ZIMBABWE SCHOOL EXAMINATIONS COUNCIL

General Certificate of Education Advanced Level

PHYSICS

9188/5

PAPER 5

NOVEMBER 2010 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 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.
ll 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 1**.

This question paper consists of 8 printed pages.

[Turn over

*Answer **question 1** and **any other 3** from the remaining questions.*

1 **(a)** **(i)** Explain

1. peak value,

2. r.m.s value of an alternating voltage.

(ii) An alternating voltage is represented by $V = 200\cos 20\pi t$

Determine its

1. frequency,

2. peak value,

3. r.m.s value. [8]

(b) **(i)** Describe the principles of operation of an ideal transformer.

(ii) Electrical energy is transmitted as high alternating voltage.

Explain the advantages of using

1. alternating voltage,

2. high voltage. [8]

(c) **(i)** State **four** properties of an ideal opamp.

(ii) Explain negative feedback.

(iii) State **two** advantages and **one** disadvantage of negative feedback. [8]

2 (a) (i) State the Bernoulli effect.

(ii) Give the conditions under which the Bernoulli effect is valid.

(iii) With the aid of a labelled diagram, explain how the Bernoulli effect is applied in atomizers.

[8]

(b) **Fig. 2.1** shows an ideal incompressible fluid of density 790 kgm^{-3} flowing from A to B in a tube of varying cross-section. The cross-sectional area decreases from 390 mm^2 at *A* to 210 mm^2 at *B*. The fluid has a speed of 5.2×10^{-3} ms^{-1} at *A*.

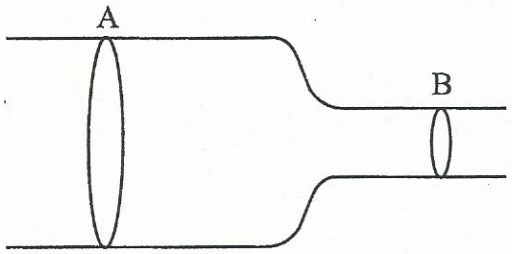

Fig 2.1

Calculate

1. the speed of the fluid at *B*,

2. the pressure difference between *A* and *B*.

[4]

3 (a) Define electric field strength and state its unit. [2]

(b) **Fig. 3.1** shows **two** parallel plates each of length 2.5 *cm* and a distance 15 *mm* apart. The upper plate is maintained at a potential of 50 *V* and the lower plate at a potential of −50 *V*.

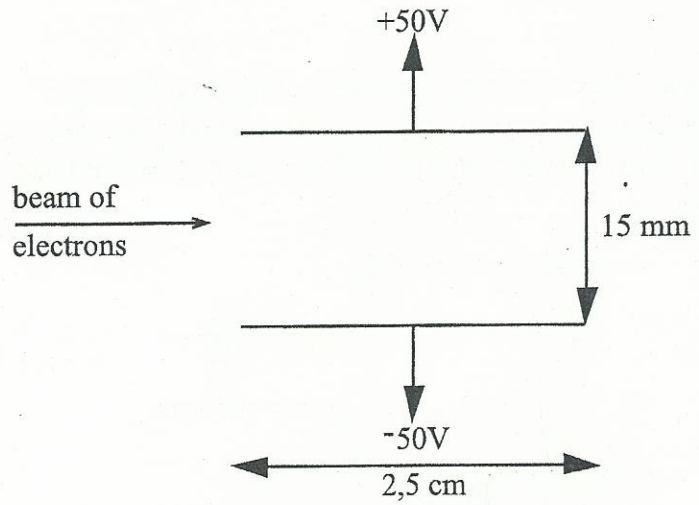

Fig. 3.1

A beam of electrons enters the electric field at right angles to the field at a speed of $5.5 \times 10^7 ms^{-1}$.

Calculate the

(i) time spent by the electrons between the plates.

(ii) electric field strength between the plates.

(iii) force on each electron.

(iv) acceleration of the electron.

(v) speed of the electron as it leaves the plates. [8]

(c) State the change(s) which must be made to **Fig. 3.1** for these electrons not to be deflected. [2]

4 **(a)** State **four** basic assumptions of an ideal gas. [4]

(b) **(i)** State what is meant by *internal energy of a system.*

(ii) Explain why the internal energy of an ideal gas is wholly kinetic. [2]

(c) When 150 J was supplied to an ideal gas at 1000 kPa its volume changed from $2{,}5 \times 10^{-4} m^3$ to $5.8 \times 10^{-4} m^3$.

Determine the

(i) potential energy of the gas,

(ii) work done by the gas,

(iii) change in internal energy and state if this is an increase or decrease. [6]

5 (a) Define (i) *capacitance,*

(ii) *electric potential.*

[2]

(b) An isolated metal sphere of radius, r, has a charge, Q, concentrated at its centre.

(i) Give an expression of the electric potential, V, at the surface of the sphere.

(ii) Hence show that the capacitance, C, of the capacitor is

$$C = 4\pi\varepsilon_o r.$$

[3]

(c) A capacitor marked "$15\,\mu F,\ 20\ V$" is charged by connecting it to a $3\ V$ battery.

(i) Explain the significance of $20\ V$.

(ii) Calculate the

1. energy supplied to the capacitor,
2. energy stored by the capacitor.

(iii) Comment on your answers in (ii) above.

[7]