |                                            |            |                                             |                            |            |                           |  |
|                                                                                                                                                                                                                                                                       | *A                                                                                                                                                                                                                                                                                                                                                              | 2                                           |  |            |                                            |            |                                             |                            |            |                           |  |
|                                                                                                                                                                                                                                                                       | Micro-organisms (or named example) lose water (by osmosis) <b>or</b> shrivel <b>or</b> die                                                                                                                                                                                                                                                                      | 1                                           |  |            |                                            |            |                                             |                            |            |                           |  |
| 9  + 1  + 1  |                                                                                                                                                                                                                                                                                                                                                                 |                                             |  |            |                                            |            |                                             |                            |            |                           |  |

| Question 16 (d)                     |                                                                                                                                                                                         | 30   |
|-------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| (i)                                 | Name the kingdom to which yeast belong.                                                                                                                                                 |      |
|                                     | *Fungi                                                                                                                                                                                  | 3    |
| (ii)                                | Name the type of asexual reproduction shown in the diagram.                                                                                                                             |      |
|                                     | *Budding                                                                                                                                                                                | 3    |
| (iii)                               | Identify <b>one</b> advantage of asexual reproduction.                                                                                                                                  |      |
|                                     | Fast <b>or</b> only one parent <b>or</b> less complex <b>or</b> maintains favourable traits                                                                                             | 3    |
| (iv)                                | Copy the diagram <b>into your answerbook and</b> label any <b>three</b> parts.                                                                                                          |      |
|                                     | Any three parts correctly labelled                                                                                                                                                      | 3(1) |
| (v)                                 | Micro-organisms, such as yeasts, can be grown in the laboratory. Precautions such as <u>asepsis</u> and <u>sterility</u> should be taken. Explain <b>both</b> underlined terms clearly. |      |
|                                     | Asepsis: Free from pathogens.                                                                                                                                                           | 3    |
|                                     | Sterility: Free from ( <b>all</b> micro-)organisms.                                                                                                                                     | 3    |
| (vi)                                | Name <b>one other</b> species you have studied that is a member of the same kingdom as yeast.                                                                                           |      |
|                                     | <i>Rhizopus</i>                                                                                                                                                                         | 3    |
| (vii)                               | State how the process of asexual reproduction you named at part (ii) above differs in the species you named at part (vi) above.                                                         |      |
|                                     | Uses spores (or sporulation)                                                                                                                                                            | 3    |
| (viii)                              | Name <b>one other</b> unicellular organism you have studied <b>and</b> the kingdom to which it belongs.                                                                                 |      |
|                                     | Name: <i>Amoeba</i> <b>or</b> bacteria                                                                                                                                                  | 3    |
|                                     | Kingdom: Protista <b>or</b> Monera (must match named organism)                                                                                                                          | 3    |
| 9 ✓ <sub>3</sub> + 3 ✓ <sub>1</sub> |                                                                                                                                                                                         |      |

| Question 17                                                                               |                                                                                                                                       | Any two of (a), (b), (c), (d) | 30, 30      |
|-------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|-------------|
| <b>Question 17 (a)</b>                                                                    |                                                                                                                                       |                               | <b>30</b>   |
| <b>(i)</b>                                                                                | Identify <b>each</b> type of blood vessel, <b>X</b> and <b>Y</b> .                                                                    |                               |             |
|                                                                                           | X: *Arteriole                                                                                                                         |                               | <b>2</b>    |
|                                                                                           | Y: *Venule                                                                                                                            |                               | <b>2</b>    |
| <b>(ii)</b>                                                                               | Explain the following terms:                                                                                                          |                               |             |
|                                                                                           | <b>1.</b> <i>Blood pressure</i>                                                                                                       |                               |             |
|                                                                                           | The force the blood exerts on the walls of blood vessels (or named blood vessel)                                                      |                               | <b>3</b>    |
|                                                                                           | <b>2.</b> <i>Pulse</i>                                                                                                                |                               |             |
|                                                                                           | (Rhythmic) expansion (and contraction) of arteries                                                                                    |                               | <b>3</b>    |
| <b>(iii)</b>                                                                              | How does the blood pressure change as blood flows in the direction indicated on the diagram?                                          |                               |             |
|                                                                                           | *Decreases                                                                                                                            |                               | <b>3</b>    |
| <b>(iv)</b>                                                                               | Draw labelled diagrams of a vein <b>and</b> an artery <b>and</b> a capillary to clearly show the structural differences between them. |                               |             |
|                                                                                           | Diagram of vein: thin wall <b>and</b> large lumen                                                                                     |                               | <b>2</b>    |
|                                                                                           | Diagram of artery: thick wall <b>and</b> small lumen                                                                                  |                               | <b>2</b>    |
|                                                                                           | Diagram of capillary: wall one cell thick                                                                                             |                               | <b>2</b>    |
|                                                                                           | Labels: muscle wall / lumen / valve / endothelium <b>Any two</b>                                                                      |                               | <b>2(1)</b> |
| <b>(v)</b>                                                                                | Name the type of vessel that is also present in capillary network that absorbs the excess tissue fluid around the cells.              |                               |             |
|                                                                                           | *Lymph (vessel)                                                                                                                       |                               | <b>3</b>    |
| <b>(vi)</b>                                                                               | Describe the effects of the following factors on the circulatory system:                                                              |                               |             |
|                                                                                           | <b>1.</b> Exercise                                                                                                                    |                               |             |
|                                                                                           | Correct matching effect described                                                                                                     |                               | <b>3</b>    |
|                                                                                           | <b>2.</b> Diet                                                                                                                        |                               |             |
|                                                                                           | Correct matching effect described                                                                                                     |                               | <b>3</b>    |
| <b>6</b> ✓ <sub>3</sub> <b>+</b> <b>5</b> ✓ <sub>2</sub> <b>+</b> <b>2</b> ✓ <sub>1</sub> |                                                                                                                                       |                               |             |

| Question 17 (b)                     |                                                                                                                           | 30 |
|-------------------------------------|---------------------------------------------------------------------------------------------------------------------------|----|
| (i)                                 | Copy the diagram into your answerbook and sketch and label each of the named structures below in their correct locations. |    |
| 1.                                  | A sweat gland: Sketch in correct location <b>and</b> labelled                                                             | 3  |
| 2.                                  | A hair: Sketch in correct location <b>and</b> labelled                                                                    | 3  |
| (ii)                                | Name the <b>two</b> main components of sweat.                                                                             |    |
|                                     | *Water                                                                                                                    | 2  |
|                                     | *Salt                                                                                                                     | 2  |
| (iii)                               | In warm conditions, sweat is produced.<br>Describe how this helps to regulate body temperature.                           |    |
|                                     | Water evaporates from surface of skin                                                                                     | 2  |
|                                     | Using body heat                                                                                                           | 2  |
|                                     | Cools body down                                                                                                           | 2  |
| (iv)                                | State <b>and</b> explain how hair on the skin contributes to temperature regulation in cold conditions.                   |    |
|                                     | State: Hair stands up <b>or</b> piloerection                                                                              | 2  |
|                                     | Explain: Traps air                                                                                                        | 2  |
|                                     | Insulates                                                                                                                 | 2  |
| (v)                                 | Explain the term <i>endotherm</i> .                                                                                       |    |
|                                     | An animal that can generate its own heat <b>or</b> an animal that can regulate (or control) its own temperature           | 3  |
| (vi)                                | What name is given to the ability of organisms to maintain a constant internal environment?                               |    |
|                                     | *Homeostasis                                                                                                              | 3  |
| (vii)                               | State <b>one</b> reason why it is important for organisms to maintain a constant internal environment.                    |    |
|                                     | So enzymes (or metabolism) can work efficiently <b>or</b> described                                                       | 2  |
| 4 ✓ <sub>3</sub> + 9 ✓ <sub>2</sub> |                                                                                                                           |    |



| Question 17 (c)                                                             |                                                                                                                                                                                                    | 30   |
|-----------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| (i)                                                                         | Explain the term <i>excretion</i> .                                                                                                                                                                |      |
|                                                                             | Removal of the waste products of metabolism from the body (or cells or organisms)                                                                                                                  | 3    |
| (ii)                                                                        | 1. Draw a large diagram of the human urinary system labelling the following parts:<br><b>Kidney; Ureter; Bladder, Urethra</b>                                                                      |      |
|                                                                             | Diagram: Kidney <b>and</b> ureter <b>and</b> bladder <b>and</b> urethra all in correct locations<br>(One missing or incorrect location = 3 marks)<br>(Two missing or incorrect location = 0 marks) | 2(3) |
|                                                                             | Labels: Kidney / Ureter / Bladder / Urethra                                                                                                                                                        | 4(1) |
|                                                                             | 2. <b>On the diagram you have drawn</b> , place an arrow to clearly show the pathway of urine flowing through the ureter.                                                                          |      |
|                                                                             | Correct arrow showing pathway of urine (through the ureter)                                                                                                                                        | 2    |
| (iii)                                                                       | 1. What name is given to this structure?                                                                                                                                                           |      |
|                                                                             | *Nephron                                                                                                                                                                                           | 2    |
|                                                                             | 2. Name the parts labelled <b>A and B</b> .                                                                                                                                                        |      |
|                                                                             | A: *Bowman's capsule                                                                                                                                                                               | 2    |
|                                                                             | B: *Loop of Henle                                                                                                                                                                                  | 2    |
|                                                                             | 3. Outline what happens in <b>each</b> part labelled <b>A and B</b> during urine production.                                                                                                       |      |
|                                                                             | A: Filtration (of small molecules) <b>or</b> described                                                                                                                                             | 3    |
|                                                                             | B: Reabsorption of water <b>or</b> reabsorption of ions (or salts) <b>or</b> described                                                                                                             | 3    |
| (iv)                                                                        | Under normal conditions, there is no protein in urine.<br>State a reason for its absence from urine.                                                                                               |      |
|                                                                             | (Protein) is too big to be filtered or described                                                                                                                                                   | 3    |
| <b>6</b> ✓ <sub>3</sub> + <b>4</b> ✓ <sub>2</sub> + <b>4</b> ✓ <sub>1</sub> |                                                                                                                                                                                                    |      |

| Question 17 (d)                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                     | 30   |
|-----------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| (i)                                                                         | Name the fluid found in the central canal.                                                                                                                                                                                                                                                                                                                                                                          |      |
|                                                                             | *Cerebrospinal (fluid)                                                                                                                                                                                                                                                                                                                                                                                              | 2    |
| (ii)                                                                        | 1. Name the protective tissue <b>Y</b> surrounding the spinal cord that has three layers.                                                                                                                                                                                                                                                                                                                           |      |
|                                                                             | *Meninges                                                                                                                                                                                                                                                                                                                                                                                                           | 2    |
|                                                                             | 2. Name <b>one other</b> structure that protects the spinal cord.                                                                                                                                                                                                                                                                                                                                                   |      |
|                                                                             | *Vertebrae                                                                                                                                                                                                                                                                                                                                                                                                          | 2    |
| (iii)                                                                       | Name the regions of the spinal cord labelled <b>P</b> and <b>Q</b> .                                                                                                                                                                                                                                                                                                                                                |      |
|                                                                             | <b>P:</b> *White matter                                                                                                                                                                                                                                                                                                                                                                                             | 2    |
|                                                                             | <b>Q:</b> *Grey matter                                                                                                                                                                                                                                                                                                                                                                                              | 2    |
| (iv)                                                                        | 1. Draw a large diagram of a neuron.                                                                                                                                                                                                                                                                                                                                                                                |      |
|                                                                             | Diagram: Dendrites <b>and</b> cell body with a nucleus <b>and</b> axon<br>(One missing = 3 marks; two missing = 0 marks)                                                                                                                                                                                                                                                                                            | 2(3) |
|                                                                             | 2. <b>On your diagram</b> label the following parts:<br><b>Axon; Dendrite; Myelin sheath</b>                                                                                                                                                                                                                                                                                                                        |      |
|                                                                             | Axon / Dendrite / Myelin sheath                                                                                                                                                                                                                                                                                                                                                                                     | 3(1) |
|                                                                             | 3. <b>On your diagram</b> indicate with an arrow the direction of travel of an impulse.                                                                                                                                                                                                                                                                                                                             |      |
|                                                                             | Arrow from dendrite towards axon <b>or</b> away from the cell body                                                                                                                                                                                                                                                                                                                                                  | 2    |
| (v)                                                                         | Describe the mechanism of a reflex action.                                                                                                                                                                                                                                                                                                                                                                          |      |
|                                                                             | Receptor detects stimulus <b>or</b> impulse (or message) generated (at receptor) /<br>(Impulse) travels along sensory neuron /<br>Passes to an interneuron <b>or</b> to the CNS (or grey matter) /<br>Passes to motor neuron /<br>Passes to the effector <b>or</b> effector reacts <b>or</b> muscle contracts<br><br><b>Any three</b><br><b>If 'impulse' or 'message' is not mentioned, award a maximum of 2(3)</b> | 3(3) |
| <b>5</b> ✓ <sub>3</sub> <b>+ 6</b> ✓ <sub>2</sub> <b>+ 3</b> ✓ <sub>1</sub> |                                                                                                                                                                                                                                                                                                                                                                                                                     |      |



