



Coimisiún na Scrúduithe Stáit
State Examinations Commission

**LEAVING CERTIFICATE
APPLIED 2010**

MARKING SCHEME

ENGINEERING

COMMON LEVEL

Leaving Certificate Applied, 2010

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.

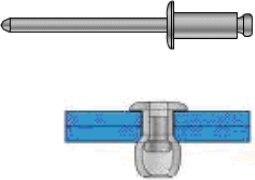
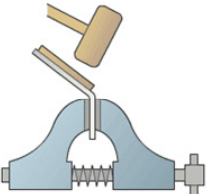



Section 1 (90 Marks)

Answer **all three** questions

Section 1 Q1.

45 marks

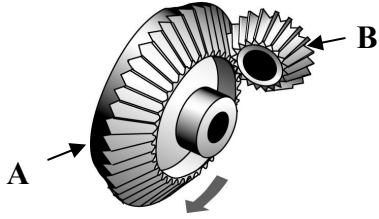
Give brief answers to **any fifteen** of the following:
(sketches may be used to explain your answers)

QUESTION	ANSWER
<p>(a) Identify the joining process shown opposite and give a practical example of where it could be used.</p> 	<p>Joining Process: <i>Pop Riveting</i></p> <p>Use: <i>Ideal for use in joining light sheet metal, eg. the body of airplanes.</i></p> <p><i>3 marks</i></p>
<p>(b) State a reason why a mallet is being used to bend the metal as shown.</p> 	<p>Reason : <i>The mallet is used to bend the metal as it will not leave indentation marks on the metal.</i></p> <p><i>3 marks</i></p>
<p>(c) Name the process that has been used to join the metals shown opposite.</p> 	<p>Name of process: <i>Brazing</i></p> <p><i>3 marks</i></p>
<p>(d) Identify the tool shown and state a suitable use for it.</p> 	<p>Name of tool : <i>Socket Wrench</i></p> <p>Use : <i>A socket wrench allows you to turn nuts and some bolts with more ease than a regular wrench.</i></p> <p><i>3 marks</i></p>
<p>(e) Suggest a suitable material that could be used in making the propeller and give a reason for its suitability.</p> 	<p>Material : <i>Stainless Steel</i></p> <p>Reason : <i>Stainless steel will not corrode.</i></p> <p><i>3 marks</i></p>

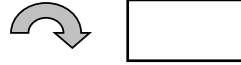
QUESTION

ANSWER

- (f) Gear A is moving in the direction shown. Tick the correct box to show the direction of gear B.

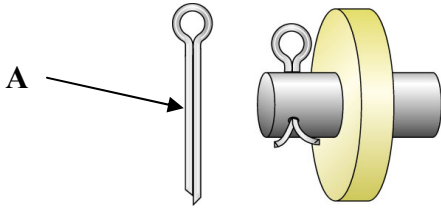


Tick the box to indicate correct direction of Gear B



3 marks

- (g) Identify the pin marked A and state a reason for its use.

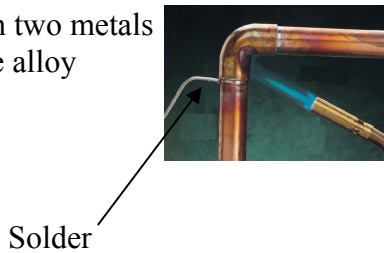


Name : *Split Pin*

Reason : *Ideal for preventing a wheel from coming off an axle, eg. a golf trolley.*

3 marks

- (h) Tick the correct box to indicate which two metals are used in the alloy solder.



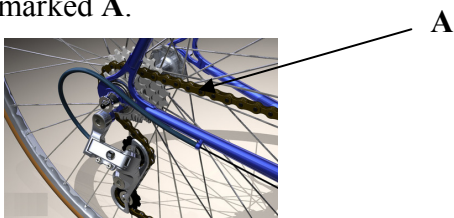
Tin + Lead

Tin + Zinc

Zinc + Lead

3 marks

- (i) Suggest a suitable material that could be used to manufacture the bicycle chain marked A.



Suitable material :

Stainless Steel or Carbon Steel

3 marks





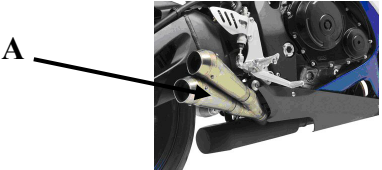
- (j) Outline **two** advantages of an adjustable spanner.



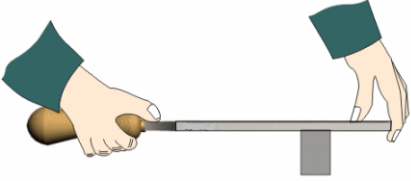
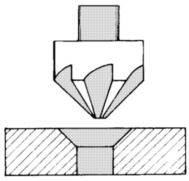



Advantage 1 : *Can be used to tighten or loosen various sizes of nuts.*

Advantage 2 : *This is a cost effective tool as it saves investing in a range of spanners.*

3 marks

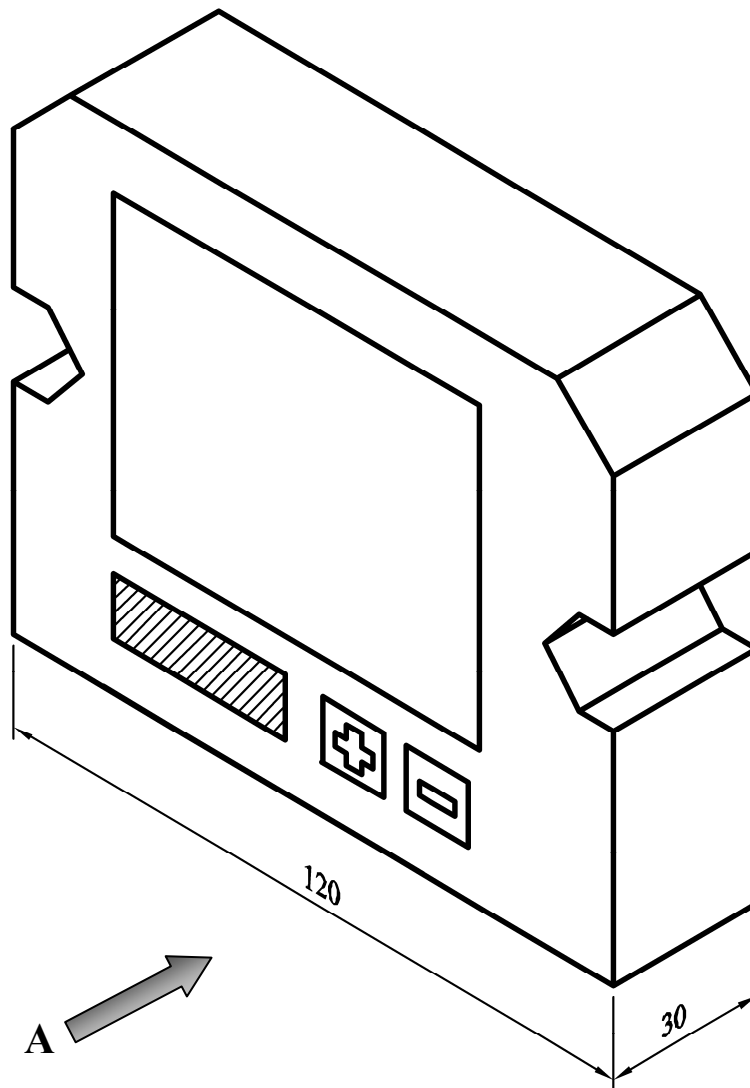
QUESTION	ANSWER
<p>(k) Name a suitable material used to make the anvil shown, and give one reason for your choice of material.</p> 	<p>Material : <i>Wrought Iron</i></p> <p>Reason : <i>The material is tough and can absorb impact.</i></p> <p style="text-align: right;"><i>3 marks</i></p>
<p>(l) Tick the most suitable type of plastic that could be used to allow the frame shown to be moulded.</p> 	<p>Thermosetting plastic <input type="checkbox"/></p> <p>Thermoplastic <input checked="" type="checkbox"/></p> <p style="text-align: right;"><i>3 marks</i></p>
<p>(m) State a suitable use for the battery shown.</p> 	<p>Use : <i>Motor Car Engines</i></p> <p style="text-align: right;"><i>3 marks</i></p>
<p>(n) Identify the item shown below and state a suitable use for it.</p> 	<p>Name : <i>Ball Bearing Ring</i></p> <p>Use : <i>To assist a shaft rotating smoothly, eg an axle of a tram.</i></p> <p style="text-align: right;"><i>3 marks</i></p>
<p>(o) Suggest a suitable material for the exhaust pipes labelled A on the motorbike shown below.</p> 	<p>Material for exhaust pipes:</p> <p><i>Stainless Steel</i></p> <p style="text-align: right;"><i>3 marks</i></p>

QUESTION	ANSWER
<p>(p) Choose a suitable material for the casing of the personal music player shown and give a reason for your choice of material.</p> 	<p>Suitable material : <i>Aluminium</i></p> <p>Reason : <i>Possible reasons include light, aesthetically pleasing and will not crack on impact.</i></p> <p style="text-align: right;"><i>3 marks</i></p>
<p>(q) Name and give a use for the special screw shown below.</p> 	<p>Name of screw : <i>Allen Bolt</i></p> <p>Use : <i>The head of the bolt takes up less space and can often be used in bicycles.</i></p> <p style="text-align: right;"><i>3 marks</i></p>
<p>(r) Identify one safety precaution that should be used when filing metal.</p> 	<p>Safety precaution:</p> <p><i>Grip the file properly with both hands to prevent the file from slipping off the material.</i></p> <p style="text-align: right;"><i>3 marks</i></p>
<p>(s) Name the drill bit shown below and give a reason for its use.</p> 	<p>Name : <i>Countersinking Drill Bit</i></p> <p>Reason : <i>To provide a countersunk hole to enable a countersunk bolt or screw to remain flush with the surface of the material.</i></p> <p style="text-align: right;"><i>3 marks</i></p>
<p>(t) Identify the tool shown and give a use for it in the engineering room.</p> 	<p>Name : <i>Tin Snips</i></p> <p>Use : <i>The tin snips is used to cut sheet metal.</i></p> <p style="text-align: right;"><i>3 marks</i></p>

A pictorial view of a GPS unit is shown below.

Draw the following **two** views of the GPS unit on the grid paper opposite:

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



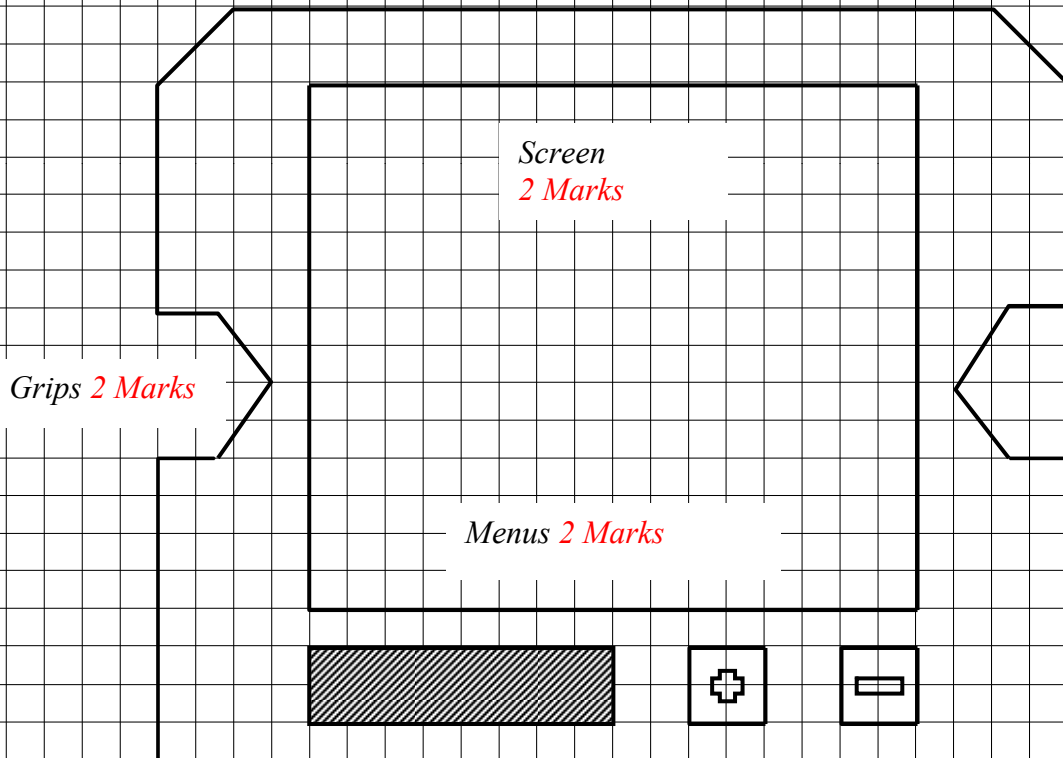
Elevation and Plan

Note: Each grid square is 5 mm long

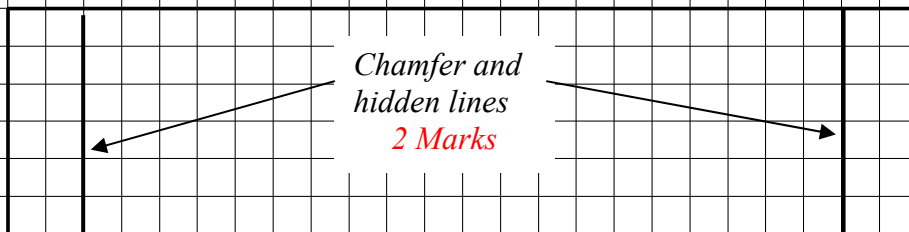
Proportion and Quality - 15 Marks

Excellent	12-15
V Good	9-11
Good	6-8
Fair	3-5
Poor	0-2

Outline 2 Marks

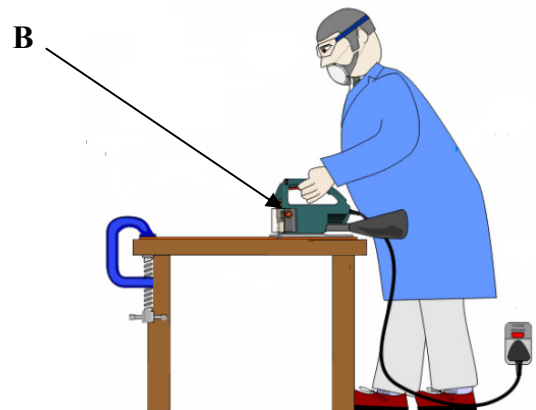


Complete the Elevation



Complete the Plan

(a) Name the **two** pieces of equipment shown at **A** and **B** below. State **two** safety precautions that should be observed when operating **each** piece of equipment.



A - Name of equipment

Power Hacksaw *1 Mark*

Safety Precaution 1

Ensure the material being cut is secured properly in the machine vice.

1 Mark

Safety Precaution 2

Do not touch the material or blade while the machine is cutting.

1 Mark

B - Name of equipment

Electrical Jigsaw *1 Mark*

Safety Precaution 1

Ensure the electrical cable is kept clear of the cutting blade.

1 Mark

Safety Precaution 2

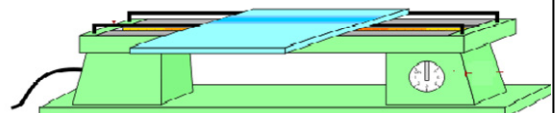
Ensure protective guard covers the blade when in use.

1 Mark

(b) The diagram shows a strip heater which is commonly used to bend plastics. Identify **two** safety precautions that should be observed by students when using the strip heater.

Safety Precaution 1 : *Ensure the plastic material is monitored during the bending process to avoid over heating and possible burning.*

2 Marks



Safety Precaution 2 : *Ensure the electrical cable is kept clear of the heating element during the heating process.*

2 Marks

(c) Describe **any two** safety features on a drilling machine.

Safety Feature 1 : *There is a transparent swarf guard attached to the drilling machine to prevent swarf from becoming a safety hazard.*

2 Marks

Safety Feature 2 : There are holes on the machine table to enable a machine vice to be bolted to the table.

2 Marks



(d) State **one** safety precaution that should be observed when using the angle grinder shown.

A face guard should be worn to prevent sparks from entering the operator's eyes.

2 Marks



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

A



Symbol A : *Corrosive substances*

2 Marks

B



Symbol B : *Danger electrical voltage*

2 Marks

Section 2 (150 Marks)

Answer **any three** questions

Section 2 **Q4.**

50 marks

- (a) Design, in the spaces provided, a suitable **support stand** to enable the backboard and basketball ring shown to be free-standing in a school playground.

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

- (i) A method for attaching the backboard to the support stand;
- (ii) A method to ensure the support stand is free-standing.

Draw in **Grid A** at least **two** sketches of different ideas you considered for the design of the support stand.

Draw in **Grid B** a sketch of the **final solution** for the support stand.



At least **two sketches** for the support stand should be drawn below in **Grid A**.

Grid A - IDEAS

Sketches of ideas

10 marks

A sketch of the **final solution** for the support stand should be drawn below in **Grid B**.

Grid B – FINAL SOLUTION

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*

- (b) A frame to hold two swings is shown opposite.



- (i) Suggest a suitable material for manufacturing the frame of the swing.

Black Mild steel

4 Marks

- (ii) Give **one** reason for your choice of material.

Black mild steel is strong and can be welded easily.

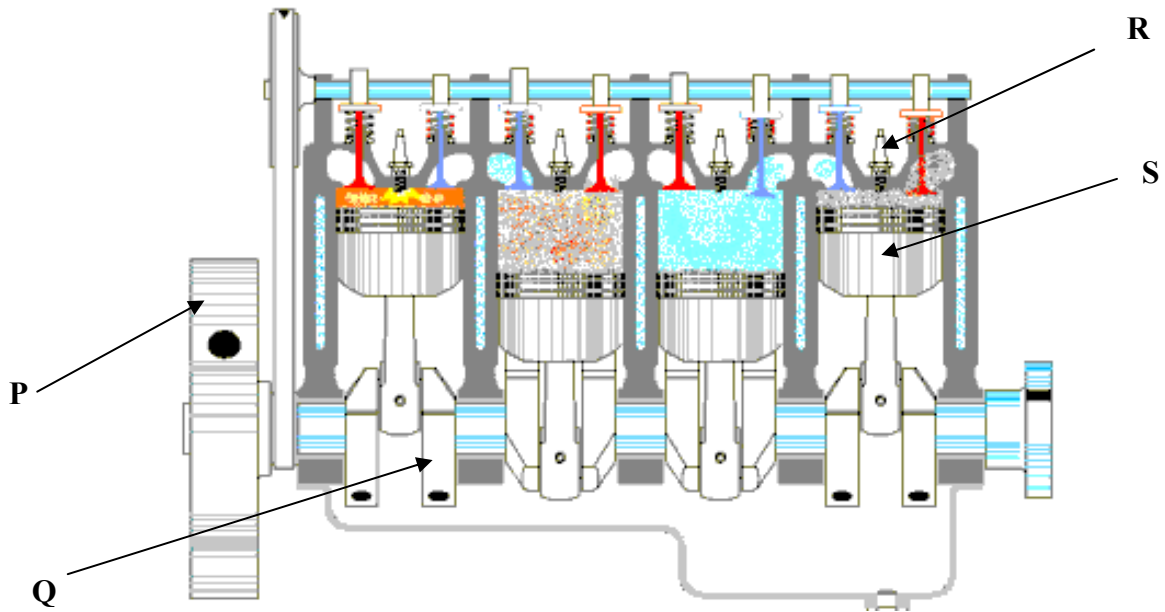
3 Marks

- (iii) Outline **one** reason why there are two uprights in the design shown.

There are two uprights in the design to provide strength and stability to the structure.

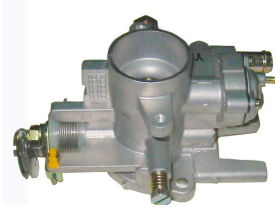
3 Marks

- (a) A cross sectional diagram of a four stroke engine is shown below.
Name and describe the function of **each** of the labelled parts, **P, Q, R** and **S**.



Part	Name of Part	Function
P	Flywheel	The flywheel acts as a storage device for the rotational energy produced. This enables a smoothing effect to occur.
		<i>2 Marks</i>
Q	Crankshaft	The crankshaft helps to translate the linear motion of the piston into rotational motion.
		<i>2 Marks</i>
R	Spark Plug	The spark plug is used to ignite the fuel entering the chamber.
		<i>2 Marks</i>
S	Piston	The purpose of the piston is to transfer force from expanding gas in the cylinder to the crankshaft via the connecting rod.
		<i>2 Marks</i>

(b) Identify the engine part shown and explain its function.



Name: *Carburettor*

2 Marks

Function : *The carburettor helps to mix or blend the air and fuel together.*

2 Marks

(c) A car requires regular servicing. Below a mechanic is replacing the engine oil. In the table below name and describe **three** key steps necessary to change the engine oil in a car.

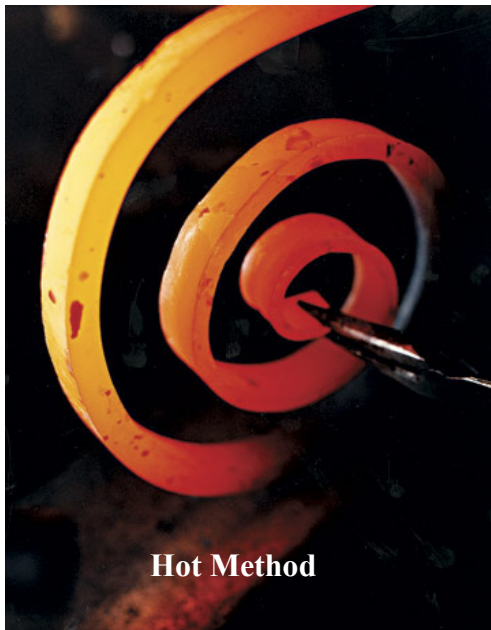


Step	Name of Step	Description
1	<i>Remove the drain plug</i>	<i>Loosen the drain plug underneath the oil sump and allow the old oil to drain out. When all the old oil has been removed replace the drain plug carefully.</i>
	<i>5 Marks</i>	<i>5 Marks</i>
2	<i>Change the oil filter</i>	<i>Remove the oil filter and replace carefully with a new one making sure it is correctly tightened.</i>
	<i>5 Marks</i>	<i>5 Marks</i>
3	<i>Refill the sump with new oil.</i>	<i>Carefully pour in the new oil using a funnel to assist the process. Check the oil level to ensure the correct amount of oil has been included.</i>
	<i>5 Marks</i>	<i>5 Marks</i>

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

A diagram of each method is shown as a useful guide.

(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 cold jig and twist into the required 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

Systems Module

(Any two topics comprise a full module)

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

Topic (a) – Computer Aided Design (CAD)

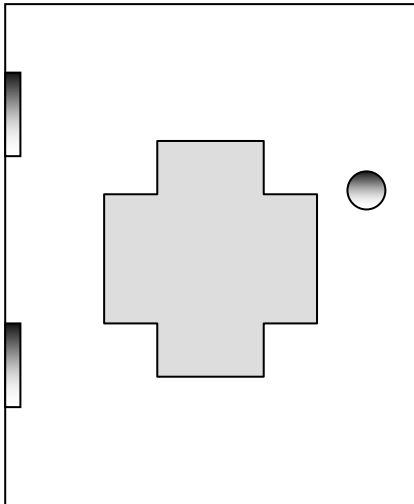
Topic (b) – Electricity

Topic (c) – Electronics

Topic (d) – Mechanisms

Topic (e) – Pneumatics

- (a) A CAD drawing of a first-aid cabinet is shown below. List **any four** CAD commands necessary to produce the drawing.



Command 1 : *Line*

4 Marks

Command 2 : *Rectangle*

4 Marks

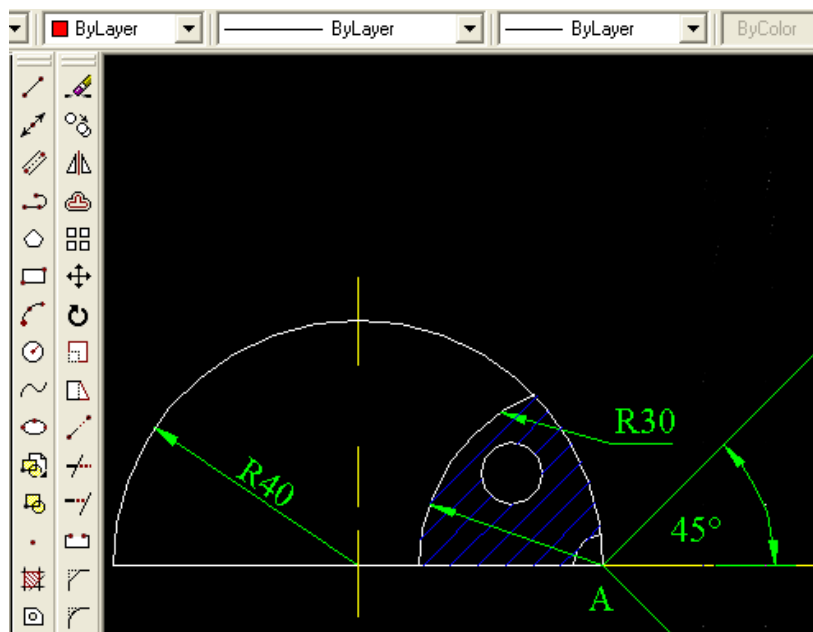
Command 3 : *Copy*

4 Marks

Command 4 : *Circle*

4 Marks

- (b) The drawing below is produced by a CAD package. Explain the procedure involved in inserting dimensions on a CAD drawing.



Procedure :

Dimensioning in CAD is generally automatic. Lines, arrows and text are all taken care of by the dimension commands. CAD dimensions are special blocks which can easily be edited or erased as necessary. CAD divides dimensions into four main categories: Linear, Radial, Ordinate and Angular.

9 Marks

(a) A typical selection of tools used by an electrician is shown below. Identify in the space provided, the **four** tools marked P, Q, R and S.



P : Long Nosed Pliers 2 Marks

Q : Tongue and Groove Pliers 2 Marks

R : Measuring Tape 2 Marks

S : Wire Strippers 2 Marks

(b) Name and explain the function of the electrical equipment shown opposite.



Name : Distribution Board (Miniature Circuit Breaker Board) 3 Marks

Function : The distribution box contains either fuses or circuit

breakers. The ESB supply then connects the lights and sockets via the fuse board.

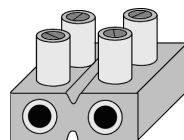
2 Marks

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



Name : Electrical Transformer 2 Marks

Use : The transformer is used to change voltage from one level to another. 2 Marks



Name : Wire Connector 2 Marks

Use The connector is used to join two wires safely 2 Marks



Name : Electrical Extension Cable 2 Marks

Use : The extension cable is used to bring current to areas which are isolated. 2 Marks

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



Name : *Multi meter*

2 Marks

Use : *A multi meter has the ability to measure voltage, current and resistance.*

2 Marks



Name : *Integrated Chip (IC)*

2 Marks

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

2 Marks



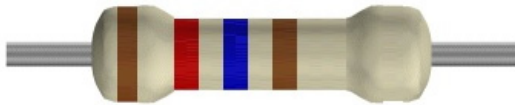
Name : *Capacitor*

2 Marks

Use : *A capacitor stores electrical charge.*

2 Marks

(b) Identify the electronic component shown and explain the function of the coloured bands on the body of the component.



Name : *Resistor*

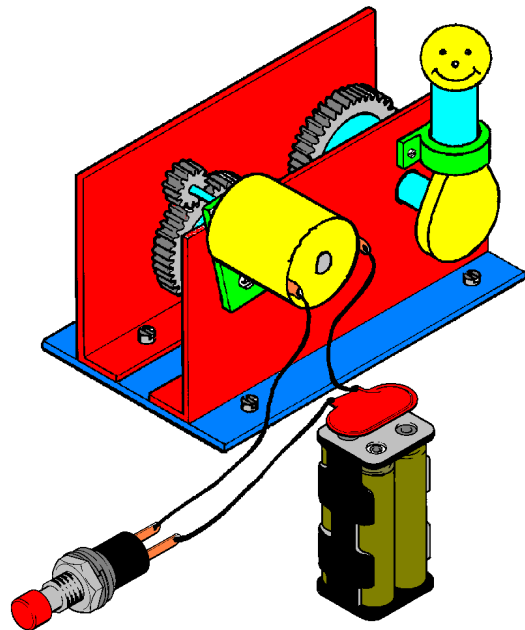
2 Marks

Function of coloured bands

The coloured bands determine the value in ohms of the resistor.

2 Marks

(c) Shown opposite is an electronic toy for a small child. In the space provided describe briefly how the toy works.

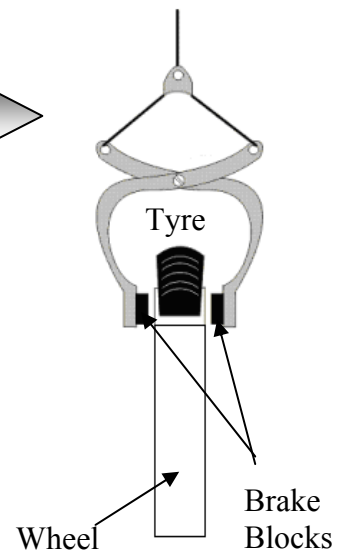


Description :

When the push switch is pressed it completes the circuit which switches on the motor. The motor turns the gear train which rotates the cam. The 'smiley face' then follows the cam and moves up and down.

9 Marks

(a) The diagrams show a braking mechanism commonly found on bicycles. Explain how the mechanism works.

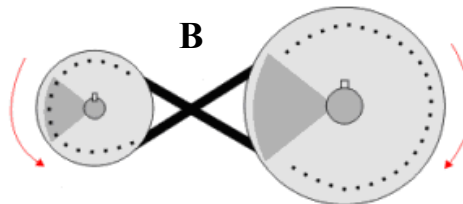
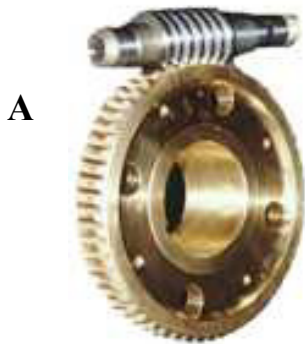


Explanation :

When the brake lever is applied it pulls the centre pull which moves the brake blocks onto the rim of the wheel. This creates friction which slows down the bike. When released the brake blocks move back to their original position.

7 Marks

(b) Identify the **three** mechanisms A, B and C shown below and state **one** use of each.

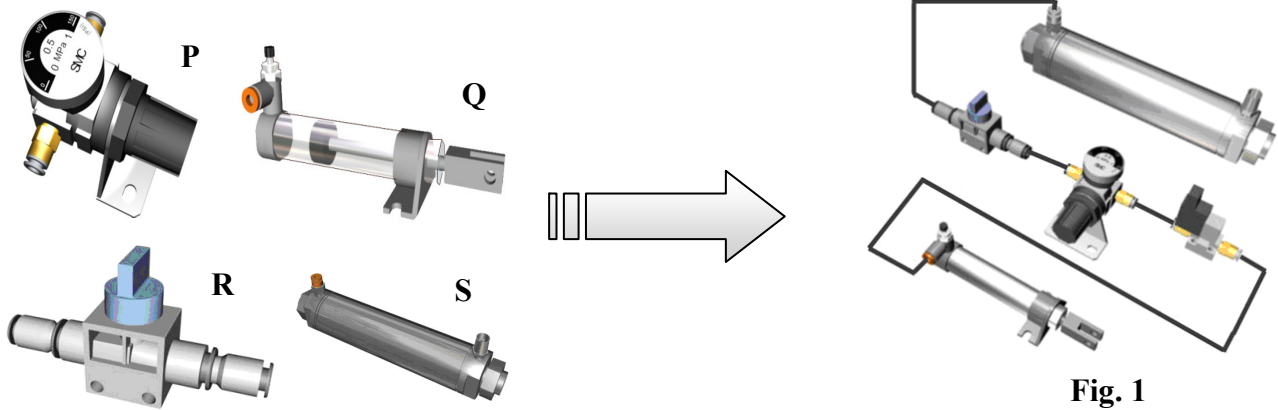


	Name	Use
Mechanism A	Worm and Wheel 3 Marks	Used to change rotary motion between planes. 3 Marks
Mechanism B	Pulleys and Vee Belt 3 Marks	Used to transmit rotary motion. They are often used in machines, eg. the drilling machine. 3 Marks
Mechanism C	Bevel Gears 3 Marks	Bevel gears are used to change rotary motion between planes. They are often found in hand drills. 3 Marks

(a) Match the pneumatic symbols on the left with the correct name on the right. The first one is completed as an example.

			Connected Pipes <i>3 Marks</i>
			3/2 Port Valve <i>3 Marks</i>
			Reservoir <i>3 Marks</i>
			Exhaust Air <i>3 Marks</i>
			Main Air Supply <i>3 Marks</i>
			Double Acting Cylinder <i>3 Marks</i>

(b) The pneumatic components P, Q, R and S are shown below. These components are connected to form the pneumatic circuit shown in Fig. 1. Describe the operation of the pneumatic circuit.



Description :

The valve 'R' is switched on. The compressed air from the compressor 'S' goes through the pressure gauge 'P' and moves the single acting cylinder 'Q' in a linear motion.

6 Marks

(c) Pneumatic systems use compressed air to perform a variety of tasks. Name **two** areas where pneumatic systems are used.

1. Used to operate sliding doors
2 Marks

2. Used in presses to punch paper
2 Marks

