



Coimisiún na Scrúduithe Stáit
State Examinations Commission

Leaving Certificate 2025

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
SEEN	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.

Write your answers in the spaces provided. **72 marks**

1. Sustainable living practices have the potential to preserve vital resources, reduce environmental impact, and promote a healthier planet for people and nature for generations to come.



Describe **each** of the following terms in relation to sustainable living.

Off-Grid:

Not being physically hooked up to utilities by wires, pipes or cables. Off-grid homes therefore rely completely on their own energy sources, which can often be renewable energy sources such as the sun and the wind.

Circular Economy:

A model of production and consumption, which involves sharing, leasing, reusing, repairing, refurbishing and recycling existing materials and products as long as possible.

(6 marks, 3 + 3)

2. Distinguish, with an example, between additive manufacturing and subtractive manufacturing processes in the production of plastic pulley wheels.

Additive manufacturing, also known as 3D printing, builds objects layer by layer.



Subtractive manufacturing involves removing material from a solid block using cutting tools and machines. Lathework, routing, milling etc.

(6 marks, 3 + 3)

3. Ireland's Climate Action Plan has an overall renewable electricity target of 80%, with offshore wind as a significant contributor.

Outline **two** challenges of using offshore wind as a sustainable source of renewable energy.

- **High cost of construction and maintenance**
- **Can have a visual impact in some areas**
- **Environmental impact on marine life**
- **May disrupt commercial shipping and traditional fishing areas**
- **Slow return on investment.**



(6 marks, 3 + 3)

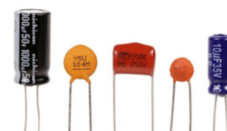
4. (i) State the function of a capacitor.

A capacitor's primary function is to store electrical energy in an electric circuit and release it as needed.

- (ii) Distinguish between a polarised and non-polarised capacitor.

A polarised capacitor must be connected with a particular polarity (negative and positive direction) in a circuit.

A non-polarised capacitor can be connected in either direction and will still operate.



(6 marks, 3 + 3)

5.

Calculate the power required by the mobile crane to lift the load shown, to a height of 5 metres in 6 seconds.

Calculation:

Work done = force x distance

Work done = 1200 x 5 = 6000

Power required (W/T) = 6000/6 = 1000 W



(6 marks)

6. Briefly describe the following cybercrimes.

(i) Phishing:
the fraudulent practice of sending emails or other messages purporting to be from reputable companies in order to induce individuals to reveal personal information, such as passwords and credit card numbers.

(ii) Ransomware attack:
this is where malicious software (malware) encrypts the victim's files or locks them out of their system, demanding a ransom payment (often in cryptocurrency) to restore access.

(6 marks, 3 + 3)

7. Ireland's sailing team of Robert Dickson and Sean Waddilove competed in the 2024 Paris Olympics in the men's skiff event using the boat shown in the image.

Name an appropriate material to be used for **each** boat part listed and outline a property of **each** material named.



Part	Material	Properties
Sail	Nylon/Kevlar	Hard wearing, high tensile strength, etc.
Mast	Aluminium alloy/ Carbon Fibre	Tempered for strength, lightweight, strong, etc
Hull	Fibreglass/Aluminium	Strength, resistance to corrosion, etc.

(6 marks)

8. Use **two** graphic techniques to enhance the representation of the game controller shown.

Enhancement techniques
Such as:

**Rendering, shading, colouring,
horizon line, colour splash etc.**



(6 marks, 3 + 3)

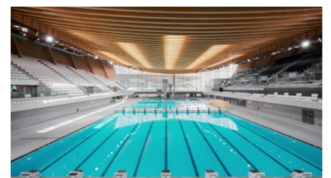
9. The Olympic Aquatic Centre was constructed for the 2024 Paris Olympics and Paralympic Games. The roof is supported by the largest concave timber frame in the world, spanning 90 m and using a framework of more than 2,700 m³ of wood.

- (i) Give a reason for using a frame structure for this roof.

**It gives inherent strength to the structure to resist external forces.
Cover materials can be replaced without removing the entire roof.**

- (ii) Suggest **two** advantages of using wood for the frame.

- **Gives a natural material appearance and texture**
- **Has a thermal insulation property**
- **Can be formed to give aesthetic appeal with unusual shapes, such as the curved roof shown**
- **Wood is more environmentally friendly than alternative materials, etc.**



(6 marks, 2 +2 + 2)

10. The image shows the X Series workstation designed for work and gaming by designer Svyatoslav Zbroy. Anthropometric data was used to design this chair.

- (i) Explain the term anthropometric data.

Design is based on the measurement, size and shape of the human individual.

- (ii) Outline **one** advantage of using products that are ergonomically designed.

Improved Comfort and Health: Users often spend long hours seated in front of a computer, which can lead to various physical health problems.

Ergonomically designed products can also help increase productivity.

By reducing the risk of injury and improving employee health and well-being, ergonomically designed products can help reduce costs associated with absenteeism.

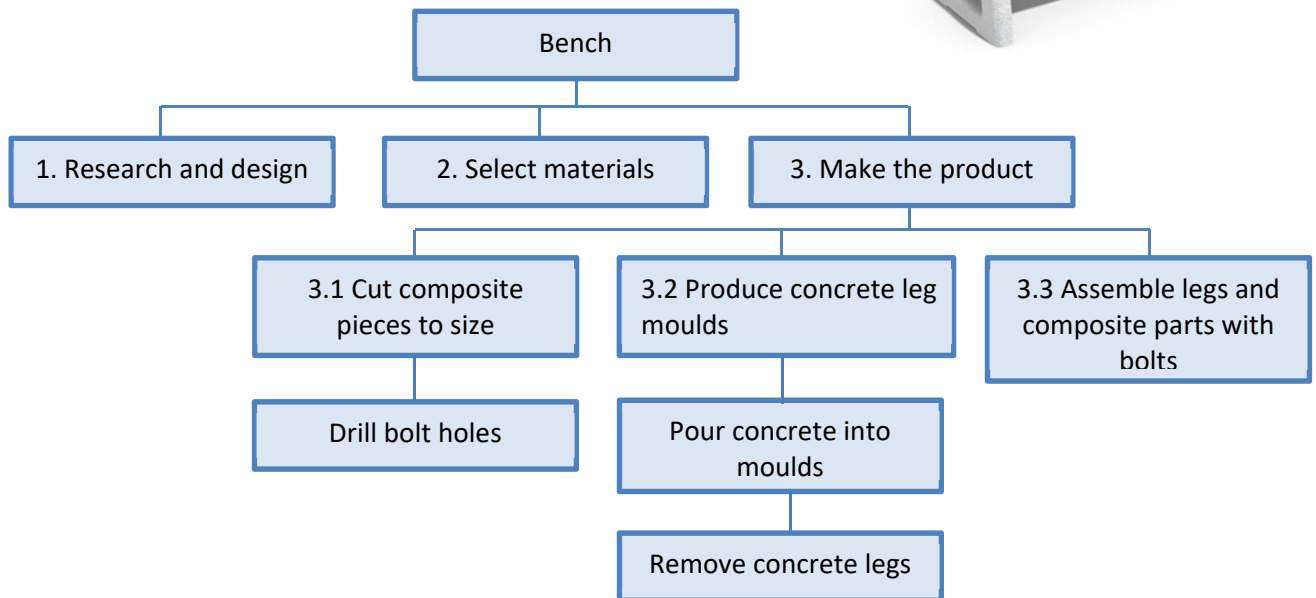


(6 marks, 3 + 3)

11. The park bench shown is made using concrete legs with composite seat and backrest. Compile a Work Breakdown Structure (WBS) for making the bench.



Suggested solution – alternative formats acceptable



(6 marks)

12. Calculate the total resistance of the circuit shown.

Calculation:

Series: $R_2 + R_3 = 8k + 4k = 12k$

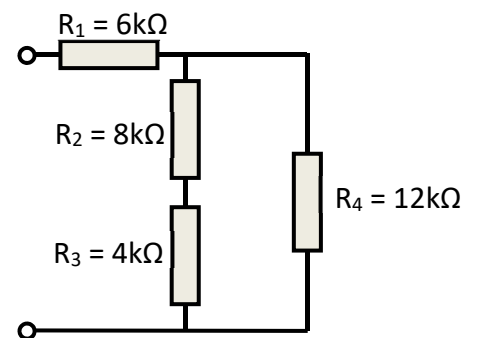
Parallel:

$1/R_{total} = 1/R_{series} + 1/R_4 = 1/12k\Omega + 1/12k\Omega = 2/12 = 1/6k\Omega$

$1/R_{total} = 1/6k\Omega$ or (Product/Sum = $144/24 = 6k\Omega$)

$R_{total} = 6k\Omega$

Total Resistance of circuit: $6 + 6 = 12k\Omega$



(6 marks)

13. Diving boards are adjusted according to individual swimmer requirements.

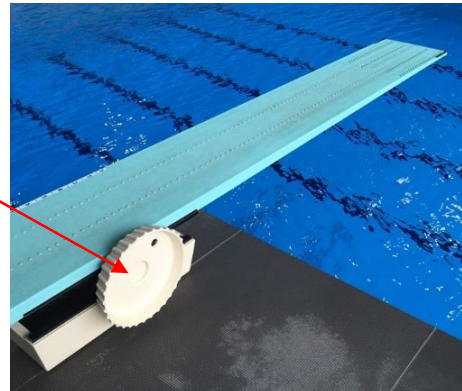
Outline, using annotated sketches, an electro-mechanical method of adjusting the tilt angle of the diving board shown.

Suggested solutions:

The wheel can be adjusted with the foot, it could be automated with a switch and motor.

Servo motor and controller, motor and linkages, motor and a cam etc.

Alternative electro-mechanical solutions acceptable:



(6 marks)

14. Cutting fluids and lubrication systems are used to ensure the safety and long-life of CNC machines.

(i) Name **two** machine lubricants.

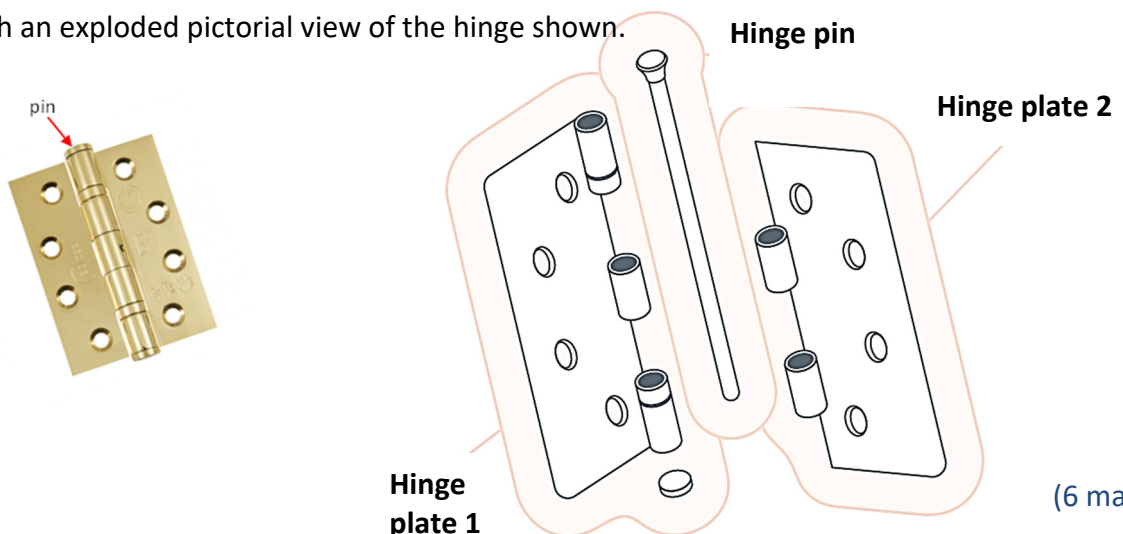
Mineral or synthetic oils, grease, graphite, etc.

(ii) Describe how cooling and lubrication will prolong the life of cutting tools.

Lubricants are substances that reduce friction and offer smooth movement between the running parts of machinery and equipment. Cutting and cooling fluids will reduce the build-up of heat which will prolong tool life.

(6 marks, 4 + 2)

15. Sketch an exploded pictorial view of the hinge shown.



(6 marks)

Question 2 - Answer 2(a) **and** 2(b)(a) - 8 marks, (b) - 10 marks, (c) **OR** (d) - 6 marks

- 2(a) (i) Distinguish between pre-programming and live control of Xylobands.

Pre-programming: **is carried out in advance and loaded on to the device.**

Live control: **involves managing and manipulating systems or processes in real-time. This can include adjusting parameters, responding to system feedback, or making decisions based on current conditions.**

- (ii) Each Xyloband is powered by a lithium-ion button cell battery.
Suggest why this power source was chosen for Xylobands.
Lithium-ion button cell batteries are used in compact, low-profile devices and electronics due to their high energy density, wide operating temperature range, good shelf life, rechargeability. These batteries offer a cost-effective and sustainable alternative to disposable batteries, making them suitable for various applications.

(8 marks, 4 + 4)

- 2(b) Xylobands use RGB LEDs which contain three separate diodes: red, green and blue. A range of colours can be produced by adjusting the intensity of each of these diodes.

- (i) A RGB requires a voltage of 2.2 V (red), 3.3 V (green) and 3.3 V (blue).
If the current for each diode is set to 20 mA, calculate the **total** power consumption of one RGB LED.

$$P = V \times I$$

$$(P = I^2 \times R \text{ or } P = V^2/R)$$

$$\text{Red LED} = 2.2V \times 0.02A = 0.044W$$

$$\text{Green LED} = 3.3V \times 0.02A = 0.066W$$

$$\text{Blue LED} = 3.3V \times 0.02A = 0.066W$$

$$\text{Total Power of one RGB LED} = 0.044W + 0.066W + 0.066W = 0.176W$$

- (ii) Calculate the value of protective resistor required for a 12 V car LED light which is limited to a current of 15 mA with a voltage drop of 1.95 V.

$$V = 12 - 1.95 = 10.05 \text{ V}$$

$$I = 15 \text{ mA} = 0.015 \text{ A}$$

$$R = \frac{V}{I} = \frac{10.05}{0.015} = 670 \, \Omega \quad (680 \, \Omega \text{ is the closest standard resistor size})$$

- (iii) Describe, with an application in each case, the function of a variable resistor, an LDR, and a thermistor.

A variable resistor **allows the resistance in a circuit to be adjusted manually e.g. volume control**

An LDR **changes its resistance based on the intensity of light falling on it e.g. automated lighting systems.**

A thermistor **is a resistor whose resistance changes with temperature e.g. heat sensors**

(10 marks, 4 + 3 + 3)

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

2(c) (i) Suggest **two** measurable quality attributes of an RGB LED light strip.

Luminous Intensity: Indicates how bright the LED strip is when turned on.

Color Accuracy: Reflects how accurately the strip reproduces colors compared to natural light.

Power Consumption: Important for energy efficiency.

Voltage rating: Has to match power supply.

Lifespan- Tested under standard conditions.

(ii) Describe, using the RGB LED light strip as an example, **each** of the following dimensions of quality:

Conformance: **The degree to which a product's design and operating characteristics meet established standards.**

Serviceability: **How easily a product can be maintained or repaired when issues arise.**

Reliability: **This dimension reflects the probability of LED strip malfunctioning or failing within a specified time period.**

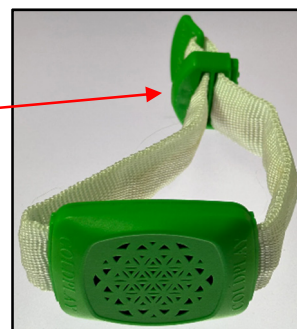
(6 marks, 3 + 3)

OR

2(d) Xylobands are considered disposable electronic items to be recycled after a concert.

(i) Describe, using annotated sketches, a suitable clasp/closing mechanism for the Xyloband wrist strap.

**Tightness can be adjusted.
Fast secure locking buckle**



(ii) Outline **two** challenges to be considered when recycling Xylobands.

Large volume created after each concert or event.

Low value items may not be viable to recycle.

Batteries are integrated into product.

Range of components and materials used.

(6 marks, 4 + 2)

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

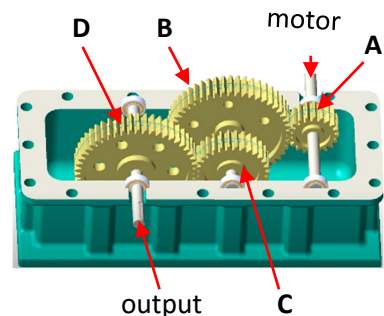
(a) - 8 marks, (b) - 10 marks, (c) OR (d) - 6 marks

- 3(a) (i)** Outline **two** advantages of using personal transport pods.
Reduced traffic congestion as pods are small in size, most pods are driven electrically with reduced emissions, pods are safer than other modes of personal protection and can be autonomously driven, increases independence for persons of reduced mobility, etc.
- (ii)** Explain how LIDAR and GPS are utilised in autonomous transport vehicles.
LIDAR (Light detection and ranging) uses laser pulses to scan an area and locate objects. It will detect obstacles, vehicles, road markings to guide a safe path.
GPS (Global positioning system) uses satellite signals to determine location of vehicle, it will identify position on a digital map.

(8 marks, 4 + 4)

3(b) A gearbox that could be used in a personal transport pod is shown in the graphic.

- (i)** State **two** advantages of using a compound gear system.
Compound gear trains are used to achieve a larger speed reduction or torque increase compared to simple gear trains.
They maintain a more compact design and higher efficiency.
- (ii)** The electric motor rotates at 630 RPM and is connected to the gearbox shown.
If gear A has 20 teeth, gear B has 60 teeth, gear C has 30 teeth and gear D has 60 teeth. Calculate the output speed of the gear system.



$$\text{(Driver/driven x Driver/driven) x speed}$$
$$(20/60 \times 30/60) \times 630 = (1/3 \times 1/2) \times 630$$

$$1/6 \times 630 = 105 \text{ RPM}$$

- (iii)** Describe a method of reducing friction and wear as the gears rotate in the housing of the gearbox.
The gearbox can be filled with oil up to the split in the casing. As the gears rotate, they will carry the lubricating oil to all moving parts of the gearbox. As speed increases, the oil will be moved quicker to lubricate effectively. Bearings etc.

(10 marks, 4 + 4 + 2)

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

- 3(c) (i) Suggest a suitable material for the manufacture of the body of the Pod. Give **one** reason for selecting this material.

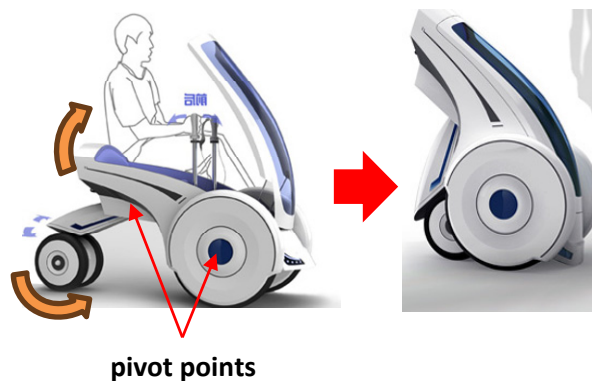
Carbon fibre composite will be lightweight yet capable of withstanding impacts. It can be fabricated in one piece. Fibre glass, aluminium etc.

- (ii) Describe, using annotated sketches, a means of:

- folding in the rear wheels of the Pod
- securing the wheels in place when in use.

Suggested solutions, alternatives accepted:

The personal pod has two pivot points that allow the device to fold in the directions shown



R Clip and Pin to secure the wheels in place when in use.

(6 marks, 2 + 4)

OR

- 3(d) (i) Outline **two** reasons for the use of Bluetooth technology for AirTags.
Bluetooth technology uses accurate short-range technology which locates items nearby. Wi-Fi is not essential which may enhance data security and privacy. This has low power consumption and links to the 'Find my' network. Smartphones have built-in Bluetooth to connect to AirTags. Bluetooth can operate effectively even in indoor or crowded environments like airports. Bluetooth on AirTags supports encryption which ensures only the owner can see the tag's location.

- (ii) Compare Bluetooth technology with WiFi, in terms of range and data transfer speeds.

Range: **Bluetooth generally accurate up to 10m, it is limited by obstacles. Wi-Fi has a range up to 100m and is better at penetrating walls.**

Data transfer rate: **Bluetooth up to 24 Mbps, Wi-Fi 100-1000 Mbps. Wi-Fi is significantly faster.**

(6 marks, 2 + 4)

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 a reason for not crushing plastic bottles in a reverse vending machine.
The vending machine depends on the ability of the machine to read barcodes which may get damaged when crushing.
- (ii) Give **two** advantages of recycling aluminium cans.
Aluminium is difficult and expensive to produce, environmentally friendly, recycles well
 (10 marks, 6 +4)

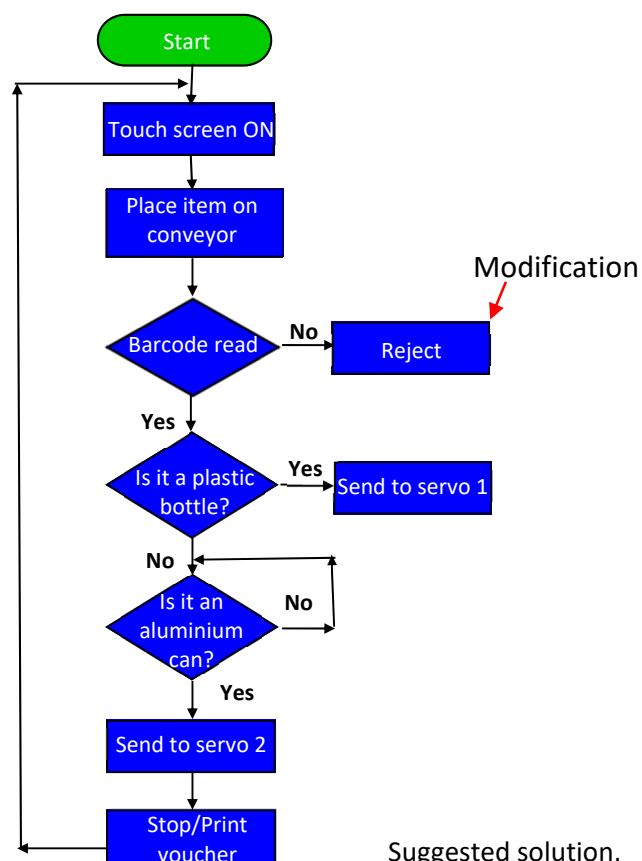
1(b) (i) Draw a flowchart:

- (ii) Modification:
Barcode will read to accept or reject item placed on conveyor belt.

- (iii) Suggest a method of sensing when a storage compartment in the machine is full.

A limit switch at the top of the container could be used to stop any further processing of materials.

LDR and LED
Distance/Motion sensor.



Suggested solution,
 Alternatives accepted:

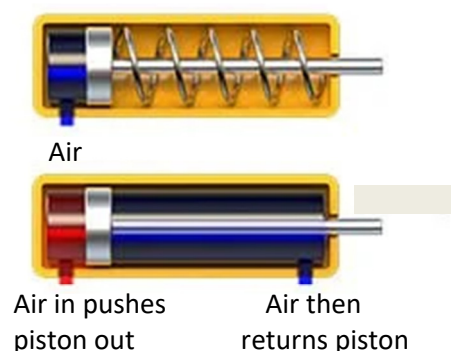
(16 marks, 10 + 4 + 2)

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

- 1(c) (i)** Distinguish between the operation of a single acting cylinder and a double acting cylinder in a pneumatic circuit.

A single-acting pneumatic cylinder **has just one port. This is where the air enters and forces the piston out in one direction. It has a spring to return the piston.**

A double-acting cylinder **includes two ports. One for the air to enter and extend the piston, and the other for retracting the cylinder. It needs to be driven in both directions.**



- (ii)** Outline **two** safety advantages of using pneumatic systems in gas exploration.
Can be used in hazardous and explosive environments, pneumatic control is usually more powerful, pneumatic sequential control is very effective, pneumatic systems are usually more robust and reliable, etc.

(14 marks, 8 + 6)

OR

- 1(d) (i)** Describe **three** key characteristics of a humanoid robot.

In general, humanoid robots have a torso, a head, two arms and two legs. However, some forms of humanoid robots may model only part of the body for example, from the waist up. Some humanoid robots also have heads designed to replicate human facial features such as eyes and mouths. Androids are humanoid robots built to aesthetically resemble humans.

- (ii)** Outline, with appropriate examples, **two** uses for humanoid robots.

They move in environments designed for human beings and can be used to interact with people as receptionists in providing information and processing tasks.

Humanoid robots can be designed to have the functionality of other robots and work in production, administration, hazardous environments and research.

(14 marks, 6 + 8)

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) Outline **two** benefits of using RFID rather than barcodes.

Increased efficiency, reduced wait times at checkout, cost savings, fewer shop assistants needed, speed of checkout, RFID tags can be read without direct line of sight, greater range, RFID can store more information, etc.

- (ii) Suggest **two** other uses for RFID technology.

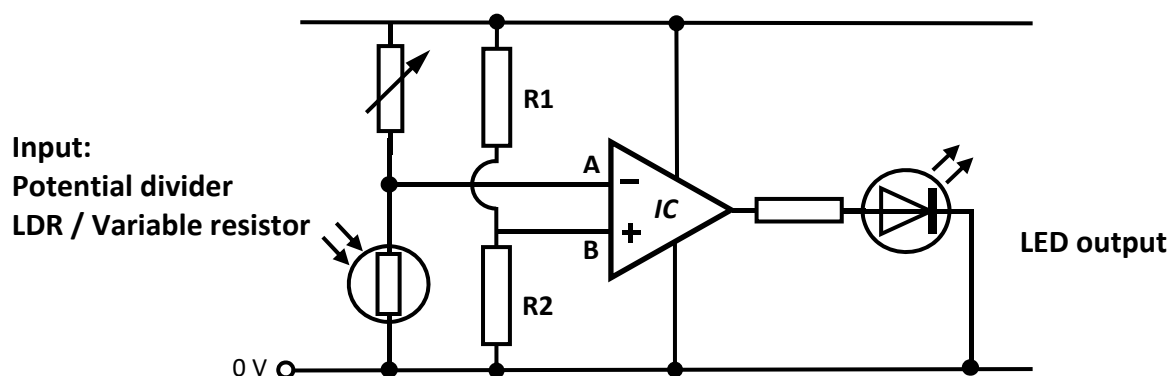
A suitable application for RFID technology could be in healthcare, particularly for tracking medical equipment. RFID tags can be attached to medical devices and tools, allowing hospitals to manage their inventory more effectively, prevent loss or theft, and ensure that the right equipment is available when needed.

RFID can also be used for pet and livestock tracking, vehicle tracking, employee ID badges for building entry, contactless entry to events, etc.

(10 marks, 6 + 4)

- 2(b) (i) Name the integrated circuit (IC) shown.
Op-Amp

- (ii) Complete the circuit to include an appropriate input and output.



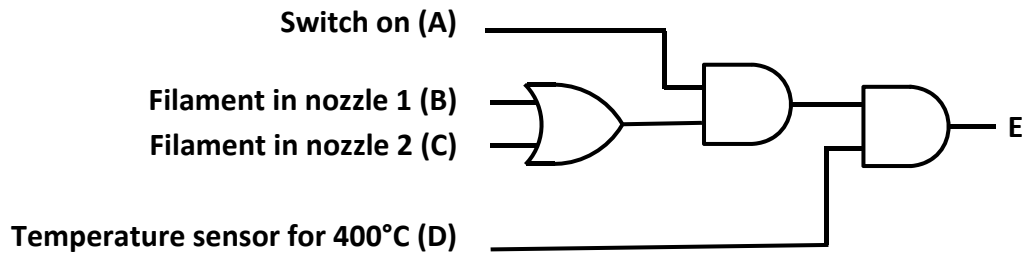
- (iii) Describe the operation of this circuit making reference to components IC, R1 and R2.

The basic principle of this circuit is to compare the voltages at the Op-Amp IC. The potential divider at R1 and R2 provides a reference voltage at B. The LDR and resistor provide a potential divider circuit with the voltage from A feeding into the Op-Amp. As light level changes, the resistance of the LDR changes. When the voltage into the Op-Amp rises above the reference voltage at B, the LED output of the IC is turned on.

(16 marks, 2 + 8 + 6)

Answer 2(c) or 2(d)

2(c) (i) Draw a logic gate circuit to represent the operation of the 3D printer.



(ii) Compile a truth table for this system.

A	B	C	D	E
0	0	0	0	0
0	0	0	1	0
0	0	1	0	0
0	0	1	1	0
0	1	0	0	0
0	1	0	1	0
0	1	1	1	0
1	0	0	0	0
1	0	0	1	0
1	0	1	0	0
1	0	1	1	1
1	1	0	0	0
1	1	0	1	1
1	1	1	0	0
1	1	1	1	1

(14 marks, 8 + 6)

OR

2(d) (i) Outline the purpose of meter A and the purpose of meter V in the circuit shown.

Meter A – **Ammeter** – reads current in Amps

Meter V – **Voltmeter** – reads voltage in Volts.

(ii) Calculate the readings at meter A and meter V if R1 is 4 kΩ and R2 is 2 kΩ.

Meter A: $I = V/R_{\text{total}}$
 $I = 12 / (4000 + 2000) = .002A$

Meter V: $V = I \times R_1$
 $V = .002 \times 4000 = 8V$

(14 marks, 6 + 8)

Option 3 - Information and Communications Technology

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

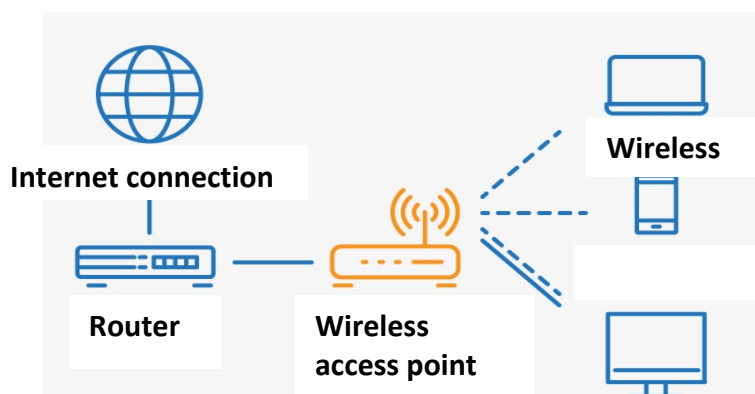
Answer 3(a) and 3(b)



- 3(a) (i) Describe **two** advantages of foldable screens.
Will create an increased screen space, portable devices, screen is protected as it folds, etc.
- (ii) Outline some challenges for the manufacture of foldable screens.
Maintaining an image with a folding screen, producing a robust hinge for the folding screen, additional moving parts are required, fitting a battery into a foldable design, etc.

(10 marks, 4 + 6)

- 3(b) (i) Describe the architecture of a wireless network, making reference to the devices that encode, transmit and receive data. Explain the role of **each** device in data transmission.



A wireless network connects computers without using network cables.

Computers use radio communications to send data between each other. Devices can communicate directly with other wireless computers or connect to an existing network through a wireless Access Point.

Encoding devices convert digital information in to a suitable format for transmission across a wireless network, these include Wi-Fi routers.

Transmission devices transfer information between two or more points with antennae and device receivers.

- (ii) Outline the purpose of a signal repeater in a wireless network.
A wireless repeater is a device that receives a wireless signal and transmits it to extend the signal over longer distances. Wi-Fi repeaters save the cost of getting additional Wi- Fi connections.
- (iii) Explain the threats of wireless eavesdropping and Denial-of-Service (DoS).
Wireless eavesdropping is the unauthorised monitoring, reading or interception of network communications usually with the intention of capturing sensitive data. It often takes the form of passive surveillance and is aided by unencrypted communication.
Denial-of-service (DoS): DoS attack makes a service that would usually work unavailable, such downtime loses revenue for business, reduces productivity, danger of theft of funds, data and intellectual property.

(16 marks, 8 + 4 + 4)

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

- 3(c) (i)** Distinguish, with an example in each case, between *spreadsheet software*, *presentation software* and *graphics software*.

Spreadsheet software: **is used to calculate, organise and analyse data in table format using rows and columns e.g. MS excel, Google sheets, etc.**

Presentation software: **will produce visual aids and slideshows for communication, marketing or educational uses e.g. MS PowerPoint, Google slides, etc.**

Graphics software: **will create, edit and edit images e.g. Adobe Photoshop, GIMP, Canva, solidworks, CAD etc.**

- (ii)** Outline **two** advantages of using vector images and **two** advantages of using bitmap images.

Vector images **tend to be used in logos which are made up of lines and curves. They are resolution-independent which means they can be scaled using mathematical formulas to maintain the position of the different shapes. Advantages are vector images can be scaled to any size without loss of image quality, they have a lower file size and are easy to edit.**

Bitmap images **are made up of tiny dots called pixels. Bitmaps are ideal for complex images such as photographs, they are readily available and don't require expertise to create as long as the user has access to a digital camera or a scanner.**

(14 marks, 6 + 8)

OR

- 3(d) (i)** State **two** advantages for a company using cloud based services.

- **cost savings on storage devices,**
- **reliable and consistent storage,**
- **eliminate updates and maintenance,**
- **supports real-time collaboration**
- **effective access, etc.**

- (ii)** Explain what is meant by endpoint protection.

Endpoint protection involves securing endpoints or entry points of end user devices such as laptops, PC's and mobile devices. This prevents them being exploited or accessed by malicious threats.

(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 DfE in product design.
Product design philosophy aims to integrate environmental awareness and generate minimal waste during production, marketing, distribution, use and disposal.
- (ii) Material selection: **The use of sustainable materials, using the smallest amount of material for the project, etc.**
 Manufacturing processes: **the amount of energy used by manufacturing processes, time taken, etc.**
 End-of-life management: **repurposing or recycling the object after it is used, disposal of parts, etc.**

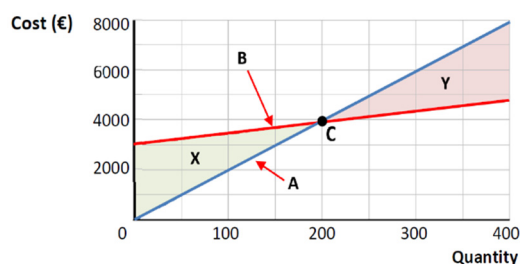
(10 marks, 4 + 6)

- 4(b) (i) The cost for producing one unit by skilled labour: **€20 (8000/400)**

The fixed cost for computerised machinery: **€3000**

$$\begin{aligned} \text{The break-even quantity (BEQ)} &= \frac{\text{Fixed costs}}{(\text{Manual cost per unit} - \text{automated cost per unit})} \\ &= \frac{3000}{20 - 5} \\ &= \mathbf{200 \text{ units}} \end{aligned}$$

(or read from graph, where line A and B intersect)



- (ii) Compare the profitable use of the skilled labour process with the automated process in **both** region X and region Y.
In region X the automated process will make a loss until it reaches BEQ.
In region Y, the automated process will be profitable, the amount of profit will increase with volume.
- (iii) Outline **one** marketing advantage of a manually produced item and **one** marketing advantage of a machine produced item.

Manually produced items have greater flexibility to alter the design of a product.

Machine produced ensures consistency of quality of product and repeatability of production can be emphasised.

(16 marks, 6 + 6 + 4)

Answer 4(c) or 4(d)

- 4(c) (i)** Outline, with an example, the principles of Just-in-time (JIT) manufacturing.
Suppliers are coordinated with the manufacturing company, products are delivered in line with market demand. This reduces the amount of stock stored with less materials, parts, tools and space used. Advantages include quick response to demand, less investment in storage, quick turnaround of products, increased workforce flexibility, reduces waste, etc.
- (ii)** Electronic kanban systems are increasingly being used.
Outline the operation of a Kanban system with reference to workflow, kanban cards and the potential advantages of electronic Kanbans.

Operation:	Each Kanban card represents a work task with information such as description, owner, deadline and status included. Cards are moved to the next column when complete.
Workflow:	is visualised on a Kanban board with task cards progressing from left to right until complete.
Advantages:	Electronic Kanban systems create a digital board which can be automated to sync with production systems. This saves time and monitoring of progress.

(14 marks, 6 + 8)

OR

- 4(d) (i)** Name the production process at each of the stages at A, B, C, and D.
- A - Once-off projects:** tend to produce single or low number of items, can be more expensive etc.
- B - Batch production:** products produced over a particular period of time as demand for the items may fluctuate, low volume, used for sporting items that may change each year, etc.
- C - Mass production:** standard products are produced in large volumes, demand is high and stable, used for household electrical items etc.
- D - Continuous production:** Generally, factories are dedicated to single number of products with high volume, systems are highly standardised and automated, used to produce items such as sugar etc.
- (ii)** Select a suitable production process for the manufacture of 10,000 promotional badges for a sports club. Justify your selection.

Batch production - using a production process such as injection moulding. This will automate production for efficient manufacture, it will involve considerable set-up in producing moulds but will not then be labour intensive.

(14 marks, 8 + 6)

Option 5 – Materials Technology

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

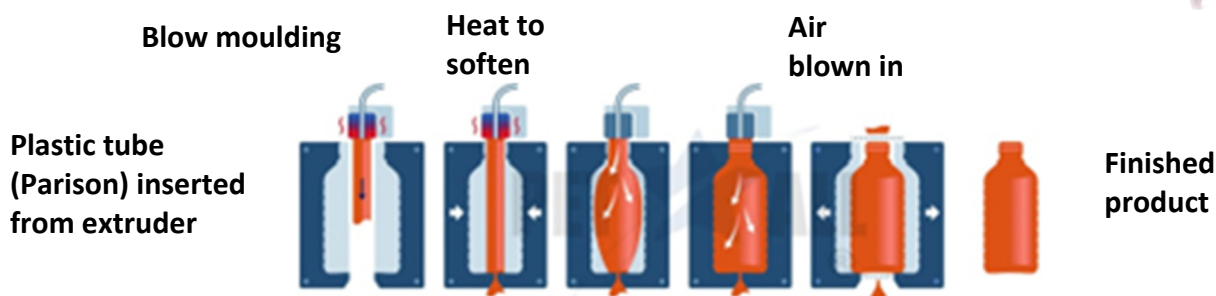
Answer 5(a) **and** 5(b)

- 5(a) (i) Outline **two** environmental advantages of the ReSculpted scheme.
Customer loyalty is created and enhanced by the return of bottles scheme, recyclability of the bottles is enhanced by the reward scheme, etc.
- (ii) Describe **two** factors that contribute to the degradation of plastic materials over time.
Plastic materials are prone to brittleness as they age particularly if exposed to sunshine's ultra-violet rays. Plastic materials are often moulded with thin sections making them prone to damage. Pollution and acid rain can degrade some plastic materials.

(10 marks, 4 + 6)

- 5(b) (i) Suggest a suitable plastic material for the bottle. Justify your selection.
PET, PVC, Polyethylene, Polypropylene etc.
Easily moldable, flexible, etc.

- (ii) Describe, with annotated sketches, a suitable process to manufacture the bottle in large quantities.



- (iii) Suggest a reason for using a different plastic material for the lid of the bottle.
Will create a more solid, less flexible container, allows the product to stack easier, etc.

(16 marks, 4 + 8 + 4)

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

- 5(c) (i) Distinguish clearly, with an example in each case, between hardwoods, softwoods and manufactured boards.

Hardwoods: come from deciduous trees. They tend to grow slower and have a denser grain e.g. oak, beech, etc.

Softwoods: come from coniferous trees. They grow faster and are typically lighter and softer than hardwoods, e.g. pine, spruce, etc.

Manufactured boards: are engineered wood products made by bonding wood fibers, veneers, or particles with adhesives e.g. MDF, Plywood, etc.

- (ii) Describe, with an application in each case, non-ferrous metals and alloy metals.

Non-ferrous metals: **do not contain iron e.g. aluminium, copper, zinc, lead, tin, gold, silver etc. Applications: copper pipes, gold/silver for jewellery etc.**

Alloy metals: **are combinations of metals to create a different metal e.g. brass is an alloy of copper and zinc. Bronze is an alloy of copper and tin, stainless steel is an alloy of iron, carbon and chromium etc. Applications: Brass/ornaments, Bronze/statues, stainless steel/cutlery etc.**

(14 marks, 6 + 8)

OR

- 5(d) (i) Describe how a scroll saw enables a curve to be cut in a thin material.
Scroll saw has a thin straight blade produces intricate work, this blade moves with reciprocating motion.

- (ii) Outline **two** safety precautions to be observed when using a scroll saw.

- **the workpiece needs to be gripped confidently**
- **cutting debris should be extracted from the blade**
- **an appropriate cutting speed needs to be used**
- **the machine should be firmly attached to the table**
- **use appropriate PPE, etc.**
- **Ensure the blade guard is in place**
- **Ensure the piece holdfast is in place directly over the material**



(14 marks, 8 + 6)



Leaving Certificate Examination, 2025

Technology

Coursework Briefs

Ordinary Level and Higher Level

200 marks

The Thematic Briefs for the Leaving Certificate Examination 2025 are given overleaf.

The Coursework must be available for assessment by Friday 11 April 2025.

Leaving Certificate Technology

Ordinary Level and Higher Level 2025

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 11 April 2025.

Leaving Certificate 2025 - Higher Level

Thematic Brief

Goal 12 of the United Nations Sustainable Development Goals focuses on ensuring sustainable consumption and production patterns, which are vital for preserving the livelihoods of both current and future generations. With the planet facing resource depletion and an increasing global population projected to reach 9.8 billion by 2050, it is imperative to address the challenges of sustainable consumption and production (adapted from <https://sdgs.un.org/goals/goal12>).

As individuals, we can practice responsible consumption in many areas of our lives, such as; food, water, energy, transportation, clothing, textiles, and waste management. By being mindful of our consumption habits and making conscious choices to reduce our environmental footprint, we can play a significant role in promoting sustainability and protecting the planet for future generations.

In a context of your choice, and with a focus on modern materials and processes, design and manufacture a working model of a device, system, product, or interactive display that promotes or contributes to sustainable consumption in our lives.

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 hardcopy printout and a digital file (USB flash drive) must be included in your portfolio.

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.	10
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.	10
5	Design ideas and selection of optimum solution	Annotated freehand sketches related to your design specification , outlining three possible solutions. Optimum solution identified and justified.	15
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.	15
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.

