



Coimisiún na Scrúduithe Stáit  
State Examinations Commission

**LEAVING CERTIFICATE  
APPLIED 2012**

**MARKING SCHEME**

**ENGINEERING**

**COMMON LEVEL**

*Leaving Certificate Applied, 2012*

**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.

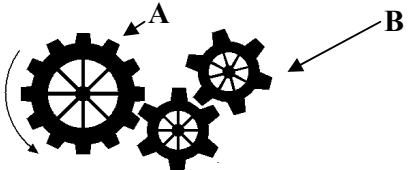
**45 marks**

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 and give a practical example of where it could be used.</p> 	<p>Joining process     <i>Welding</i></p> <p>Use     <i>To join two pieces of steel together</i></p> <p style="text-align: right;"><i>3 marks</i></p>
<p>(b) Name the tool shown and state <b>one</b> use for it.</p> 	<p>Name     <i>Vice Grips</i></p> <p>Use     <i>To clamp two pieces of materials together before drilling</i></p> <p style="text-align: right;"><i>3 marks</i></p>
<p>(c) State a suitable material to make the car exhaust shown.</p> 	<p>Name of material     <i>Stainless Steel</i></p> <p style="text-align: right;"><i>3 marks</i></p>
<p>(d) Identify the engineering component shown and state <b>one</b> use for it.</p> 	<p>Name     <i>Bearing</i></p> <p>Use     <i>To enable a shaft to rotate freely, eg a steering mechanism</i></p> <p style="text-align: right;"><i>3 marks</i></p>
<p>(e) Name the finishing process shown.</p> 	<p>Name of process     <i>Polishing</i></p> <p style="text-align: right;"><i>3 marks</i></p>


QUESTION	ANSWER
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**(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**.





*3 marks*

**(g)** Identify the special bolt shown and give **one** advantage of using this type of bolt.




Name *Allen Head Bolt*

Advantage *The head of the bolt takes up less space.*

*3 marks*

**(h)** Name the washer shown and give a suitable use for it.

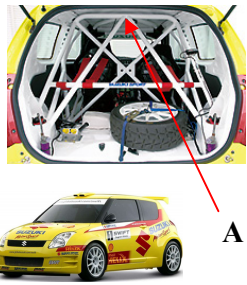


Name *Spring Washer*

Use *Helps to keep the nut in place and absorbs vibration*

*3 marks*


**(i)** Suggest a suitable material that could be used to manufacture the roll cage marked **A**, in the rally car shown opposite.



Suitable material *Bright Mild Steel*

*3 marks*

**(j)** Tick the correct box to indicate the two metals used to make the alloy solder, shown opposite.



Lead and Tin

Copper and Zinc

Copper and Tin

*3 marks*

QUESTION	ANSWER
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(k) Name the tool shown opposite and state **one** use for it in the Engineering room.



Tool *Lathe Chuck Key*  
 Use *To open and close a chuck on the centre lathe*

*3 marks*

(l) Please tick the correct box to show the most suitable type of metal used to make the *plumbing fitting* marked A.



Brass

Aluminium

*3 marks*

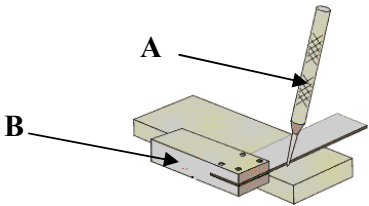
(m) Identify the filing technique shown.



Filing technique  
*Draw Filing*

*3 marks*

(n) Name the tools marked A and B below.



Name of tool A *Scriber*  
 Name of tool B *Try Square*

*3 marks*

(o) Identify the screw shown and state a suitable use for it.



Name of screw *Countersunk Head Screw*  
 Use *To fit flush with the surface of the material being joined*

*3 marks*

QUESTION	ANSWER
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(p) Choose a suitable material for the casing of the laptop computer shown and give a reason for your choice of material.



Suitable material *Polycarbonate Plastic*

Reason *It is very durable and does not crack easily.*

*3 marks*

(q) Name and give a use for the tool shown below.

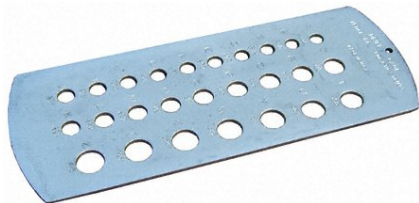


Name of tool *Stillson Wrench*

Use *For rotating or holding round work*

*3 marks*

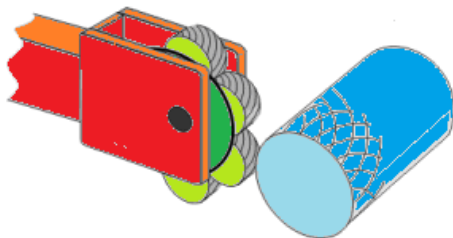
(r) State a use for the item shown below.



Use *This is a drill gauge and is used to measure the diameter of a drill bit.*

*3 marks*

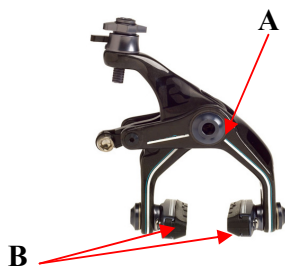
(s) Identify the turning process shown below.



Name of process *Knurling*

*3 marks*

(t) Identify the mechanism marked A and suggest a suitable material for part B.

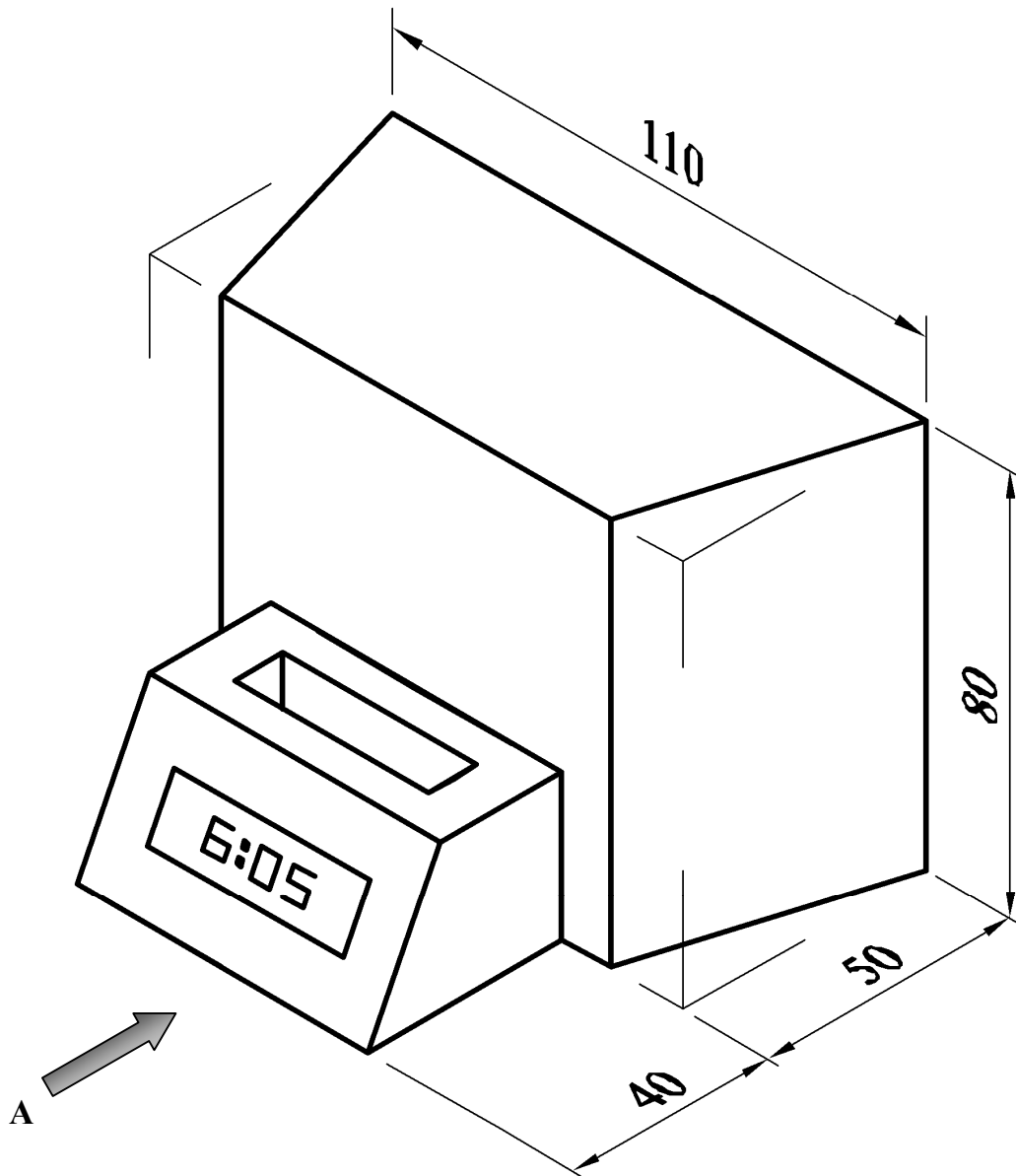


Name of mechanism A *Brake calipers*

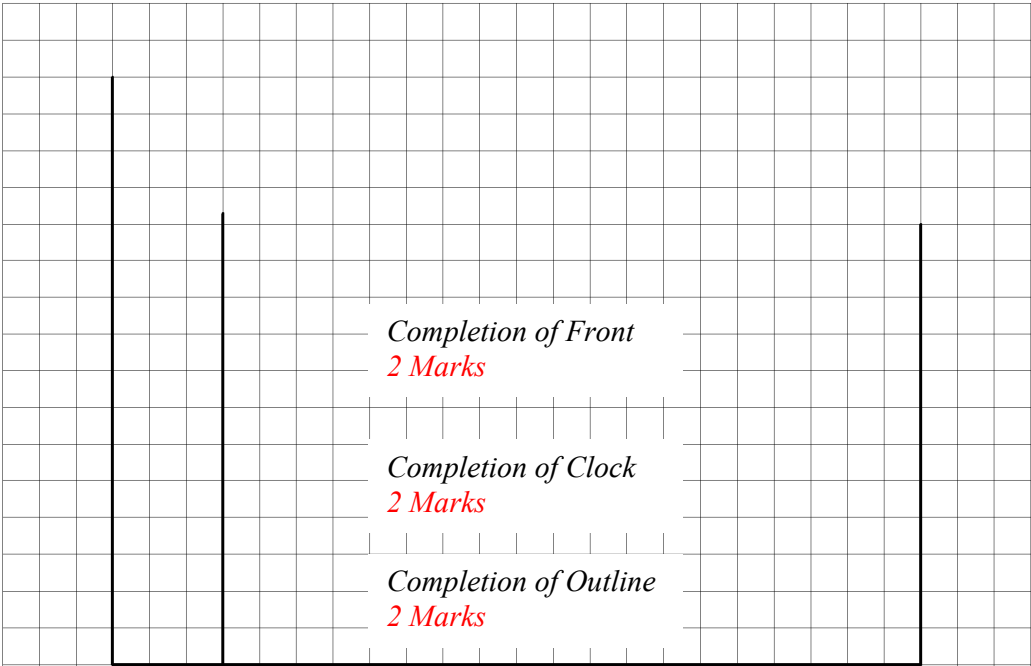
Material for B *Rubber with some added carbon to make it durable*

A pictorial view of a docking station for a personal music player is shown below. Draw the following **two** views of the docking station 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

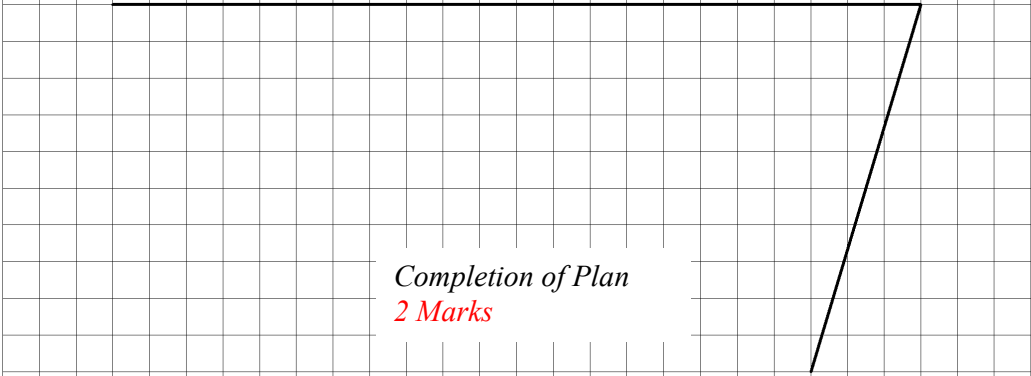


*Completion of Front*  
*2 Marks*

*Completion of Clock*  
*2 Marks*

*Completion of Outline*  
*2 Marks*

Complete the Elevation



*Completion of Plan*  
*2 Marks*

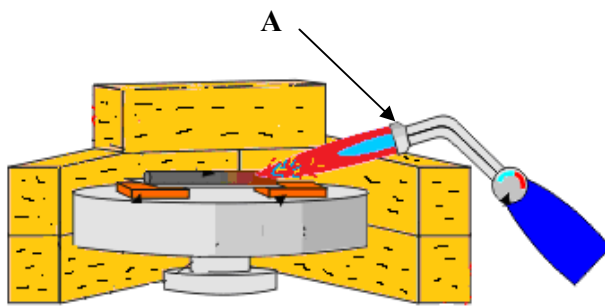
*Completion of Docking Area*  
*2 Marks*

Complete the Plan

<u>Proportion and Quality</u>	
<i>Excellent</i>	<i>12-15</i>
<i>V Good</i>	<i>9-11</i>
<i>Good</i>	<i>6-8</i>
<i>Fair</i>	<i>3-5</i>
<i>Poor</i>	<i>0-2</i>



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



**A** - Name of engineering equipment

*Brazing Torch* *1 Mark*

Safety Precaution 1

*Ensure a safety shield is worn to protect the eyes.*

*1 Mark*

Safety Precaution 2

*Ensure the gas is turned off when finished with the torch.*

*1 Mark*

**B** - Name of engineering equipment

*Centre Lathe* *1 Mark*

Safety Precaution 1

*Ensure the material being machined is secured properly in the chuck of the centre lathe.*

*1 Mark*

Safety Precaution 2

*Do not touch the material while the chuck of the centre lathe is rotating.*

*1 Mark*

- (b) The diagram shows a dot punch and hammer being used to mark out a metal piece.  
Identify **two** safety precautions that should be observed by students when marking out.

Safety Precaution 1 *Ensure all burrs are removed from the material being marked out.*

*2 Marks*

Safety Precaution 2 *Ensure all marking out tools are placed back in their proper place when finished the marking out process.*

*2 Marks*



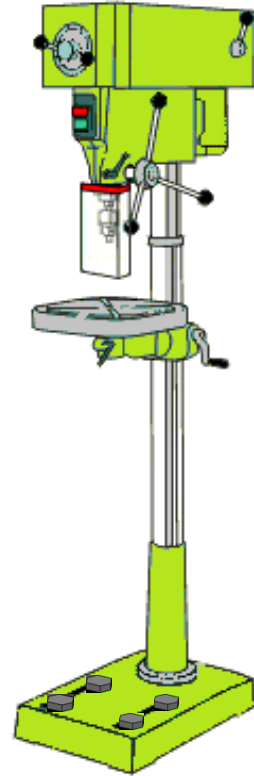
(c) Describe **any two** safety features on the drilling machine shown.

Safety Feature 1      *The drilling machine has a transparent protective guard at the front of the chuck.*

*2 Marks*

Safety Feature 2      *There are slots on the drilling machine table to enable a machine vice to be bolted securely to it before drilling.*

*2 Marks*



(d) State **one** safety precaution that should be observed when using the electric power hacksaw shown.

*Keep your fingers clear of the cutting blade at all times.*

*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**      *Wear suitable eye protection.*

*2 Marks*

**B**



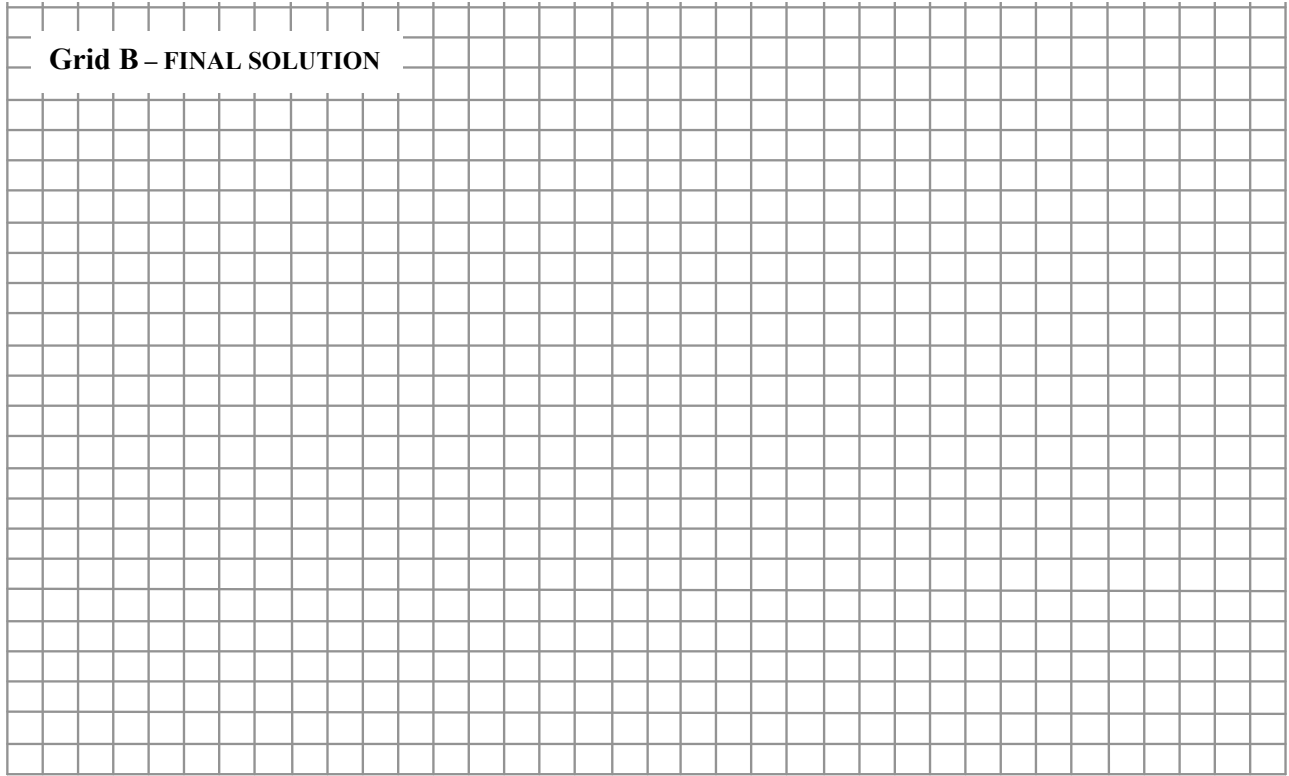
Symbol **B**      *Wear ear protection to prevent machine noise from damaging your hearing.*

*2 Marks*



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

**Grid B – FINAL SOLUTION**



(b)

- (i) Suggest a suitable material for manufacturing the frame of the airport luggage trolley shown.

*Stainless Steel*

*3 Marks*

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

*Stainless steel is durable and will not rust.*

*3 Marks*

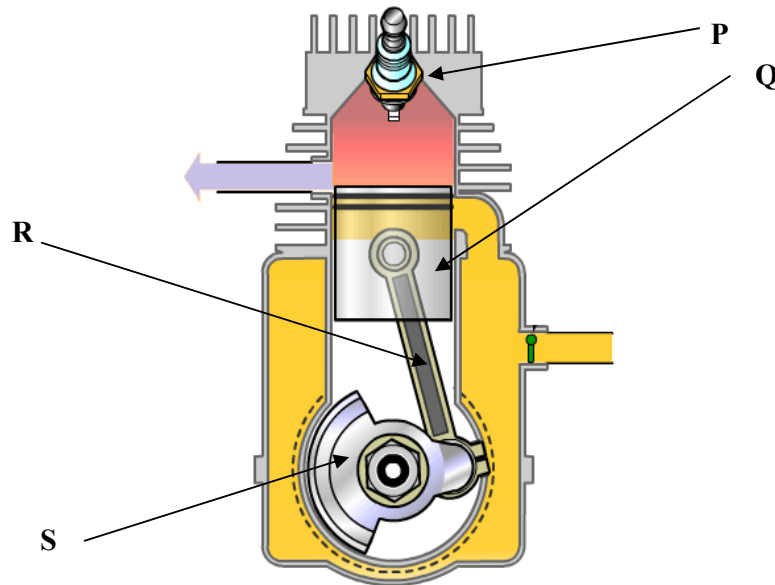
- (iii) Suggest **one** suitable improvement that could be considered in the design of the trolley shown.

*The basket could be enlarged to hold additional hand luggage.*

*4 Marks*



- (a) A cross sectional diagram of a two-stroke engine 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	Spark Plug	The spark plug is used to ignite the fuel entering the chamber.
	3 Marks	3 Marks
Q	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
R	Connecting Rod	The purpose of a connection rod is to provide fluid movement between pistons and a crankshaft.
	3 Marks	3 Marks
S	Crankshaft	The crankshaft helps to translate the linear motion of the piston into rotational motion.
	3 Marks	3 Marks

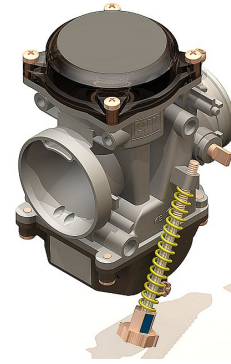
**(b)** Identify the part shown in the diagram opposite and state the function of this part in a car engine.

Name *Carburettor*

*1 Mark*

Function *The function of a carburettor is to mix the right amount of fuel with air so that the engine runs properly.*

*1 Mark*



**(c)** Some important parts of a car engine are shown below. Identify the parts labelled U, V, W and X and state the function of each.



Part	Name of Part	Function
U	<i>Windscreen wash tank</i> <i>3 Marks</i>	<i>Windshield washer fluid is used in cleaning the windscreen of a car with the windscreen wiper while the vehicle is being driven. The fluid is stored in a tank.</i> <i>3 Marks</i>
V	<i>Brake Fluid Tank</i> <i>3 Marks</i>	<i>Brake fluid is used in hydraulic brake systems to help apply immediate force to the brakes. The brake fluid is stored in a reservoir tank.</i> <i>3 Marks</i>
W	<i>Radiator</i> <i>3 Marks</i>	<i>The radiator is the main part of the car's cooling system, and its primary function is to ensure exactly the right temperature for the car's engine to operate at maximum potential.</i> <i>3 Marks</i>
X	<i>Car Battery</i> <i>3 Marks</i>	<i>A car battery stores electrical energy. This power is then needed to ignite the starter and once the car starts the alternator will power everything and recharge the battery.</i> <i>3 Marks</i>

(a) Describe briefly, in the spaces below, **any three** stages used to produce the decorative scroll in the hand 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*







## **Systems Module**

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

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

Topic (a) – Computer Aided Design (CAD)

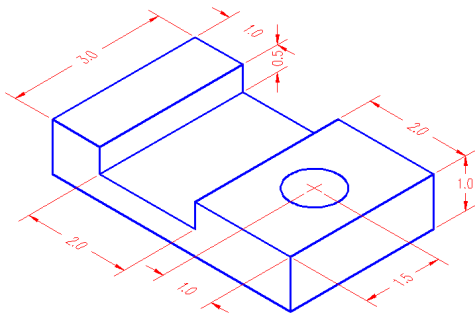
Topic (b) – Electricity

Topic (c) – Electronics

Topic (d) – Mechanisms

Topic (e) – Pneumatics

(a) A CAD drawing of a machine guide is shown below. List **any four** CAD commands necessary to produce the drawing below.



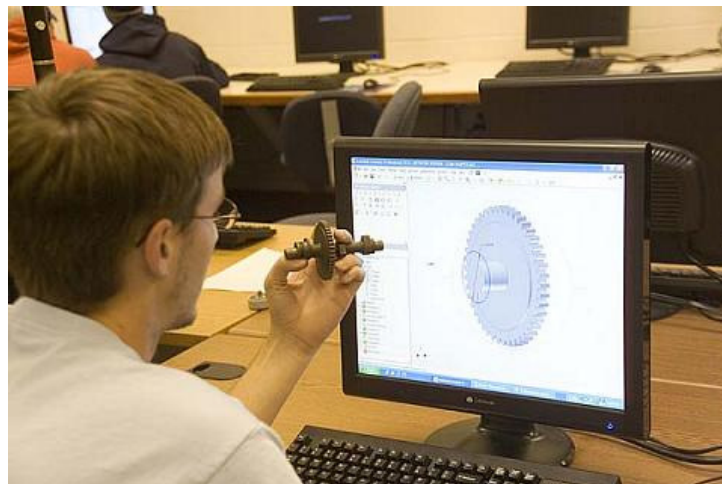
Command 1 : *Line* 4 Marks

Command 2 : *Rectangle* 4 Marks

Command 3 : *Copy* 4 Marks

Command 4 : *Circle* 4 Marks

(b) Give **two** advantages of using CAD drawings over traditional pencil drawings.



Advantage 1 *The drawings are accurate and can be shared easily.*

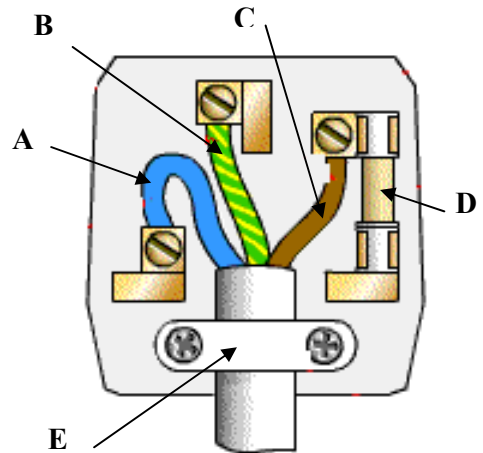
*5 Marks*

Advantage 2 *The drawings can be changed easily without having to draw the entire drawing again.*

*4 Marks*

(a) Identify, in the spaces provided, the components of the three-pin plug shown below.

Part	Name
A	Neutral Wire <span style="float: right;">2 Marks</span>
B	Earth Wire <span style="float: right;">2 Marks</span>
C	Live Wire <span style="float: right;">2 Marks</span>
D	Fuse <span style="float: right;">2 Marks</span>
E	Cable Holder <span style="float: right;">2 Marks</span>



(b) Identify the electrical component shown below and give a use for it.






Name of Component *Miniature Circuit Breaker Board*

*2 Marks*

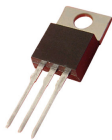
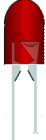

Use *The Miniature Circuit Breaker Board contains either fuses or circuit breakers. The ESB supply then connects the lights and sockets via the fuse board.*

*1 Mark*

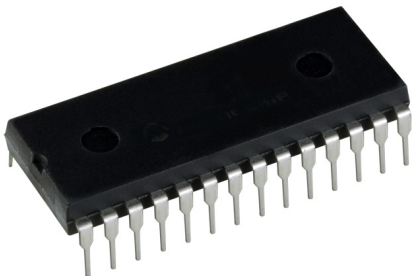
(c) Name and state a suitable use for **each** of the components shown below.

		
Name <i>Phase Tester Screwdriver</i> <span style="float: right;"><i>2 Marks</i></span>	Name <i>Wire Connector Block</i> <span style="float: right;"><i>2 Marks</i></span>	Name <i>Electrical Switch</i> <span style="float: right;"><i>2 Marks</i></span>
Use <i>To test voltage currents in electrical appliances</i> <span style="float: right;"><i>2 Marks</i></span>	Use <i>To connect individual electrical wires</i> <span style="float: right;"><i>2 Marks</i></span>	Use <i>Switches on/off the electricity. The light indicates the status of the switch.</i> <span style="float: right;"><i>2 Marks</i></span>

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

 Name <i>Transistor</i> Use <i>It can function as an amplifier or a switch</i>	 Name <i>Light Emitting Diode (LED)</i> Use <i>To indicate the status of the power</i>	 Name <i>Capacitor</i> Use <i>To store electrical charge</i>
<i>2 Marks</i>	<i>2 Marks</i>	<i>2 Marks</i>
<i>2 Marks</i>	<i>2 Marks</i>	<i>2 Marks</i>

(b) Identify the electronic component shown and explain its function.

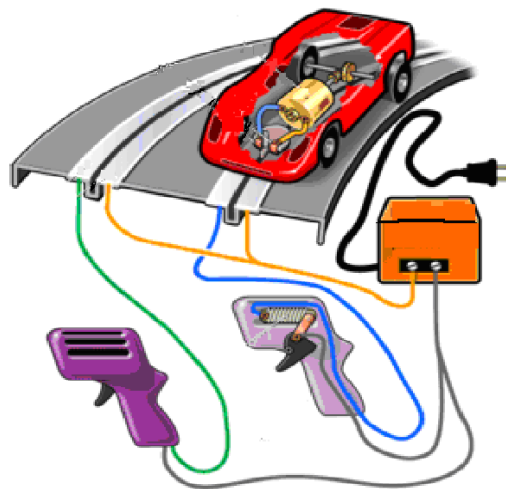


Name : *IC Chip*  
 Use : *An integrated chip is a miniature electronic circuit.*

*2 Marks*

*2 Marks*

(c) An electronic toy car is shown below. Describe briefly, in the space provided, how the toy car works.

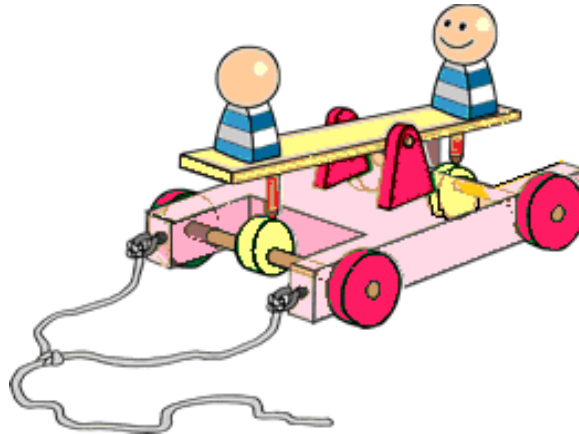


Description

*The transformer is plugged into the mains supply and the power switched on in the unit. The transformer reduces the mains voltage. When the handheld devices are switched on they close the circuit and power the motor. The motor is geared to the wheels and these rotate propelling the car forward.*

*9 Marks*

- (a) The diagram below shows a mechanism to operate a pull-along toy. Explain how the mechanism works.

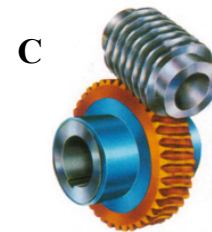
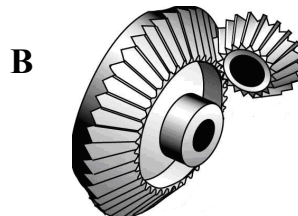
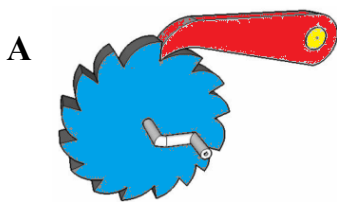


Explanation

*When the toy is pulled along by the string the wheels rotate. There is a cam mechanism connected to the axels that rotates as it moves. The follower rests on top of the cam and moves linear up and down as the cam rotates. This enables the see-saw mechanism to go up and down as it pivots in the centre.*

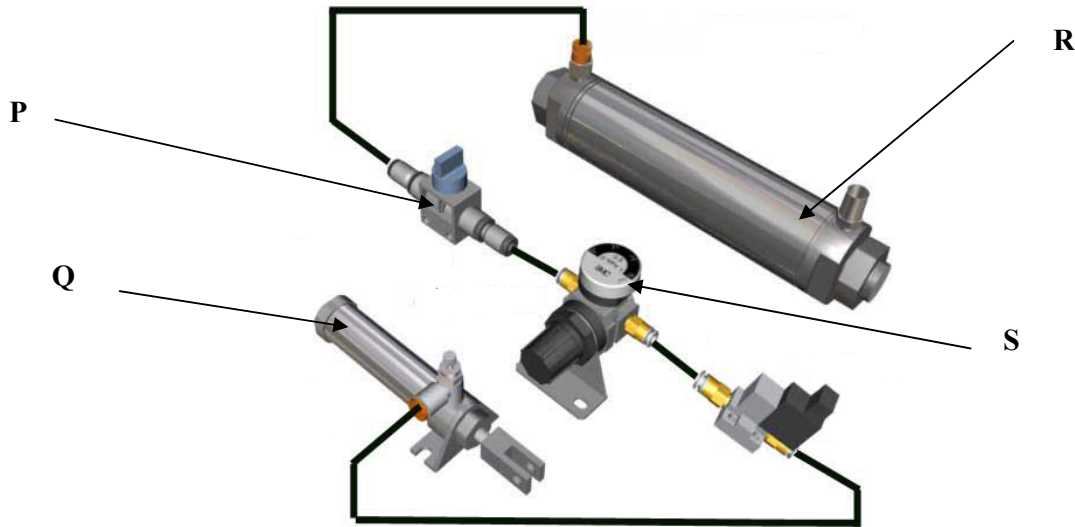
10 Marks

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



	Name	Use
Mechanism A	<i>Ratchet and Pawl</i> 2 Marks	<i>Used to change rotary motion between planes.</i> 3 Marks
Mechanism B	<i>Bevel Gears</i> 2 Marks	<i>Bevel gears are used to change rotary motion between planes. They are often found in hand drills.</i> 3 Marks
Mechanism C	<i>Worm and wheel</i> 2 Marks	<i>Used to change rotary motion between planes.</i> 3 Marks

(a) Identify the pneumatic components below and state the function of each.



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

(b) Pneumatic systems require safe work practices. Identify the component below and state the safety function it has in a pneumatic circuit.

Name of Component *Pneumatic Pressure Gauge* **3 Marks**

Safety Function *The Pneumatic Pressure Gauge ensures that there is a safe working pressure in the pneumatic circuit.* **2 Marks**





