



Coimisiún na Scrúduithe Stáit
State Examinations Commission

Leaving Certificate 2026

Marking Scheme

Engineering

Ordinary 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.

LEAVING CERTIFICATE, 2026

Marking Scheme

Written Examination and Practical Examination

***ENGINEERING –
Materials and Technology***

ORDINARY LEVEL

Introduction – written examination

In considering the marking scheme, the following should be noted.

1. The solutions presented are examples only. All other valid solutions are acceptable and are marked accordingly.
2. The detail required in any answer is determined by the context and the manner in which the question is asked, and by the number of marks assigned to the answer in the examination paper and, in any instance, therefore, may vary from year to year.
3. Bonus marks at the rate of 5% of the marks obtained will be given to a candidate who answers entirely through Irish and who obtains less than 75% of the total marks. In calculating the bonus to be applied decimals are always rounded down, not up e.g., 4.5 becomes 4; 4.9 becomes 4, etc. The bonus table given on the next page applies to candidates who answer entirely through Irish and who obtain more than 75% of the total marks.
4. The table below contains information about annotations used for marking throughout the exam paper.

Annotation	Meaning
	Blank page
	Page marked by examiner



Coimisiún na Scrúduithe Stáit

Marcanna Breise as ucht freagairt trí Ghaeilge

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

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

Tábla 200 @ 5%

Bain úsáid as an tábla seo i gcás na n-ábhar a bhfuil 200 marc san iomlán ag gabháil leo agus inarb é 5% gnáthrata an bhónais.

Bain úsáid as an ngnáthrata i gcás 150 marc agus faoina bhun sin. Os cionn an mharc sin, féach an tábla thíos.

Bunmharc	Marc Bónais
151 - 153	7
154 - 160	6
161 - 166	5
167 - 173	4

Bunmharc	Marc Bónais
174 - 180	3
181 - 186	2
187 - 193	1
194 - 200	0

LEAVING CERTIFICATE

ENGINEERING - Materials and Technology

(Ordinary Level – 200 marks)

Written Examination Marking Scheme 2026

Answer any four questions

Question 1: 50 marks

Any eight parts @ 6 marks each.

Award 1 extra mark for each of the first two correctly answered parts.

Question 2: 50 marks

- (a) (i) One part @ 6 marks (6)
- (a) (ii) One part @ 5 marks (5)
- (a) (iii) One part @ 4 marks (4)
- (b) Any two parts @ 6 marks (12)
- (c) (i) Three parts @ 3 marks (9)
- (c) (ii) Three parts @ 2 marks (6)
- (d) Any two parts @ 4 marks (8)

Question 3: 50 marks

- (a) Two parts @ 5 marks (10)
 - (b) Any two parts @ 7 marks (14)
 - (c) Any two parts @ 7 marks (14)
 - (d) Any two parts @ 6 marks (12)
- OR**
- (d) Any two parts @ 6 marks (12)

Question 4: 50 marks

- (a) (i) One part @ 2 marks (2)
- (a) (ii) One part @ 2 marks (2)
- (a) (iii) One part @ 2 marks (2)
- (b) Any two parts @ 3 marks (6)
- (c) Any three parts @ 5 marks (15)
- (d) Any three parts @ 5 marks (15)
- (e) Two parts @ 4 marks (8)

Question 5: 50 marks

- (a) (i) Three parts @ 5 marks (15)
- (a) (ii) Any one part @ 5 marks (5)
- (b) Any two parts @ 5 marks (10)
- (c) Any two parts @ 5 marks (10)
- (d) Two parts @ 5 marks (10)

Question 6: 50 marks

- (a) Any three parts @ 5 marks (15)
 - (b) Any three parts @ 5 marks (15)
 - (c) (i) One part @ 6 marks (6)
 - (c) (ii) Two parts @ 3 marks (6)
 - (c) (iii) Any two parts @ 4 marks (8)
- OR**
- (c) (i) One part @ 6 marks (6)
 - (c) (ii) Two parts @ 3 marks (6)
 - (c) (iii) Two parts @ 4 marks (8)

Question 7: 50 marks

- (a) Any two parts @ 6 marks (12)
 - (b) (i) One part @ 5 marks (5)
 - (b) (ii) One part @ 5 marks (5)
 - (b) (iii) One part @ 5 marks (5)
 - (b) (iv) One part @ 5 marks (5)
 - (c) (i) Any three @ 3 marks (9)
 - (c) (ii) One part @ 5 marks (5)
 - (c) (iii) Two parts @ 2 marks (4)
- OR**
- (c) (i) Any two parts @ 3 marks (6)
 - (c) (ii) One part @ 6 marks (6)
 - (c) (iii) One part @ 6 marks (6)

Sample Answers *and* Marking Scheme

Note: The solutions presented are examples only.

All other valid solutions are acceptable and are marked accordingly.

Question 1

(50 Marks)

(a) State two safety precautions that must be observed when using a pillar drill.

- Wear personal protective equipment (PPE) such as safety goggles to protect your eyes from flying swarf.
- Always ensure the chuck key is removed from the chuck before starting the pillar drill.

Safety Precautions
Award 3 + 3 Marks
Total (6) Marks

(b) Give one advantage and one disadvantage of using adhesives for joining materials.

- **Advantage:** Adhesives can join dissimilar materials without the need for heat or mechanical fasteners.
- **Disadvantage:** Adhesive joints may not be as strong as welded or bolted joints and can weaken over time.

Advantage
Award 3 Marks
Disadvantage
Award 3 Marks
Total (6) Marks

(c) Explain the importance of testing when designing engineering projects.

Testing ensures that the design functions correctly and performs as intended. It helps identify faults or areas for improvement before final production, reducing the risk of failure.

Explanation
Award 6 Marks
Total (6) Marks

(d) Name the cutting tool shown opposite and give one example of where it may be used.

- The cutting tool shown is a countersink drill.
- A countersunk drill is used to create a conical recess around a drilled hole. This allows the head of a countersunk screw to sit flush with the surface of the material.

Name
Award 3 Marks
Use
Award 3 Marks
Total (6) Marks

(e) Explain the term melting point in relation to plastics.

The melting point is the temperature at which a plastic, changes from solid to liquid.

Explanation
Award 6 Marks
Total (6) Marks

(f) The car jack shown depends on hydraulic technology to function. Explain the term hydraulic technology.

Hydraulic technology uses pressurised liquids, typically oil or water, to generate, control, and transmit power. Hydraulic car jacks use a lever operated pump to force oil into a cylinder, elevating a piston which can lift a heavy car.

Explanation
Award 6 Marks
Total (6) Marks

(g) Explain the term electrical conductor and give one example of a material that can be used as an electrical conductor.

- An electrical conductor is a material that allows electric current to flow through it easily.
- Copper, used in electrical cables, is a good example of an electrical conductor.

Explanation
Award 3 Marks
Example
Award 3 Marks
Total (6) Marks

(h) Describe the main operating features of any one of the following:

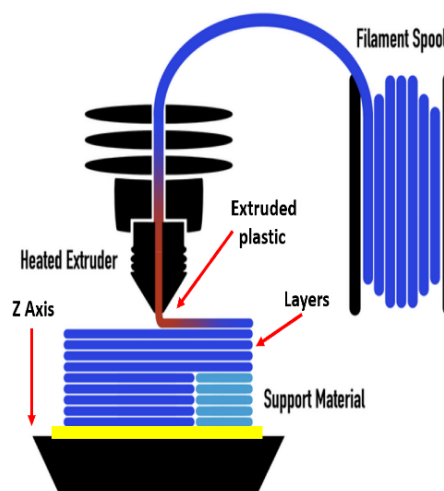
(i) Machine vice

A machine vice features one stationary jaw and one movable, sliding jaw that closes via a screw mechanism to clamp the workpiece. These jaws are often hardened and ground to ensure flatness and parallelism. Many models feature slots in the base for secure, precise mounting to T-slots on a machine table.

Description
Award 6 Marks
Total (6) Marks

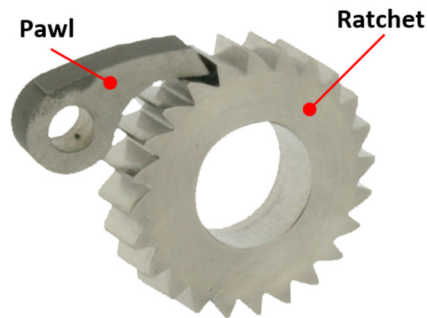
(ii) 3D printer

A 3D printer features a heated extruder which moves around, melting a plastic filament and depositing it onto the build platform. Stepper motors allow the nozzle to move right/left in the X axis and forward/back in the Y axis. When the print process begins, the build platform moves down in steps in the Z axis. This movement allows the plastic material to be added, building the component in layers. The frame of the printer provides structural stability to minimize vibrations that can affect print precision.



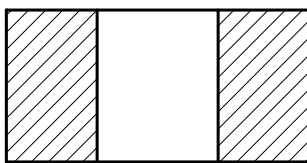
(iii) Wire Tensioner

The wire tensioner shown consists of a ratchet and pawl. As the ratchet is rotated the wire is wrapped around a central shaft, pulling the wire tight. The pawl falls below each tooth as the ratchet rotates. If the rotation of the ratchet stops, the pawl will hold the ratchet in place keeping the wire in tension. The ratchet below is unable to rotate anti-clockwise as the pawl is locked in place.



(i) Explain the difference between a $\varnothing 10$ mm hole and an M10 mm hole.

- A $\varnothing 10$ mm hole is produced using a diameter 10 mm drill, producing a hole which is 10 mm in diameter. A $\varnothing 10$ mm hole is typically used to provide clearance for a bolt, pin or shaft to pass through.
- An M10 mm hole has internal threads cut on the inside of the hole. An M10 mm hole allows an M10 bolt to screw into it. The 'M' signifies a metric thread is used and the number 10 indicates the size of the threaded hole.



$\varnothing 10$ mm hole



M 10 mm hole

(j) Identify the mandatory safety symbol shown.

The mandatory safety symbol shown requires safety goggles to be worn.



Difference

$\varnothing 10$ mm hole

Award 3 Marks

M10 mm hole

Award 3 Marks

Total (6) Marks

Identification

Award 6 Marks

Total (6) Marks

(k) Any one:

(i) Smart technology

Smart technology refers to devices or systems that can sense, respond, and adapt to changes in their environment. These technologies often use sensors, software, and connectivity such as Bluetooth or Wi-Fi to collect data and make decisions without human input. Examples include smart thermostats, autonomous vehicles, and smart manufacturing systems.

(ii) Cybersecurity

Cybersecurity is the practice of protecting systems, networks, programs, and data from digital attacks, theft, or damage. It involves implementing layered defenses—combining people, processes, and technology—to ensure the confidentiality, integrity, and availability of information. Key measures include preventing ransomware, phishing, and unauthorized access to secure digital infrastructure and sensitive data.

(iii) 5G

5G is the 5th generation mobile network, a global wireless standard designed to deliver significantly faster data speeds (up to 10-100x faster than 4G), ultra-low latency, increased reliability, and massive network capacity. It enables near-instantaneous connections for smartphones and smart devices.

Explanation
Award 6 Marks
Total (6) Marks

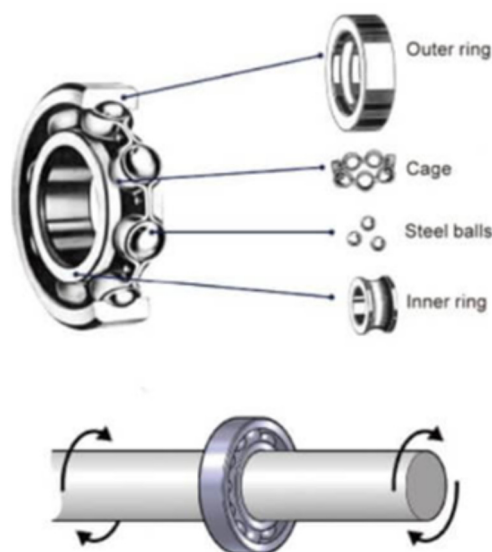
(l) Any one:

(i) Surface finish

Surface finish refers to how smooth or rough a part is after manufacture, directly affecting its aesthetics, friction, wear resistance and sealing capabilities. Surface finish can be measured in terms of roughness, waviness and lay.

(ii) Ball bearing

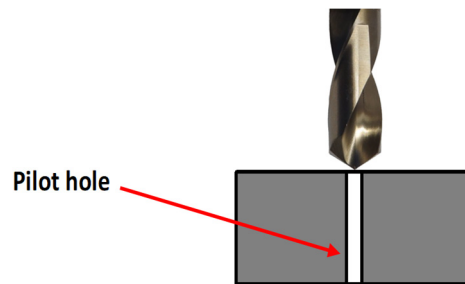
A ball bearing usually comprises of an inner ring, and an outer ring, a number of steel or ceramic balls and a cage used to hold the balls in place. The balls roll between the rings, reducing friction between rotating surfaces. A ball bearing also helps to support both radial loads (perpendicular to the shaft) and axial loads (parallel to the shaft).



Explanation
Award 6 Marks
Total (6) Marks

(iii) Pilot hole

A pilot hole must be drilled before using a large drill. This keeps the large drill central as it guides the drill through the piece when drilling.



(m) Application:

An eye bolt is used for moving heavy machinery or equipment. Eye bolts are often screwed into a solid surface or threaded hole, allowing ropes, chains, or lifting hooks to be attached securely. The eyebolt shown below is used to help tow a car.



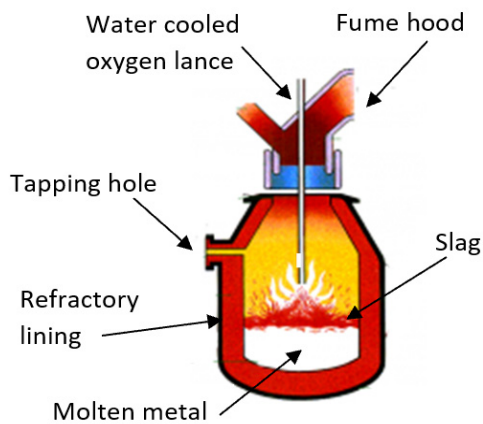
Application
Award 6 Marks
Total (6) Marks

Question 2

(50 Marks)

(a) Any one:

(i) Diagram and labeled parts:



Basic Oxygen Furnace

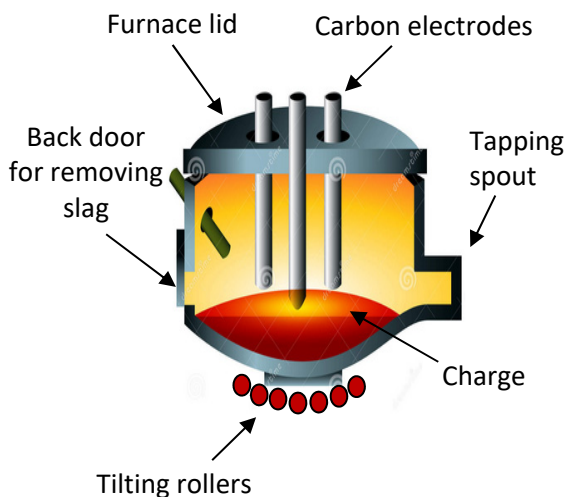
(ii) Metal produced

Steel.

(iii) How the metal is removed

The furnace is rotated and the steel is poured out through the tapping hole. The furnace is then rotated in the opposite direction and the slag is removed.

(ii) Diagram and labeled parts:



Electric Arc Furnace

(ii) Metal produced

Steel / High carbon steel.

(iii) How the metal is removed

The furnace is tilted on rollers and the metal is poured off through the tapping spout.

(i) Diagram

Award 6 Marks

(ii) Metal

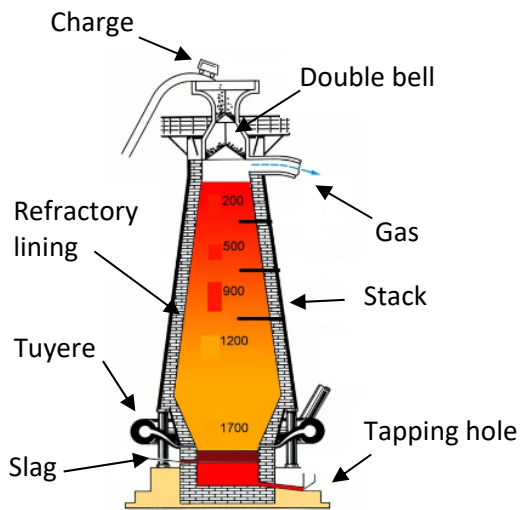
Award 5 Marks

(iii) Removal

Award 4 Marks

Total (15) Marks

(iii) Diagram and labeled parts:



Blast Furnace

(ii) Metal produced

Iron

(iii) How the metal is removed

The iron sinks to the base of the furnace and is removed through the tapping hole at the bottom.

(b) Name any two:

(i) Alloy - Cast Iron: Iron and Carbon

(ii) Alloy - Brass: Copper and Zinc

(iii) Alloy - Solder: Lead and Tin.

(c)

Saddle seat:

(i) Material: Gel padding with vinyl cover

(ii) Reason: Comfortable, moulds to rider's shape, vinyl is easy to clean.

Frame:

(i) Material: Aluminium / Carbon fibre

(ii) Reason: Lightweight, easy to control bicycle on rough terrain, yet strong to sustain impacts / resistant to corrosion.

Tyre:

(i) Material: Rubber

(ii) Reason: Rubber is tough and can be moulded and inflated to provide grip, especially on rough terrain.

Name of metals

Award 6 + 6 Marks

Total (12) Marks

Material

Award 3 + 3 + 3 Marks

Reason

Award 2 + 2 + 2 Marks

Total (15) Marks

(d) Any two:

Mechanism (i)

Name - Bevel Gears

Use - Bevel gears in a hand drill, convert the vertical rotation of the hand crank into horizontal rotation of the drill chuck, changing the direction of the drive by 90°.



Mechanism (ii)

Name - Worm & Wheel

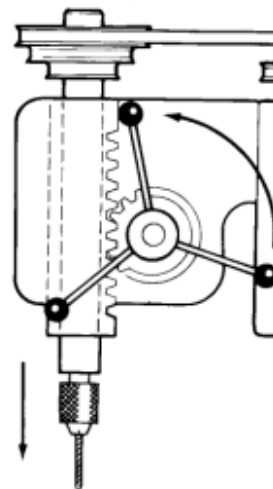
Use - Used on guitars to tighten the strings. The mechanism will hold the strings tight due to its self-locking capability, which prevents the wheel from driving the worm.



Mechanism (iii)

Name - Rack and pinion.

Use - Pillar drilling machine, used to move the drill spindle vertically when drilling.



Name and Application

Award 4 + 4 Marks

Total (8) Marks

Question 3**(50 Marks)****(a) State two safety precautions:**

- Wear correct PPE such as heat-resistant gloves.
- Be careful of splash back from the cooling medium.

(b) Any two:**(i) Cooling high carbon steel slowly from 900°C**

Annealing is a heat treatment process used to soften metals. To anneal steel, it is heated to a cherry red colour, approx. 900° and allowed to cool down as slow as possible. This can be achieved by leaving the metal in a furnace while the furnace is cooling down. Annealing relieves internal stresses, increases ductility and malleability of a metal.

(ii) Cooling high carbon steel quickly from 900°C

Hardening is a heat treatment process of cooling high carbon steel quickly from 900°C in oil or water. Hardening will produce a hard and brittle material which will resist indentation, wear or scratching.

(iii) Cooling hardened high carbon steel quickly from 250°C

Tempering is where a metal is heated to a suitable temperature, in this case 250°C which is below the reddening temperature, and then cooling in oil or water. Tempering will reduce some of the steel's hardness but will increase it's toughness.

(c) Any two:**(i) Normalising**

Normalising is carried out to refine the structure of steel and to remove internal stresses caused by cold working such as hammering, rolling or bending. It is similar to the annealing of steel, except the cooling rate is much faster.

(ii) Case hardening

Case hardening is a method of making low carbon steel very hard on the outside while leaving its centre tough. Low carbon steel may be case hardened by first increasing the amount of carbon in the outer surface by 'carburising'. Carburising is carried out by heating the steel to a cherry red and allowing it to cool in a carbon rich material. The steel part will now have a skin or 'case' rich in carbon. The part is then heated to a cherry red and quenched, producing a hardened skin with a tough core.

Safety Precautions
Award 5 + 5 Marks
Total (10) Marks

Processes
Award 7 + 7 Marks
Total (14) Marks

Heat treatment
Award 7 + 7 Marks
Total (14) Marks

(iii) Carbon content

Carbon content refers to the percentage of carbon contained in steel.

- Low Carbon Steel contains 0.05% to 0.25% by weight of carbon.
- Medium Carbon steel contains 0.30% to 0.60% by weight of carbon
- High Carbon Steel contains 0.60% to 1.5% by weight of carbon.

(d) Any two:

(i) Malleability

The ability of a material to be hammered and/or formed without breaking.

(ii) Elasticity

The ability of a material to deform under stress and return to its original shape and size when the force is removed.

(iii) Tensile strength

The ability of a material to withstand being pulled apart or stretched.

OR

(d) Any two:

(i) Workplace safety:

- Remote controlled robots can perform inspections in high-voltage areas, eliminating the need for humans to be exposed to dangerous environments.
- Robots can be utilised to handle repetitive, heavy or strenuous lifting tasks that could cause muscle strains or back injuries.

(ii) Manufacturing processes:

- Industrial robots are used to perform arc welding, spot welding and laser welding.
- Pick and place robots are used to identify, grab, and move items from one location to another, such as placing components onto circuit boards or sorting products into packages.

(iii) Pneumatics

- Pneumatics refers to the use of compressed air to generate energy and create motion.
- Pneumatic technology has a wide range of uses from air brakes, to dental drills, exercise machines and jackhammers.

Explanations

Award 6 + 6 Marks

Total (12) Marks

Any two:

(i) Safety

Award 3 + 3 Marks

(ii) Two Processes

Award 3 + 3 Marks

(iii) Explain

Award 6 Marks

Total (12) Marks

(a)**Type of flames produced:**

- (i) Equal amounts of oxygen and acetylene produce a neutral flame
- (ii) Excess oxygen produces an oxidising flame.
- (iii) Excess acetylene produces a carburising flame.

Flames

Award 2 + 2 + 2 Marks**Total (6) Marks****(b) Any two:****(i) Flux**

A flux is used to remove oxides from the surface of the parts being soldered and to prevent further oxidation when the parts are heated. Flux also helps the solder to flow into the joint by capillary attraction.

Descriptions

Award 3 + 3**Total (6) Marks****(ii) Tinning**

Tinning is the process used when a thin layer of solder is required to cover components before sweating. The tip of a soldering iron is often tinned to ensure good heat transfer when soldering.

(iii) Mechanically clean

Mechanically clean refers to the removal of oxides, burnt flux, and excess solder from the tip of the soldering iron or workpiece using abrasive tools, rather than relying on just the flux.

(iv) Sweated joint

Sweating is a process used when joining two pieces together by soldering. When sweating, both surfaces are coated separately with solder then placed together and heated until the solder on both remelts and unites. When the solder cools, both parts are held together.

(c) Any three:

(i) Gas regulator

The gas regulator is positioned at the top of the gas cylinder in both oxy-acetylene welding and MIG / TIG welding. The prime function of the gas regulator is to allow the operator manage outlet gas pressure. A regulator knob is rotated by the operator to adjust the outlet pressure of the gas and once adjusted; the regulator maintains the outlet pressure at a fix level. Gauges on the regulator indicate the gas pressure and the amount of gas remining in the cylinder.

(ii) Welding apron

A welding apron is a specialised piece of PPE designed to protect a welder's body from heat, sparks and molten splatter when welding.

(iii) Welding goggles

Welding goggles are used to provide eye protection while some forms of welding, brazing and cutting are being carried out. They are intended to protect the eyes not only from the heat, but also from sparks or debris. A full facemask may be required for arc welding.

(iv) Fume extractor

A fume extractor is a local ventilation system designed to capture and filter toxic gases, metal fumes and particles directly at the source.

(d) Any three:

(i) State one benefit of using an assembly jig in welding.

An assembly jig helps to hold the parts in the correct position when welding, making the process faster, more accurate, and safer.

(ii) Suggest one method of joining copper pipes.

Copper pipes can be joined by soldering or using compression or push fit fittings.

(iii) Give one advantage of using a temporary joint in engineering.

A temporary joint allows machines to be taken apart for repairs / maintenance or testing before final operation.

(iv) Explain the function of an earth clamp in arc welding.

An earth clamp is clamped to the material before welding, the clamp completes the circuit allowing the arc to form between the electrode and material.

Function

Award 5 + 5 + 5

Marks

Total (15) Marks.

Explanations

Award 5 + 5 + 5

Marks

Total (15) Marks

(e) Two safety precautions:

- Wear a welding helmet with a proper filter to protect your eyes and face from sparks and harmful UV light.
- Keep the work area dry and clear of flammable materials to prevent fires and electric shocks.

Safety Precautions
Award 4 + 4 Marks
Total (8) Marks

(a) (i) Name each:

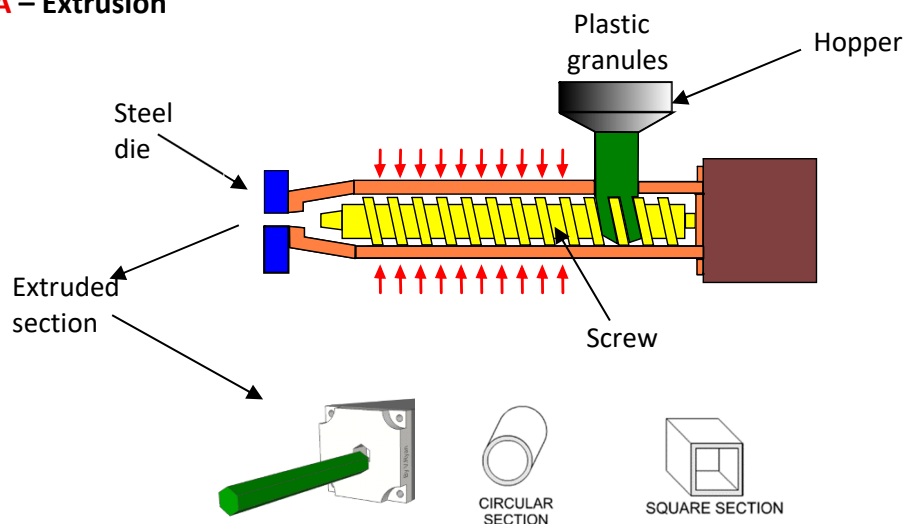
A: Extrusion

B: Vacuum forming

C: Injection moulding

(ii) Describe any one:

A – Extrusion



Plastic granules are fed through a hopper and move along the screw in the cylinder. Heaters melt the granules into a liquid which is forced through a steel die, forming a long 'tube like' shape. The shape of the die determines the shape of the tube. The extruded section is then cooled and forms a solid shape. The tube may be printed upon and cut at equal intervals.

(i) Name

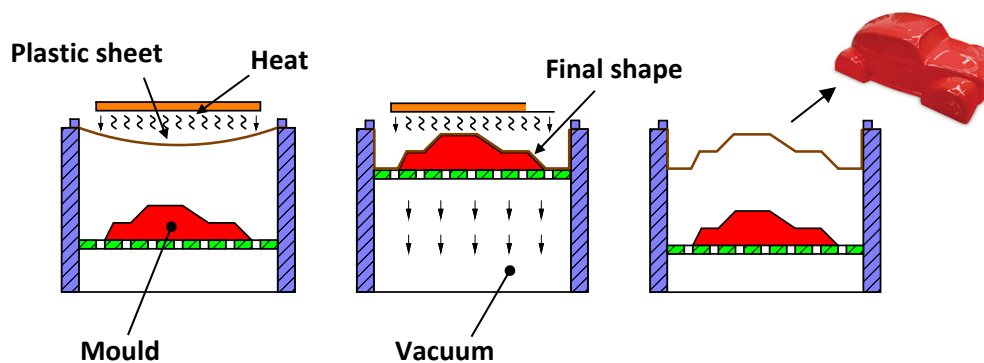
Award 5 + 5 + 5 Marks

(ii) Description

Award 5 Marks

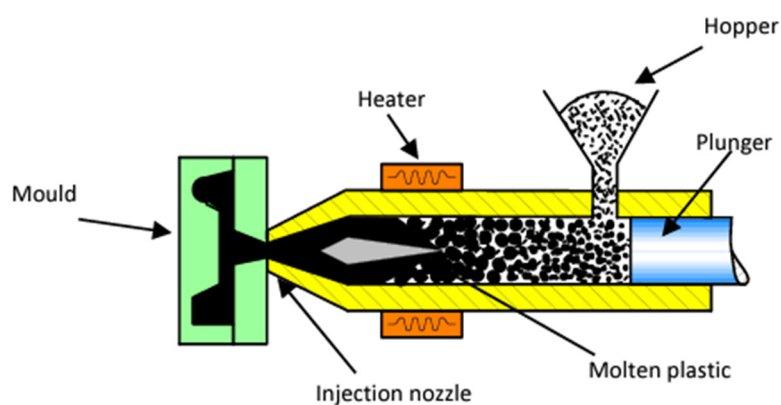
Total (20) Marks

B – Vacuum forming



A thermoplastic sheet is clamped in a frame and heat is applied until the sheet begins to sag. At this stage, the mould is lifted up into the plastic sheet and vacuum pressure is applied. This causes the plastic sheet to pull against the mold and form the final shape. After cooling, the mould is lowered and the plastic part is removed from the frame. Excess material is trimmed away.

C – Injection moulding



Thermoplastic is softened by heating it inside an injection nozzle. The softened plastic is forced by a plunger into a cold mould where it hardens rapidly and is then ejected. Injection moulding is used for the rapid moulding of components.

(b) Any two:

(i) Fiberglass

Fiberglass is a fibrous glass; a man-made material used for insulation or structural reinforcement (GRP). Fiberglass is often used with a thermoplastic resin to produce boat or canoe bodies.

(ii) Biodegradable plastic

Biodegradable plastics are designed to decompose through the action of microorganisms (bacteria, fungi) into water / carbon dioxide. Biodegradable plastics unlike conventional plastics can break down in months rather than centuries, often used in packaging, agricultural films and medical applications.

(iii) Thermoplastic

Thermoplastic can be heated and softened over and over again.

(iv) Elastic memory

This describes the ability of a plastic to return to its original shape after being formed. The plastic remembers its original shape and will return to this shape if heated.

Descriptions

Award 5 + 5 Marks

Total (10) Marks

(c) Any two:

(i) Rear light cover: - Acrylic / Polycarbonate.

(ii) Interior door cover: - ABS (Acrylonitrile Butadiene Styrene).

(iii) Seat belts: - Nylon.

(iv) Wheel covers: - Polypropylene.

Material

Award 5 + 5

Total (10) Marks

(d) Any two:

- Plastics can leak into our seas and rivers where they entangle with marine life and are often mistaken for food, leading to starvation, internal injuries and death.
- Incorrect burning of plastics can release dangerous toxic fumes into the atmosphere leading to air pollution.

Hazards

Award 5 + 5

Total (10) Marks

Question 6

(50 Marks)

(a) Any three:

A – Three jaw self-centering chuck.

B – Tool post.

C – Tailstock.

D - Drill chuck.

Lathe parts

**Award 5 + 5 + 5
Marks**

Total (15) Marks

(b) Any three:

(i) Spindle speed

Spindle speed is measured in revolutions per. minute (RPM) and is the number of times the spindle turns in one minute, how fast the spindle spins.

Explanations

Award 5 + 5 + 5

Total (15) Marks

(ii) Swarf

Swarf is the waste material produced when the chip is cut from a workpiece.



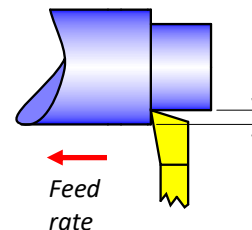
(iii) Coolant

Coolant is used when machining metals to improve tool life, reduce the buildup of heat, improve surface finish and flush away chips from the cutting area.



(iv) Feed

Feed refers to the rate at which a cutting tool advances into or along the surface of a workpiece.



(c)

(i) Describe the process of knurling.

A knurling tool is fitted to the tool post and set at 90° to work. The center lathe is then turned on at a very slow speed. The knurling tool is moved into the workpiece. Two opposing rollers which press into the piece are moved parallel to the axis of the work producing a diamond pattern on the surface of the material. A lubricant should be used on the workpiece and rollers to help reduce friction.

(ii) Name two other machining processes that can be performed on a centre lathe.

- Drilling, using the tailstock.
- Parting off.

(iii) Identify any two integrated safety features found on a centre lathe.

- Interlocked chuck guard, a protective shield covering the rotating chuck. If the guard is lifted away from the chuck, an interlock switch automatically stops the rotating chuck.
- Emergency stop button or foot pedal, a large easily accessible, mushroom shaped button or foot pedal designed to immediately stop the operation of the centre lathe.

OR

(c)

(i) Explain the term CNC.

The term CNC refers to a Computer Numerically Controlled manufacturing machine. The CNC machine follows a computer program to manufacture pre-designed parts.

(ii) Any two CNC machines found in a modern engineering workshop.

- CNC lathe
- 3D printer.

(iii) Two advantages of using CNC machines.

- CNC manufacturing machines can produce complex parts to a high degree of accuracy.
- CNC machines can provide 24/7 operation with minimal labor and improved safety.

(i) Process

Award 6 Marks

(ii) Name

Award 3 + 3 Marks

(iii) Safety

Award 4 + 4 Marks

Total (20) Marks

(i) Explanation

Award 6 Marks

(ii) Two CNC machines

Award 3 + 3 Marks

(iii) Two Advantages

Award 4 + 4 Marks

Total (20) Marks

Question 7**(50 Marks)****(a)****(i) Interference fit**

An interference fit is achieved when the shaft is larger than the hole.
A force is required to assemble the shaft and hole.

(ii) Lower Limit

Lower limit refers to the smallest size a component can be when working to a tolerance.

(iii) Clearance fit

A clearance fit is achieved when the shaft is smaller than the hole.
The shaft is a loose fit in the hole.

Descriptions

Award 6 + 6 Marks**Total (12) Marks****(b)**

- | | | |
|--------------|----------------------------------|-------------------|
| (i) | Nominal diameter of the body: - | 20.00 mm diameter |
| (ii) | Largest diameter of the hole: - | 14.10 mm diameter |
| (iii) | Smallest diameter of the body: - | 19.50 mm diameter |
| (iv) | Tolerance of the hole: - | 0.2 mm |

Calculations

**Award 5+5+5+5
Marks****Total (20) Marks****(c)****(i) Name any three:**

- A** Vernier height gauge
- B** Dividers
- C** Vernier callipers
- D** Vee block and Clamp

(i) Name

Award 3+3+3 Marks

(ii) Explanation

Award 5 Marks

(ii) Two Advantages

Award 2 + 2 Marks**Total (18) Marks****(ii) Explain why it is important to zero a measuring tool before use.**

To ensure accuracy, consistency and reliability in measurements.

(iii) Give two advantages of a digital readout on measuring instruments.

- Helps to eliminate reading errors.
- Speeds up the measuring process, easy to read in low light levels.

OR

(c)

(i) Identify any two electronic components on the PCB shown.

- Capacitor
- Switch
- Fixed resistor
- LED
- Diode
- Transistor
- Variable resistor
- IC (Integrated Circuit)
- Connector block

(ii) Explain one benefit of using PCBs in project work.

Components are soldered directly to copper tracks eliminating loose wires, improving reliability of circuit construction and operation.

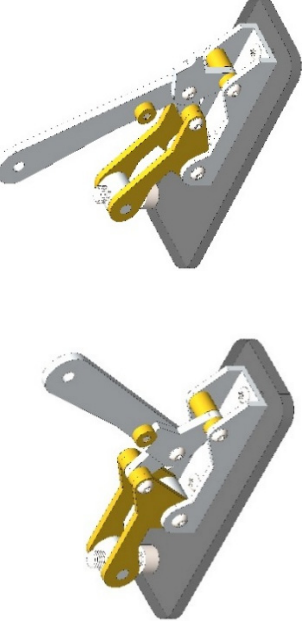
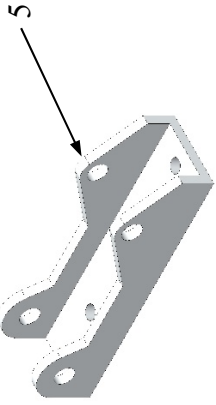
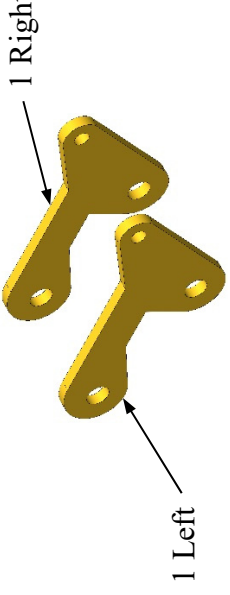
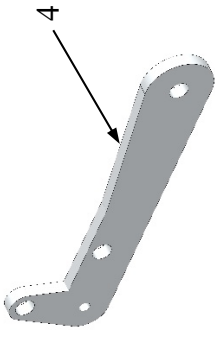
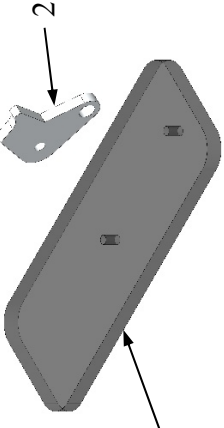
(iii) State one other application of a timer circuit.

Timer circuits are used in microwaves to count down the cooking time.

(i) Components
Award 3 + 3 Marks
(ii) Benefit
Award 6 Marks
(iii) Application
Award 6 Marks
Total (18) Marks



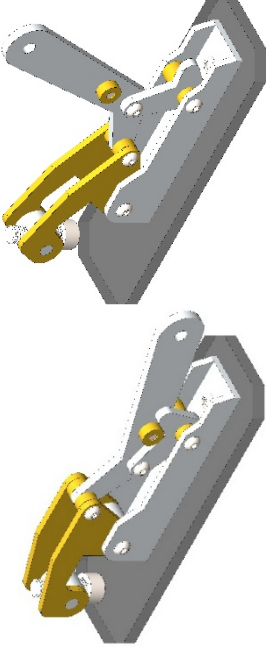
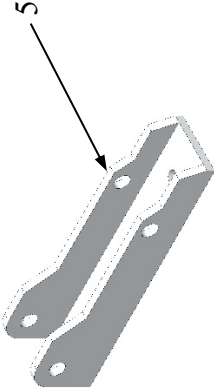
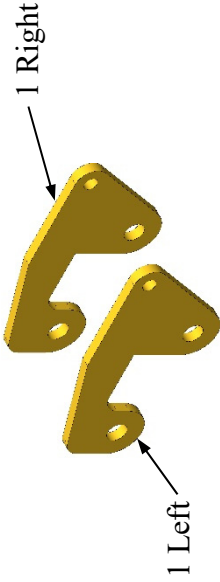
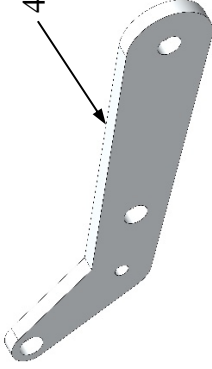
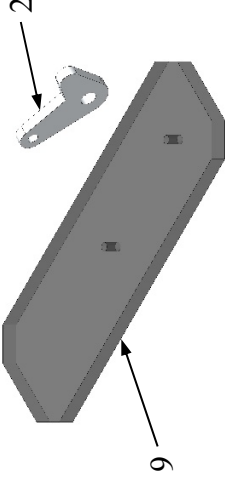
Coimisiún na Scrúduithe Stáit
State Examinations Commission
Leaving Certificate Engineering Practical Marking Scheme 2026 - Day 1

Section	Part Number	Pictorial Sketch / Description	Concept	Mark	Mark
1	All Parts of Test-piece		Assembly, Function & Finish Assembly Function Finish	5 10 5	20
2	Part 5		Part 5 20 Marks	5 5 5 5	20
3	Parts 1		Part 1 Left 10 Marks Part 1 Right 10 Marks	5 5 5 5	20
4	Part 4		Part 4 20 Marks	5 5 5 5	20
5	Part 2 & Part 9		Part 2 10 Marks Part 9 10 Marks	5 5 5 5	20

100 Marks (x1.5 = 150 Total)



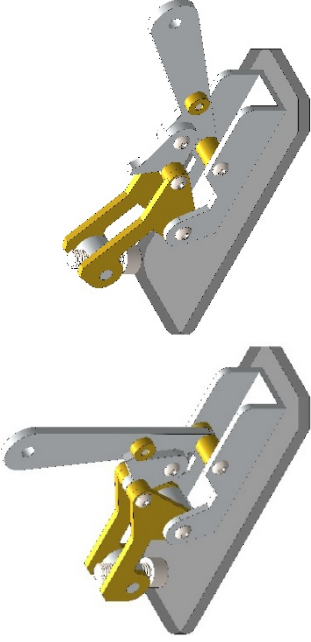
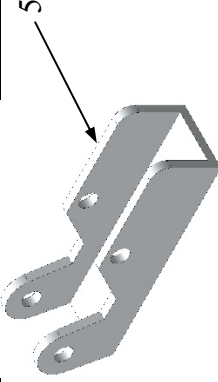
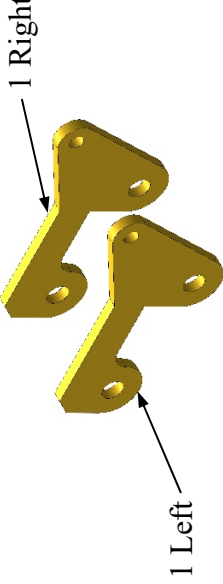
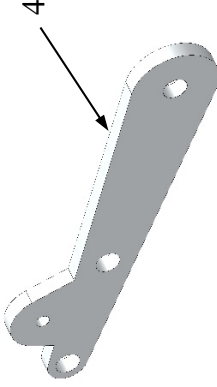
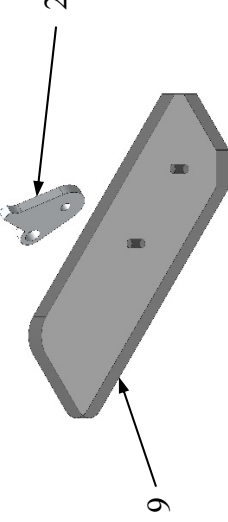
Coimisiún na Scrúduithe Stáit
State Examinations Commission
Leaving Certificate Engineering Practical Marking Scheme 2026 - Day 2

Section	Part Number	Pictorial Sketch / Description	Concept	Mark	Mark
1	All Parts of Test-piece		Assembly, Function & Finish Assembly Function Finish	5 10 5	20
2	Part 5		Part 5 20 Marks	5 5 5 5	20
3	Parts 1		Part 1 Left 10 Marks Part 1 Right 10 Marks	5 5 5 5	20
4	Part 4		Part 4 20 Marks	5 5 5 5	20
5	Part 2 & Part 9		Part 2 10 Marks Part 9 10 Marks	5 5 5 5	20

100 Marks (x1.5 = 150 Total)



Coimisiún na Scrúduithe Stáit
State Examinations Commission
Leaving Certificate Engineering Practical Marking Scheme 2026 - Day 3

Section	Part Number	Pictorial Sketch / Description	Concept	Mark	Mark
1	All Parts of Test-piece		Assembly, Function & Finish Assembly Function Finish	5 10 5	20
2	Part 5		Part 5 20 Marks	5 5 5 5	20
3	Parts 1		Part 1 Left 10 Marks Part 1 Right 10 Marks	5 5 5 5	20
4	Part 4		Part 4 20 Marks	5 5 5 5	20
5	Part 2 & Part 9		Part 2 10 Marks Part 9 10 Marks	5 5 5 5	20

100 Marks (x1.5 = 150 Total)

