**YEAR 2004 PAPER 2 PHYSICS: 11 NOVEMBER 2004**

SECTION A
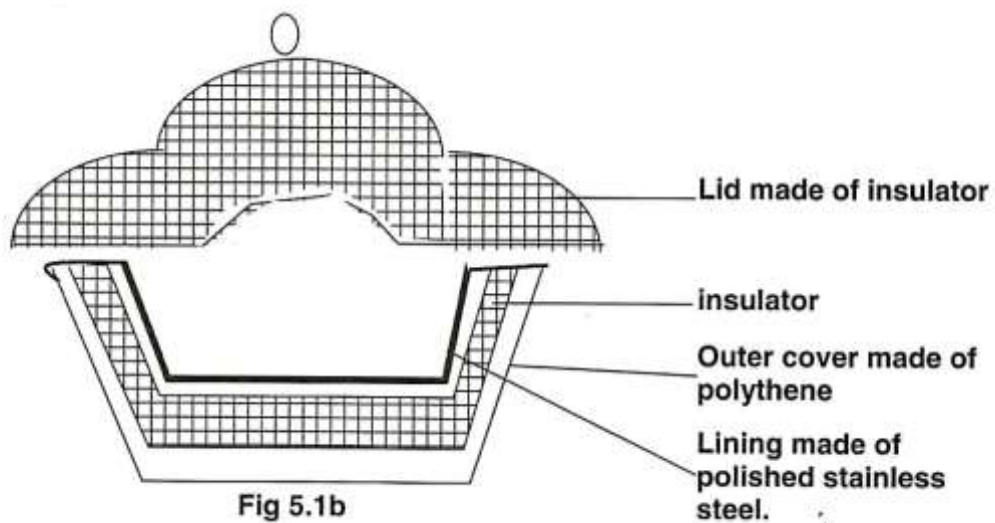
Answer **all** questions (45 Marks)

1. (a) What physical quantity can be measured using a micrometer screw gauge? [1]

    (b) State two precautions needed in the usage of the instrument.

2. **(a) A** small boy placed an iron ball into a trough filled with mercury. Given that the densities of mercury and iron are 13.6g/cm^3 and 7.86g/cm^3 respectively:

    (i)   State whether the ball will sink or float in mercury. [1] -------------------------------- **[1]**

    (ii)   Give a reason for your answer in (i). _____ **[1]**

    (b) Calculate the mass of iron that would occupy a volume of 3.33cm^3.   [2]

3. A pupil running with a constant acceleration takes 50 seconds to complete a race.

    (a)   If the speed of the pupil at the finishing line is 5m/s, sketch a speed-time graph for the race on the axes shown below.
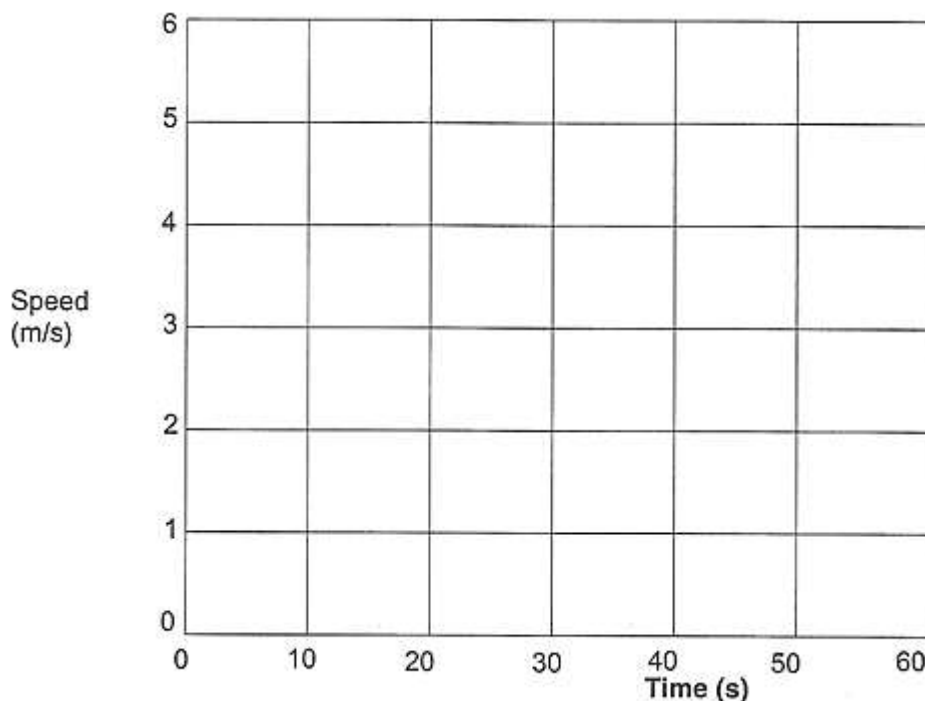

    (b)   What was the total distance covered by the pupil in the race up to the finishing line?

    (c)   Calculate the average speed of the pupil for the entire race.

4. A man of height 1,8m lifts a bucket of water of mass 16kg from the ground and places it on top of his head. Assume g = 10N/kg.

   (a) What type of energy has the water acquired?

   (b) Calculate this energy

   (c) Explain why the temperature of a piece of metal that is being hammered rises.

5. **(a)** Recently the Americans sent their spaceship called Challenger into outer space. Comment on its mass and weight both on Earth and in outer space.

   (b) The figure 5.1b below shows a cross-section of the food warmer.) The figure 5.1b below shows a cross-section of the food warmer.

Fig 5.1b

Lid made of insulator

insulator

Outer cover made of polythene

Lining made of polished stainless steel.

Describe briefly how the food warmer is able to keep food warm for longer periods.

6. The Figure 6.1 below shows the diagram of a uniform rod used by a man to lift buckets of water suspended from points **A** and **B** with 25kg and 20kg of water respectively. The rod is balanced when the man's shoulders support the rod at point C


25kg   20kg
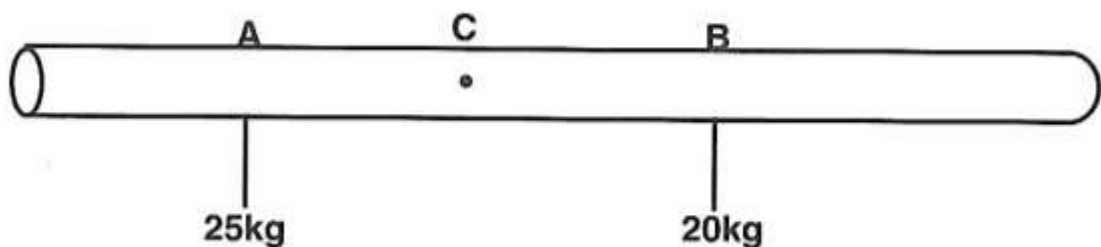
   (a) What would happen if the bucket at **A** was moved away from **C?**

   (b) Mention two measures which should be taken to restore equilibrium apart from bringing the bucket **A** back to its original position.
   **(c)** Mention one condition of equilibrium.

7. **(a)** Sound waves are longitudinal in nature. Define a longitudinal wave.

    (b) in the space below:

    (i)   Draw a diagram showing a sound wave.

    (ii)   Label the wavelength and amplitude of the sound wave above.   [2]

    (c) A sound wave of wavelength 55cm travels at 330m/s. Calculate its frequency.

8. A student carried out an experiment to determine the magnetic properties of two metals **A** and **B** using a permanent magnet as shown in Fig 8.1 below.

Fig 8.1
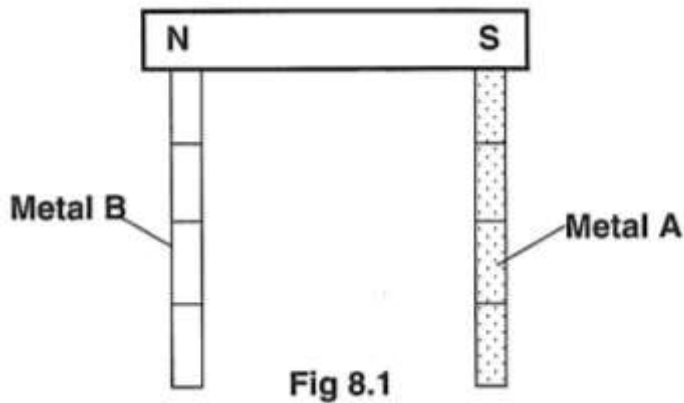
When the link was broken the following results were obtained.


Fig 8.2
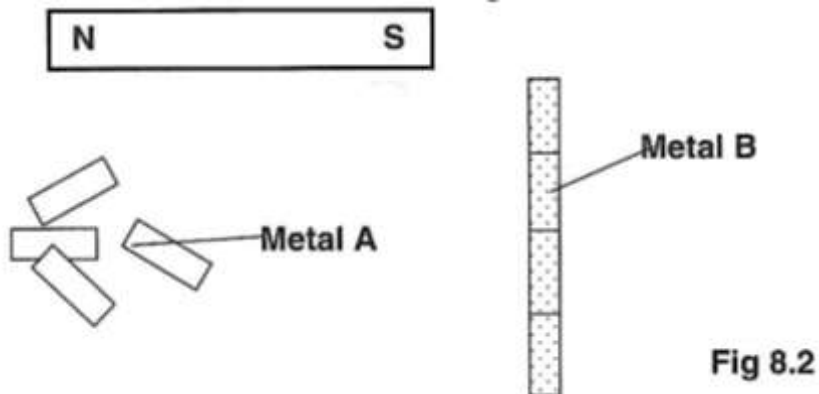
    a.   Identify the metals A and B.

    b.   Mention one use of metal **A** due to its behaviour in the experiment above.

    c.   Give two advantages of using electromagnets rather than permanent magnets in cranes used to lift metal sheets.

9. Figure 9.1 below shows a lamp connected to a cell and a battery.

Fig 9.1 I = 0.5A
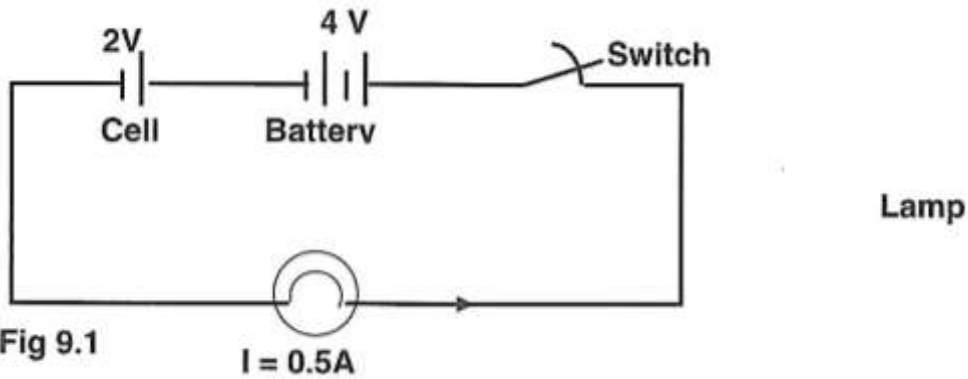
(a) How much charge flows through the lamp in **1** minute?

(b) Calculate the energy used by the lamp.

10. Figure 10.1 below shows the decay curve of Polonium - 218 when it decays through alpha emission.

Time/minutes   Fig. 10.1
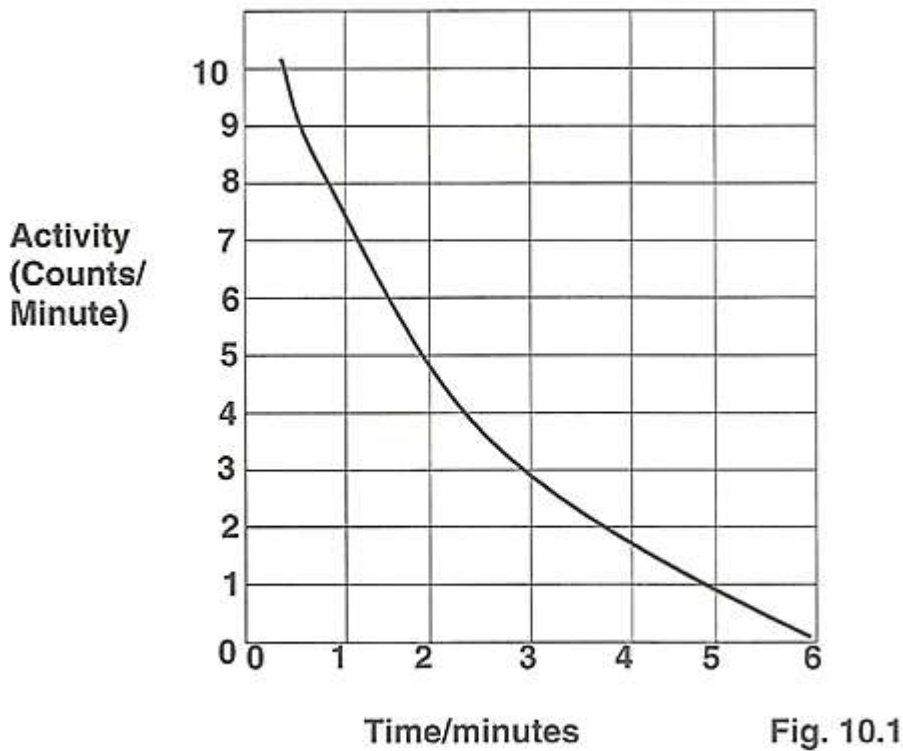
(a) What is half-life?

(b) From the decay curve above, determine the half-life of Polonium - 218.

(c) Explain why Polonium - 218 would be an ideal radioactive substance to use in checking blood circulation in human beings.

(d) Complete the nuclear equation below to show the nuclear structure of element X.

$$^{218}_{84}Po \rightarrow {}^{4}_{2}\alpha + X$$
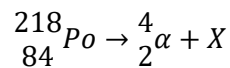
SECTION B

11. **(a)** Describe a simple experiment to show that an electric current has a magnetic effect.   [5]

   (b) An electric lamp is marked 12V, 24W. State what is meant by this marking. [1]

   (c) Calculate

      (i)   the resistance of the lamp   [2]

      (ii) The time taken for the lamp to use 0.48 kWh of energy.   [2]

12. **(a)** Describe how you would find experimentally a value for the speed of sound in the open air using thunder flash fireworks as the source of sound.   [5]

   (b)   State the principal sources of error in the experiment and show how they could be reduced.   [3]

   (c)   An explosion is made at the end of a steel tube **1**.6km long, and two sounds are heard at the other end with an interval of 4.4 seconds between them. If the speed of sound in the air is 340m/s, calculate the speed of sound in steel. [2]

                                                                                           [10]

13. (a) Define refractive index. [2]

   (b) Describe an experiment you would perform to determine the refractive index of a rectangular glass blocks. [5]

   (c) A liquid is 25cm deep. What is its apparent depth when viewed from above, if the refractive index of the liquid is 1.25?[3]