



Coimisiún na Scrúduithe Stáit
State Examinations Commission

Leaving Certificate Applied 2014

Marking Scheme

ENGINEERING

Common 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 Applied, 2014

Vocational Specialism – Engineering
(240 marks)

Written Examination
Sample Answers *and* Marking Scheme

1. Answer **all** questions from Section 1.
2. Answer **any three** questions from Section 2.
3. If Question 7 is attempted, answer **any two** topics.

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

Section 1 (90 Marks)

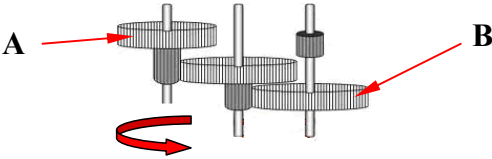
Answer all three questions.

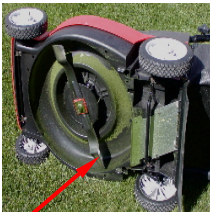
Section 1 Q1.

45 marks

Give brief answers to **any fifteen** of the following:
(Sketches may be used to explain your answers.)

QUESTION	ANSWER
(a) Identify the tool shown below and give a suitable use for it in the engineering r 	Name: <i>Ball Pein Hammer</i> Use: <i>The hammer can be used to the dot punch when marking out a piece of mild steel.</i> 3 Marks
(b) State a suitable material for manufacturing the roll bar, marked A, on the tractor shown. 	Suitable material: <i>Carbon steel would be a suitable material.</i> 3 Marks
(c) Name the engineering item shown and give a suitable use for it. 	Name: <i>Machine Vice</i> Use: <i>To secure a piece of metal when using a bench drill.</i> 3 Marks
(d) Identify a suitable material to manufacture the kitchen hinge, marked A, shown opposite. 	Suitable material: <i>Cold Rolled Steel</i> 3 Marks
(e) The tool shown opposite is often found in a plumber's tool kit. Give a relevant use for this tool. 	Relevant use: <i>The tool is used to dispense silicon from a tube. It is often used to seal showers in bathrooms.</i> 3 Marks

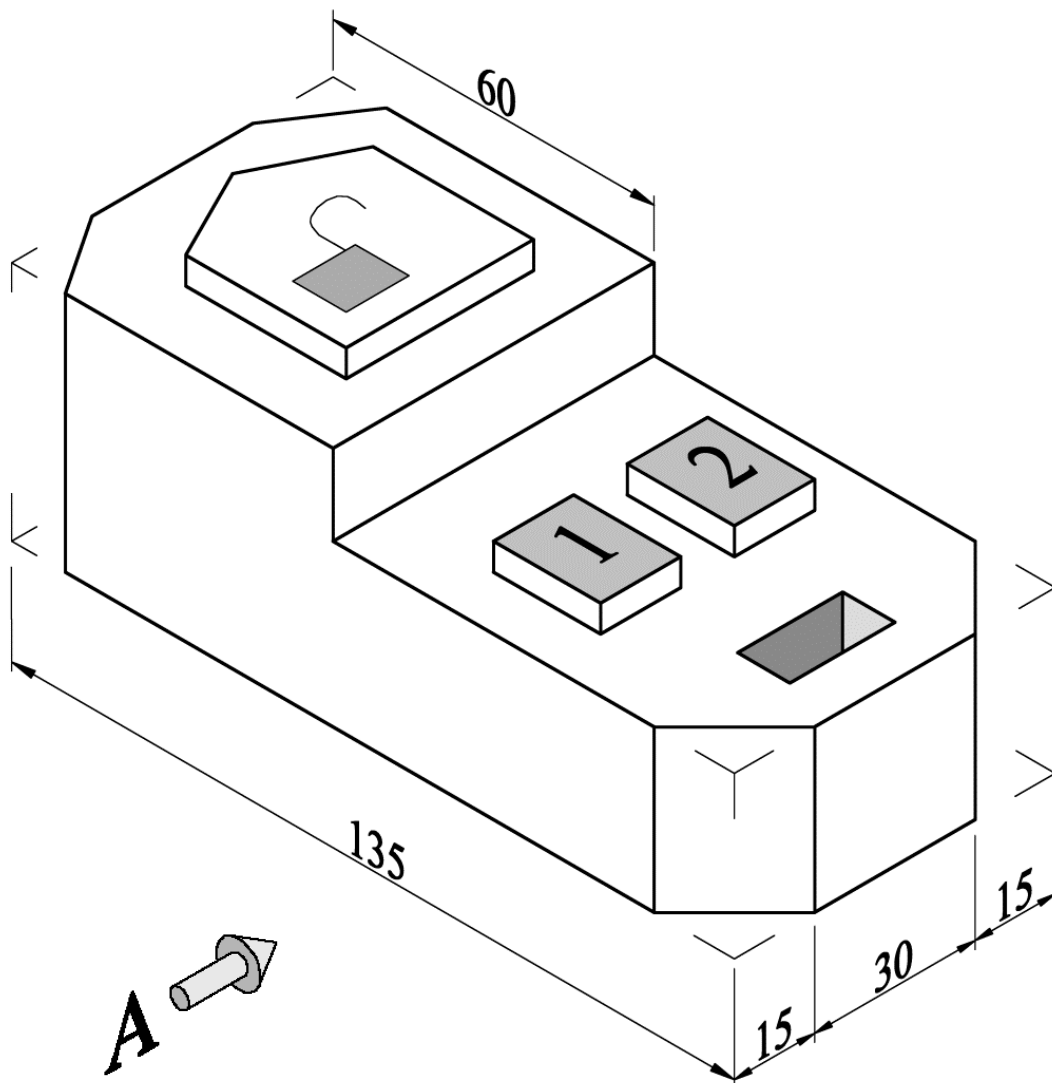
QUESTION	ANSWER
(f) Gear A is moving in the direction shown. Tick the correct box to show the direction of gear B. 	Tick the correct box to show the direction of gear B.  X  3 Marks
(g) Identify the cutting tool marked A and give one safety precaution that should be observed when using this tool. 	Name: <i>Cold Chisel</i> Safety precaution: <i>Wear goggles to prevent any metal chips from entering the eyes.</i> 3 Marks
(h) Name the special tool shown opposite and give a suitable use for it in the engineering room. 	Name: <i>Hand Vice</i> Use: <i>To clamp or hold two pieces of metal together before drilling them.</i> 3 Marks
(i) Suggest a suitable material that could be used to manufacture the casing marked A, on the computer processor shown opposite. 	Suitable material: <i>Aluminium</i> 3 Marks
(j) Tick the correct box to indicate the two metals used to make the alloy solder. 	Tin and Lead X Copper and Zinc Copper and Tin 3 Marks

QUESTION	ANSWER
(k) Name the tool shown below and state one use for it. 	Name: <i>Stillson Wrench</i> Use: <i>The stillson is used to grip pipes when tightening or loosening connections.</i> 3 Marks
(l) Suggest a suitable metal used to manufacture the electrical wire core marked A. Give one reason for your choice of metal. 	Metal: <i>Copper</i> Reason: <i>Copper is a good conductor of electricity.</i> 3 Marks
(m) Identify the marking-out tool shown opposite and give a suitable use for it during the marking-out process. 	Name: <i>Spring Dividers</i> Use: <i>The spring dividers is used to draw circles or arcs on metals.</i> 3 Marks
(n) Name a suitable material used to manufacture the blade of the lawn mower, marked A. Give a reason for your choice of material. 	Material: <i>Hardened Steel</i> Reason: <i>Hardened steel is difficult to break.</i> 3 Marks
(o) Identify the bolt shown and state one advantage of using this type of bolt. 	Name: <i>Allen Head Screw</i> Advantage: <i>They are easy to tighten and loosen using standard allen keys.</i> 3 Marks

QUESTION	ANSWER
(p) Outline one use of the engineering equipment shown opposite and state one safety precaution to be observed when using this equipment. 	Use: <i>Used to shear metal</i> Safety precaution: <i>Ensure you keep your fingers clear of the blade prior to pulling the handle down to cut the metal.</i> 3 Marks
(q) Name and give a use for the tool shown below. 	Name: <i>Tool jig</i> Use: <i>Used to secure a round bar of metal before drilling</i> 3 Marks
(r) List any three items or equipment required to carry out the joining process shown. 	1. <i>Spelter</i> 2. <i>Gas Torch</i> 3. <i>Flux</i> 3 Marks
(s) Identify the equipment below and give a suitable use for this equipment in the engineering room. 	Name: <i>Vice Jaws Protectors</i> Use: <i>The vice jaws protectors are used to prevent the jaws of the vice damaging the piece of metal being held.</i> 3 Marks
(t) Suggest a suitable use for the jubilee clip shown opposite. 	Suitable use: <i>The jubilee clip shown is used to secure a fitting to a hose pipe.</i> 3 Marks

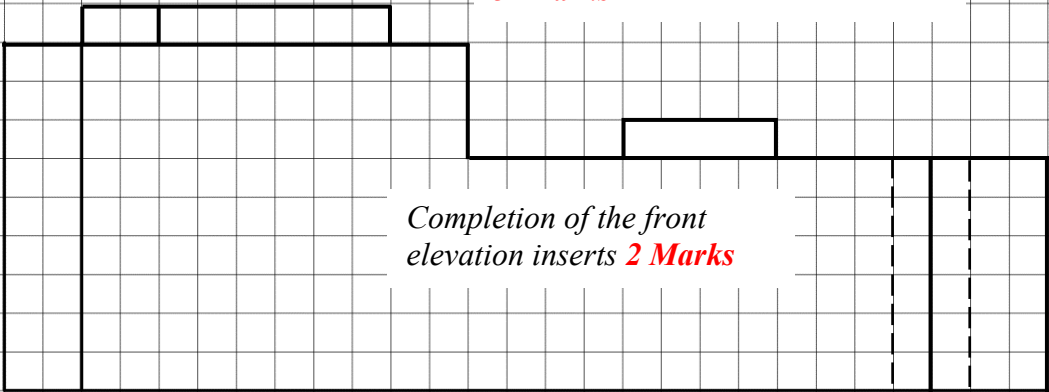
A pictorial view of a remote control unit for an electric gate is shown below.
Draw the following **two** views of the remote control unit on the grid paper opposite:

- (a) A front elevation in the direction of arrow A;
- (b) A plan projected from view (a).



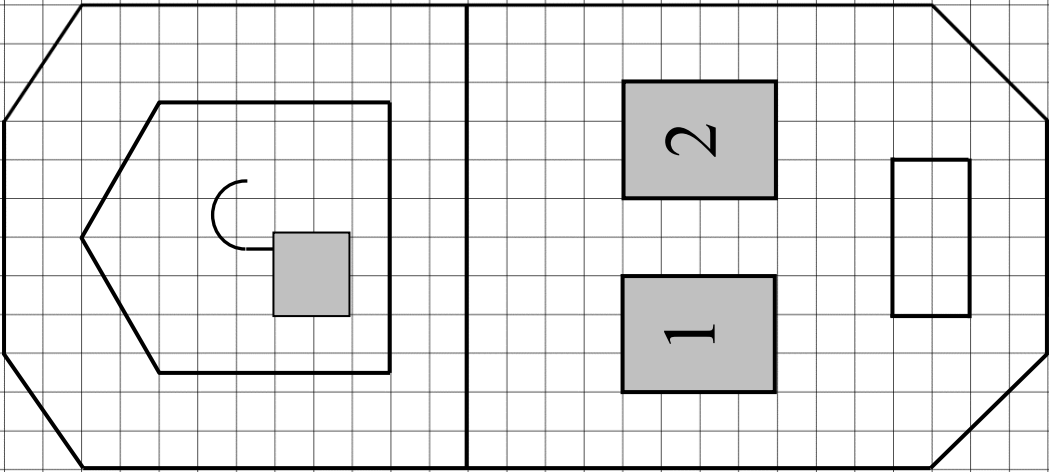
Note: Each grid square represents 5 mm.

Completion of the elevation outline
3 Marks



Completion of the front
elevation inserts **2 Marks**

Complete the Elevation



Completion of the plan
outline **3 Marks**

Completion of internal inserts
in plan **2 Marks**

Complete the Plan

Proportion and Quality - 15 marks

Excellent	12 - 15
Very Good	9 - 11
Good	6 - 8
Fair	3 - 5
Attempt	0 - 2

- (a) Name the **two** engineering processes shown at **A** and **B** below. State **two** examples of safety precautions being observed in **each** case.



A - Name of engineering process:

Electric Arc Welding

1 Mark

Safety Precaution 1:

Ensure you are wearing suitable eye protection.

1 Mark

Safety Precaution 2:

Ensure you are wearing protective clothing

1 Mark

B - Name of engineering process:

Turning on the Centre Lathe

1 Mark

Safety Precaution 1:

Ensure the guard is in place to prevent swarf from entering the eyes.

1 Mark

Safety Precaution 2:

Ensure there is no items of clothing loose that could get caught in the revolving chuck.

1 Mark

- (b) The diagram shows a school engineering workshop. Identify **two** safety precautions that should be observed when working in this type of classroom environment.

Safety Precaution 1:

The floor should be clean with no items of material or equipment causing obstructions.

2 Marks

Safety Precaution 2:

All tools should be returned to their proper place.

2 Marks



- (c) Describe **any two** safety precautions to be observed when using the electrical jigsaw shown.

Safety Precaution 1:

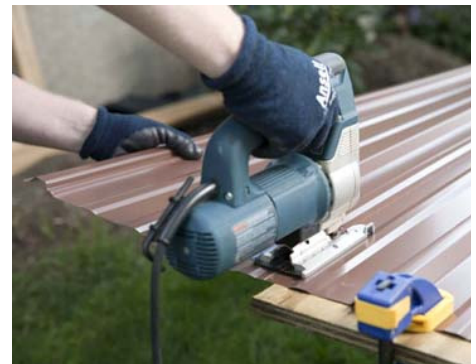
Keep the electrical power cable clear of the jigsaw blade when cutting.

2 Marks

Safety Precaution 2:

Keep your fingers and hand clear of the blade when cutting the material.

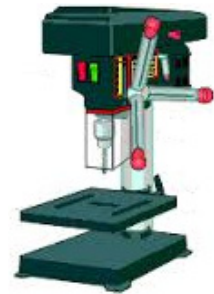
2 Marks



- (d) State **one** safety feature required for the safe operation of the electric bench drill shown.

Ensure all work is secured tightly before you commence drilling.

2 Marks



- (e) The safety symbols below may be found in an engineering workshop. Give a brief explanation for **each** of the symbols shown.



Symbol A:

Danger- high voltage

2 Marks



Symbol B:

Danger- explosive materials

2 Marks

Section 2 (150 Marks)

Answer any three questions.

Section 2

Q4.

50 marks

- (a) Design, in the spaces provided, a suitable bracket for attaching the shower head to the back wall of the shower unit shown.

The design should clearly show **each** of the following:

- (i) A method to enable the bracket to be attached to the back wall of the shower unit;
- (ii) A method to enable the shower head to be attached to the bracket.

Draw in **Grid A** at least **two** sketches of different ideas you considered for the design of the shower head bracket.

Draw in **Grid B** a sketch of the **final solution** for the shower head bracket.



At least **two sketches** of ideas for the shower head bracket should be drawn below in **Grid A**.

Grid A - IDEAS

Sketches of ideas contributing to Final Solution - **30 Marks**

Excellent **25-30 Marks**

Very Good **20-24 Marks**

Good **15-19 Marks**

Fair **10-14 Marks**

Attempt **0-9 Marks**

A sketch of the **final solution** for the shower head bracket should be drawn below in **Grid B**.

Grid B – FINAL SOLUTION

10 additional marks available for sketches presented resulting in the final solution.

Excellent	9-10 Marks
Very Good	7-8 Marks
Good	5-6 Marks
Fair	3-4 Marks
Attempt	1-2 Marks

- (b) A traditional watch is shown at **A** and a modern watch is shown at **B**. Outline **three** main differences in the design features of the two watches.

1. *The method of reading the time is different on both watches – hands display v digital display.*

4 Marks

2. *The material and design of the strap is much different – leather v plastic.*

3 Marks

3. *The shape of the face of each watch is different in each case – circular v rectangular.*

3 Marks

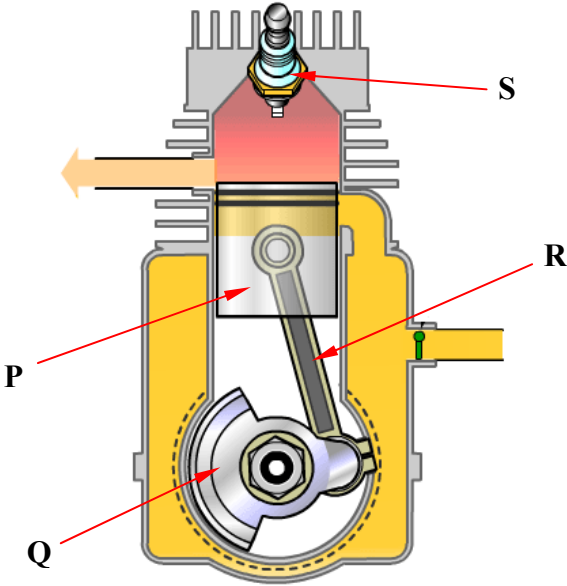


Watch A
(Traditional Watch)



Watch B
(Modern Watch)

- (a) A diagram of a model two-stroke engine suitable for a small motor bike is shown below. Identify and describe the function of **each** of the labelled parts, **P**, **Q**, **R** and **S**.



Part	Name of Part	Function
P	Piston	The purpose of the piston is to transfer force from expanding gas in the cylinder to the crankshaft via the connecting rod.
	3 Marks	3 Marks
Q	Crankshaft	The crankshaft is the part of an engine that translates reciprocating linear piston motion into rotation.
	3 Marks	3 Marks
R	Connecting Rod	The conrod connects the piston to the crank or crankshaft.
	3 Marks	3 Marks
S	Spark Plug	The spark plug is used to ignite the compressed fuel/air mixture by an electric spark.
	3 Marks	3 Marks

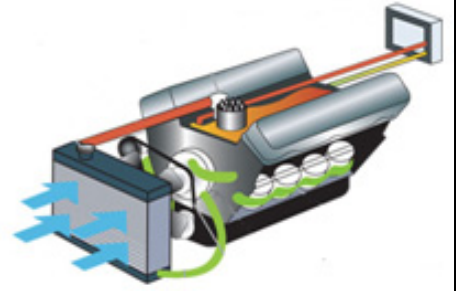
- (b) The system shown opposite is found in a modern car.
Identify the system and describe its function in a modern car.

Name: *Cooling System*

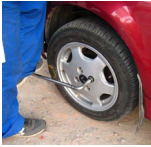
3 Marks

Function: *A pump, driven by a pulley and belt from the crankshaft, drives hot coolant out of the engine to the radiator, which is a form of heat exchanger. Unwanted heat is passed from the radiator into the air stream.*

3 Marks

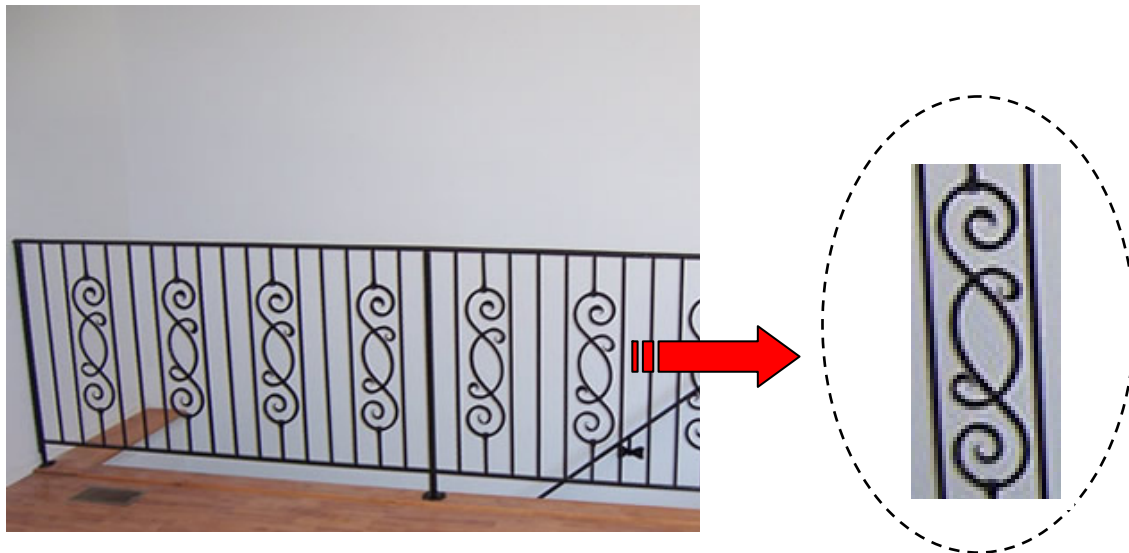


- (c) Describe in the spaces below the key steps involved in changing the wheel on a car.
The photographs shown may assist you in answering the question.

	Steps	Description	
1		<i>Loosen the bolts slightly with a wheel brace before jacking up the car.</i>	4 Marks
2		<i>Jack the car up ensuring it is on a level surface</i>	4 Marks
3		<i>Loosen the bolts on the wheel fully</i>	4 Marks
4		<i>Remove the wheel carefully.</i>	4 Marks
5		<i>Put the new wheel in position and begin tightening the bolts. Let the jack down and remove from underneath the car. Tighten the bolts fully then.</i>	4 Marks

- (a) Describe, in the spaces below, **any three** stages used to produce the decorative scroll in the safety rail shown. Your description can refer to a hot **or** a cold treatment method of forming the scroll.

(Use sketches as appropriate.)



Stage 1:

Measure and mark out the length of scroll required.

8 Marks

Stage 2:

Heat the metal until it is cherry red and twist around a jig or shape with the hammer. The metal may be needed to be reheated during this stage. (Hot Method).

Place the metal in the scrolling machine with the required jig and bend to shape (Cold Method).

8 Marks

Stage 3:

Cool the metal carefully and clean it before painting (Hot Method)

Clean the scroll carefully and apply an appropriate finish (Cold Method).

8 Marks

- (b) The decorative piece, shown below, is produced using a range of decorative metalwork processes. Describe, in the spaces below, **any four** key stages used to produce this decorative piece. (*Use sketches as appropriate.*)



Stage 1: Cut and file out the design piece.

5 Marks

Stage 2: Clean the copper back piece and prepare to solder the design piece onto it.

5 Marks

Stage 3: Solder the design piece onto the copper piece and allow to cool.

5 Marks

Stage 4: Clean the piece and apply a suitable lacquer. Allow to dry in a well ventilated area.

5 Marks

- (c) State **two** safety precautions to be observed during the production of the decorative piece shown in part (b) above.

Safety Precaution 1:

Wear gloves that are heat resistant to prevent burns to the skin when soldering.

3 Marks

Safety Precaution 2:

When applying the lacquer and afterwards when allowing to dry, ensure the procedure takes place in a well ventilated environment.

3 Marks

Systems Module

(**Any two** topics comprise a full module.)

Answer **any two** from the following five topics:

Topic (a) – Computer Aided Design (CAD)

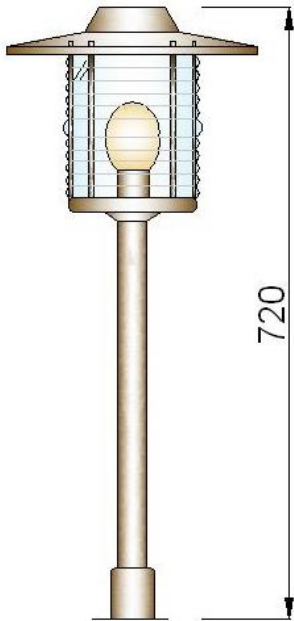
Topic (b) – Electricity

Topic (c) – Electronics

Topic (d) – Mechanisms

Topic (e) – Pneumatics.

- (a) A simple CAD drawing of a garden light is shown below. List **any four** CAD commands necessary to produce the drawing below.



Command 1 : Line

4 Marks

Command 2.: Chamfer

4 Marks

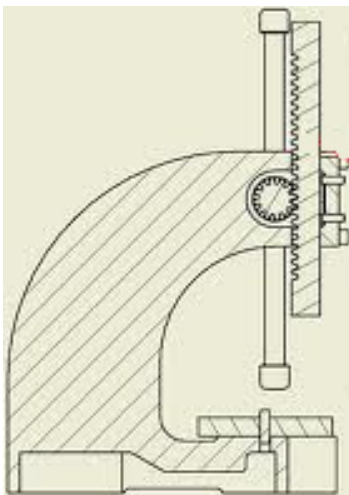
Command 3 : Linetype

4 Marks

Command 4 : Dim

4 Marks

- (b) The cross sectional view of an engineering component with some hatching is produced by a CAD package. Explain the procedure involved in hatching an area on a CAD drawing.

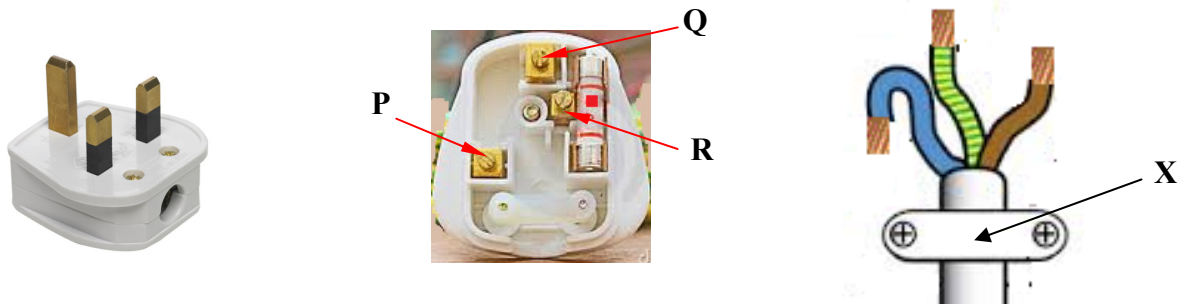


Procedure:

Start the hatch command The quick preview updates as you select any variants or change any values in the Hatch Ribbon panels. Different patterns may be tested. It is possible to scroll through all the different patterns that are available. Always use the Continuous line type for hatching layers

9 Marks

- (a) The diagram below shows a typical three-pin plug. Answer **all** questions in the spaces provided.



- (i) Complete the table below to indicate how you would wire the three-pin plug correctly.

Connection	Colour of wire	Location of wire in plug above (P, Q or R)
Earth (E)	<i>Yellow and Green</i>	<i>Q</i> 2 Marks (1 + 1)
Live (L)	<i>Brown</i>	<i>R</i> 2 Marks (1 + 1)
Neutral (N)	<i>Blue</i>	<i>P</i> 2 Marks (1 + 1)

- (ii) What is the purpose of the fuse in a three-pin plug?

The fuse breaks the circuit if a fault in an appliance causes too much current flow. This protects the wiring and the appliance if something goes wrong. The fuse contains a piece of wire that melts easily. If the current going through the fuse is too great, the wire heats up until it melts and breaks the circuit. **3 Marks**

- (iii) Describe the purpose of the part labelled X in the diagram above.

This is the cable holder and prevents the cable from becoming detached from the plug. **2 Marks**

- (iv) What is the voltage of a typical domestic electrical supply in Ireland?

ESB Networks undertakes to deliver single phase electricity within a voltage range of 207 Volts to 253 Volts. **2 Marks**

- (b) Name and state a suitable use for **each** of the items shown, which are used by an electrician.



Name: *Multi Point Extension Lead* **2 Marks**

Use: *To provide an electrical power source to many items.* **2 Marks**



Name: *Multimeter* **2 Marks**

Use: *The meter can be used to measure current, voltage or resistance.* **2 Marks**



Name: *Residual Current Device* **2 Marks**

Use: *This is a device that disconnects a circuit whenever it detects that the electric current is not balanced.* **2 Marks**

(a) Name and state a suitable use for **each** of the components shown below.



Name: Potentiometer **2 Marks**

Use: Commonly used to control electrical devices such as volume controls **2 Marks**



Name: IC Chip **2 Marks**

Use: An integrated chip is a miniature electronic circuit. **2 Marks**



Name: Capacitor **2 Marks**

Use: To store electrical charge **2 Marks**

(b) Identify the tool shown and explain its use in electronics.

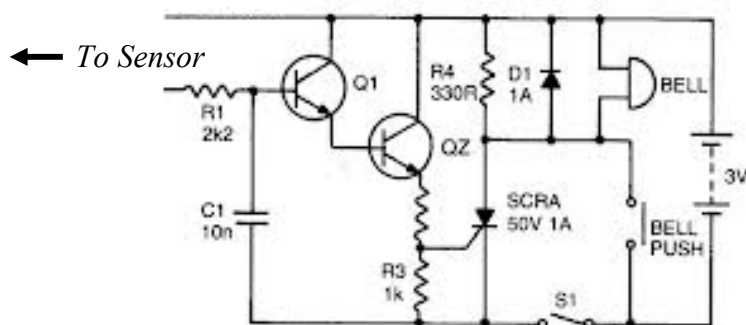


Name: Soldering Iron **2 Marks**

Use: A soldering iron is a hand tool used in soldering. it supplies heat to melt the solder so that it can flow into the joint between two pieces. It is very suitable for small electronic work.

2 Marks

(c) An electronic circuit for a rain sensor alarm is shown below. Describe in the space provided how the electronic circuit works.

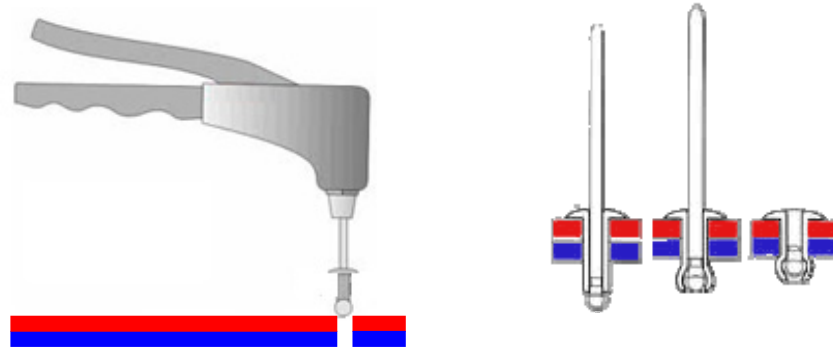


Rain Sensor

Description : This rain detector will give you a heads-up the instant it starts to rain. The battery-powered circuit draws virtually no current when the sensor is dry and the current consumption is low when the buzzer is activated. The circuit is basically a handy flasher circuit that operates well on only 3 volts using ordinary silicon transistors. When the circuit is triggered, the buzzer is pulsed about once per second for a very short time, giving it a "dripping water" sound which seems appropriate.

9 Marks

- (a) The diagrams below show a hand-operated pop riveter. Explain how the pop riveter mechanism works.

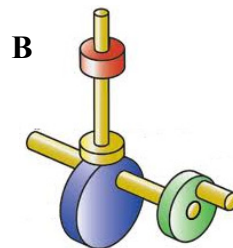


Explanation:

A rivet, which consists of a smooth cylindrical shaft with a head on one end, is a permanent mechanical fastener. When the handles of the rivet gun are pulled together, it creates torque that pulls the pin of the rivet into the gun. This presses the head up against the gun, which in turn flattens it. Once flattened, the rivet pin breaks at a pre-made weak spot in the pin, and leaves the flattened head behind so as to hold the riveted materials together.

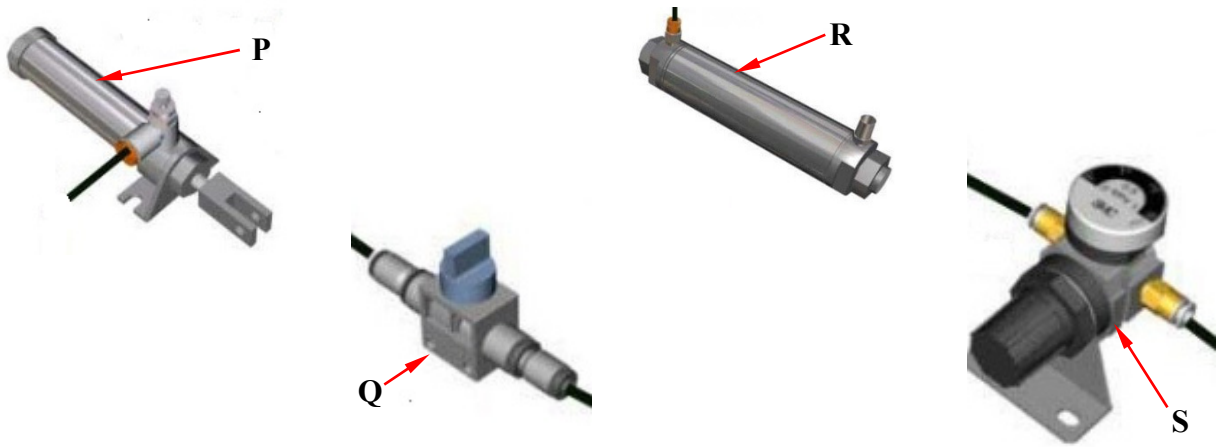
10 Marks

- (b) Identify the mechanisms shown below and give a suitable use for **each** of them.



	Name	Use
Mechanism A	Ball Bearing 3 Marks	A bearing is a device that is used to enable rotational or linear movement. 2 Marks
Mechanism B	Cam and Follower 3 Marks	The cam and follower transforms rotary motion into linear motion or vice versa. 2 Marks
Mechanism C	Pulley and Belt 3 Marks	The pulley and belt mechanism allows for mechanical power, torque, and speed to be transmitted across axles. 2 Marks

- (a) Identify the pneumatic components P, Q, R and S shown below and state the function of each.



	Name	Function
P	Single Acting Cylinder	These cylinders have a driving force in one direction only and return to 'home' with the aid of a spring.
	3 Marks	2 Marks
Q	On/off Valve	The valve is used to turn on/off the compressed air in the circuit.
	3 Marks	2 Marks
R	Reservoir	The reservoir prepares large quantities of compressed air to supply fast switching drives in a pneumatic circuit.
	3 Marks	2 Marks
S	Pneumatic Regulator	The regulator is used to control the air pressure in the pneumatic circuit.
	3 Marks	2 Marks

- (b) A pneumatic lift table is shown opposite. Describe briefly the role of pneumatics in the operation of the lift table.

The pneumatic mechanism helps the lift table to move up and down in a vertically direction. The device employs a scissors mechanism to raise or lower goods and/or persons.

5 Marks



