Section A

Answer **all** the questions. **[50 marks]**

1 **Figure 1.1** shows the reading on a vernier calliper.

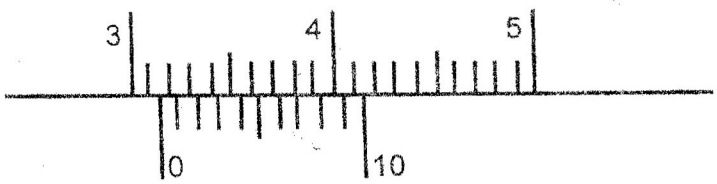

Figure 1.1

(a) What are the readings of the scales?

(i) main scale _____ [1]

(ii) vernier scale _____ [1]

(b) A certain measuring instrument when zeroed reads 0.03 mm below the zero mark.

When this instrument is used to measure the thickness of a material, the reading is 2.06 mm.

What is the thickness of this material?

_____

_____ [2]

[Total:4]

2 **Figure 2.1** shows an arrangement of a track for the toy car to run up and down the hills. The toy car moves from point A without being pushed.

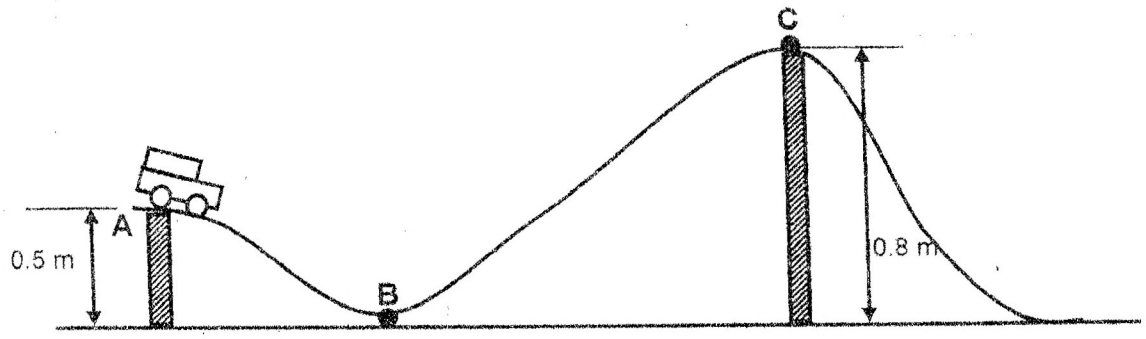

Figure 2.1

mass of the car is 150 g and taking g = 10 N/kg then;

(i) name the energy the toy car possess when at point **A**.

_____ [1]

(ii) calculate the amount of energy the car posses while at point **A**.

_____

_____

[1]

(b) Ignoring all effects due to friction, calculate the velocity of the car as it passes point **B**.

_____

_____

_____ [3]

(c) **(i)** Does the car reach point **C**?

_____ [1]

(ii) Give a reason for your answer in **(c)** **(i)** above.

_____

_____

_____ [1]

[Total:7]

3 **Figure 3.1** shows a diagram of a simple type of a corkscrew bottle opener. A 5N force is applied at point **C** to just remove the cork stopper.

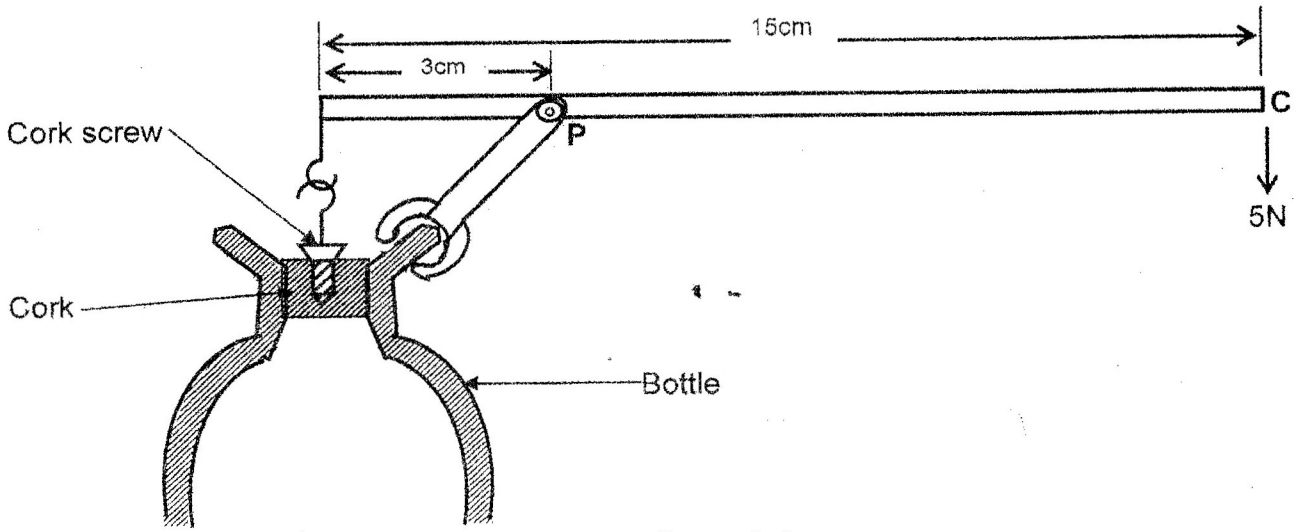

Figure 3.1

(i) Write down the equation for finding the moment of force about a fixed point.

_____

_____ [1]

(ii) Calculate the moment of the 5N force about **P**.

_____

_____ [2]

(iii) Calculate the force which is produced on the cork when the force shown is applied

_____

_____ [2]

[5]

What is the meaning of the statement "The specific heat capacity for water is 4200 J/kg°C."

_____

_____

_____ [2]

Figure 4.1 shows a set up of apparatus which was used to determine the specific heat capacity of aluminium. The joule meter measures the amount of energy supplied.

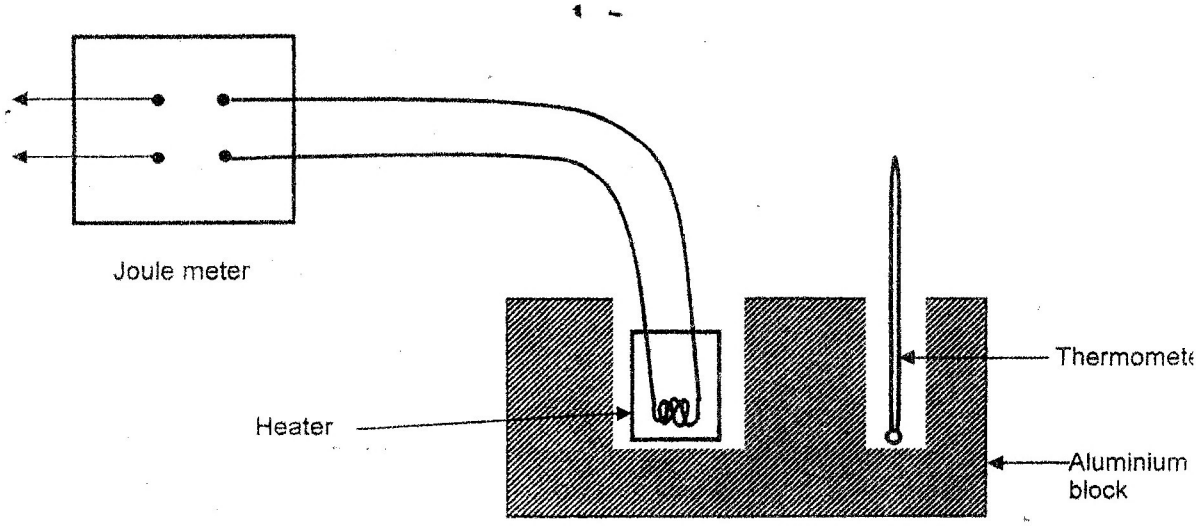

Figure 4.1

esults obtained were as follows:

Mass of block of aluminium	2 kg
Initial temperature	25°C
Final temperature	27°C
Initial Joule meter reading	3500 J
Final Joule meter reading	7100 J

(i) Calculate the energy absorbed by the aluminium block.

_____

_____

_____ [1]

(ii) From the results above determine the specific heat capacity for aluminium.

_____

_____

_____

_____ [2]

(iii) State the assumption made in calculating your answer in **4 (ii)** above.

_____

_____

_____

_____ [1]

(iv) State two precautions you might have to make so as to make the assumption made a reasonable one.

1 _____

_____

2 _____

_____ [2]

[Total 8]

5 **Figures 5.1 (a)** and **5.1 (b)** show rays of light from the object O to the lens as used in different optical instruments.

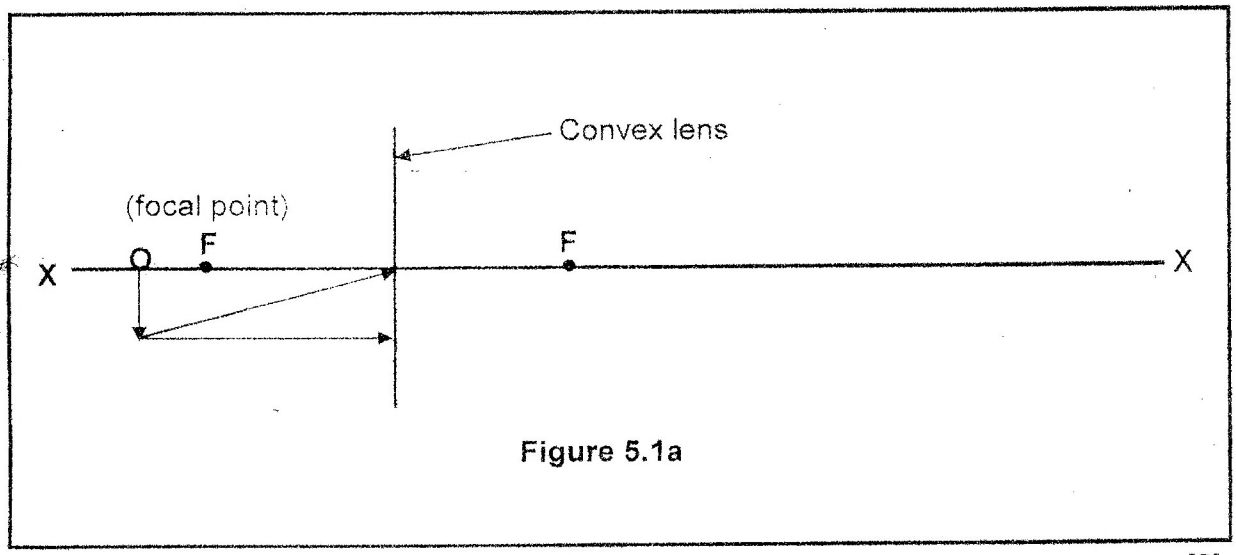

Figure 5.1a

[2]

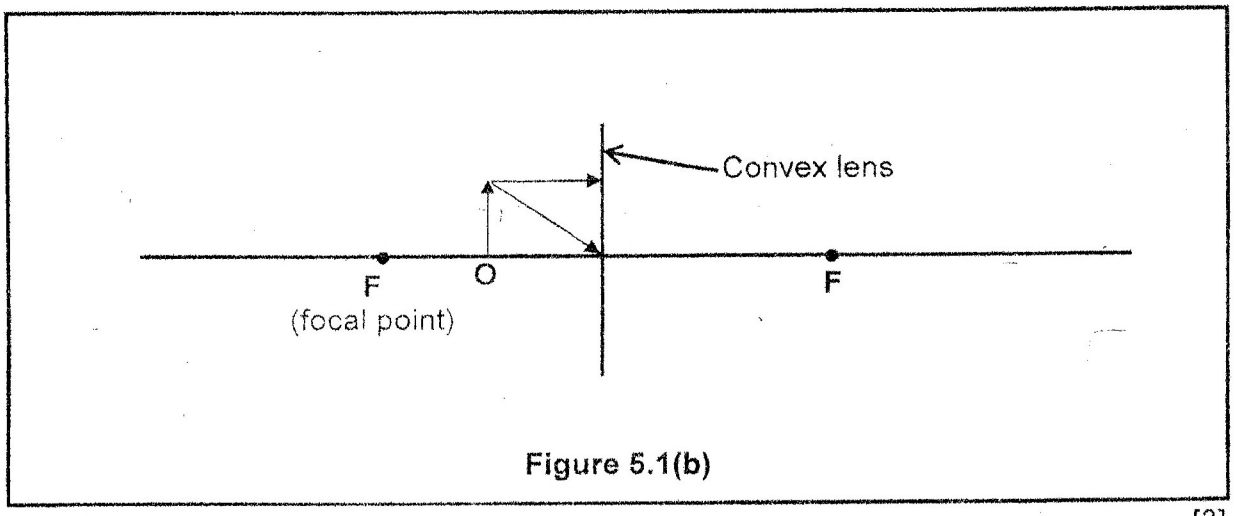

Figure 5.1(b)

[3]

Complete the ray diagrams in both **Figures 5.1 (a)** and **5.1 (b)**.

Label the image formed in each of the diagrams as **I**.

Describe the image formed by the ray diagram of **Figure 5.1 (b)**.

_____

_____ [3]

[Total 8]

ure 6.1 shows a demonstration of how the magnetic field lines from a magnet pass ough a ring structure.

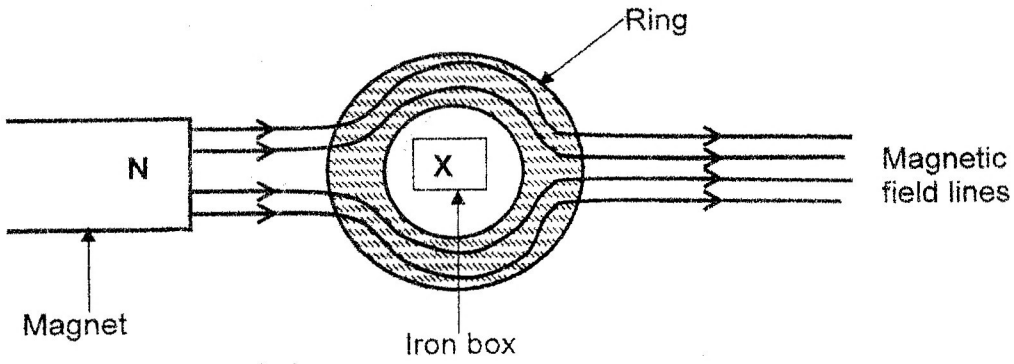

Figure 6.1

What is the purpose of the ring in **Figure 6.1**?

_____

_____

_____ [1]

) Explain why the ring produces such a pattern of field lines.

_____

_____

_____ [1]

) What material is the ring made of, for the pattern of field lines shown to be achieved?

_____

_____

_____ [1]

(d) What change if any, would there be if the ring used was made of copper?

_____

_____

_____ [1]

(e) What would happen to the iron box if the ring was made of glass?

_____

_____

_____ [1]

[Total 5]

7 (a) State three safety features found in a three pin plug.

(i) _____

(ii) _____

(iii) _____ [3]

(b) **Figure 7.1** shows a house hold circuit diagram showing a fridge, a stove and a geyser of power ratings 0.8 kW, 0.9kW and 0.6 kW respectively.

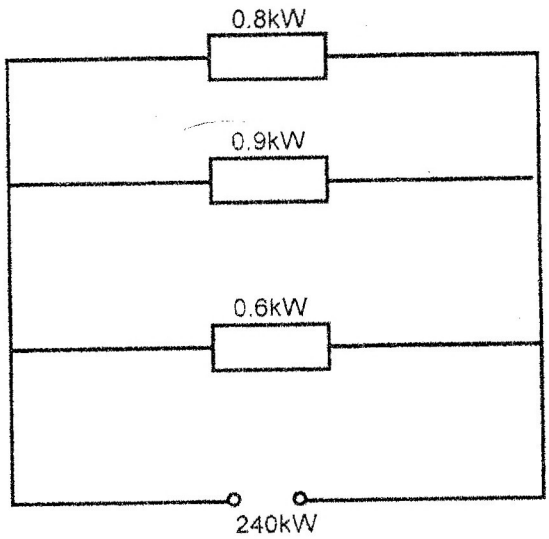

Figure 7.1

If the appliances are left "ON" for 8 hours daily for seven days, find:

(i) the total electrical power consumed in one week.

_____

_____ [3]

(ii) The electricity bill for one week if one electrical unit costs K20.

_____

_____

_____

_____ [2]

[Total 8]

Strontium – 90 emits a β-particle and has a half-life of 30 years.

(a) Explain the term 'half-life'.

_____

_____ [1]

(b) What happens to the atomic number of an atom when it emits a Beta particle?

_____

_____ [1]

(c) What happens to the mass of an atom when it emits a Beta particle?

_____

_____

_____ [1]

(d) A sample of strontium-90 gives a reading of 80 counts per second on a radiation detector (Rate meter). Calculate how long it will take for the count to drop to 20 counts per second.

_____

_____ [2]

[Total 5]

Section B

[45 marks]

Answer **only three** questions from this section. Each question in this section carries 15 marks.

Use the separate answer sheets provided by the invigilator / supervisor.

9 **Table 9.1** shows results of an experiment in which an object was allowed to drop from different heights.

Height of fall, h/cm	200	180	160	140	120	100
Time taken t/s	0.64	B 0.61	0.54	0.53	0.50	0.45
t^2/s^2	A 0.41	0.37	0.29	0.28	0.25	0.20

Table 9.1

(a) (i) Determine the values of **A** and **B**. [2]

(ii) Plot a graph of h (y – axis) and t^2 on the x – axis. [5]

(iii) Which pair of points appear to have been measured or recorded incorrectly. [1]

(iv) Ignoring this pair of incorrectly recorded reading draw the best fit line using the remaining points. [1]

(v) Determine the gradient of the graph line. [2]

(vi) Suggest what quantity the gradient you have determined is. [1]

(b) Explain what is meant by:

(i) centre of mass, [1]

(ii) the term 'neutral equilibrium', [1]

(iii) the term 'stable equilibrium'. [1]

[Total 15]

Two loud speakers producing sound notes of the same pitch were placed a reasonable distance apart.

A man walked from one speaker towards the other and observed that the sound he heard varied between loud to less loud (silent or quiet)

(a) Explain with the aid of a diagram why sound he heard became loud at some points and less loud (or silent) at other points. [6]

(b) What property of a wave would,

(i) increase the loudness of a sound note? [1]

(ii) increase the sharpness of a sound note? [1]

(c) (i) Define wavelength. [1]

(ii) Name any two waves that are transverse in nature. [2]

(d) A person stands 120 m away from a high wall and claps two blocks of wood together at a steady rate such that 40 claps are made in 30 seconds.

If each clap coincides with the echo of the previous clap,

Calculate the speed of sound on that day. [2]

(e) Explain what happens to the speed of sound in air if,

(i) the air pressure rises, [1]

(ii) the temperature of the air rises. [1]

[Total 15]

11 **Figure11.1** is a home made solar powered water heating system. The arrangement is such that cold water is supplied through one pipe and the warm water comes out through another pipe.

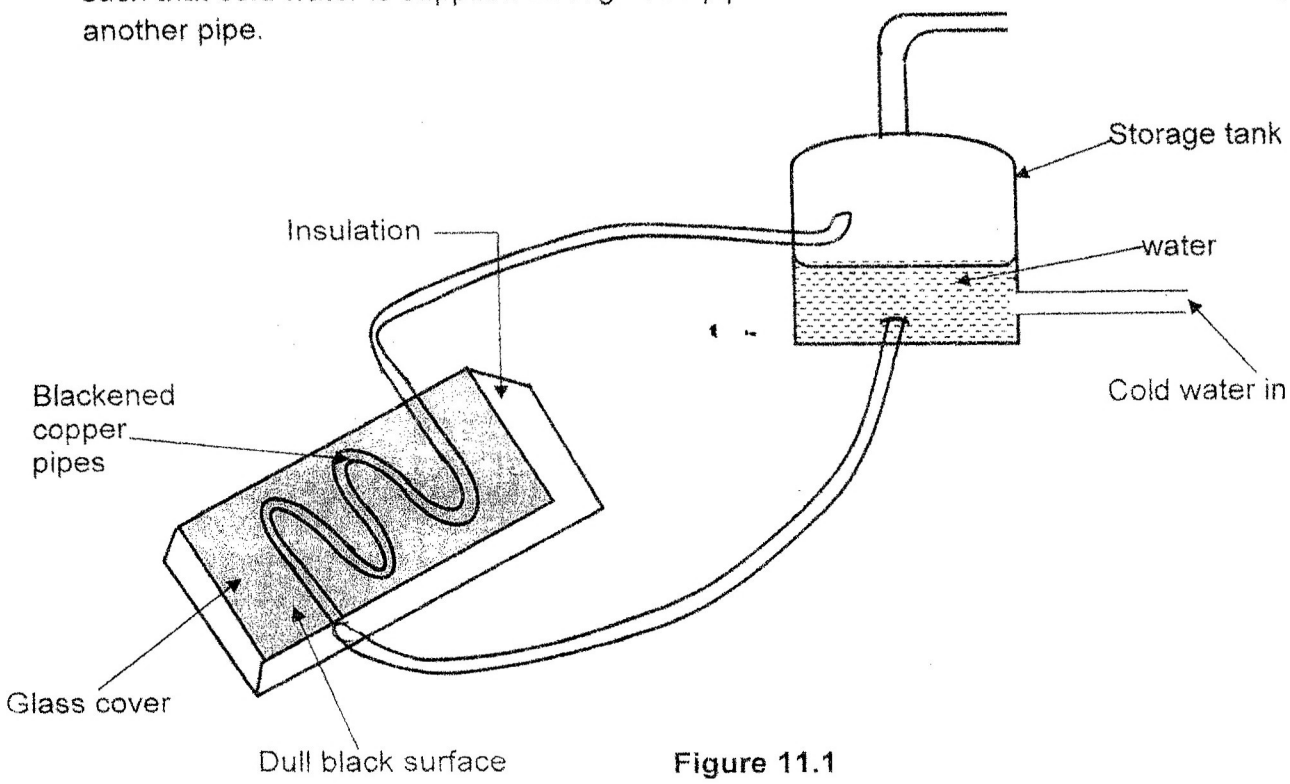

Figure 11.1

(a) **(i)** Explain why the pipes are painted black. [2]

(ii) State two reasons for the use of copper pipes as opposed to iron pipes. [2]

(iii) Explain the function of the glass cover over the pipes. [2]

(iv) Describe and explain how water circulates in the system. [3]

(b) Explain why heat rays easily pass through the glass cover to the copper pipes, but do not come out through the same glass cover that easily. [3]

(c) Define green house effect and explain its effects on the environment. [3]

[Total 15]

a special device used in electric and electronic equipment.

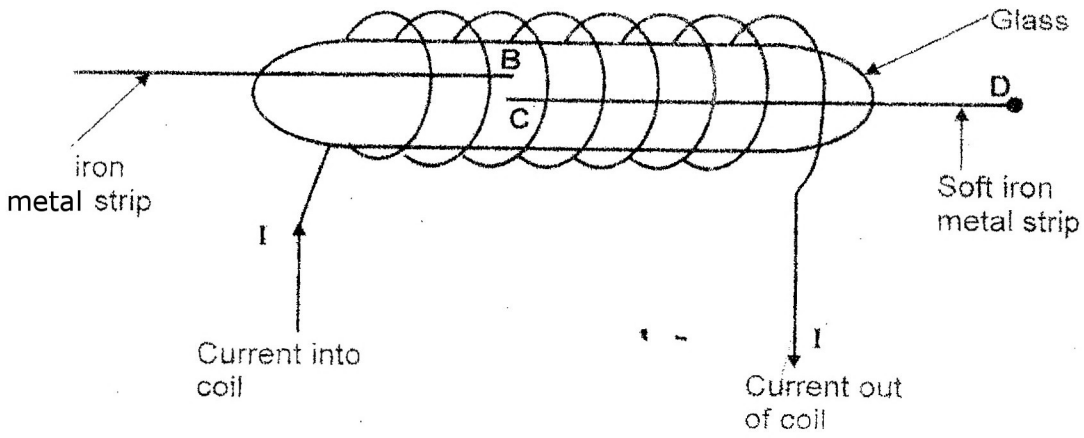

Figure 12.1

(i) Name the device in the **Figure 12.1** [1]

(ii) Briefly explain how this device works. [2]

(iii) What is the device used for? [1]

Figure 12.2 below shows part of an alarm system used for alerting the owner of a T.V. of the presence of thieves when they lift it off the display cabinet.

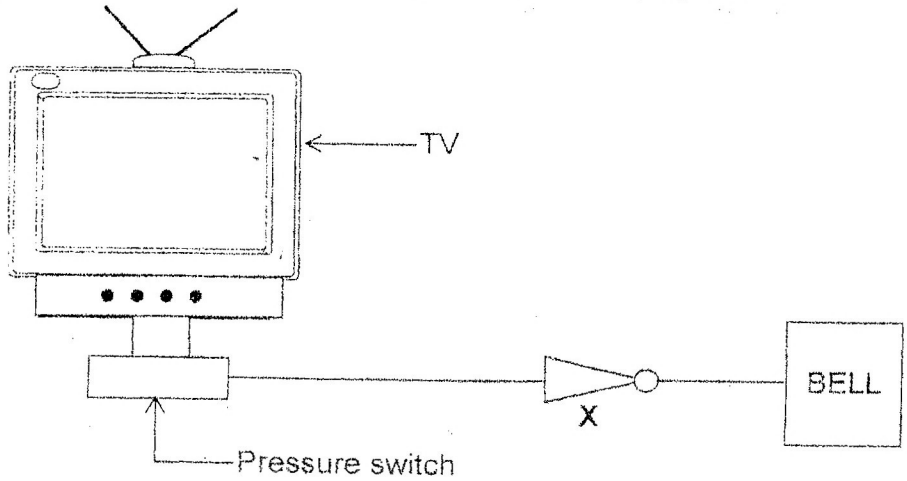

Figure 12.2

The pressure switch is closed when the T.V. set is on the display and open when it is lifted.

(i) Name the logic gate labelled **X**. [1]

(ii) Complete the truth table for the logic gate X.

INPUT	OUTPUT
0	
1	

[2]

(iii) Someone lifts the T.V. Briefly explain how the switch in connection with the logic gate operates to make the bell ring. [2]

(c) **Figure 12.3** is a simplified diagram of a cathode ray oscilloscope.

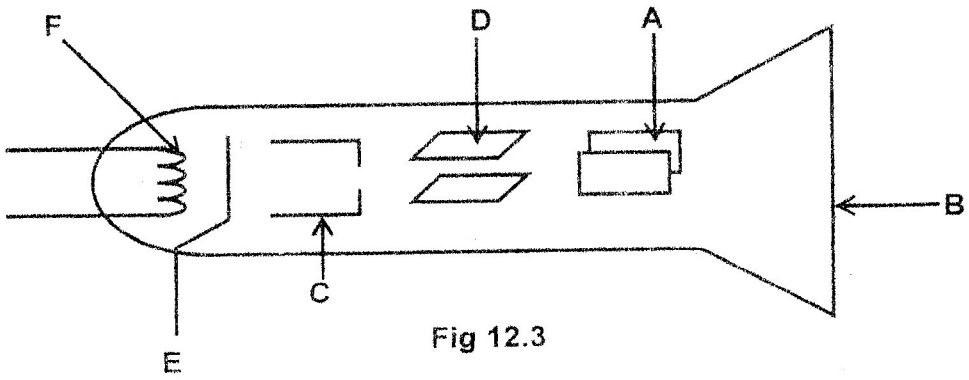

Fig 12.3

(i) What are cathode rays? [1]

(ii) Explain how cathode rays are produced. [1]

(iii) Name the parts marked C and E. [2]

(iv) What are the functions of C and E in the C.R.O.? [2]

[Total 15]