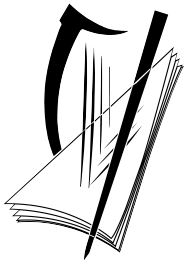


Coimisiún na Scrúduithe Stáit
State Examinations Commission

Leaving Certificate 2019

Marking Scheme

Engineering - Materials and Technology

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 2019

Marking Scheme

Written Examination and Practical Examination

ENGINEERING –
Materials and Technology

ORDINARY LEVEL

LEAVING CERTIFICATE

ENGINEERING - Materials and Technology

(Ordinary Level – 200 marks)

Written Examination Marking Scheme 2019

Answer Question 1, Sections A and B and **Three other questions.**

Question 1: **Total - 65 Marks**

Section A – **30 Marks**
Any six @ 5 marks each — Two part answers 3 + 2

Section B – **35 Marks**
Any three parts @ 12 + 12 + 11 marks — Two part answers 6 + 6 or 6 + 5

Question 2: Total - **45 Marks**

(a) Three parts @ 3 each (9)

(b) (i) 6
(ii) 4
(iii) 3 (13)

(c) (i) 3 + 3 + 3
(ii) 2 + 2 + 2 (15)

(d) (i) 2 + 2
(ii) 4 (8)

Question 3: Total - **45 Marks**

(a) (i) 5 + 5
(ii) 5
(iii) 5 (20)

(b) (i) 6 or 5
(ii) 5 or 6 (11)

(c) 3 + 3 (6)

(d) Any two parts @ 4 each (8)

OR

(d) (i) 2 + 2
(ii) 2 + 2 (8)

Question 4: Total - **45 Marks**

(a) (i) 3 + 3 + 3
(ii) 3 + 3 + 3 (18)

(b) Any three parts @ 3 each (9)

(c) Any three parts @ 4 each (12)

(d) 3 + 3 (6)

Question 5: Total - **45 Marks**

(a) (i) 3 + 3 + 3
(ii) 12 (21)

(b) Any two parts @ 5 each (10)

(c) Any two parts @ 4 each (8)

(d) 3 + 3 (6)

Question 6: Total - **45 Marks**

(a) Any three parts @ 5 each (15)

(b) Any three parts @ 5 each (15)

(c) (i) 5
(ii) 5
(iii) 3 + 2 (15)

OR

(c) 5 + 5 + 5 (15)

Question 7: Total - **45 Marks**

(a) Any two parts @ 5 each (10)

(b) Four parts @ 5 each (20)

(c) Any three parts @ 5 each (15)

OR

(c) (i) 2 + 2 + 2
(ii) 3 + 3 + 3 (15)

Sample Answers *and* Marking Scheme

Note: **The solutions presented are examples only.**
All other valid solutions are acceptable and are marked accordingly.

Question 1 (65 Marks)

SECTION A - 30 MARKS — **6 parts @ 5 marks each**
For two part answers award 3 + 2

SECTION B - 35 MARKS — **2 parts @ 12 marks each**
1 part @ 11 marks
Award 6 + 6 or 6 + 5 as appropriate

SECTION A – 30 MARKS — **MARKS**

(a) 1. Wear protective goggles.
2. Make sure the guard is set to the appropriate height. — **3 + 2 Marks**

(b) To inspect/view parts that are inaccessible naturally to the eye. — **5 Marks**

(c) 1. Good conductor of heat/electricity.
2. Ductile. — **3 + 2 Marks**

(d) The use of robotics for spot welding car chassis during assembly. — **5 Marks**

(e) **(i)** Temporary joint - Nut and bolt
(ii) Permanent joint - A welded joint — **3 + 2 Marks**

(f) - Rack and pinion
- used for adjusting the height of the table on a pillar drill. — **3 + 2 Marks**

(g) Vacuum forming can be used to form biscuit trays / sandwich packs. — **5 Marks**

(h) - Battery.
- To supply electrical current to an electrical circuit. — **3 + 2 Marks**

SECTION B – 35 MARKS

Describe
Award 12 (11) Marks
Total (12, 11) Marks

(i) Any one:

Pop riveting gun
A pop riveting gun is used to create a pop riveted joint in sheet metal.
A pop rivet is placed into the gun and passed through a pre-drilled hole in the metals to be joined. As the handles of the gun are squeezed, a clamping mechanism grips the shaft of the rivet and draws it back. The enlarged end of the shaft causes the remaining part of the rivet to expand thereby clamping the sheet metal together. When the tensile force on the rivet gets too great the shaft breaks off leaving the pop rivet joint behind.

Shears
The material is clamped into position. A moving blade then comes down across a fixed blade to cut the material by a shearing action. For larger shears the moving blade may be set on an angle or "rocked" in order to shear the material progressively from one side to the other; this angle is referred to as the shear angle.

Tailstock
The tailstock is part of a centre lathe which can be moved along the bedway. The tailstock facilitates drilling, tapping, reaming or supporting the outer end of long work. A chuck or rotating centre can be fitted into the barrel and this can be moved forward or back by rotating a hand wheel located at the back of the tailstock. A second lever can be used to clamp the tailstock in any desired position on the bedway.

Explain
Award 6 + 6(5)
Total (12, 11) Marks

(j) Any two:

Hacking
Is the activity of illegally trying to obtain data trough accessing another person's or an organisations computer device. Hacking can be done by a person known as a 'hacker' or achieved through a virus / program.

Virtual reality
Virtual reality uses computer-generated graphics to produce a simulation of three-dimensional images or environments which can be interacted with in a seemingly real or physical way by the user. Using special electronic equipment, such as VR headsets/helmets the user feels part of a scene or that they can take part in activities by way of a screen inside the headset. Gloves with sensors are often supplied to enhance the experience.

Mobile technology
Electronic equipment such as mobile phones, tablets, laptops, etc. that you can use in multiple locations without the need to hardwire (wireless) to other units. The user has full access and use of all functions while on the move with the device. Mobile technology uses specific platforms where transmitters and receivers send and receive data on specific wavelengths.

Skype
Skype is a software used on electronic devices to voice call or video call with a single person or a group of people anywhere in the world.
The software allows both voice and visual communication with others through your computer, tablet or mobile phone.

(k) **Hazard:**
A hazard is a potential source of harm / danger or health effect on an individual or individuals.

Example:
Operating a centre lathe without wearing personal protection equipment.

Definition
Award 6
Example
Award 6(5)
Total (12, 11) Marks

(l) **Any two:**

Counter sinking drill
A countersinking drill is a cutter which widens the mouth of a hole to accommodate a CSK screw, the screw fits flush with the surface. Countersinking drills have point angles of either 60^{o} or 90^{o}.

Blind hole
A blind hole refers to a hole that is reamed, drilled, or milled to a specified depth without breaking through to the other side of the workpiece.

Swarf
Swarf is the waste material produced when the chip is cut from the workpiece. Swarf is produced when drilling on a drilling machine or turning on the centre lathe.

Reamer
Reamers are designed to enlarge the size of a previously formed hole by a small amount but with a high degree of accuracy and finish. There are also non-precision reamers which are used for more basic enlargement of holes or for removing burrs.

Explain
Award 6 + 6 (5)
Total (12, 11) Marks

(m)

Name: Four jaw independent chuck.

Application: Used to hold square or rectangular bar for machining on a centre lathe.

Name
Award 6
Application
Award 6(5)
Total (12, 11) Marks

Question 2 (45 Marks)

(a) **(i) Metal:** Pig iron
(ii) Metal: Steel
(iii) Metal: Steel

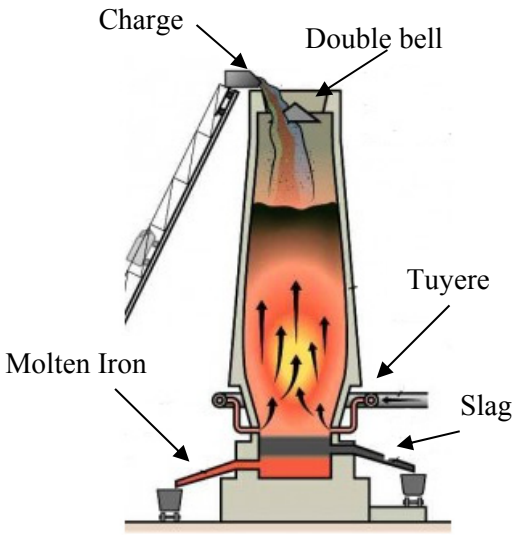
Name
Award 3 @ 3 Marks
Total (9) Marks

(b) **Selected Furnace**

(i) Diagram and Labels **@ 6 Marks**
(ii) Materials in charge **@ 4 Marks**
(iii) Heating the charge **@ 3 Marks**
Total (13) Marks

Blast furnace

(i) Diagram & main parts

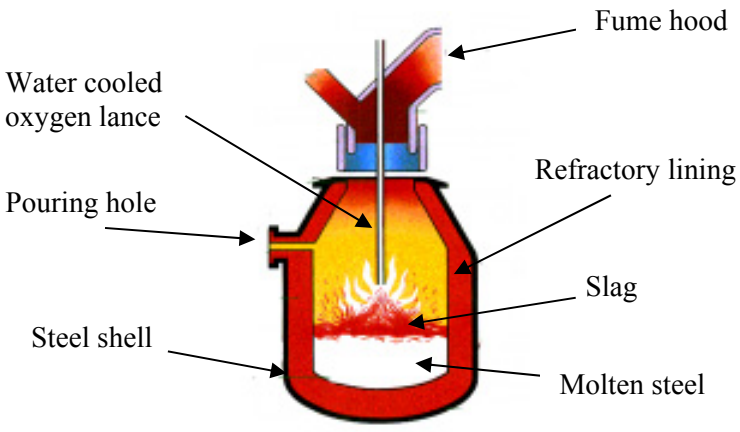


(ii) Materials used in the charge
Iron ore, Coke & Limestone

(iii) Heating the charge
As the coke burns it provides heat to melt the charge. To support the burning process air is blown into the charge through the tuyere.

Basic Oxygen

(i) Diagram & main parts

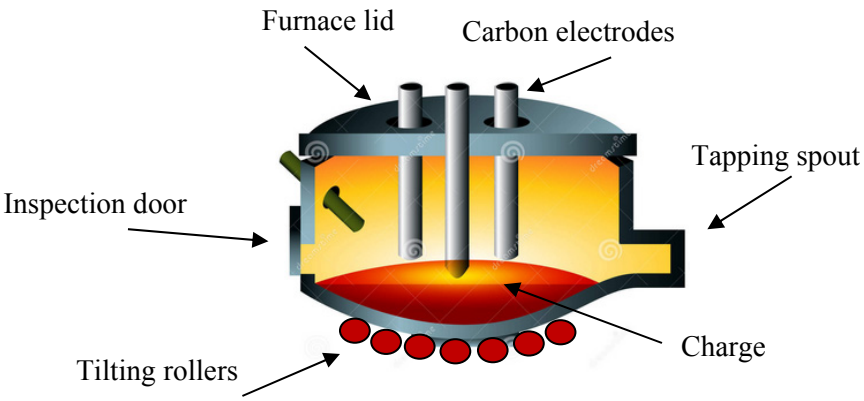


(ii) Materials used in the charge
Scrap metal, Pig iron & Limestone

(iii) Heating the charge
Oxygen blown onto the surface of the molten metal produces intense heat which burns unwanted impurities from the charge.

Electric arc furnace

(i) Diagram & main parts



(ii) Materials used in the charge
Scrap metal, Pig iron & Carbon

(iii) Heating the charge
Heat for this furnace is produced by an electric arc created by current flowing between the carbon electrodes and the charge.

(c)

	Material	Reason
Handle:	Rubber	For better grip and flexibility.
Frame:	Carbon fiber Tubular streel Tubular aluminum	Light / strong
Wheel hub:	Aluminum	Light / will not rust

Material
Award 3 @ 3 Marks
Reason
Award 3 @ 2 Marks
Total (15) Marks

(d) **(i)** Brass & Solder

(ii) Brass: Copper and Zinc
or
Solder: Lead and Tin

(i) Named alloy
Award 2 @ 2Marks
(ii) Metals used
Award 2 + 2
Total (8) Marks

Question 3 (45 Marks)

(a)

(i) Two heat treatments:

Hardening

Hardening point A of the cold chisel is achieved by heating the tip to a cherry red (900℃) and quenching in water.

(i) Explain
Award 2 @ 5 Marks
Total (10)

Tempering

Tempering the point A is achieved by heating the tip to 200℃ / 300℃ and quenching in water.

Mechanical properties

(ii) Cutting edge A - Tough & Hard

(iii) Head B - Tough / Soft

(ii) One Property **@ 5 Marks**
(iii) One Property **@ 5 Marks**
Total (10)

(b) Heat treatment processes

Describe (i) & (ii)
Award 1 @ 6 Marks
Award 1 @ 5 Marks
Total (11)

(i) Quenching

Quenching is when a hot metal is cooled very quickly i.e. when a cherry red metal is moved about when dipped into cold water.

(ii) Work hardening

When a metal is hammered or shaped when cold it becomes hard and brittle at the point where the cold - working occurs. Some metals are prone to work hardening, copper and aluminum are typical examples where hardness values can be increased by cold working.

(c) Two safety precautions:

- Wear protective clothing to protect from hot water splashes or rising steam.
- Be cautious of flames when cooling hot metals in oils.

Safety Precautions
Award 2 @ 3 Marks
Total (6) Marks

(d) Any two metal properties:

Explain
Award any 2 @ 4 Marks
Total (8)

(i) Malleability:
The ability to be hammered or rolled into a thin sheet without fracturing.

(ii) Tensile strength:
Tensile strength is the maximum force or load applied to a piece before it breaks or fractures, divided by the original cross-sectional area.

(iii) Brittleness:
A brittle material will break / shatter under impact. Cast iron, glass and concrete are brittle materials.

OR

(i) Processes
Award 2 @ 2 Marks
(ii) Advantages
Award 2 @ 2 Marks
Total (8) Marks

(d) (i) Two processes - Car manufacture & circuit board assembly.
(ii) Two advantages – Accuracy of manufacture, speed of production

Question 4 (45 Marks)

(a) (i)
A - Oxidising flame
B - Carburising flame
C - Neutral flame

Name
Award 3 @ 3 Marks
Total (9) Marks

(ii)

A - Oxidising flame – An oxidizing flame has more oxygen than acetylene.

B - Carburising flame - A carburising flame has more acetylene than oxygen.

C - Neutral flame - A neutral flame has equal amounts of oxygen and acetylene.

Proportions
Award 3 @ 3 Marks
Total (9) Marks

(b) Description of any three:

Descriptions
Award any 3 @ 3 Marks
Total (9) Marks

(i) Earth clamp:
The earth clamp is a clamp which is clamped onto the material being welded. The earth clamp is connected to the power. The other lead from the welder is connected to the electrode. When the electrode touches the material, the circuit is complete through the earth clamp and an arc is produced.

(ii) Flashback arrestor
The flashback arrestor is a device fitted on the hose between the tank and the welding torch. It prevents the backflow of the flame through the gas hose, avoiding an explosion.

(iii) Flux:
Protects the weld area and prevents oxidisation during welding.

(iv) Electrode:
An electrode is used to conduct current through a workpiece to fuse two pieces together. Depending upon the process, the electrode is either consumable, in the case of gas metal arc welding or shielded metal arc welding, or non-consumable, such as in gas tungsten arc welding.

(c) Any three:

Explanations
Award any 3 @ 4 Marks
Total (12) Marks

(i) To join sheet steel:
Spot welding / soldering / use of pop rivets

(ii) Testing circuits before soldering:
There may be an issue with the circuit i.e. it may not be working properly. Once it is soldered together it is permanently joined and becomes more difficult to fix any issues that may be in the circuit.

(iii) Difference between and M5 hole and a Ø5 hole:
An M5 hole is a hole which is threaded to a metric 5mm thread.
A Ø5 hole is a hole which has been drilled to a diameter 5mm using a 5mm drill.

(iv) Ventilation:
Adhesives produce dangerous fumes, ventilation provides a flow of fresh air which helps to dilute the fumes when using adhesives.

(d) Two safety precautions:

Safety precautions
Award 2 @ 3 Marks
Total (6) Marks

- Check all the electrical cables / equipment for damage.
- Make sure you are wearing all the correct and necessary PPE.

Question 5 (45 Marks)

(a) (i) Name processes:

Name
Award 3 @ 3 Marks
Total (9) Marks

A - Injection moulding

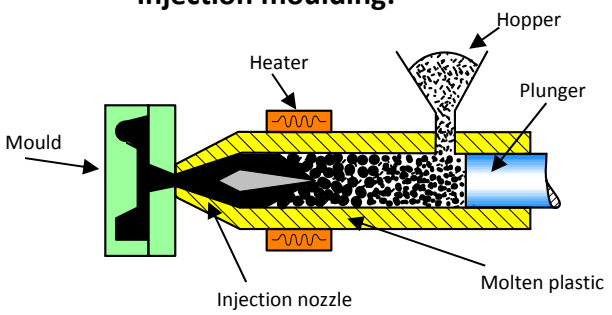
B - Blow moulding

C - Compression forming

(ii) Any one manufacturing process:

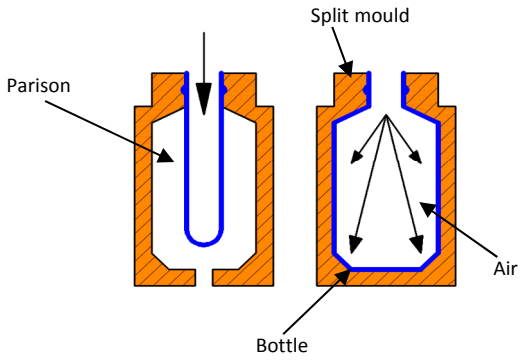
Describe
Award 12 Marks
Total (12) Marks

Injection moulding:



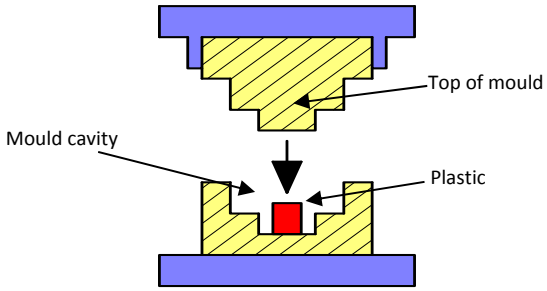
Thermoplastic is softened by heating it inside an injection nozzle. The softened plastic is forced by a plunger into a cold mould where it hardens rapidly and is then ejected. Injection moulding is used for the rapid moulding of components.

Blow Moulding:



Used to produce articles from a heated thermoplastic tube called a parison. The article is moulded by the internal shape of a split mould. The mould closes around the extruded parison and air is blow inside forcing the parison out against the wall of the mould. The component is allowed to cool before being removed from the opened mould.

Compression moulding:



A measured amount of thermosetting plastic polymer is placed into the cavity of the mould. Heat from the mould causes the polymer to melt. The mould cavity is shaped to form the outside of the object. The top half of the mould closes dispensing the melted plastic to form the object. Pressure is maintained to allow the plastic to harden. Once solidified the mould is opened and the part is released.

(b) Describe any two - plastic technology:

Describe
Award any 2 @ 5 Marks
Total (10) Marks

(i) Thermosetting plastic
Remains hard even when exposed to further heat.

(ii) Elastic memory
This describes the ability of a plastic to return to it's original shape after being formed. The plastic remembers it's original shape and will return to this shape if heated i.e. it is a smart material.

(iii) Thermoplastic
A thermoplastic can be softened and reformed many times. Thermoplastics are also suitable for recycling.

(c) Any two suitable plastics:

Name of Plastic
Award any 2 @ 4 Marks
Total (8) Marks

(i) Rear light: Perspex / Acrylic / (PMMA)

(ii) Tool handle: Cellulose acetate (CA) / ABS

(iii) Kitchen worktop: Melamine-formaldehyde (MF) / Bakelite

(d) Safety precautions:

Safety Precautions
Award 2 @ 3 Marks
Total (6) Marks

- Do not overheat the object (metal) to be plastic dip coated.
- Use gloves when handling the hot component.

Question 6 (45 Marks)

(a) Identifying any three parts:

Name
Award any 3 @ 5 Marks
Total (15) Marks

(i) Slocomb drill / Centre drill

(ii) Self-centering three jaw chuck

(iii) Parting off tool

(iv) Chuck key

(b) Any three machining terms:

Explain
Award any 3 @ 5 Marks
Total (15) Marks

(i) Cutting speed: Cutting speed is defined as the speed at which the work moves with respect to the tool.

(ii) Clearance angle: Without a clearance angle, no cutting would take place. The clearance angle ensures that only the cutting edge of a tool makes contact with a piece. It provides clearance between the cutting tool face and the workpiece.

(iii) Tolerance: Tolerance is the range within which the final size of a product can lie. Tolerance is the difference between the upper and lower limits.

(iv) Cutting fluids: Cutting fluids are used in metal machining for a variety of reasons improving tool life, reducing the buildup of heat, improving surface finish and flushing away chips from the cutting zone.

(c)

(i) Name **@ 5 Marks**
(ii) Describe **@ 5 Marks**
(iii)Safety Precautions **@ 3 + 2 Marks**
Total (15) Marks

(i) Knurling

(ii) A knurling tool set against a piece of round section of bar. The lathe is set so that the chuck revolves at a low speed. The knurling tool is then pressed against the rotating steel and pressure is slowly increased until the tool produces a pattern on the bar.

(iii) Have no loose clothing hanging near the turning bar on the lathe/wear PPE

OR

Advantages
Award 3 @ 5 Marks
Total (15) Marks

(c) Three advantages of a CNC lathe:

- Easier and quicker to mass produce the piece shown on a CNC lathe
- Less chance of errors if made on a CNC lathe
- Reduced labor cost

Question 7 (45 Marks)

Describe
Award any 2 @ 5 Marks
Total (10)

(a) Describe any two:

(i) Interference fit

An interference fit produces a tight fit where both parts require force during assembly.

(ii) Clearance fit

A clearance fit produces a loose fit. When the largest shaft can fit into the smallest hole a clearance fit is achieved.

(iii) Upper limit

The largest dimension a piece can be manufactured to.

(b)

Calculations
Award 4 @ 5 Marks
Total (20)

(i)	Nominal diameter of the shaft:	32.00 mm
(ii)	Largest diameter of the shaft:	32.08 mm
(iii)	Smallest diameter of the hole:	31.94 mm
(iv)	The tolerance of the hole:	0.12 mm

Name & application (3 + 2)
Award any 3 @ 5 Marks
Total (15)

(c) Any three:

(i) Plug gauge - Used to check the diameter size of internal holes.

(ii) Combination set - Can be used for multiple marking out exercises such as marking angles, measuring and to locate the exact centre of a round bar.

(iii) Digital Vernier calipers - Used for accurately measuring the diameter of round bars or internal diameters of holes. Measurement can be read directly from a digital display.

(iv) Feeler gauge - Used to check the gap between two parts.

OR

(i) & (ii)
Name & Function (2 + 3)
Award 3 @ 5 Marks
Total (15)

(c) (i) & (ii) Any three electronic components:

A. DC Motor – Used to provide mechanical movement.

B. A buzzer – Used to provide an audible warning etc.

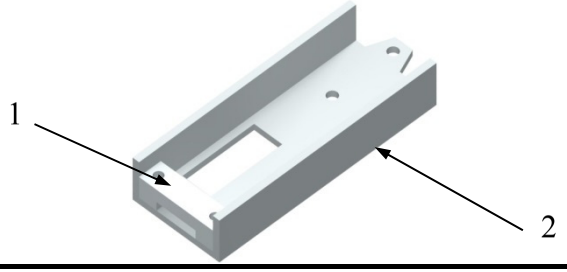
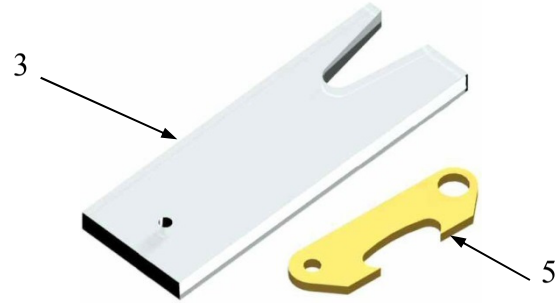
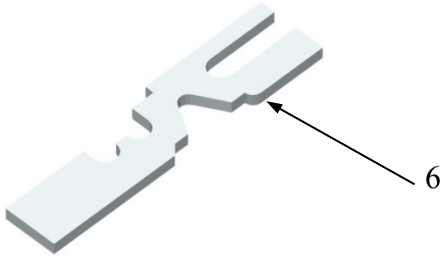
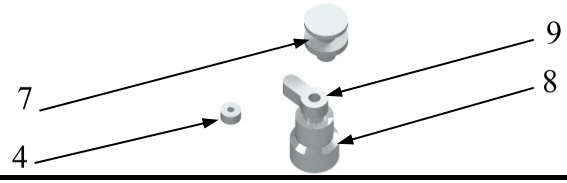
C. A switch – Used to turn on / off the control circuit.

D. Light Emitting Diode (LED) – Used as an indicator to show the circuit is on.

Coimisiún na Scrúduithe Stáit
State Examinations Commission

Day 1 - Leaving Certificate Engineering - Practical Marking Scheme 2019

Subjective Marking 1 - 20 | 17 - 20 Excellent | 13 - 16 Very Good | 9 - 12 Good | 5 – 8 Poor | 1 - 4 Very Poor

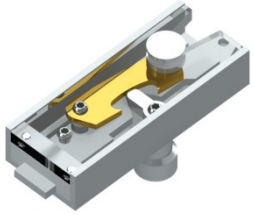
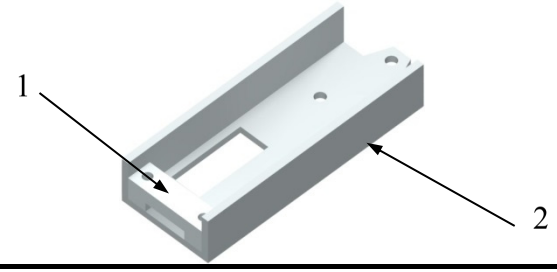
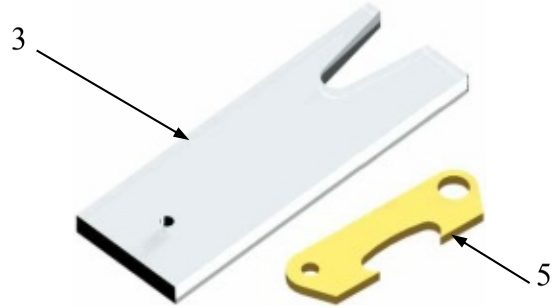
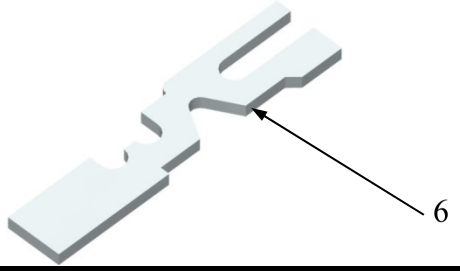
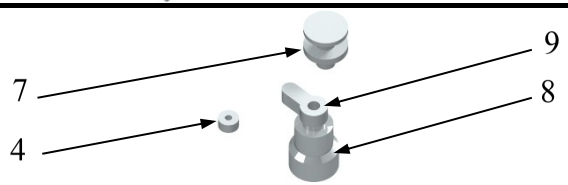
Section	Part Number	Pictorial Sketch / Description	Concept		Mark	Mark
1	**All Parts**		**Assembly** **Function** **Finish** Subjective Mark 1 – 20		**20**	**20**
2	**Parts 1 and 2**		**Part 1** 5 Marks	Pre-Prepared Work	**2**	**20**
				18mm × 4mm Slot	**3**	
			Part 2 15 Marks	Pre-Prepared Work	**2**	
				Ø4.5mm & Ø8mm Holes	**5**	
				Rectangular Slot	**4**	
				End Tab	**4**	
3	**Parts 3 and 5**		**Part 3** 6 Marks	Marking Out	**2**	**20**
				Profile	**3**	
				Drill and Tap	**1**	
			Part 5 14 Marks	Marking Out	**4**	
				Ø4.5mm & Ø8mm Holes	**2**	
				External Profile	**4**	
				Internal Profile	**4**	
4	**Part 6**		**Part 6** 20 Marks	Marking Out	**4**	**20**
				8mm Guiding Slot	**3**	
				Tapered Slot Profile	**4**	
				16mm Locking Slots Profile	**4**	
				3mm Step, Taper and Radius	**3**	
				18mm Bolt Profile	**2**	
5	**Parts 4, 7, 8 and 9**		**Parts 4, 7 & 8** 10 Marks	Turning, Drilling and Tapping	**5**	**20**
				Knurling	**5**	
			Part 9 10 Marks	Marking Out and Ø4.5mm Hole	**2**	
				External Profile	**8**	

100 Marks (×1.5 = 150 Total)

Coimisiún na Scrúduithe Stáit
State Examinations Commission

Day 2 - Leaving Certificate Engineering - Practical Marking Scheme 2019

Subjective Marking 1 - 20 17 - 20 Excellent 13 - 16 Very Good 9 - 12 Good 5 – 8 Poor 1 - 4 Very Poor

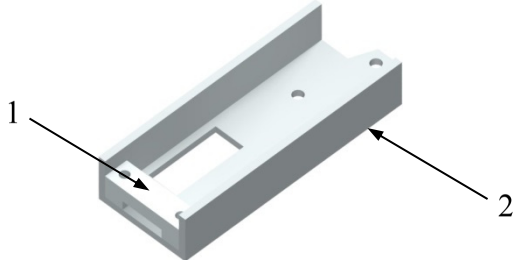
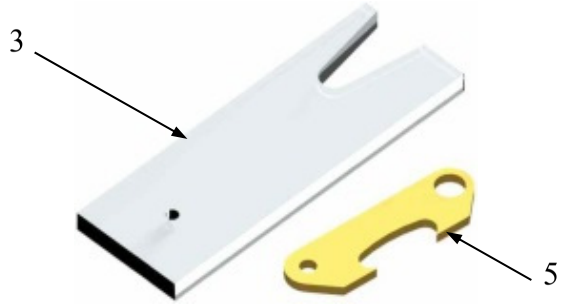
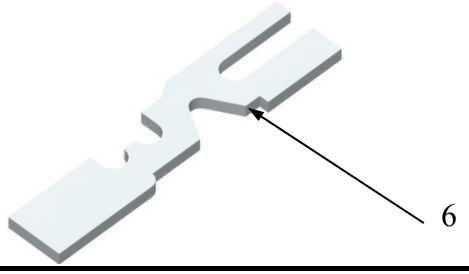
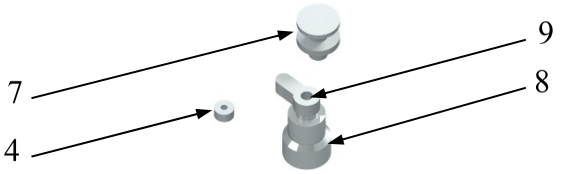
Section	Part Number	Pictorial Sketch / Description	Concept		Mark	Mark
1	**All Parts**		**Assembly** **Function** **Finish** Subjective Mark 1 – 20		**20**	**20**
2	**Parts 1 and 2**		**Part 1** 5 Marks	Pre-Prepared Work	**2**	**20**
				18mm × 4mm Slot	**3**	
			Part 2 15 Marks	Pre-Prepared Work	**2**	
				Ø4.5mm & Ø8mm Holes	**5**	
				Rectangular Slot	**4**	
				End Tab	**4**	
3	**Parts 3 and 5**		**Part 3** 6 Marks	Marking Out	**2**	**20**
				Profile	**3**	
				Drill and Tap	**1**	
			Part 5 14 Marks	Marking Out	**4**	
				Ø4.5mm & Ø8mm Holes	**2**	
				External Profile	**4**	
				Internal Profile	**4**	
4	**Part 6**		**Part 6** 20 Marks	Marking Out	**4**	**20**
				8mm Guiding Slot	**3**	
				Tapered Slot Profile	**4**	
				16mm Locking Slots Profile	**4**	
				3mm Step, Taper and Radius	**3**	
				18mm Bolt Profile	**2**	
5	**Parts 4, 7, 8 and 9**		**Parts 4, 7 & 8** 10 Marks	Turning, Drilling and Tapping	**5**	**20**
				Knurling	**5**	
			Part 9 10 Marks	Marking Out and Ø4.5mm Hole	**2**	
				External Profile	**8**	

100 Marks (×1.5 = 150 Total)

Coimisiún na Scrúduithe Stáit
State Examinations Commission

Day 3 - Leaving Certificate Engineering - Practical Marking Scheme 2019

Subjective Marking 1 - 20 | 17 - 20 Excellent | 13 - 16 Very Good | 9 - 12 Good | 5 – 8 Poor | 1 - 4 Very Poor

Section	Part Number	Pictorial Sketch / Description	Concept		Mark	Mark
1	**All Parts**		**Assembly** **Function** **Finish** Subjective Mark 1 – 20		**20**	**20**
2	**Parts 1 and 2**		**Part 1** 5 Marks	Pre-Prepared Work	**2**	**20**
				18mm × 4mm Slot	**3**	
			Part 2 15 Marks	Pre-Prepared Work	**2**	
				Ø4.5mm & Ø8mm Holes	**5**	
				Rectangular Slot	**4**	
				End Tab	**4**	
3	**Parts 3 and 5**		**Part 3** 6 Marks	Marking Out	**2**	**20**
				Profile	**3**	
				Drill and Tap	**1**	
			Part 5 14 Marks	Marking Out	**4**	
				Ø4.5mm & Ø8mm Holes	**2**	
				External Profile	**4**	
				Internal Profile	**4**	
4	**Part 6**		**Part 6** 20 Marks	Marking Out	**4**	**20**
				8mm Guiding Slot	**3**	
				Tapered Slot Profile	**4**	
				16mm Locking Slots Profile	**4**	
				3mm Step, Taper and Radius	**3**	
				18mm Bolt Profile	**2**	
5	**Parts 4, 7, 8 and 9**		**Parts 4, 7 & 8** 10 Marks	Turning, Drilling and Tapping	**5**	**20**
				Knurling	**5**	
			Part 9 10 Marks	Marking Out and Ø4.5mm Hole	**2**	
				External Profile	**8**	

100 Marks (×1.5 = 150 Total)

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