



Coimisiún na Scrúduithe Stáit
State Examinations Commission

Leaving Certificate 2026

Marking Scheme

Technology

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.

The table below contains information about annotations used for marking throughout the examination paper.

Annotation	Use	Marks (if applicable)
✓ ₁	Valid information	1
✓ ₂	Valid information	2
✓ ₃	Valid information	3
✓ ₄	Valid information	4
✓ ₆	Valid information	6
✓ ₈	Valid information	8
✓	Surplus information seen by examiner	N/A
0	Incorrect answer	0
⋈	Page seen by examiner/ information not valid	N/A

Section A.

Answer **any twelve** questions. All questions carry 6 marks.

72 marks

1. Dublin Airport has launched phase one of its onsite solar farm, resulting in more than 20% of the airport's annual electricity needs coming from renewable solar energy by 2030.

Outline **one** environmental benefit and **one** economic benefit of Dublin Airport's investment in its onsite solar energy farm.

Environmental:

Reduced Dependence on Non-Renewable Energy, cleaner energy production, utilisation of unused land around airport, etc.

Economic:

Reduced electricity costs, revenue from underutilised land, protection from rising energy prices, etc.



(6 marks, 3 + 3)

2. Underwater treadmills are exercise machines designed for use in water, typically in a pool or a self-contained tank.

Outline **two** challenges associated with the design of underwater treadmills.

- **Waterproofing**
- **Corrosion resistance**
- **Risk of electrocution etc.**



(6 marks, 3 + 3)

3. Calculate the voltmeter reading (V) in the circuit shown.

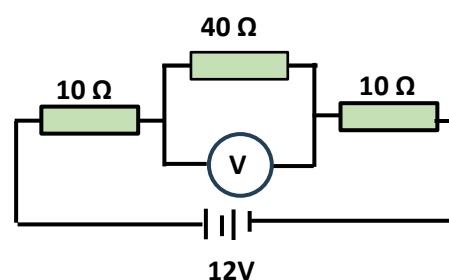
$$\begin{aligned} V_{out} &= (V_{in} \times R_2) / (R_1 + R_2 + R_3) \\ &= (12 \times 40) / (10 + 40 + 10) \\ &= 480 / 60 \\ &= 8V \end{aligned}$$

OR

$$R_{\text{total}} = 10 + 40 + 10 = 60 \, \Omega$$

$$I = V/R = 12/60 = 0.2 \text{ amp}$$

$$\text{Voltage across } 40 \, \Omega = I \times R = 0.2 \times 40 = 8 \text{ V}$$



(6 marks)

4. Kopper Kreations is an award winning Irish company that hand-makes products such as the elegant duo candelabra using mostly reclaimed and recycled copper plumbing pipe and fittings.

- (i) State **two** properties of copper that make it a suitable material for the duo candelabra.

Will bend into shape easily, has an attractive colour that will polish well, can be joined effectively using readily available joints or soldering, etc.



- (ii) Outline a suitable method for joining the copper parts.

Copper can be soldered using a torch, soldering wire or stick. The copper is cleaned using a flux, heat applied and solder introduced forming the joint as it cools.

(6 marks, 4 + 2)

5. Companies use shock-absorbing polymer foam to ensure safe transport of fragile products.

- (i) Name **one** shock absorbing polymer.

Polyurethane foam, expanded polystyrene (EPS), neoprene etc.



- (ii) Outline **two** other properties of these polymers that make them suitable as packing materials.

Foamed polymers will add volume to the materials, can be moulded into shape, lightweight, impact resistant, etc.

(6 marks, 2 + 4)

6. Cybersecurity is vital in an increasingly digital world.

- (i) Outline the cyber safeguarding method of two-factor authentication (2FA).

Two-factor authentication is a login process that requires two forms of authentication to verify access. These include SMS codes, authenticator Apps, push notifications, biometrics, etc.



- (ii) Outline **two** features of a strong password.

A strong password is at least 16 characters, unique, and uses a mix of uppercase/lowercase, letters, numbers, and symbols e.g. Eo1]54@%>`\$jB@*G

(6 marks, 2 + 4)

7. Many brands engage in a cycle of fast fashion resulting in planned obsolescence of garments.

(i) Outline **two** characteristics of fast fashion.

Trend driven products, low quality, low cost, lose shape easily, mass produced etc.

(ii) Explain what is meant by the term planned obsolescence in relation to clothing.

Refers to the deliberate design and marketing of garments to have a short lifespan—both physically and stylistically—to encourage frequent replacement.



(6 marks, 4 + 2)

8. Use **two** graphic techniques to enhance the representation of the cordless drill shown.



Two graphic techniques demonstrated

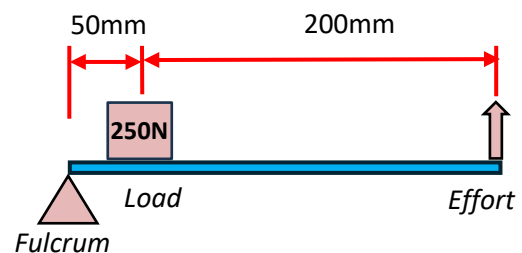
(6 marks 3 + 3)

9. Machine systems can create a mechanical advantage. This is represented by the lever shown.

(i) The lever is static. Calculate the effort required, if the load exerts 250 N on the lever.

Calculation:

$$\begin{aligned}
 F \times D &= \text{Effort} \times D \\
 250 \times 50 &= \text{Effort} \times 250 \\
 12500 &= \text{Effort} \times 250 \\
 \text{Effort} &= 12500/250 \\
 \text{Effort} &= 50 \text{ N}
 \end{aligned}$$



(ii) Calculate the mechanical advantage of the lever shown.

$$\text{M.A.} = \frac{\text{Load}}{\text{Effort}} = \frac{250}{50} = 5$$

(6 marks, 4 + 2)

10. A jigsaw can be used to make straight and curved cuts in a range of materials.

- (i) Outline the type of motion that describes the cutting action of the blade in the jigsaw shown.

Reciprocating motion: a repeated motion up and down.

- (ii) State **two** safety precautions to be observed when using a jigsaw.

Hands to be kept away from the moving blade, blades only to be changed with the machine unplugged, avoid using excessive force when cutting, etc.

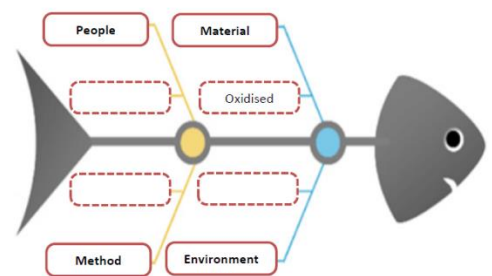


(6marks, 4 + 2)

11. A team uses a cause and effect (fishbone) diagram to explore identified problems. Four cause categories used for analysing poor-quality soldering on circuit boards for an electronic company are shown below.

For each cause identified, name **one** element that contributes to that cause.

People: **Unskilled, in-experienced**
Method: **Materials available, quality of tools**
Environment: **Low Light level, limited space**



Suggested elements, other viable answers accepted.

(6 marks, 2 + 2 + 2)

12. Self-healing paint is a type of smart material coating that can automatically repair minor scratches or damage without any human intervention.

- (i) Explain what is meant by the term smart material.

Materials that alter their properties (shape, colour, viscosity, etc.) in a controlled, reversible manner in response to external stimuli.



- (ii) Describe, with applications, **two** external stimuli that might be used in smart materials.

Piezoelectrical materials - electrical charge when mechanically stressed.

Thermochromic materials change colour with temperature change, used for glass.

Photochromatic materials change colour in response to light.

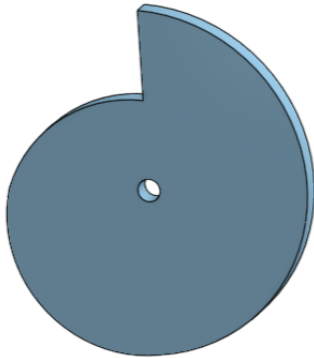
Shape memory alloys return to original shape when heated.

Self-healing materials repair faults e.g. self-healing concrete, etc.

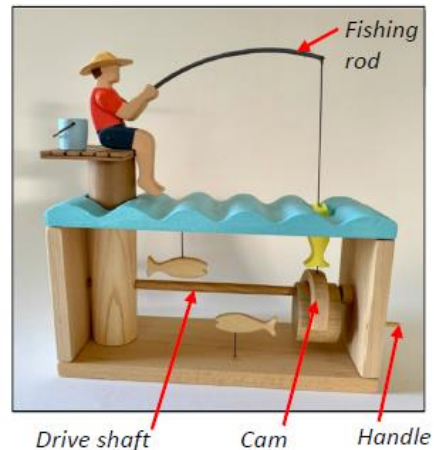
(6 marks, 2 + 4)

13. An animated model of a fishing scene is shown. The fishing rod will rise slowly, and then drop quickly, as the handle turns and the cam rotates.

In the box below, sketch a suitable cam profile shape that will generate the required motion of the fishing rod. **Note:** The black dot represents the centre of the drive shaft.



Snail or drop cam



(6 marks)

14. A smart vacuum cleaner has a power rating of 1500 watts. It is used for 1 hour every day, at an electricity cost of 34.64 cent per kilowatt-hour.

- (i) Calculate the weekly cost of electricity to operate the vacuum cleaner.

$$7 \times 34.64 \times 1.5 = 363.72 = \text{€}3.64$$

- (ii) Describe the function of any **two** sensors used in a smart vacuum cleaner.

LiDAR – creates efficient pathways.

Camera – identify and avoid objects.

Optical encoders – will track distances travelled.

Gyroscope and accelerometers – measure robot orientation, tilt and acceleration.

IR sensors – detects objects.

Ultrasonic sensors – measures distance to objects.

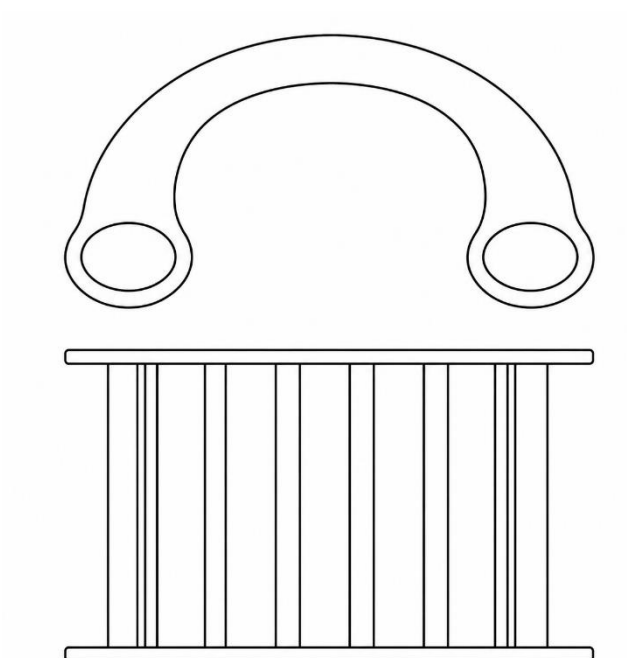
Thermistor – monitor temperature to avoid overheating.

Current sensor – monitors battery usage.



(6 marks, 4 + 2)

15. Sketch a front elevation and a plan of the child's climbing arch shown.



(6 marks, 3 +3)

*Suggested Solution:
Any valid alternative solution accepted.*

Section B - Core

Answer Question 2 AND Question 3

48marks

Question 2 - Answer 2(a) and 2(b)

(a) - 8 marks, (b) - 10 marks, (c) OR (d) - 6 marks

- 2(a) (i) State **two** advantages of using 3D printing technology for construction compared to traditional methods.
3D printing is a fast construction method, it allows intricate curved designs to be achieved more easily, it can incorporate service ducts, less wastage of materials, etc.
- (ii) Discuss **two** potential challenges of adopting 3D printing for the widespread construction of houses in Ireland.
Machines are very expensive, setting up is complex, traditional wall-building is one of the most efficient parts of construction for the straight walls used in most construction, incorporating gaps for windows and doors is a challenge, etc.

(8 marks, 4 + 4)

- 2(b) (i) Describe, using annotated sketches, a mechanical means of raising and lowering the 3D printer head platform.

Suggested solution:

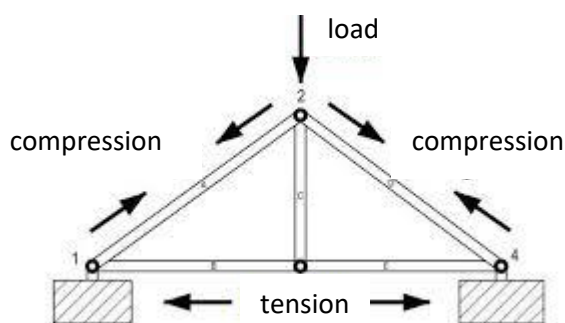
platform



The print head can be placed on a platform which will raise and lower using stepper motors for strong and precise movement.

Rack and Pinion, pinion driven by stepper motor.

- (ii) Outline **one** benefit of using a gantry frame structure in the construction of houses.
Reduces construction time on repetitive lifting tasks, reduced injury risk, can carry heavy loads efficiently, can customise for individual projects, etc.
- (iii) Explain, using annotated sketches, what is meant by the term *triangulation* in a frame structure.
**Reinforces a frame structure to increase rigidity, stability and strength.
The load is spread downward along their sides.**



(10 marks, 4 + 2 + 4)

Answer 2(c) **or** 2(d)

- 2(c) (i)** Suggest **two** industries that might use standards developed by the NSAI.

Construction, manufacturing, electrical, healthcare, etc.

- (ii)** Using 3D printed houses as an example, distinguish between *perceived quality* and *performance* as dimensions of quality.

Perceived quality is the customers perception of the quality of a product, it can be influenced by brand name, price, sales and marketing.

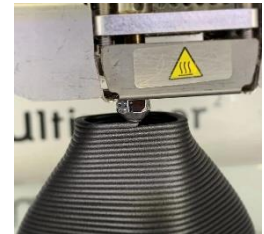
Performance relates to the primary operating characteristics with a focus on functionality and technical specifications.

(6 marks, 2 + 4)

OR

- 2(d) (i)** Describe, using annotated sketches, 3D printing as an additive manufacturing process.

A process that creates three-dimensional objects by depositing materials -such as plastic, metal, or resin - layer upon layer based on a digital CAD model.



- (ii)** Explain how 3D printing can have a positive impact on the environment.

Limited waste of material while manufacturing.

Components are designed to have hollow shells to minimise material use.

Feasible to manufacture individual complex products without additional equipment.

Products can be made in single units rather than fitting a range of parts together.

Transport costs can be reduced as designed parts can be transferred electronically and produced in any location.

(6 marks, 4 + 2)

Question 3 - Answer 3(a) and 3(b)

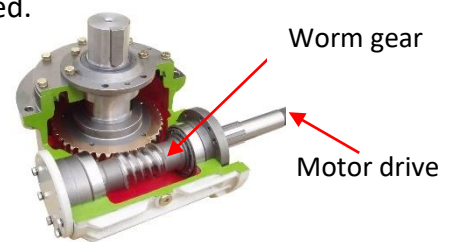
(a) - 8 marks, (b) - 10 marks, (c) OR (d) - 6 marks

- 3(a) (i)** Outline **two** advantages of the Celtic Interconnector for Ireland and France.
Potential expansion of renewable sources of power, expanded power capacity, reduction on reliance on gas for power generation, etc.
- (ii)** Explain the importance of conductive materials and insulation materials in the HVDC cable.
Conductive materials carry electricity through copper or aluminium cable. Insulators prevent current from flowing and will prevent current escaping in cables through their plastic insulative cover.

(8 marks, 4 + 4)

- 3(b) (i)** Describe, using annotated sketches, an electro-mechanical means of driving the rotating carousel slowly to allow the cable to be laid on the seabed.

The rotating carousel can be driven by a ring gear or worm gear drive mechanism, this will give the required controlled slow movement.



- (ii)** Calculate how many houses (average annual usage of 3,500 kWh per house) could be served by the 700 MW of available power.

$$700\text{MW} = 700,000 \text{ kWh}$$

$$(700,000 \times (365 \times 24)) / 3,500 = 1.752,000 \text{ houses} \quad \mathbf{1.75 \text{ Million homes.}}$$

- (iii)** State **two** reasons for the loss of some power in long-distance transmission cables.
Presence of joints, loss through heat and environmental factors, material impurities, length of cable etc.

(10 marks, 4 + 4 + 2)

Answer 3(c) or 3(d)

- 3(c) (i)** Differentiate, with applications, between AC and DC.
Alternating Current (AC) periodically reverses direction and fluctuates in voltage, ideal for long-distance transmission and household power.
Direct Current (DC) flows steadily in one direction with constant voltage, crucial for electronics, battery storage and solar panels. AC is easily transformed to higher/lower voltages, whereas DC offers stable, precise power.
- (ii)** Outline the energy conversions that take place in tidal energy generation.
Tidal generation converts kinetic energy to mechanical energy to electrical energy. A dam system converts potential energy to mechanical energy.

(6 marks, 4 + 2)

OR

- 3(d)** Describe the environmental impact of large-scale transportation of goods by air (planes), land (trucks), and sea (ships) in terms of carbon emissions and pollution.

	Carbon emissions	Pollution
Air transport	Approx. 2% of global CO ₂ emissions generating 500g of CO ₂ per tonne-km. The most carbon intensive option.	Nitrogen oxides, sulfate and soot are emitted at high altitudes impact on clouds and global warming.
Land transport	Approx 7% of global CO ₂ emissions, generating 150g of CO ₂ per tonne-km. There is an increase in emissions from heavy-duty trucks.	Major source of nitrogen oxide and fine particulate matter. This contributes to poor air quality. Noise pollution in urban areas is increasing.
Sea transport	Over 90% of global trade uses shipping, it generates 10g of CO ₂ per tonne-km.	Uses high sulfur fuel which contributes to pollution. Causes water pollution through illegal discharges and operational releases.

(6 marks, 2 + 2 + 2)

Section C - Options *Answer any one of the five optional questions. 40 marks*

Option 1 - Applied Control Systems

(a) - 10 marks, (b) - 16 marks, (c) OR (d) - 14 marks

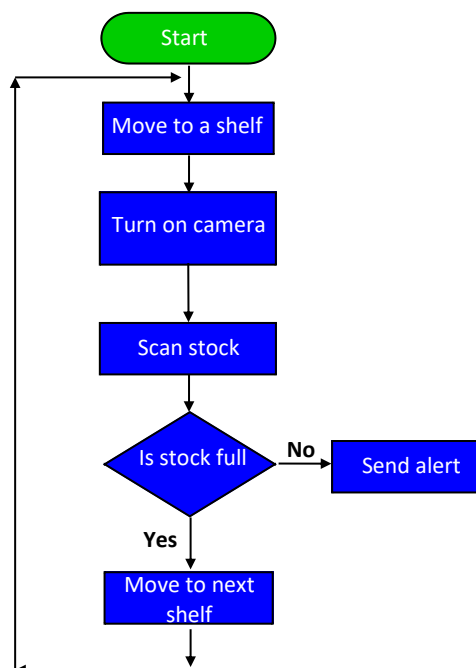
Answer 1(a) **and** 1(b)

- 1(a) (i) Suggest **three** benefits of using robots in the retail industry
Promotes operational efficiency, precision inventory monitoring, reduced labour costs, warehousing can be optimized through precise picking and packing, can enhance customer experience through consistent customer service, promotes real-time analytics of products, etc.

- (ii) Explain the term computer vision.
A form of AI where machines are trained to interpret through image recognition and object detection.

(10 marks, 6 + 4)

- 1(b) (i) Draw the flowchart:



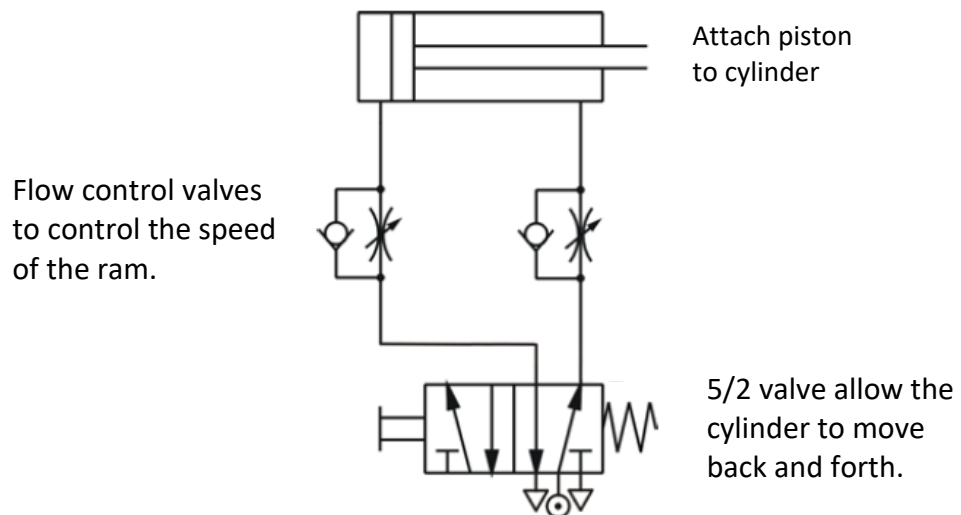
Suggested solution,
Alternatives accepted:

- (ii) Describe **two** sensors integrated into the robot to allow safe navigation in a busy shop.
LiDAR scanners can map and detect objects in real-time and adjust movement. Vision cameras can distinguish humans from objects. Ultrasonic sensors use sound waves to detect obstacles even in low visibility. Infrared sensors for collision avoidance.
- (iii) Discuss how customer privacy can be safeguarded when programming robots.
A 'privacy by design' approach is implemented to include minimizing data collection, data processing locally, using strong encryption techniques with regular review of processes and data retention policies.

(16 marks, 10 + 4 + 2)

Answer 1(c) **or** 1(d)

- 1(c) (i) Outline **two** reasons for the use of pneumatic control in compactor systems.
Pneumatic systems offer a clean, reliable and cost-effective system for generating the linear force to compress waste. Automation of the system is easy which is particularly suitable for maintenance.
- (ii) Draw a pneumatic circuit diagram to control the movement of the piston used to compact the cardboard.



(14 marks, 6 + 8)

OR

- 1(d) (i) Explain, with applications, the use of collaborative robots (cobots) in industry.

Cobots are industrial robots designed to operate safely with human workers. Examples of their use include loading and unloading ,CNC moulding and other machines without human intervention, assembly of parts, welding, packaging and quality inspection.

- (ii) Outline the importance of the *working envelope* of a cobot on employee safety.

This is the total space a robot arm or mechanism can reach and operate within. This is particularly important for cobot use where humans can interact with robots. Employees must be aware of working envelope to avoid impact, crushing and trapping hazards .

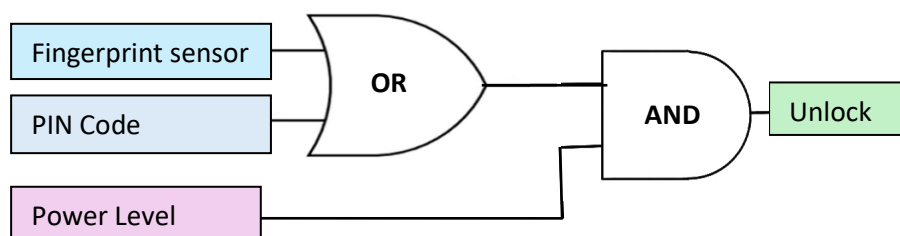
(14 marks, 8 + 6)

Option 2 - Electronics and Control

(a) - 10 marks, (b) - 16 marks, (c) OR (d) - 14 marks

Answer 2(a) **and** 2(b)

2(a) (i) Draw a logic circuit that represents the unlocking of the phone.



Suggested solution,
Alternatives accepted:

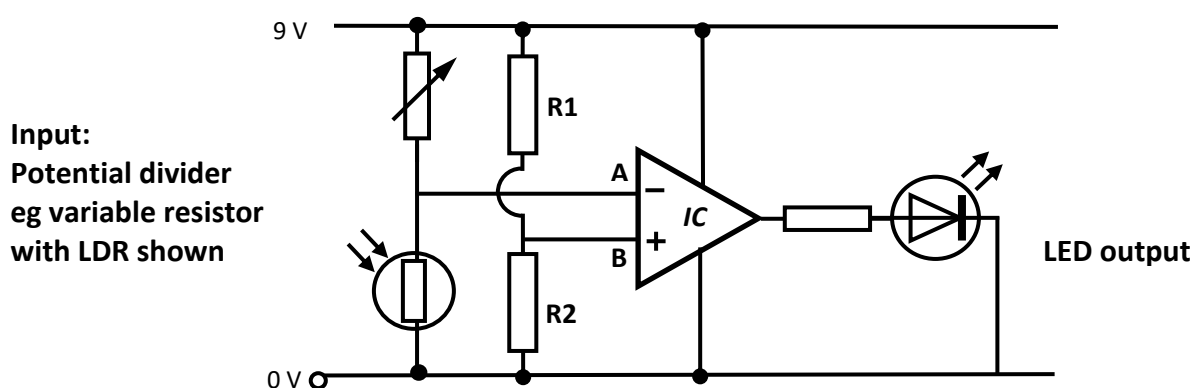
(ii) Compile a truth table for this logic circuit.

Fingerprint sensor	PIN Code	Power Level	Unlock
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	1
1	1	0	0
1	1	1	1

(10 marks, 6 + 4)

2(b) (i) Describe, with applications, the use of op-amps in modern mobile devices.
Op-amps are commonly used to amplify signals, filter noise and regulate power.
Op-amps are used in mobile audio systems to act as headphone amplifiers and microphone signal convertors.

(ii) Redraw and complete the op-amp circuit diagram shown for use as a voltage comparator.



- (iii) The battery has a capacity of 3000 mAh, and it discharges at an average hourly rate of 150 mA. Calculate the time to fully discharge the battery.

$$3000/150 = 20 \text{ hours.}$$

(16 marks, 4 + 8 + 4)

Answer 2(c) **or** 2(d)

- 2(c) Explain the purpose of **each** of the following circuit protection components:

Circuit breaker: **an electrical switch responsible for cutting off the current when it exceeds a certain limit. It will protect the rest of the installation and the connected equipment from possible overloads and short circuits.**

PCB heat-sink: **operates by drawing excess thermal energy away from high-temperature electronic components (like processors or power transistors) to prevent overheating.**

Diode: **Prevents current from flowing backward into sensitive electronic parts, which protects circuits from damage caused by incorrect battery installation or reverse polarity.**

(14 marks, 6 + 4 + 4)

- 2(d) (i) Describe, with examples, how the recycling of phone e-waste is complex and hazardous.

There is a wide range of materials (precious metals, plastics, toxic chemicals) in a smartphone. These are fused together in small amounts with intricate layering making automated shredding ineffective. Manual dismantling is largely used.

- (ii) Discuss how electronic components of a phone could be refurbished or reused.

Functional components (camera modules, charging ports, etc.) could be desoldered and used for repairs. The repair of phone boards can be used to restore functionality through replacement of microchips or other components. Phone parts (processors, screens, sensors, etc.) can be used for other uses such as security cameras and digital clocks.

(14 marks, 8 + 6)

Option 3 - Information and Communications Technology

(a) - 10 marks, (b) - 16 marks, (c) **OR** (d) - 14 marks

Answer 3(a) **and** 3(b)

- 3(a) (i) State **two** benefits of using chatbots.

Chatbots can provide immediate answers to resolve minor issues, they are available all the time and can be tailored to individual customer needs as tasks can be based on past purchases and browsing history.



- (ii) Outline the use of AI and machine learning in chatbots.

Chatbots can move beyond rigid scripted responses to provide context, interpret human intention and will improve by learning over time. Algorithms allow chatbots to interpret the important aspect of a customer query allowing free-flowing responsive questioning rather than relying on keyword matches.

10 marks, (4 + 6)

- 3(b) (i) Using a 'customer service' chatbot to answer commonly asked questions as an example, describe a rule-based chatbot making reference to user interface, rules engine, and NLP.

User interface: **the customer interacts with the company's website or mobile app, clicks on a menu of question options or with an input question eg. 'how do I track my order'. Standard responses or links can be sent back to the user.**

Rules engine: **The rules engine contains the bank of triggers, keywords and responses.**

Natural language Processing (NLP):
can be used to edit questions into a format that the rules engine can read e.g. the words 'track' and 'order' can be extracted as keywords from 'can you help me track my recent order'.

- (ii) Distinguish between the following cyberattacks:

Distributed denial-of-service (DDoS):
DDoS attack makes a service that would usually work unavailable, such downtime results in lost revenue for business, reduces productivity, danger of theft of funds, data and intellectual property.

click fraud: **automated bots or human 'farms' repeatedly click on pay-per-click ads creating a false record of ad access.**

web/content scraping:
gathers data or content from websites for price intelligence, news and content monitoring, brand monitoring and business research.

- (iii) Explain **two** limitations of rule-based chatbots.
Conversation paths are rigid based on tracking particular words.
Responses are treated as a single request without reference to other conversations.
Does not work effectively with misspellings or slang.
Complex business needs require manual building which becomes inefficient.

(16 marks, 6 + 6 + 4)

Answer 3(c) **or** 3(d)

- 3(c) (i)** Explain any **three** of the items listed.

Display: 7.9-inch LCD (1920 x 1080 resolution): **the screen has a width of 1920 pixels and a height of 1080 pixels with a Liquid Crystal Display (LCD).**

Variable Refresh Rate up to 120 Hz: **display will update up to a maximum of 120 times per second.**

Internal Storage: 256 GB: **the device has 256 Gigabytes of built-in flash memory permanently installed to save your operating system, applications and personal media files.**

Battery: 5220 mAh lithium-ion (up to 6.5 hours of battery life):
5220 mAh battery capacity with Lithium-ion battery.



- (ii) Outline **one** method of extending the data storage to 2 TB.
A 2 TB micro SD card will extend data storage, this can be inserted into the device console memory slot.

(14 marks, 10 + 4)

OR

- 3(d) (i)** State **two** advantages of using fibre optics in the roll-out of a broadband network.
Fibre optic networks provides fast speed and large bandwidth with equal upload and download speeds. Optical signals move with minimal delay and do not degrade over long distances. Data will not be intercepted without detection enhancing security. Less energy is consumed in operation.

- (ii) Outline how fibre optic technology operates in a broadband network.
Fibre optic cables transmit data using short pulses of infrared light.
Router and devices process data as electrical signals, this is converted into light pulses by a transmitter.
Light signals travel through the core of the optical fibre without leaking.
Optical repeaters boost light signals during transmission. The receiver captures the light signals and decodes and converts back to electrical signals.

(14 marks, 8 + 6)

Option 4 - Manufacturing Systems - Answer 4(a) and 4(b)

(a) - 10 marks, (b) - 16 marks, (c) OR (d) - 14 marks

Answer 4(a) and 4(b)

- 4(a) (i) Outline **two** benefits of incorporating Design for Manufacture and Assembly (DfMA) in product design.

Production costs are reduced with less material used, fewer custom parts and reduced labour for assembly.

Products are developed faster with less modifications.

Quality is improved with simpler assembly.

- (ii) In **each** case, describe a factor to be considered at the design stage to support the following aspects of DfMA:

Total number of parts: **multiple components can be combined into a single part where possible.**

Multifunctional parts: **reduced prototyping, readily available parts, reduced costs.**

Automation: **parts are designed to be compatible with automated and faster assembly.**

(10 marks, 4 + 6)

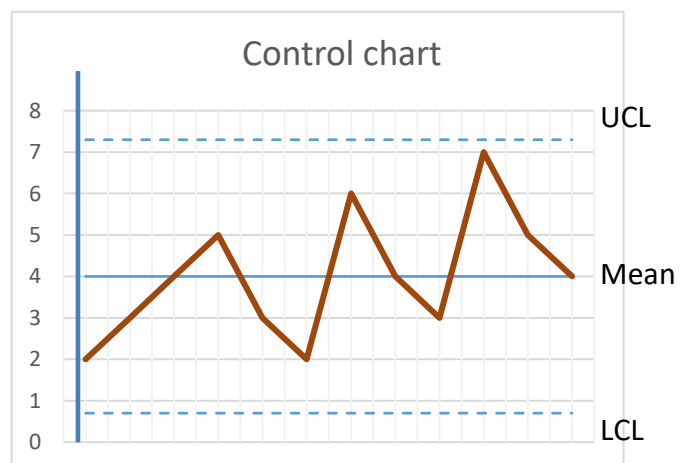
- 4(b) (i) Using the data above and assuming $\sigma = 1.1$, calculate the following:

$$\text{Mean: } \frac{2+3+4+5+3+2+6+4+3+7+5+4}{12} = \frac{48}{12} = 4$$

$$\text{UCL: } 4 + 3\sigma = 4 + (3 \times 1.1) = 7.3$$

$$\text{LCL: } 4 - 3\sigma = 4 - (3 \times 1.1) = 0.7$$

- (ii) Draw a suitable control chart for the above data.



- (iii) The control state is in control.

(16 marks, 6 + 6 + 4)

Answer 4(c) or 4(d)

- 4(c) (i) Determine the number of rejected units (non-repairable units).

Defective units: = 10
 80% repairable: = $10 \times (80/100) = 8$
 Rejected units: = $10 - 8 = 2$ units

- (ii) Calculate the process yield rate (as a percentage%).

Note: Process yield rate (%) = $\text{good units} / \text{total units} \times 100$

Total production output: 200 units

Defective units: 10 units

Rework success rate = 80%: 8 units (2 units scrapped)

Good units = total – scrapped units = $200 - 2 = 198$ units.

Process yield rate (%) = $\text{good units} / \text{total units} \times 100$
= $(198/200) \times 100 = 99\%$

- (iii) Outline **two** quality attributes that could be associated with the e-bike.

Expanded battery capacity and range.

A range of smart displays.

Power-assisted pedaling.

High-performance hydraulic disc brakes.

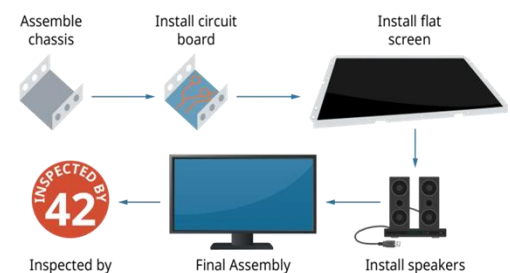
(14 marks, 4 + 6 + 4)

OR

- 4(d) Describe, with annotated sketches, each of these types of production plant layout:

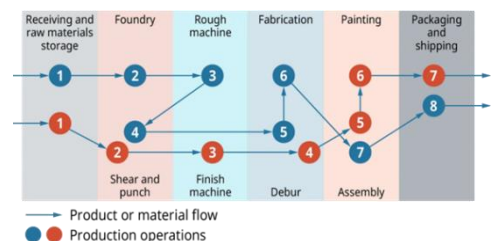
Product layout:

Equipment is arranged in a straight line or sequence based on the steps required to make a single product. Best suited for mass production and assembly lines.



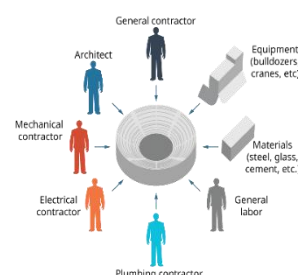
Process layout:

Similar machines and processes (e.g., all welding machines or all lathes) are grouped together in specific areas. Ideal for low-volume, high-variety manufacturing.



Fixed position layout:

The product remains stationary due to its size or weight (e.g., ships or airplanes), and workers and equipment are brought to the product.



(14 marks, 6 + 4 + 4)

Option 5 – Materials Technology

(a) - 10 marks, (b) - 16 marks, (c) OR (d) - 14 marks

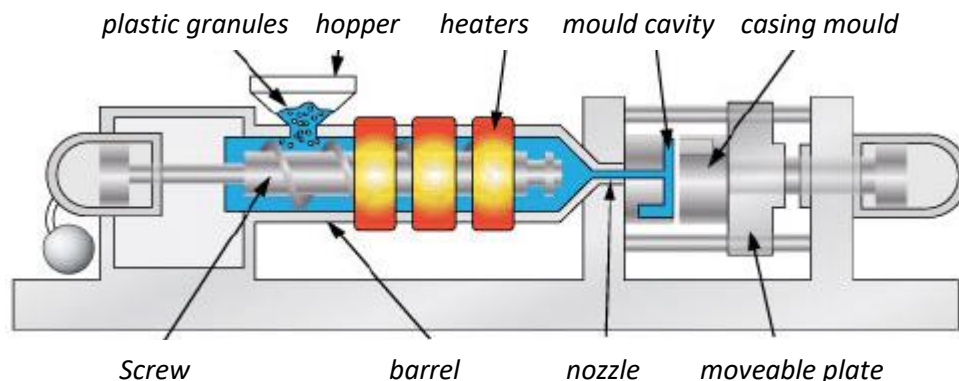
Answer 5(a) **and** 5(b)

- 5(a) (i) Outline **two** material properties that are important for producing this pizza oven.
Ability to cast into shape, must be able to withstand heat from fire, durable, hardwearing etc.
- (ii) Describe how the outside surface can be maintained for a long life.
Heat resistant paint, the surface can be oiled after use, keeping the surface clean will prolong product life etc

(10 marks, 4 + 6)

- 5(b) (i) Suggest a suitable plastic for the manufacture of the safety guard.
Justify your selection.
Polypropylene/polycarbonate /ABS/Nylon/PET/ASA will mould easily into shape, resists impact, will recycle, etc.
- (ii) Describe, with annotated sketches, a process to manufacture the safety guard.

Injection Moulding:



- Granulated thermoplastic polymer is fed into the barrel from the hopper.
 - The screw moves the polymer forward.
 - Heaters melt the polymer to liquid.
 - When there is enough liquid polymer, the ram will inject the polymer into the mould and create the shape of the safety guard.
- (iii) Suggest **two** ways the multi-function gardening tool conforms to quality standards.
The guard covers the cutting tool.
The switching allows for a power cut-off as the switch needs to be continually pushed while operating.
The motor engine is insulated and covered to prevent shock or burns.

(16 marks, 4 + 8 + 4)

Answer 5(c) **or** 5(d)

- 5(c) (i) Describe, using the multi-function gardening tool shown as an example, **three** advantages of using modular design.

Products can be customised and scaled upwards without a complete redesign.

Faster production of products with a common control motor.

Individual parts can be replaced easily.

Maintenance is simplified.

Products are more cost efficient.

- (ii) Assess the environmental impact of using modular design equipment.

There is a significant impact in reducing the amount of material used in modular design components.

Reduced e-waste as individual electronic parts can be replaced without replacing the entire product. Less e-waste is produced as the core product drives a range of individual modules.

Lifecycle should be extended.

Design for Assembly demand high quality manufacture, this promotes efficient use of resources.

(14 marks, 6 + 8)

OR

- 5(d) Compare the use of composite materials with the use of treated softwood timber:

	Composite materials	Treated softwood timber
Fabrication techniques	Requires specialised tools and specific fittings.	Very easy to work with using standard carpentry tools. Wood can be coloured/dyed
Maintenance	Does not rot and requires virtually no maintenance.	Requires regular ongoing maintenance to prevent warping, rotting and splintering.
Sustainability	Often made using a high percentage of recycled plastics and waste wood fibre, which diverts waste from landfills. The manufacturing process is energy-intensive and may not recycle easily at the end of life.	A natural, renewable and biodegradable resource. Chemicals are used in pressure treating.

(14 marks, 6 + 4 + 4)



Leaving Certificate Examination, 2026

Technology

Coursework Briefs

Ordinary Level and Higher Level

200 marks

The Thematic Briefs for the Leaving Certificate Examination 2026 are given overleaf.

The Coursework must be available for assessment by Friday 27 March 2026.

Leaving Certificate Technology

Ordinary Level and Higher Level 2026

Instructions to candidates:

1. The coursework submitted for assessment must consist of two components:
 - a design folio *and*
 - an artefact.
2. If **either** assessment component (written examination or coursework) is submitted at Ordinary Level, the subject is graded at Ordinary Level.
3. All coursework submitted for assessment must be clearly identified with your examination number.
4. The coursework submitted for assessment must be **your own individual work** and must be completed in school under the supervision of the class teacher.
5. Your coursework must not be removed from the school setting under **any** circumstances as doing so may result in such coursework being considered invalid.
6. The design folio should record all stages of your work and should document how the artefact meets the stated thematic brief.
7. Digital drawings or other manufacturing details, if presented for assessment, must be included in **hardcopy** format in your design folio.
8. Where computer aided manufacture (CAM) is used, supporting CAD drawings must be included in your design folio to authenticate your own individual work.
9. The coursework should display knowledge and skills developed through your study of the core and chosen options.
10. All important operating features of the artefact must be clearly visible and be easily accessible without dismantling.
11. Where an electrical supply is used to operate the artefact, it should be of low voltage output. Where specialised equipment is required, it must be set up by you, have clear operating instructions and be ready to use.
12. The coursework presented for assessment must be displayed in an attractive manner. Multimedia presentations, where submitted, must be of **maximum** 3 minutes duration, must be set up by the candidate and must be ready for viewing.
13. You must reference and acknowledge all research sources used such as: publications including books, professional journals and government reports; online sources and other types of media; any material generated using artificial intelligence (AI) software or applications; and material from specialist organisations and relevant individuals. To include such material without properly referencing the source will be considered plagiarism. In addition, the copying from, or reproduction of, material from such sources may also be considered plagiarism.
14. Material copied directly from the Internet or from other sources and presented as your own work will not receive any marks.
15. Any case of suspected copying, plagiarism (which includes the use of AI software), improper assistance, or procurement of work prepared by another party will be thoroughly investigated.

The coursework must be available for assessment by Friday 27 March 2026.

Leaving Certificate 2026 - Higher Level

Thematic Brief

In January 2025, Storm Éowyn swept across Ireland with record-breaking winds and rainfall, causing widespread disruption to communities, infrastructure, and essential services. From flooding and coastal erosion to structural damage and power outages, such storms highlight the urgent need for resilient design solutions. Resilient design refers to the intentional creation of buildings, infrastructure, products, and systems that can withstand, adapt to, and recover from, adverse conditions - ensuring safety, continuity, and sustainability in the future.

Resilient design can take many forms. Buildings can be elevated or reinforced to withstand flooding; roads and bridges can be engineered to resist erosion and collapse; green infrastructure, like wetlands and urban tree planting, can reduce stormwater runoff and cool urban areas. Materials and construction methods can be selected for durability, flexibility, and low environmental impact. Smart technologies can be integrated to provide real-time monitoring and rapid response systems. All of these approaches work together to reduce risk and build a more secure and adaptable society.

In a context of your choice, and with a focus on modern materials and processes, design and manufacture a working model of a device, structure, system, product, or interactive display that demonstrates a solution aimed at enhancing resilience in the context of extreme weather events.

Your solution should include an electro-mechanical element and should also be well presented.

Note: The maximum dimension of the artefact you present for assessment should not exceed 500 mm.

If multimedia presentations are used to enhance your display, a digital file ready to view on a school laptop or PC must be provided.

Coursework at Higher Level is weighted as follows:

- Design Folio - 50% of marks
- Artefact - 50% of marks

Total - 200 marks

Design Folio - Higher Level - 100 marks			
No.	Heading	Description	Marks
1	Analysis of thematic brief	Evidence of research of the broader context of the theme. Specification of chosen parameters.	7
2	Overall management of the project	Analysis of available resources, time and budget constraints; proposed timeframe/Gantt chart, etc.	5
3	Environmental impact of the project	Demonstration of environmental awareness during design and realisation . Analysis of materials available for manufacture. Consideration of energy requirements, reuse/recycling etc.	10
4	Research, investigation and specifications of brief	Further research into chosen area. Analysis of existing solutions including sub-systems. A statement outlining the candidate's final brief and related specifications.	7
5	Design ideas and selection of optimum solution	Original annotated freehand sketches related to your design specification , outlining three possible solutions. Optimum solution identified and justified.	18
6	Sketches and drawings for manufacture	Detailed annotated sketches and drawings including all elements/aspects of solution; circuit diagrams/flowcharts/models/prototypes/dimensions/scale/assembly details.	18
7	Production planning	Materials and component list and costings; scheduling, work breakdown structure; Gantt charts, critical path diagrams.	10
8	Product realisation	Sequence of manufacture including photographic record.	10
9	Testing, evaluation and critical reflection	Testing against chosen brief. Evaluation of final artefact. Comparison of planned schedules and actual schedules. Suggested modifications with justification. Critical reflection on the entire process.	10
10	Presentation and ICT	Correct sequence of presentation. Quality of material presented. Acknowledgement of sources. ICT skills in production and presentation of folio.	5

Artefact - Higher Level - 100 marks			
No.	Heading	Description	Marks
1	Artefact meets theme and specifications	Solution presented fulfils the thematic brief and the specifications as identified by the candidate.	10
2	Originality and creativity	Originality and creativity in design, aesthetics and ergonomics. Creative and appropriate use of materials.	15
3	Production skills	Processing of materials. Assembly of materials. Range and depth of skills.	30
4	Functionality	Artefact works well. Appropriate/limited use of commercial components/solutions.	20
5	Quality and finish	High quality manufacture. Artefact well finished. Due regard for health and safety.	15
6	Presentation	Coursework well presented. Parts well integrated and labelled where appropriate.	10

Note: While the general headings and marks above will largely remain the same, breakdowns may vary depending on the actual brief for any given year.

