ZIMSEC
For Performance Measurement

ZIMBABWE SCHOOL EXAMINATIONS COUNCIL

General Certificate of Education Advanced Level

PHYSICS

PAPER 5

9188/5

NOVEMBER 2008 SESSION 1 hour 15minutes

Additional materials:
- Answer paper
- Electronic Calculator and / or Mathematical tables
- Ruler (mm)

TIME 1 hour 15 minutes

INSTRUCTIONS TO CANDIDATES

Write your name, Centre number and candidate number in the spaces provided on the answer paper/answer booklet.

Answer **four** questions.

Question number 1 is compulsory.
Answer any other **three** from the remaining questions.

Write your answers on the separate answer paper provided.
If you use more than one sheet of paper, fasten the sheets together.
All working for numerical answers must be shown.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets [ ] at the end of each question or part question.
You are reminded of the need for good English and clear presentation in your answers.

Candidates are advised to spend 30 minutes on question number 1.

This question paper consists of 10 printed pages and 2 blank pages.

Answer **question number 1** and **any other 3** of the 4 remaining questions.

1 **(a)** **(i)** State the **two** laws of electromagnetic induction.

(ii) **Fig. 1.1** shows how the magnetic flux, ϕ, linking a coil varies with time, *t*.

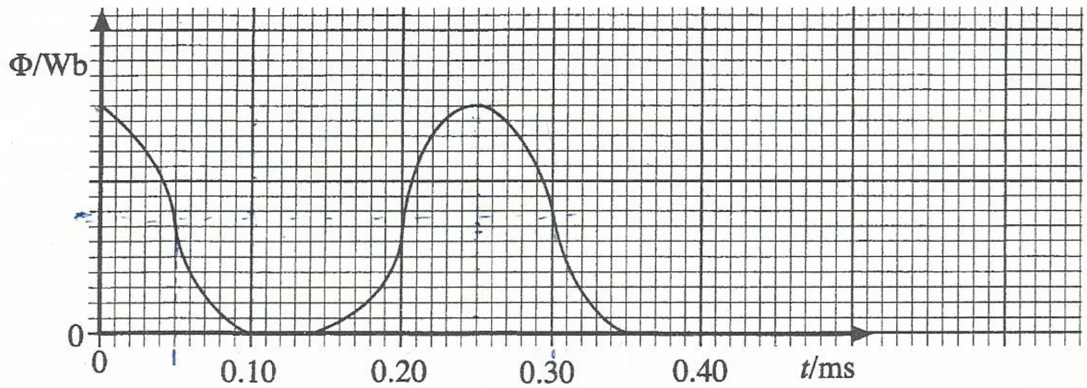

Fig. 1.1

1 Determine the frequency of the magnetic flux.

2 Sketch a graph to show how the induced e.m.f, E, varies with time.

3 If the induced e.m.f. drives a current, I, through a resistor, sketch a graph of how the current varies with time. [8]

(b) **Fig. 1.2** shows the energy level diagram for a hydrogen atom.

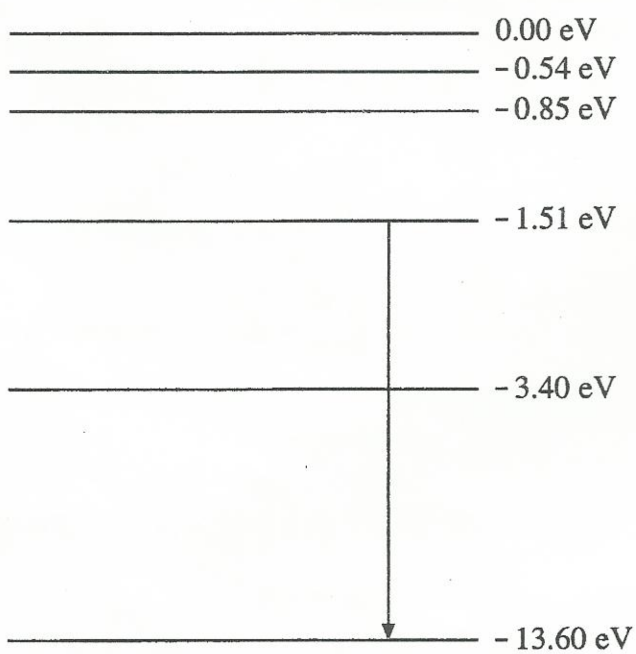

Fig. 1.2

(i) Calculate the wavelength of the radiation emitted during the transition shown by the arrow in **Fig. 1.2.**

(ii) State the region of the electromagnetic spectrum in which the emission occurs.

(iii) Deduce the effects, if any, of illuminating the hydrogen atom by an X-ray beam of frequency 2.3×10^{16} Hz. [8]

(c) (i) Explain what is meant by lamina flow.

(ii) Oil of density 0.800 g/cm^3 is flowing through a horizontal pipe as shown in **Fig. 1.3**.

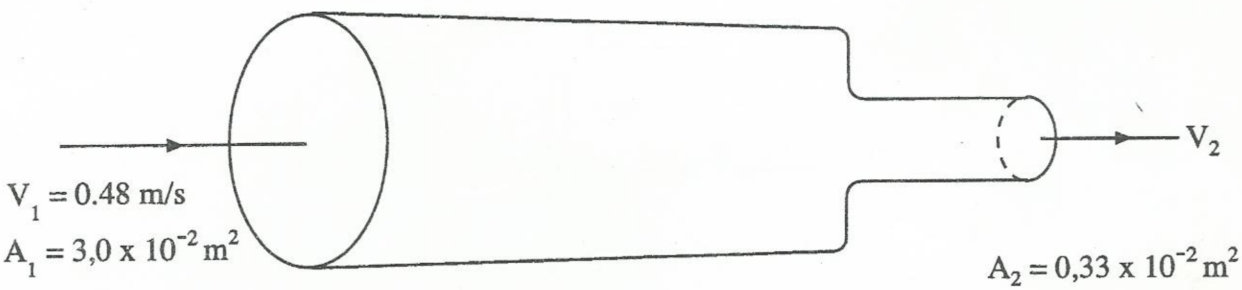

Fig. 1.3

Calculate the speed, V_2, of the oil in the narrow pipe.

[Turn over

(iii) An aerofoil shaped glass object is falling in calm air. A student places soft material vertically below the glass object on the ground, as shown in **Fig. 1.4**, to prevent it from breaking.

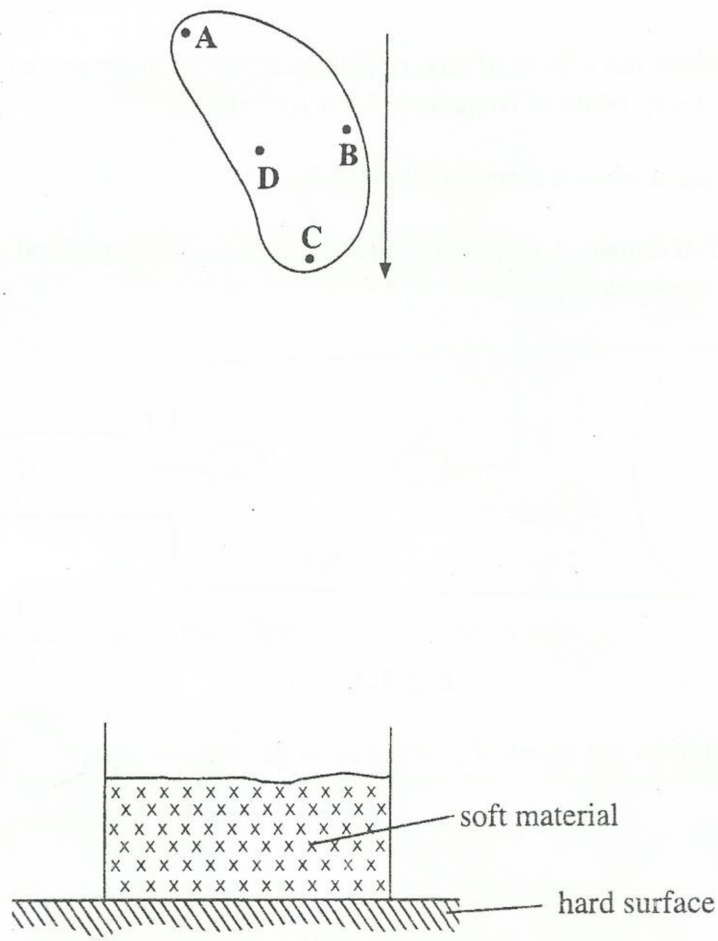

Fig. 1.4

Explain whether the student is likely to save the object from breaking. [8]

2 (a) Define the term *magnetic flux density*. [1]

(b) A magnet is suspended from a forcemeter as shown in **Fig. 2.1**.

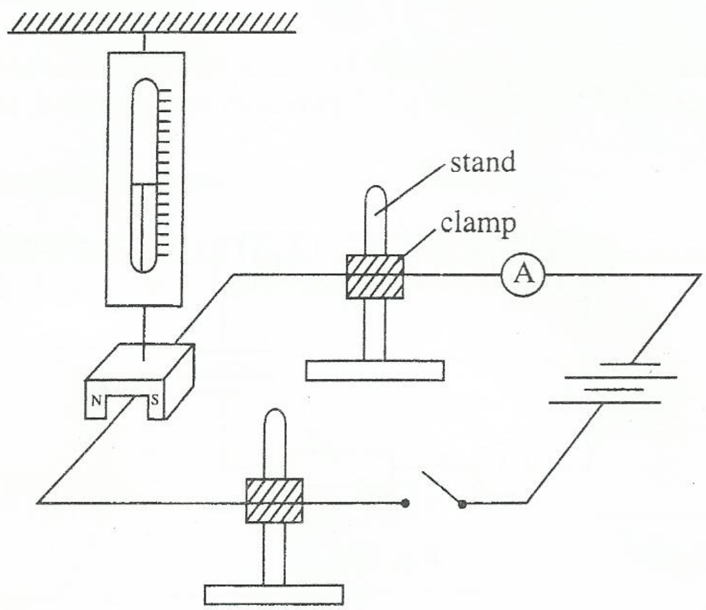

Fig. 2.1

A conductor of length 12.0 cm is held between the poles of the magnet so that it is at right angles to the magnetic field.

When the switch is open the forcemeter reads 2.36 N and when the switch is closed the forcemeter reads 2.29 N.

(i) Explain why the forcemeter reading changed.

(ii) Determine the value of the current, given that the magnetic flux density is 0.057 T.

(iii) State and explain the effect of using alternating current.

[7]

[Turn over

(c) An oscillating mass-spring system is **close** to an electromagnet as in **Fig. 2.2**.

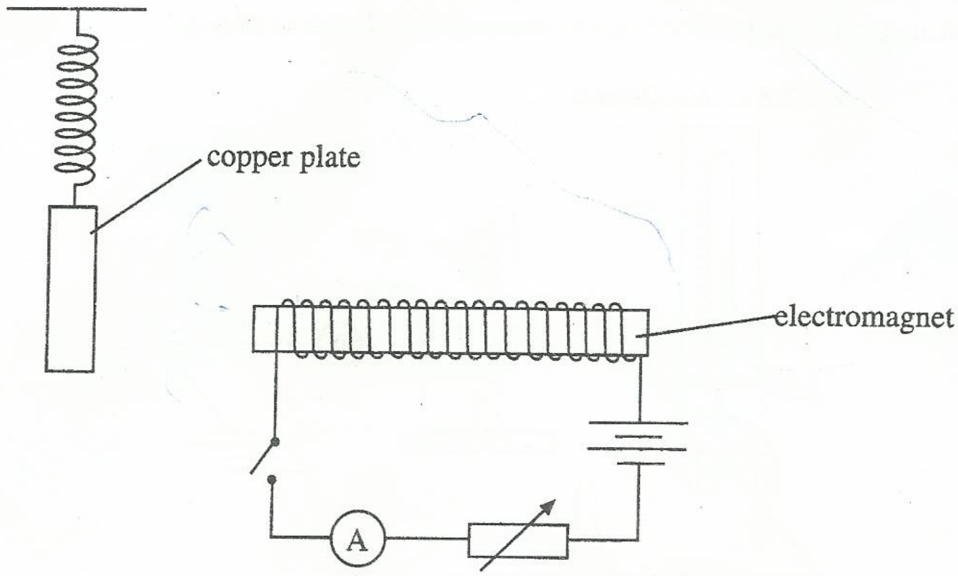

Fig. 2.2

Describe and explain the effect of closing the switch. [4]

3 (a) (i) Define the terms *density* and *pressure*.

(ii) Derive the equation $P = \rho gh$, where the symbols have their usual meaning. [4]

(b) At atmospheric pressure of 1.01×10^5 Pa, a hose pipe is arranged to drain petrol of density 0.900 g/cm^3 from a five litre container as shown in **Fig. 5.1**.

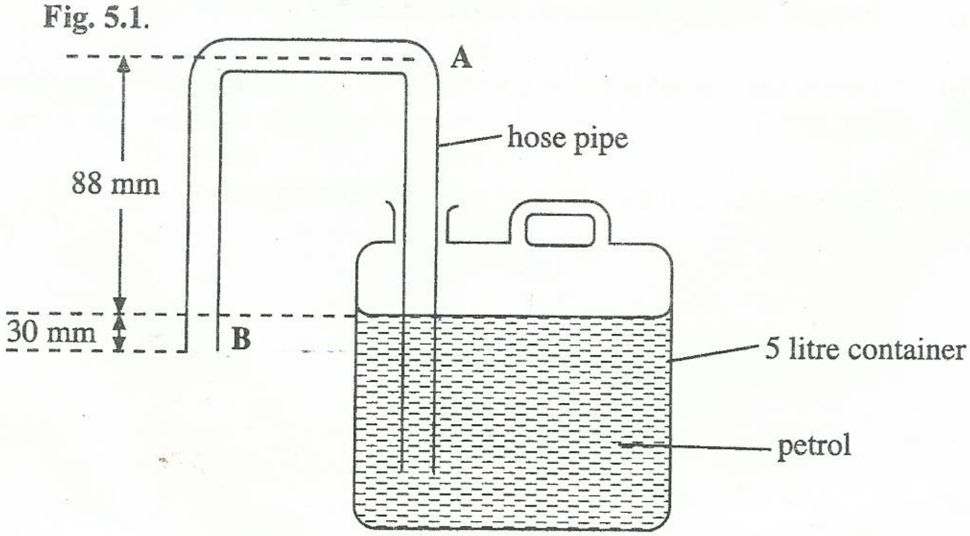

Fig. 5.1

The hose pipe is first filled with petrol and the end **B** is closed with a finger.

(i) Describe and explain what happens if the finger is removed.

(ii) Determine the pressure at **A**

1 before the finger is removed,

2 after the petrol stops flowing.

(iii) Explain why the surface of the petrol is always plane and horizontal when at rest despite tilting of the container. [8]

4 (a) Define the term *specific latent heat.* [2]

(b) **Table 4.1** shows some of the thermal properties of copper and gold that you may use.

Table 4.1

	melting point/ °C	**specific heat capacity/$Jkg^{-1}K^{-1}$**	**specific latent heat of fusion/Jkg^{-1} $\times 10^4$**
copper	1356	132	21.0
gold	1340	385	7.0

(i) Power of 1.5 kW is supplied for 30 minutes to solid copper which has just reached its melting point and it just melts, determine the mass of the copper.

(ii) By defining internal energy of a system, explain why there is an increase in internal energy during melting.

(iii) Some wedding rings can be made from a mixture of copper and gold. The mass of copper calculated in **(b)(i)** has its temperature raised to 1 400°C. Gold at 500°C was added to the copper until the temperature of the mixture was 1 375°C.

Determine the mass of gold that was added. [Assume specific heat capacity for both metals is the same in the liquid and solid states] [10]

$F = BLv \sin\theta$

$\frac{BU\sin\theta}{F}$

Pressure =

$\rho = \frac{m}{v}$

$P = \frac{F}{A}$

$P = \frac{mgh}{V}$

5 (a) Define the terms *half-life* and *activity*. [2]

(b) A 10.0 kg sample from a living plant has an activity of 30 000 counts per second due to carbon-14. A 500 g sample of the same type of plant but dead has an activity of 1 000 counts per second.

(i) Explain why carbon-14 is used in dating.

(ii) Calculate the age of the dead sample, given that the half-life of carbon-14 is 5 568 years.

(iii) Explain why the value calculated gives the time after the plant is dead. [7]

(c) The plant in **(b)** is believed to have lived for 2 000 years.

Sketch the graph of activity against time from the time the plant was alive to date. [3]