Coimisiún na Scrúduithe Stáit
State Examinations Commission

Leaving Certificate Applied, 2008

MARKING SCHEME

Vocational Specialism – Engineering
(240 marks)

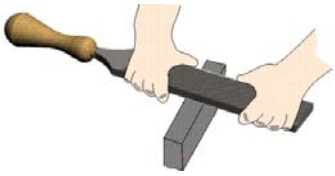
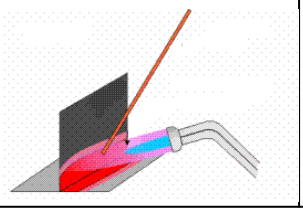
COMMON LEVEL

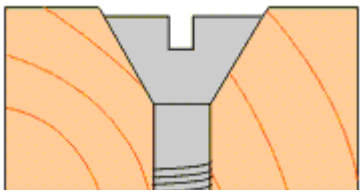
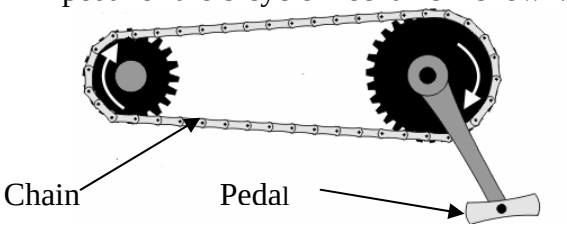
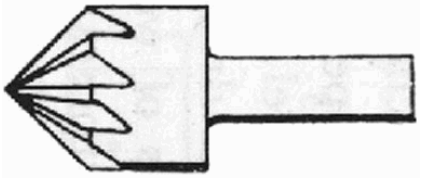
Section 1 (90 Marks)

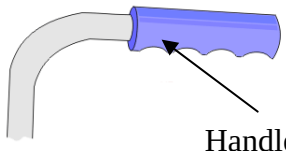
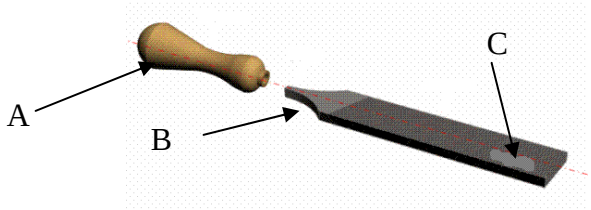
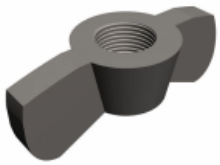
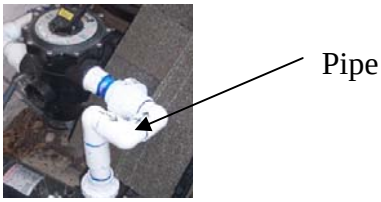
Answer **all three** questions

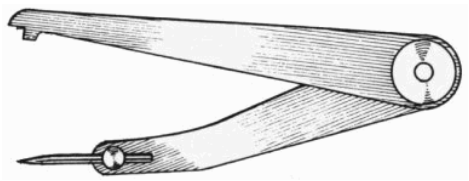
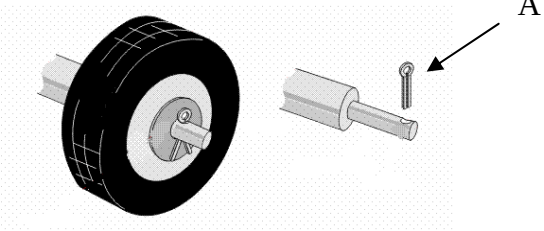
Section 1 **Q1.** **45 marks**

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

QUESTION	ANSWER
(a) Name and state the purpose of the filing technique shown here. 	Name of technique: *Draw Filing* ***(2)*** Purpose: *To create a smooth finished surface on the material* ***(1)***
(b) Identify the hand tool shown and state a suitable use for it. 	Name: *Hand Drill* ***(2)*** Suitable use: *To drill holes in material. Useful when no electrical power sources are available* ***(1)***
(c) State **one** application for the joining process shown below. 	Application: *Brazing is useful in creating a butt joint between metals* ***(3)***
(d) Identify the tool shown and state a suitable use for it. 	Tool: *Stillson* ***(2)*** Use: *Plumbers use it to tighten and loosen pipe fittings* ***(1)***
(e) Name **one** joining process shown in the structure of the bridge below and suggest a reason for its use. 	Name: *Riveting* ***(2)*** Reason: *Good strong method of joining metals****(1)***

QUESTION	ANSWER
(f) Name the screw shown and state where it may be used. 	Name: *Countersunk Screw* ***(2)*** Use: *To ensure the head of the screw is flush with the surface of the metal* ***(1)***
(g) Suggest suitable materials for the chain and pedal of the bicycle mechanism shown. 	Suitable material for chain: *Hardened Steel* ***(2)*** Suitable material for pedal: *Plastic* ***(1)***
(h) Tick the correct box to indicate the two main metals used to make solder.  	Lead + Iron ☐ Tin + Silver ☐ Tin + Lead √ **(3)**
(i) State **one** safety precaution to be observed when using an electrical jigsaw, as shown. 	Safety precaution: *Ensure the electrical lead is clear of the cutting blade* ***(3)***
(j) Name the tool shown and state its use. 	Name: *Countersunk Bit* ***(2)*** Use:*To create a countersunk hole in material* **(1)**

QUESTION	ANSWER
(k) Name a suitable material used to make the handle of the trolley shown, and give **one** reason for your choice of material.  	Material: *Plastic* ***(2)*** Reason: *The plastic can be moulded to fit the shape of the handle* ***(1)***
(l) State **one** safety precaution that must be observed when using the tool shown. 	Safety Precaution: *Ensure the chuck key is removed from the chuck prior to switching on the drilling machine* ***(3)***
(m) Name **any two** parts of the hand file shown.  	A *File Handle* ***(2)*** B *Tang* ***(1)*** C *File blade* (First correct answer 2 marks and one further answer award 1 mark)
(n) Identify the nut shown and state a suitable use for it. 	Name: *Wing Nut* ***(2)*** Use: *To tighten or loosen a nut by hand eg. a hacksaw blade* ***(1)***
(o) Suggest a suitable material for the pipe shown below. .  	Material for Pipe: *Thermoplastic as it can be bent to shape* ***(3)***

QUESTION	ANSWER
(p) What is the purpose of the odd leg callipers shown here? 	Purpose: *The odd leg callipers may be used to draw a line parallel to the surface of a metal* ***(3)***
(q) Name the item marked 'A' which is used to hold the wheel on the axel. 	Name: *Split Pin* ***(3)***
(r) What does this safety symbol indicate and where would it be used? 	This indicates *the item may be heavy and should not be lifted manually* ***(2)*** Use: *This can be displayed on heavy boxes or containers* ***(1)***
(s) Identify the tool shown and state a suitable use for it. 	Name: *Centre Drill* ***(2)*** Use: *To locate the centre of a round bar when drilling on the lathe* ***(1)***
(t) Name the tool shown and give a use for it in the engineering room. 	Name: *Junior Hacksaw* ***(2)*** Use: *To cut out slots on a piece of material* ***(1)***

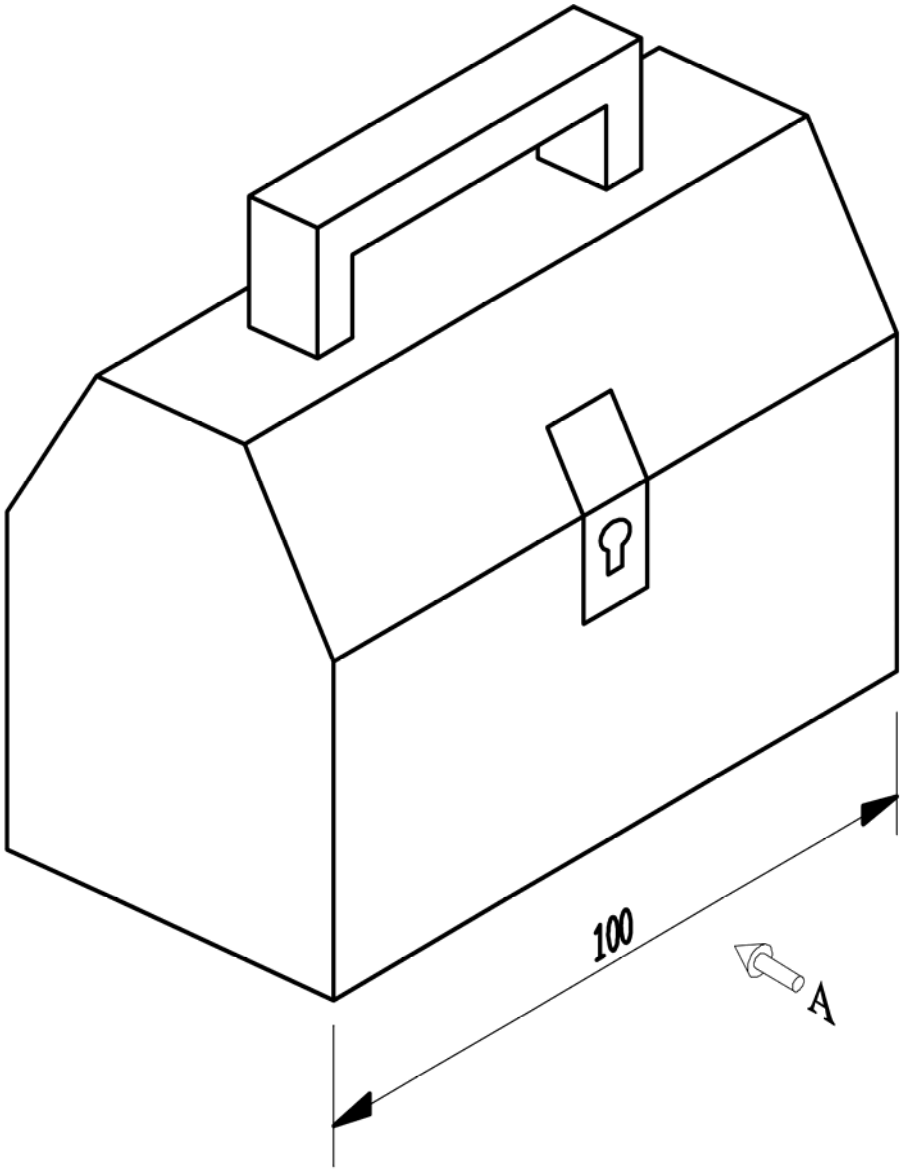
Section 1 **Q2.** **25 marks**

A pictorial view of a tool box is shown below.
Draw the following **two** views of the tool box on the grid paper opposite:

(a) A front elevation in the direction of arrow 'A'.

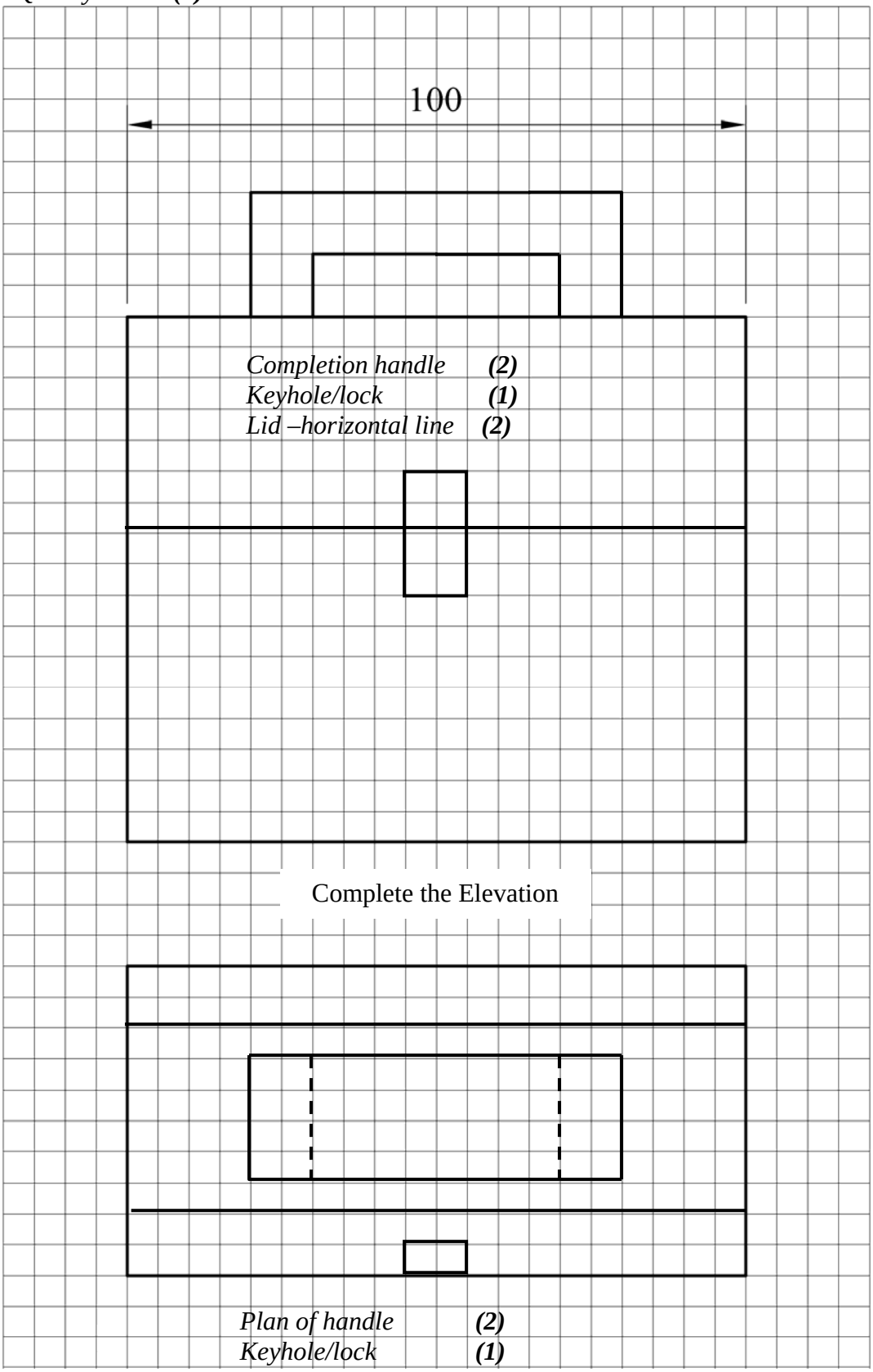
(b) A plan projected from view **(a)**.

(c) One dimension is shown on the pictorial view. Insert **three** other dimensions on your drawing in the grid paper opposite.



Dimensions ***(3)***
Proportion ***(4)***
Quality ***(8)***

Note: Each grid square is 5 mm long



Completion handle ***(2)***
Keyhole/lock ***(1)***
Lid –horizontal line ***(2)***

Complete the Elevation

Plan of handle ***(2)***
Keyhole/lock ***(1)***
Horizontal lines ***(2)***

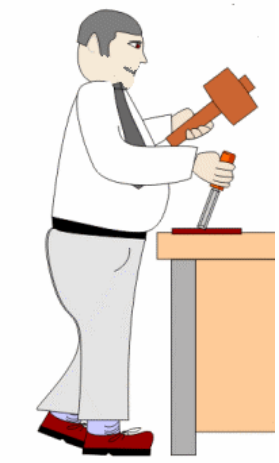
(a) Name the **two** engineering processes shown below and state **one** example of a good safety precaution being observed in **each** case.

A 

B 

Name of engineering process	Safety precaution
A *Gas Welding* ***(1)***	*Ensure protective clothing is worn to prevent damage to the skin by hot sparks* ***(2)***.
B *Turning on the Centre Lathe* ***(1)***	*Wear safety googles to prevent swarf from entering the eyes* ***(2)***.

(b) The diagram shows an operator using a chisel in the workshop without regard to safety. State **two** safety precautions that should be observed when using a chisel.



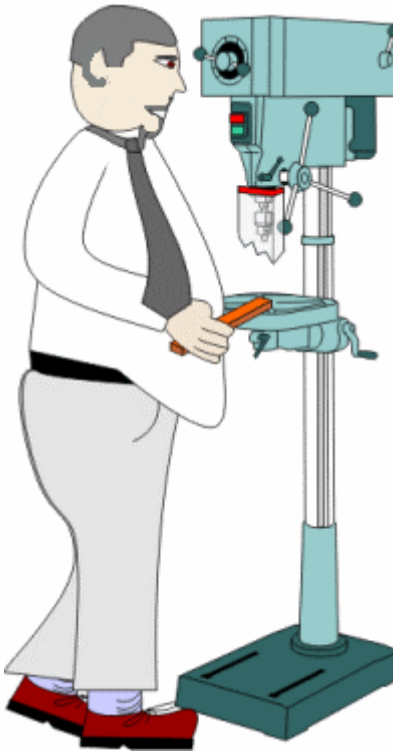
Safety Precaution 1

When striking a chisel the direction of force should be away from the body ***(2)***.

Safety Precaution 2

Safety gooles should be worn to prevent any waste metal from entering the eye ***(2)***.

(c) Describe **any two** safety precautions that should be observed by the operator using the drilling machine shown.



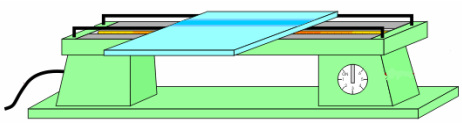
Safety Precaution 1

All loose clothing should either be removed or covered to prevent it from getting caught in the revolving chuck ***(2)***.

Safety Precaution 2

The broken chuch guard should be replaced ***(2)***.

(d) State **one** safety precaution that should be observed when using the strip heater shown to bend plastics.



The electrical lead should never be placed over the heated element in the strip heater ***(2)***.

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

A 

Symbol A **(2)**
Danger high voltage

B 

Symbol B **(2)**
Wear ear protection as machinery may be noisy

Section 2 (150 Marks)

Answer **any three** questions

Section 2 **Q4.** **50 marks**

(a) Design, in the spaces provided, a suitable support bracket(s) to enable the ladder shown to be mounted on a concrete garage wall for storage.

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

(i) A method for securing the bracket(s) to a concrete garage wall;
(ii) How the bracket(s) supports the ladder.

Draw in **Grid A** sketches of **different ideas** you considered for the ladder support bracket(s).

Draw in **Grid B** a sketch of the **final solution** for the ladder support bracket(s).

Different ideas for the ladder support bracket(s) should be drawn below in Grid A.

Grid A - IDEAS

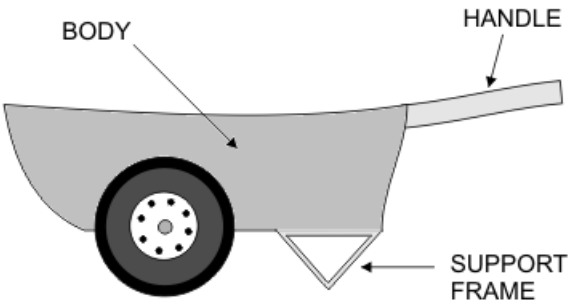
Method for securing bracket to wall	**(10)**
Method for supporting ladder	**(10)**
Sketches of Ideas	**(10)**

A sketch of the **final solution** for the ladder support bracket(s) should be drawn below in Grid B.

Grid B - FINAL SOLUTION

Completed sketch of final solution **(10)**

(b) The wheelbarrow below is designed for work in the garden.



(i) Suggest a suitable material for manufacturing the body of the wheelbarrow.

Aluminium ***(2)***

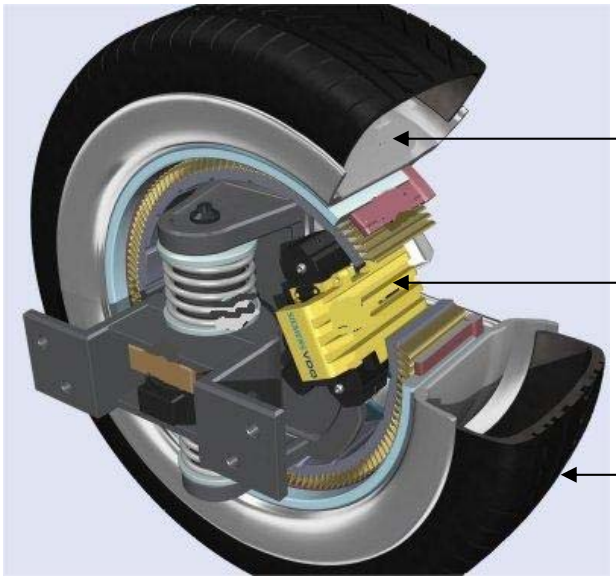
(ii) Give a reason for your choice of material.

Light and easy to shape ***(4)***

(iii) Based on your choice of material, explain how the support frame could be attached to the body of the wheelbarrow.

The support frame could be bolted to the plastic body using nuts and bolts ***(4)***

(a) A cross sectional diagram of a wheel of a car is shown below.
Identify and describe the function of the **three** labelled parts, A, B and C.



(i) Name of Part A: *Wheel rim **(3)***

Function of Part A: *To provide a support for the tyre **(3)**.*

(ii) Name of Part B: *Disc brake **(3)***

Function of Part B: *To enable the wheel to slow down or stop when the break pedal is depressed **(3)**.*

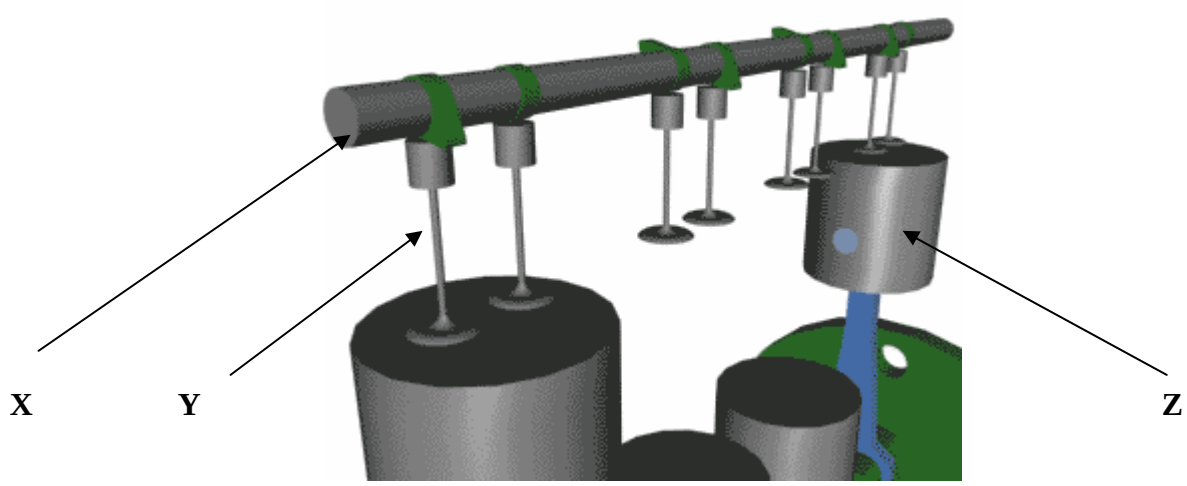
(iii) Name of Part C: *Pneumatic tyre **(3)***

Function of Part C: *The pneumatic tyre enables the wheel to move and assists in absorbing any vertical movements to ensure a smoother ride **(3)**.*

(b) Explain **one** possible reason why the car engine below has overheated.

Reason: *The engine may have overheated due to the lack of water in the radiator of the car **(8)***.

(c) Three common components used in a motor car engine are labelled X, Y and Z. Identify the **three** components and explain the function of **each**.



Part	Name of Component	Function
X	*Camshaft **(4)***	*The camshaft rotates and in doing so opens and closes the valves **(4)**.*
Y	*Valve **(4)***	*The valves enable the fuel to enter the cylinder and the exhaust gases to escape. The timing is controlled by the rotation of the camshaft **(4).***
Z	*Piston **(4)***	*The piston compresses the fuel mixture entering the cylinder prior to the power stroke **(4)**.*

Section 2 **Q6.** **50 marks**

(a) Describe briefly, in the spaces below **any four** stages used to produce the decorative scroll shown.

(Use sketches as appropriate).

Stage 1

*Clean the material using emery paper **(6)**.*

Stage 2

*Measure the appropriate distance and cut the length of metal **(6)**.*

Stage 3

*Heat the metal until cherry red **(6)**.*

Stage 4

*Using a hammer and formers bend the scroll into the required shape. Cool in cold water **(6)**.*

(b) Describe briefly **any four** stages used to enamel the piece shown in figure 'A' **using heat**. The piece is made from a flat piece of copper of dimensions 50mm x 50mm x 1mm.
(Use sketches as appropriate- some pictures are shown in figures 'B' and 'C' to help).

Figure A

Figure B

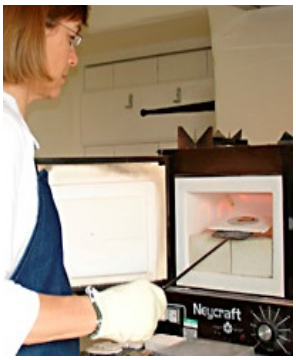


Figure C

Stage 1:

Clean the copper piece using emery paper ***(5)***.

Stage 2:

Dust the enamel powder onto the piece according to the design required ***(5)***.

Stage 3:

Heat the piece in the oven for the required temperature and time ***(5)***.

Stage 4:

Remove the piece from the oven and allow to cool **(5)**.

_____

(c) State **two** safety precautions to be observed during the enamelling process.

Precaution 1

Wear appropriate safety clothing, particularly gloves to prevent burns to the hands ***(3)***.

Precaution 2

Be careful when removing the hot enamel piece from the oven ***(3)***.

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 key ring is shown below. List any **four** CAD commands necessary to produce the drawing.

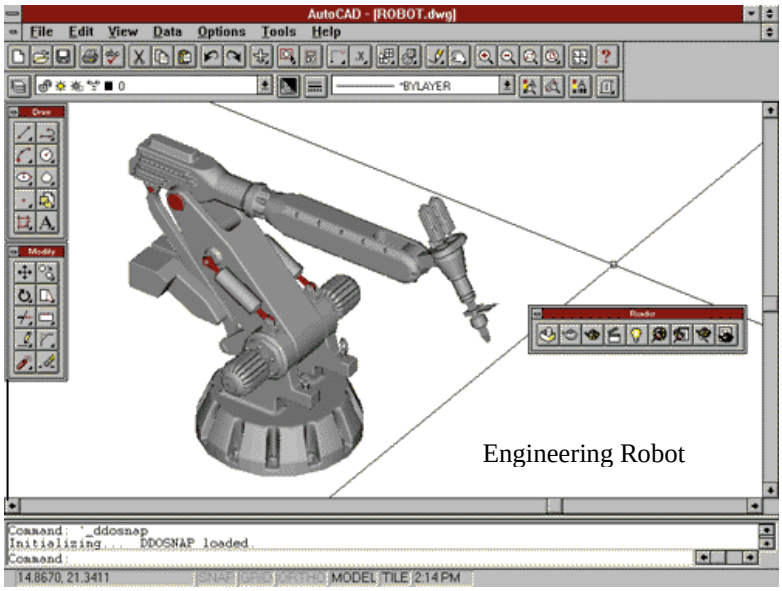
Command 1 *Rectangle* ***(4)***

Command 2 *Fillet* ***(4)***

Command 3 *Circle* ***(4)***

Command 4 *Pattern* ***(4)***

(b) The drawing of the engineering robot shown below is produced by a CAD package. Explain the procedure involved in inserting text on a CAD drawing.



Engineering Robot

Procedure

Choose from the top menu '*Format' and then 'Text style' – Select 'Style' – 'Apply'. Insert the appropriate text* ***(9)***.

(a) A generator is shown opposite.
Explain briefly how the generator works.

Explanation:
*The generator converts mechanical energy to electrical energy using electromagnetic induction. If an electric conductor, like a copper wire, is moved through a magnetic field, electric current will flow in the conductor. The mechanical moving wire is converted into the electric energy of the current that flows in the wire. Small electricity generators are often powered by reciprocating engines burning diesel **(9)**.*

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

Name: *Battery operated drill **(2)***

Use: *To drill holes when there is no AC current available **(2)**.*

Name; *Crimping Pliers **(2)***

Use: *For crimping electrical terminals and connectors **(2)**.*

Name: *Jump leads**(2)***

Use: *To assist in transferring current, often used to 'jump start' a car **(2)**.*

Name: Multi socket extension lead **(2)**.

Use: *To enable power to be provided to multiple appliances **(2)**.*

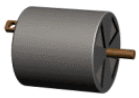
Name: *Electrical fuse **(2)**.*

Use: *To provide a safety device in electrical circuits **(2)**.*

Name: *Wire Strippers **(2)**.*

Use: *to strip back the plastic covering on electrical wires* **(2)**.

(a) Name and give a use for the **three** components shown.



Name: *Electrical Motor* ***(2)***

Use: *Converts electrical power into rotary motion* ***(2)***.

Name: *Light Dependent Resistor* ***(2)***

Use: *This can be used in circuits to vary resistance depending on light* ***(2)***.

Name: *Integrated Circuit Chip****(2)***

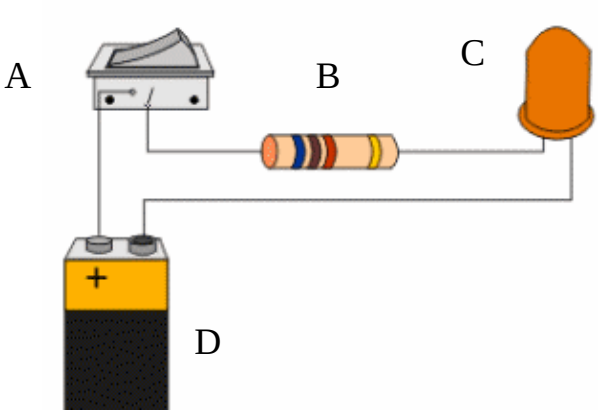
Use: This chip is a mini circuit which can be inserted in electronic circuits **(2)**.

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

Name: *Multimeter* ***(2)***

Use: *This can be used to measure either voltage, current or resistance depending on the setting chosen on the meter* ***(2)***.

(c) Identify **each** of the electronic components shown and write your answers in the table provided.

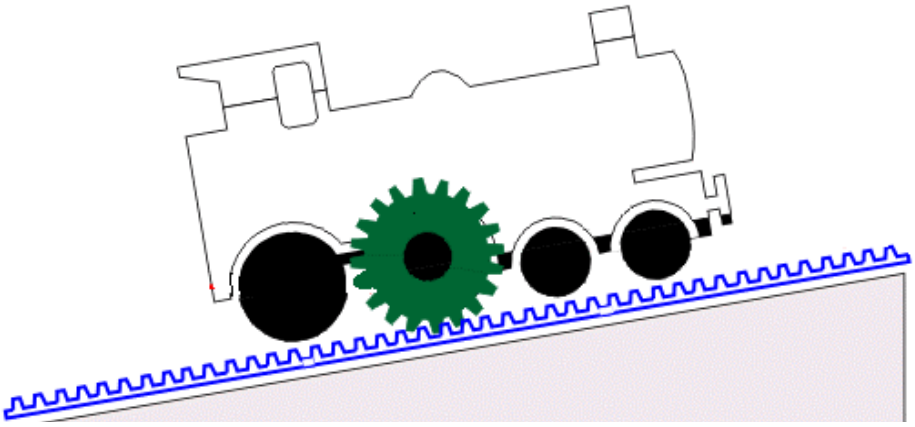


	Name of Electronic Part
A	*Switch* ***(1)***
B	*Fixed Resistor* ***(1)***
C	*Light Emitting Diode* ***(1)***
D	*Battery* ***(1)***

(d) Explain how the circuit above works.

The circuit is turned on at 'A', current flows through the circuit via the fixed resistor which is connected in series to the light emitting diode and emits light. The battery has positive and negative terminals which help form the circuit. When the switch is turned off current stops flowing and the light goes off ***(5)***.

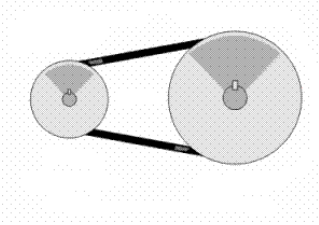
(a) The diagram below shows a train and a mechanism to help it to travel up the hill. Explain how the mechanism works.

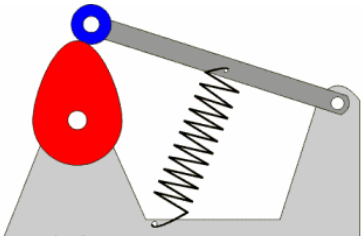


Explanation:

The mechanism operates with the help of a rack and pinion. The pinion is connected on the train while the rack is along the railway tracks. The rotary motion of the pinion guides the train along the rack ***(7)***.

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

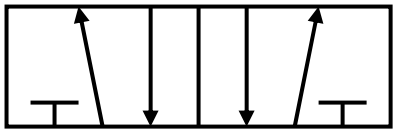
A 

B 

C 

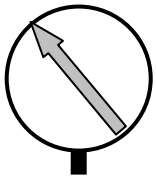
	Name	Use
Mechanism A	*Pulleys and belt* ***(3)***	*The pulleys and belt are used to transmit power from one rotating shaft to another. This mechanism is found on some drilling machines* ***(3)***.
Mechanism B	*Cam and follower* ***(3)***	*The cam rotates which can open and close a mechanism. This mechanism is used to change rotary motion to linear motion* ***(3)***.
Mechanism C	*Worm and wheel* ***(3)***	*The worm and wheel mechanism is used to change the plane of a rotary motion. It is often used as a tightening mechanism* ***(3).***

(a) Name and give a use for **any four** of the pneumatic symbols shown.



Name: *5-Port Valve* ***(3)***

Use: *Control of a double acting cylinder* ***(1)***

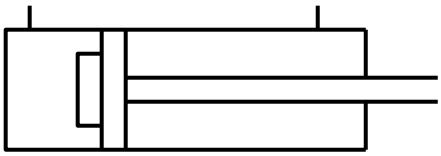


Name: *Pressure Gauge* ***(3)***

Use: *To indicate the working pressure in a pneumatic circuit* ***(1)***

Name: *Pneumatic lines crossing* ***(3)***

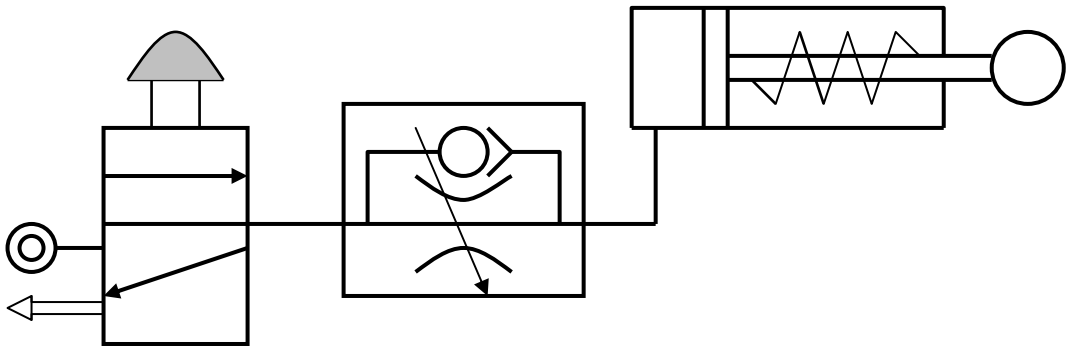
Use: *To indicate where two pneumatic lines are crossing in a circuit* ***(1)***



Name: *Double Acting Cylinder* ***(3)***

Use: *The instroke and the outstroke are controlled by compressed air. They can be used in door opening and closing mechanisms* ***(1)***.

(b) Explain how the pneumatic circuit below works.



Explanation:

When the valve is depressed air flow is restricted by the flow regulator, this helps to control the speed of the cylinder. The piston starts to move and is returned to its original position on completion of the cycle by the spring ***(9)***.