



Coimisiún na Scrúduithe Stáit
State Examinations Commission

Leaving Certificate Examination 2026
Agricultural Science

Higher Level

Monday 15 June Afternoon 2:00 - 4:30

300 marks

Examination Number

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Date of Birth

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For example, 3rd February
2005 is entered as 03 02 05

Centre Stamp

Instructions

There are **two** sections to this examination.

It is recommended that you spend about 50 minutes on Section **A** and 100 minutes on Section **B**.

Section A Answer **ten** questions from this section. There is internal choice in **four** questions.
Each question carries 10 marks.

Section B Answer any **four** questions from this section. There is internal choice in **two** questions.
Each question carries 50 marks.

Write your Examination Number and your Date of Birth in the boxes on the front cover.

Write your answers in blue or black pen. You may use pencil for sketches, graphs and diagrams only.

Write your answers in the spaces provided to all parts of the examination into this answerbook.

This answerbook will be scanned and your work will be presented to an examiner on screen.
Anything that you write outside of the answer areas may not be seen by the examiner. You are not required to use all the space provided.

There is extra space at the end of Section **A** and at the back of the booklet. Label any extra work clearly with the question number and part.

Section A

100 marks

Answer any **ten** questions.
Each question carries 10 marks.

Question 1

Irish weather conditions can prove a challenge to crop production, resulting in shorter working windows and the need to use large machines.

Analyse the photograph and answer the questions that follow.



- (a) Briefly explain with reason **one** way the machine above is environmentally friendly.

Way:
Reason:

- (b) Identify **one** negative for using this large machine.

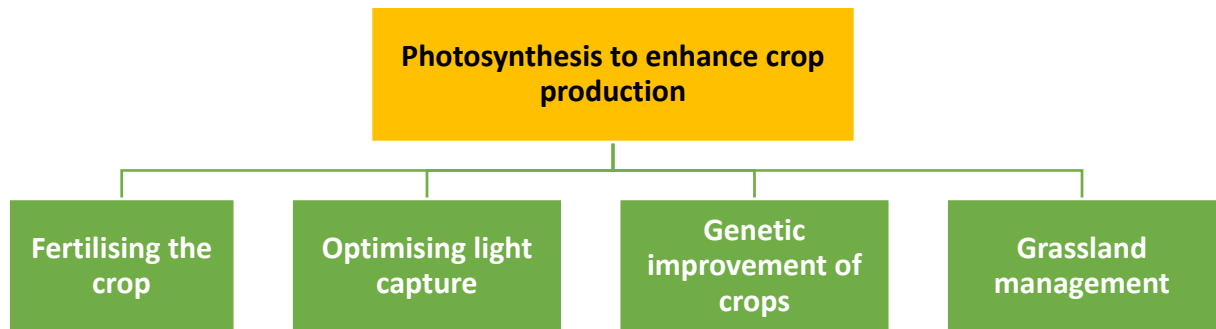
Question 2Answer **either** (a) **or** (b).**(a)** Photosynthesis is fundamental to agriculture.**(i)** Outline the role of **two** named plant structures in photosynthesis.

Named plant structure	Role in photosynthesis
1.	
2.	

(ii) Briefly describe **one** role photosynthesis contributes to the carbon cycle.

Or

- (b) Discuss how the knowledge of photosynthesis is used to enhance crop production on Irish farms. In your answer, refer to **any three** of the following:



Question 3Answer **either** (a) **or** (b).

- (a) Teagasc have confirmed the first reported case of a field population of Italian ryegrass which has proven resistant to the chemical herbicide glyphosate.

Italian ryegrass is already a major challenge on some Irish tillage farms, with some populations resistant to selective herbicides used in crops.

(Adapted from Teagasc, 2025)



- (i) Explain the underlined term.

- (ii) Outline why Italian ryegrass would be a challenge on Irish tillage farms.

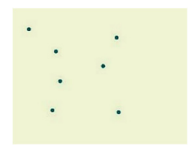
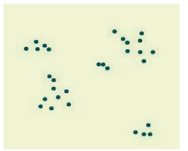
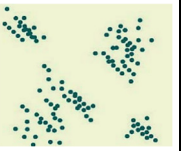
- (iii) Describe **two** ways farmers could control weeds on tillage farms without the use of herbicides.

1.
2.

Or

- (b) Sarah has identified wild oats as a weed in her ripe barley field as shown in the photograph below. She carried out an assessment close to harvest using a scorecard to determine the extent of the problem.

Analyse the information and answer the questions that follow.

Weed Score Card			
Weed score	1	2	3
Weed map			

(Adapted from Teagasc, 2025)



- (i) Using the weed score card above, determine the weed score (1 - 3) in Sarah's field shown in the photograph below and justify your answer.



Score:
Justification:

- (ii) Advise suitable weed control measures Sarah could implement on her farm.

Question 4

As the calving season progresses on dairy farms, the risk of milk fever and metabolic issues increases.

This is because later-calving cows tend to be older and are at high risk of being too high in body condition due to longer days dry.

Attention to detail on feeding dry cow minerals may also have slipped, as the farm is now very busy with calves, milking and grassland management.



(Adapted from Farmers Journal, 2025)

- (a) Explain the underlined term.

- (b) Describe **one** clinical sign or symptom of milk fever in cows.

- (c) The mineral content of a dry cow diet is designed to be low in calcium, in order to allow the cow mobilise her own calcium reserves.

Name **one** other mineral added to the diet of dry cows and give a reason for its inclusion in the diet.

Named mineral:
Reason for inclusion:

Question 5

Lameness is one of the most costly and challenging issues in dairy farming, costing on average €8,750 per annum for a 100-cow herd in 2024.

Artificial intelligence (AI) powered smart technology has emerged which uses camera and vision technology to assess and monitor cows' movement and can detect early signs of lameness.



(a) Outline **two** causes of lameness in dairy cows.

1.
2.

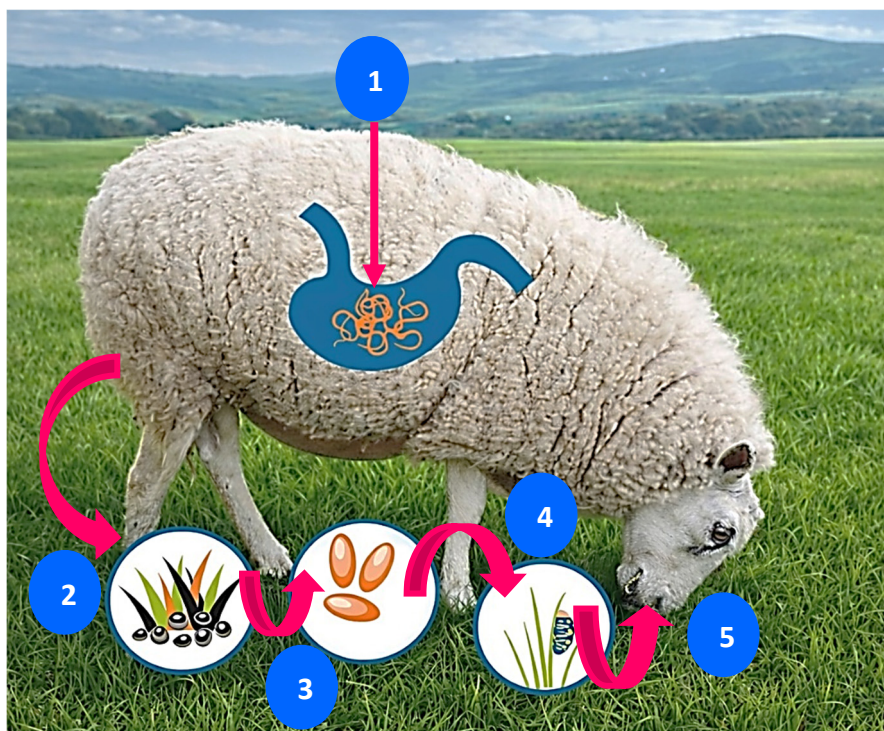
(b) Outline **one**-way lameness can be prevented.

(c) Explain why lameness is costly on dairy farms.

Question 6

Answer **either** (a) **or** (b).

- (a) A relatively new challenge on Irish farms is the blood sucking Barber's Pole worm. It is very efficient at reproducing, with faecal egg counts in excess of 5,000 eggs per gram, in a short period of time. Symptoms in animals are very like those of liver fluke. The picture shows the lifecycle of the worm. Analyse the picture and answer the questions that follow.



1	Larvae develop to mature worms; adult females lay eggs
2	Eggs pass in faeces
3	Eggs hatch and free-living larvae develop
4	Larvae develop and migrate up blades of grass
5	Grazing sheep ingest infective larvae

- (i) Explain the underlined term.

- (ii) Identify whether the parasite is an endoparasite or ectoparasite by placing a tick (✓) in the correct box.

Endoparasite	
Ectoparasite	

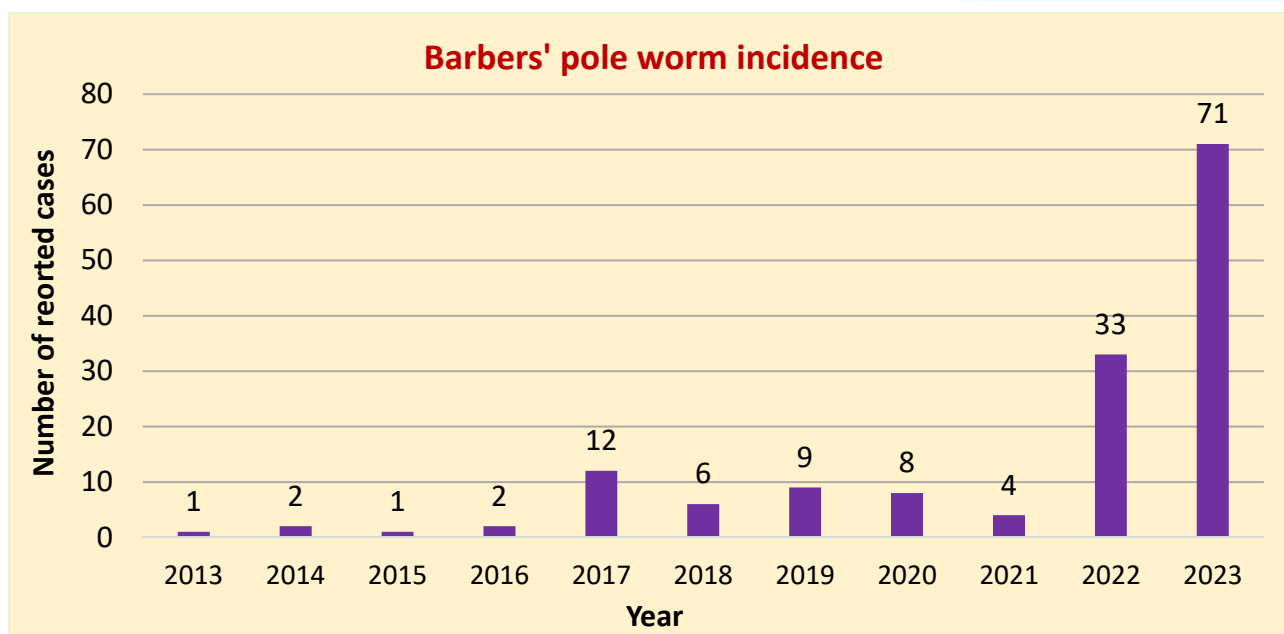
- (iii) Apart from chemical control, outline **two** ways a farmer could control or prevent this worm spreading.

1.
2.

Or

- (b) The Barber's pole worm is normally found in warm climates. Incidence from the Regional Veterinary Lab (RVL) have shown it in Ireland with the highest number of cases in the southeast and midlands.

Analyse the graph and answer the questions that follow.



(Adapted from Irish Farmers Journal, 2025)

- (i) Identify the trend in incidence of the worm on Irish farms.

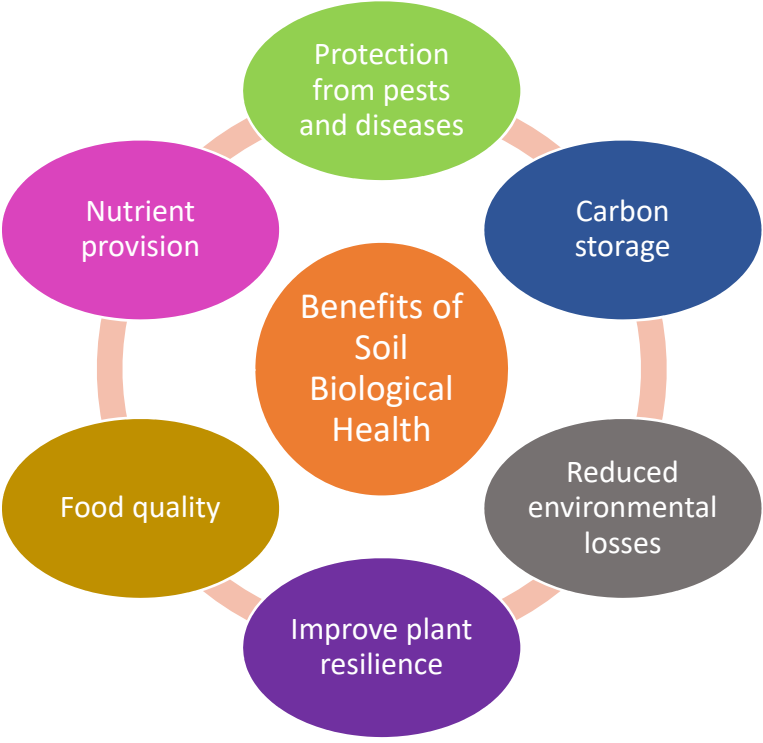
- (ii) Outline **one** reason for the trend identified in part (i) above.

- (iii) Anthelmintic resistance is becoming an issue in its control. Outline **two** practices a farmer could follow to reduce the risk of anthelmintic resistance developing.

1.
2.

Question 7

Good soil biology is essential for agricultural productivity and ecosystem health. Improving soil’s biological health is a very important aspect of all farming. Analyse the diagram and answer the questions that follow.



Outline how **any four** benefits can improve agricultural productivity and/or ecosystem health.

Question 8

A farmer is considering introducing a new beef breed (Breed A) to cross with their dairy cows (Breed B) towards the end of the breeding season to improve beef efficiency on their farm.

(a) Identify breed **A** and **B**.

A



B



--	--

(b) Compare the production traits of breed **A** and **B** under the following headings:

	A	B
Growth / milk yield performance		
Temperament		

Question 9

A student set up an investigation to compare the drainage rate of 50 g of three different soil samples, sand, clay and loam.



(a) State why this investigation is a fair test.

(b) Predict the result the student would observe from this investigation.

(c) Using your predicted result from part (b), identify with reason which soil type would be most suitable for a crop production enterprise.

Soil type:
Reason:

Question 10

During a farm walk, a farmer was asked to identify the three plants **A**, **B** and **C** found in the field.

(a) Identify any **two** of the plants **A**, **B**, and **C**.

A



B



C



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(b) The farmer accidentally bought uncertified seed containing a high percentage of weed seeds. Explain **two** risks this poses to productivity and sustainability on his farm.

1.
2.

Question 11Answer **either** (a) **or** (b).**(a)** A farmer is building new winter housing for beef cattle.**(i)** Outline with reason **two** features of good animal housing that promote animal health and welfare.

Feature	Reason
1.	
2.	

(ii) Explain how poor housing design can negatively affect the following:

Animal performance	
Farmer safety	

Or

- (b) (i) Calculate the straw bedded floor space required for 40 finishing bulls, if the recommended space per head allowances are:

Floor space (per head)	Straw bed: 4.0 m ²
	Slatted house: 2.5 m ²

Calculation:

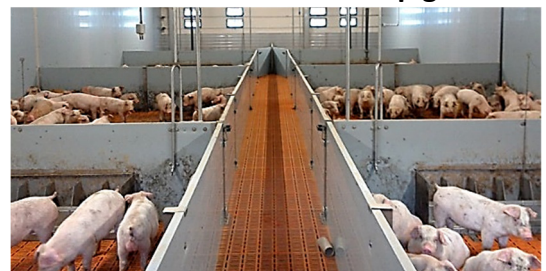
- (ii) The cattle shed was 170 m² divided into two pens.
Based on your answer in part (i), describe how the farmer would manage the housing of his finishing bulls to ensure they reach their target slaughter weight.

- (iii) Due to financial constraints, the farmer is considering converting an old slatted pig house shown in the pictures, for beef cattle housing.
- Evaluate **one** potential problem with repurposing housing designed for pigs to accommodate cattle.

Outside pig house



Inside pig house



Question 12

Alice is a sheep and beef farmer. She is planning to expand into pig production and wants high performance for her pig herd.

Using knowledge of sheep and beef production, answer the questions that follow.



- (a) Suggest **two** desirable traits the farmer might select when breeding pigs.

1.
2.

- (b) Explain how hybrid vigour could improve the performance in a pig herd.

- (c) Outline **one** genetic risk of relying heavily on pedigree breeding in animals.

[illegible]

Section B

200 marks

Answer any **four** questions.
Each question carries 50 marks.

Question 13

Dermot and Pauline are mixed tillage and sheep farmers in Co. Galway. They are planning on reseeding 10% of their 70-hectare farm and are preparing a nutrient management plan (NMP) before reseeding the grassland field.



- (a) (i) Identify the meaning of a nutrient management plan by placing a tick (✓) in the correct box.

Plan to measure nutrient outputs on a farm	
Blueprint for managing nutrient inputs and applications across the farm	
Plan to measure nutrient inputs on a farm	

- (ii) Explain how each of the following soil properties affects grass establishment:

Phosphorus (P)	
Potassium (K)	

- (b) (i) Explain *flocculation* and outline why it is important for soil structure.

Flocculation:
Importance:

(ii) Describe how soil pH **and** calcium influence flocculation in soils.

(iii) Describe with the aid of a labelled diagram an investigation to show flocculation in a sample of soil.

Labelled diagram:

--

- (c) Pauline carried out a soil test in two areas planned for grassland reseeding and she compared her data with the reference soil index shown in the tables below. Analyse the results and answer the questions that follow.

Reference soil P and K index system			
Index	P (mg/L)	K (mg/L)	Response to fertiliser
1	0 – 3.0	0 – 3.0	Definite
2	3.1 – 5.0	3.1 – 6.0	Likely
3	5.1 – 8.0	6.1 – 10.0	Unlikely
4	>8.0	>10.0	None

(Adapted from Teagasc, 2020)

Pauline's soil results				
Field	pH	P Index	K Index	Organic matter %
A	5.2	1	2	3.0
B	6.6	3	3	6.0

- (i) Compare the fertility status of Field A and Field B.

- (ii) Recommend appropriate management for each field to improve or maintain fertility.

Field A:
Field B:

Question 14

Answer both (a) **and** (b) with **either** (c) **or** (d).

Beef farmers Dylan and Margaret are aiming to improve the sustainability and profitability of their suckler-to-beef enterprise. Based on a visit from their local Teagasc advisor they were advised to:



- Improve soil fertility and drainage
- Establish a perennial ryegrass–clover sward for finishing cattle
- Increase daily live weight gain (DLG) while reducing chemical nitrogen inputs
- Ensure animal health, welfare, and safe farm practices.

Using this advice answer the questions that follow.

- (a) (i) Identify why clover is included in the sward for the finishing cattle, by placing a tick (✓) in the correct box.

Clover prevents nitrogen entering the soil	
Clover absorbs large amounts of chemical nitrogen fertiliser	
Clover fixes atmospheric nitrogen and makes it available to the soil	

- (ii) Explain why maintaining soil pH is critical for clover establishment and grass growth.

- (iii) Outline **two** ways Dylan and Margaret can ensure safe practices on the farm.

1.
2.

- (b) (i) Using your knowledge of ruminant digestion, explain how clover can increase live weight gain in the beef finishing cattle.

- (ii) Outline with reason **one** risk of grazing high-clover swards for beef cattle.

Risk:
Reason:

- (iii) Outline **two** management practices to maintain clover in a grass–clover sward under grazing conditions.

1.
2.

- (iv) Identify the average recommended clover inclusion rate in grassland swards by placing a tick (✓) in the correct box.

Clover inclusion rate	
10%	
20%	
50%	

(c) Clover seeds can be over-sown into established swards in a number of ways as shown in the photographs **A** and **B** below.

(i) Identify method **A** or **B** and explain to a group of farmers how clover seeds can be sown using this method.

A



B



Named method:

(ii) Identify the ideal post-grazing height of the sward at time of over-sowing by placing a tick (✓) in the correct box.

Post grazing height	
≤ 4cm	
≥ 8cm	
≥ 5cm	

Or

- (d) Describe with the aid of a labelled diagram, how a student could carry out an investigation to isolate and grow bacteria from the root nodules of a clover plant.



Labelled diagram:

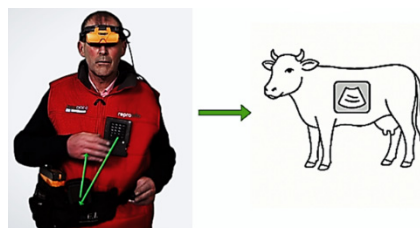
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Question 15

(a) Read the article and answer the questions that follow.

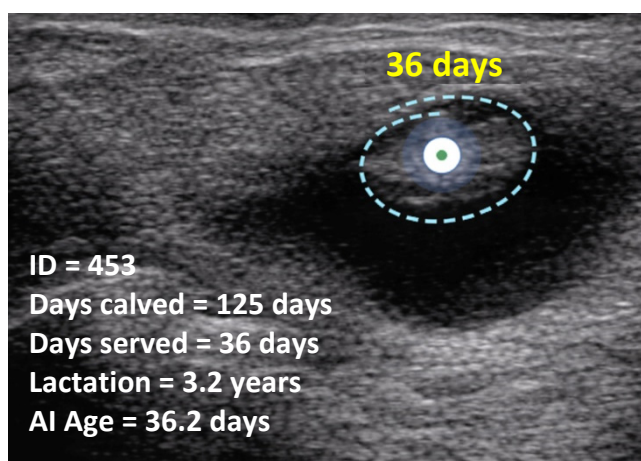
Artificial Intelligence (AI) tools are revolutionising farming

The 2025 innovation award winner at the National Ploughing Championships is a technology which utilises AI to give real-time information on cow scanning. This AI-powered reproductive intelligence allows for smarter scanning and AI-enhanced reproductive status of animals in seconds.



Benefits include:

- Identification of empty cows, stage of cycle and twin pregnancies
- Ageing pregnancies
- Cows suitable for sexed semen
- Due dry-off and calving dates
- Improved dry cow management
- 10% reduction in replacement rate.



(Adapted from Agriland and RTÉ, 2025)

(i) Identify how long the cow ID number 453 is in calf.

--

(ii) Identify the lactation number of the cow.

--

(iii) Comment on the accuracy of the AI age of this foetus.

(iv) Outline the importance of identifying twin pregnancies in cows.

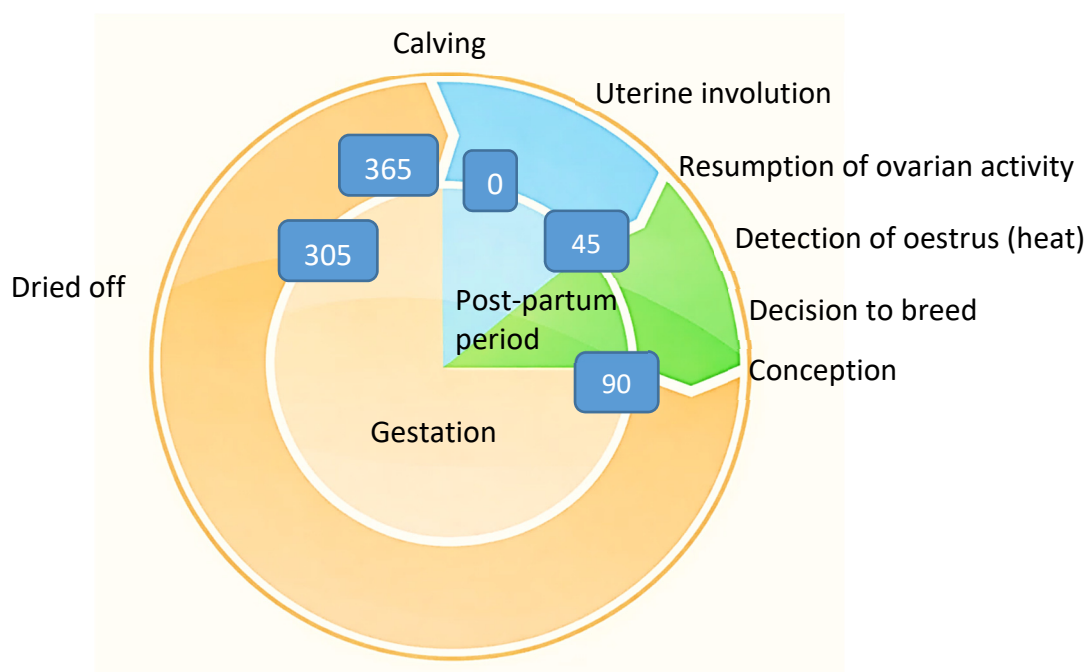
- (v)** Explain how an accurate reproductive status can improve dry cow management for next calving and breeding season.

- (b) (i)** Draw a labelled diagram of a cow's reproductive system.

Labelled diagram:

--

- (ii) In order to ensure maximum profitability is achieved targets need to be met. Using the diagram below, identify **X**, **Y** and **Z** days in the passage.



In order to maximise the profitability of a cattle farm, the aim is to produce one calf every **X** days.

After calving, 45 days are necessary in order to ensure effective uterine involution (uterus to shrink back to normal size). At this stage, the cow must have shown a resumption of ovarian activity. She can be served from the 50th day onwards and then conception must take place before the 90th day.

Since gestation lasts for around **Y** days, the breeder has only **Z** days in which to ensure that the cow is fertilised, i.e., two or three potential periods of heat.

X=

Y=

Z=

- (iii) Based on an expected calving date of the 1st February, state what date a dairy cow should be dried off.

--

- (iv) Briefly explain the importance of heat detection in the reproductive cycle of dairy cows.

Question 16

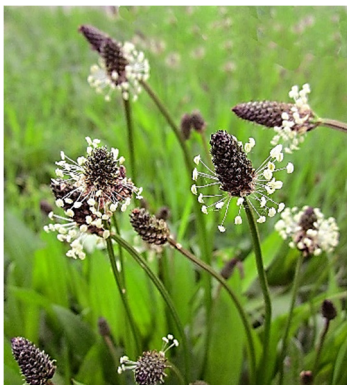
Answer both (a) **and** (b) with **either** (c) **or** (d).

Silage is a key winter feed for dairy cows in Ireland. High-quality silage depends on grass variety, growth stage at cutting, and proper storage.

- (a) (i) Describe **three** stages of grass growth and identify the ideal growth stage for cutting.

- (ii) Identify plants **A**, **B** and **C** that farmers could sow in a multi-species sward.

A



B



C



--	--	--

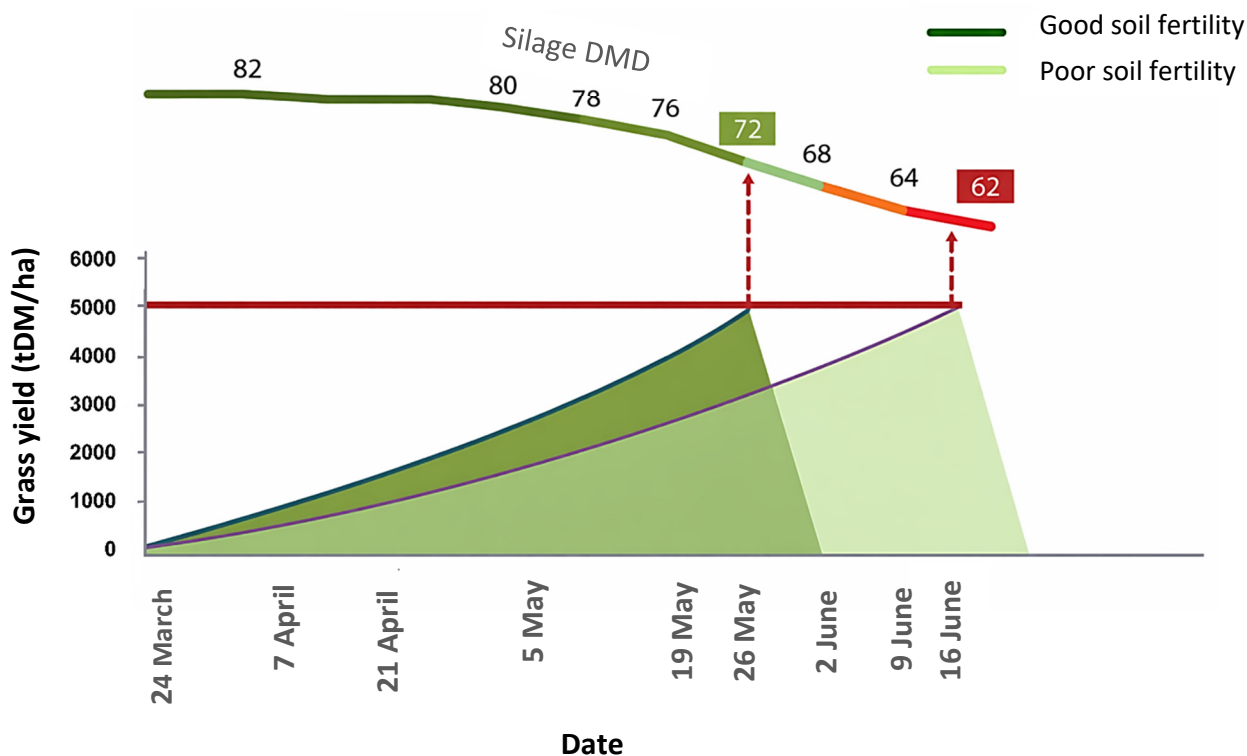
(iii) Outline **one** purpose of including plant **B** from part (ii) in a multi-species sward.

(iv) Identify whether a multi-species sward is a monoculture or polyculture sward by placing a tick (✓) in the correct box

Monoculture	
Polyculture	

(v) State with reason if farmers should graze grass in spring to 4cm prior to closing grass for silage.

(b) Soil fertility affects the quality of silage.
Analyse the graph and answer the questions that follow.



- (i) Outline how the fertility of the soil affects the yield and quality of silage.

- (ii) If the target yield is 5 tonnes Dry Matter (DM) per ha, identify at what date each soil type will reach this target.

Soil Type	Date
Good soil fertility	
Poor soil fertility	

- (iii) Outline the conclusion you make based on the results in part (ii).

- (c) Outline **one** reason why silage might spoil and how it can be prevented.

Reason	Prevention

Or

- (d) State **two** advantages of bailed silage on a sheep farm.

Question 17

In a standard suckling to beef system Teagasc over the years has set the target of producing a 400 kg steer carcase at two years of age. The table below shows the performance targets that need to be reached throughout the lifetime of a spring born suckled steer to achieve this.

Analyse the data and answer the questions that follow.

Stage	Age	Target live weight	Average Daily Gain (ADG)
Birth		X	
Weaning / housing (1 st Winter)	8 months (240 days)	315 kg	1 st Summer = 1.1 kg
Spring turnout (2 nd Summer)	12 months (365 days)	380 kg	1 st Winter = 0.5 kg
Housing (2 nd Winter)	19 months (570 days)	580 kg	2 nd Summer = ?
Slaughter	24 months (730 days)	780 kg	2 nd Winter = 1.1 kg

(Adapted from Teagasc, 2022)

- (a) (i) State the target live weight X in the table above.

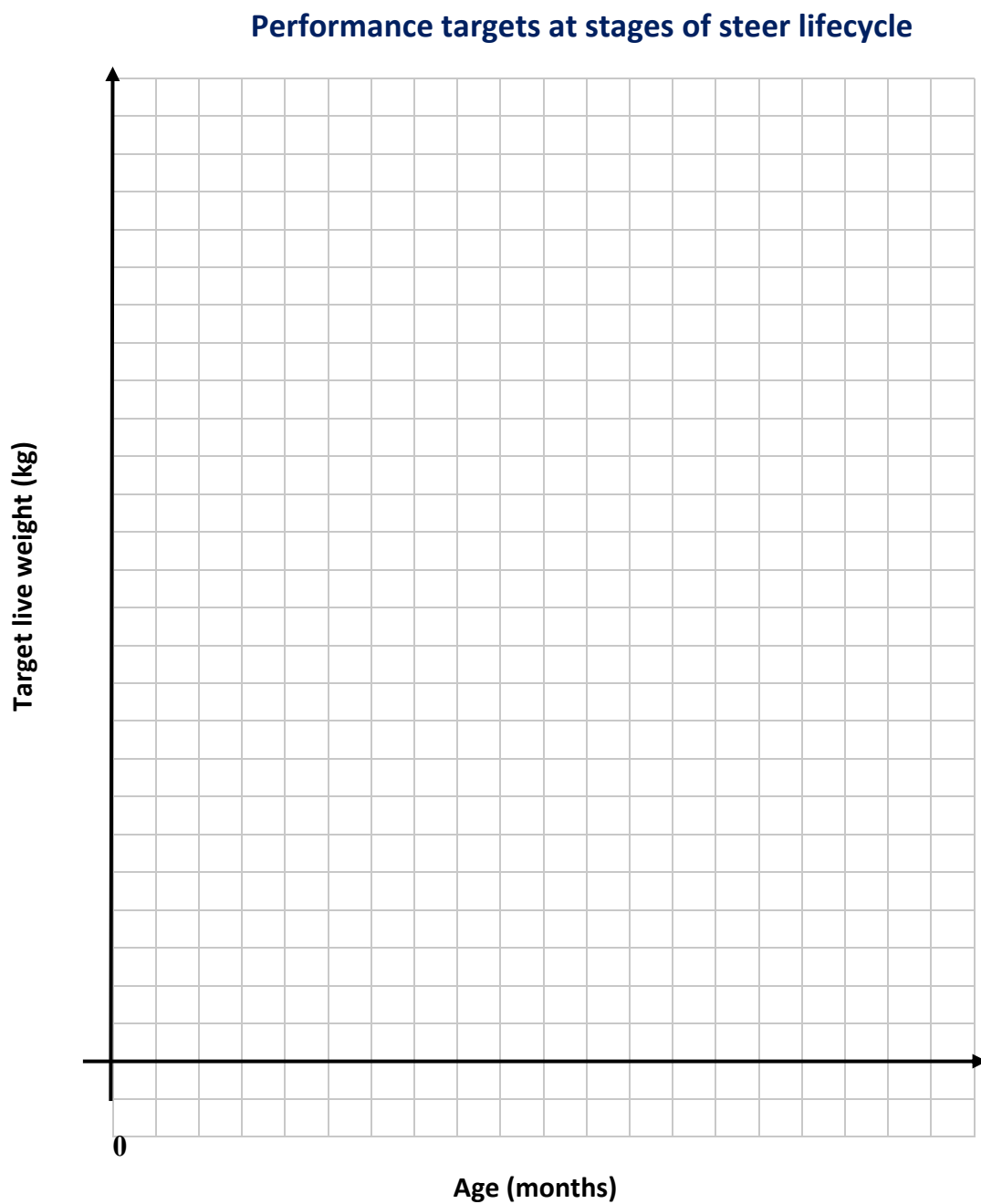
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- (ii) Calculate the ADG for the animal during its 2nd Summer.

Calculation:

- (iii) Explain why there is a difference in ADG during the different stages.

- (iv) Using the data in the table, plot a graph showing the trend in target live weight over the lifecycle of the animal.



- (v)** Outline the consequences for the profitability and/or environmental footprint of the beef production system, if performance targets are not achieved.

- (b)** Ireland is internationally recognised for producing high-quality food from grass-based systems. Over 90% of Irish beef and dairy products come from animals raised on pasture.

- (i)** Explain how Ireland's climate and agricultural practices support grass-based farming.

- (ii) In relation to grass-fed beef identify whether the following statements are true or false by placing a tick (✓) in the correct box.

The first one has been done as an example.

		True	False
Example	More consistent flavour and tenderness	☒	☐
a	High in fat	☐	☐
b	Lower in omega-3 fatty acids	☐	☐
c	Higher levels of CLA (Conjugated Linoleic Acid)	☐	☐
d	Lower in beta-carotene	☐	☐

- (iii) Outline **two** reasons why food traceability and origin labelling are important to consumers of Irish meat and dairy.

1.
2.

Question 18

Plant and animal breeding play a vital role in improving the productivity, sustainability, and profitability of Irish agriculture.

(a) Compare progeny testing and performance testing.

Progeny testing	Performance testing

(b) (i) A dairy farmer selects cows with high milk yield and good fertility.
Explain how selective breeding and genetic improvement benefit the herd over several generations.

(ii) Describe how a recording system (e.g. Irish Cattle Breeding Federation (ICBF) for cattle and Department of Agriculture, Food and Marine (DAFM) for variety lists for plants) helps farmers make genetic decisions.

(iii) State genetic traits of importance in:

Animal breeding	
Plant breeding	

- (c) The table below shows two varieties of wheat.
Analyse the data and answer the questions that follow.

Variety	Disease resistance	Yield (t/ha)	Maturity (Days)
Wheat A	High	8.1	115
Wheat B	Moderate	8.9	124

- (i) Which variety would you recommend for an early-harvest system with low chemical input?

- (ii) Justify your choice in part (i) above, with **two** reasons.

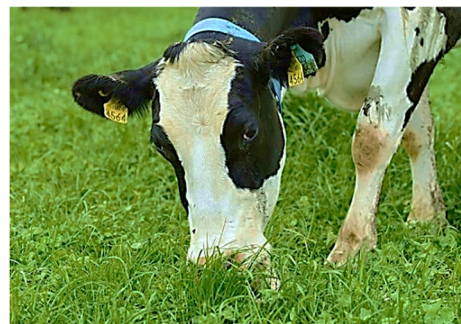
1.
2.

- (iii) Explain how genetic traits in plants **or** animals can help farmers respond to soil conditions.

- (d) 'Genocells' is a new emerging technology available for genotyped dairy herds. Bulk milk samples were tested with an accuracy of 90 – 98% for Somatic Cell Count (SCC).

Together with milk recording, this allows for better management of SCC throughout the lactation period.

(Adapted from Teagasc, 2025)

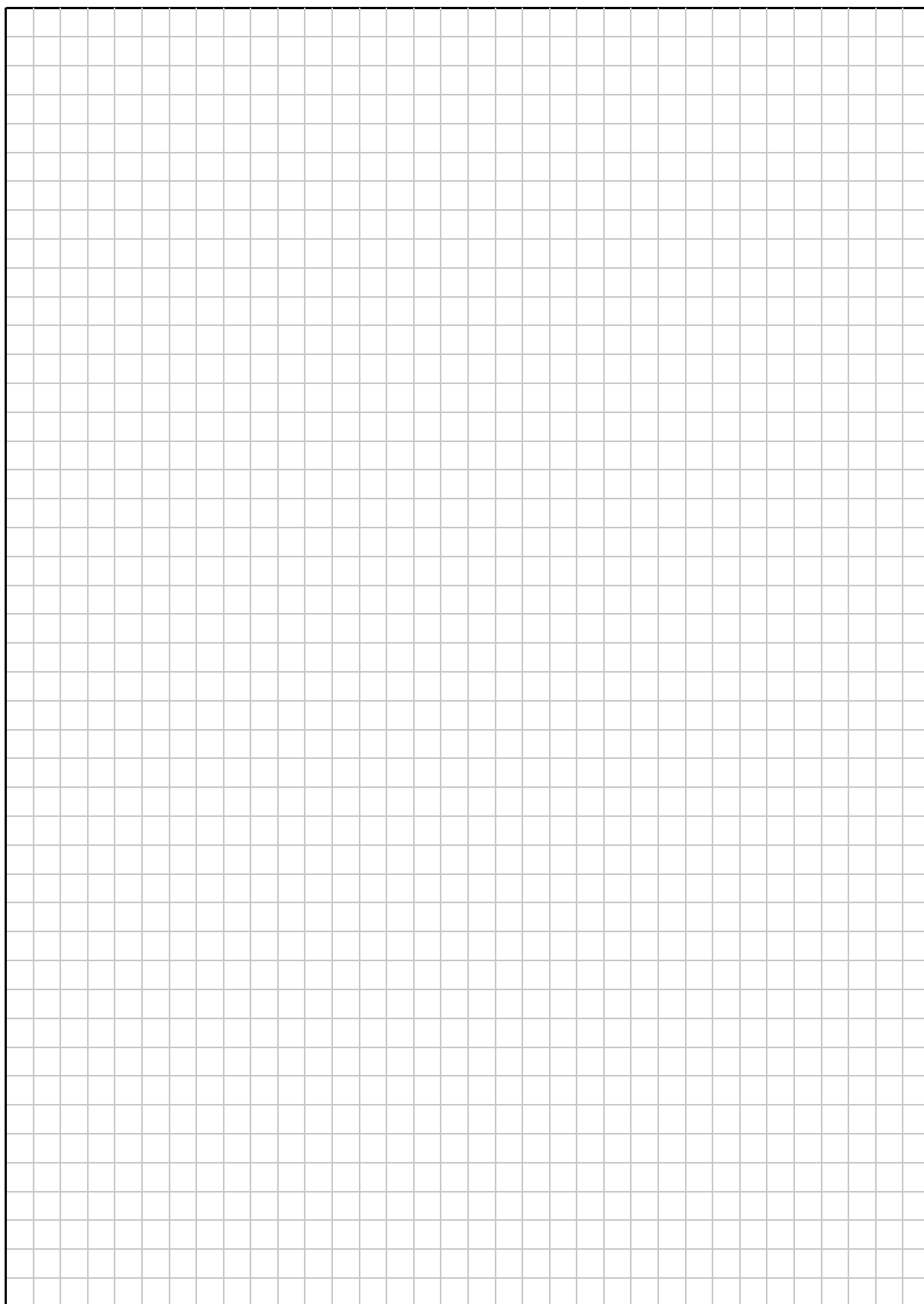


- (i) Explain the underlined term.

- (ii) Explain how the better management of SCC throughout the lactation period can benefit farmers.

[illegible]

Additional graph paper.
Label all work clearly with the question number and part.



Acknowledgements

Image(s)

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Text

Page 6	<i>First confirmed case of glyphosphate-resistant grass weed in Irish cropping systems.</i> Teagasc, 15 April, 2025.
Page 28	<i>Tipperary agritech company Herdwatch wins enterprise Ireland's innovation arena award.</i> https://www.rte.ie/news/business/2025/0917/1533883-2025-enterprise-ireland-innovation-arena-awards/ 17 September 2025

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Leaving Certificate – Higher Level

Agricultural Science

Monday 15 June

Afternoon 2:00 - 4:30