ZIMBABWE SCHOOL EXAMINATIONS COUNCIL

General Certificate of Education Advanced Level

PHYSICS

PAPER 3

9188/3

JUNE 2012 SESSION

50 minutes

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

TIME 50 minutes

INSTRUCTIONS TO CANDIDATES

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

Answer **three** questions.

Question 1 is compulsory.
Answer any other **two** 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 25 minutes on **question 1**.

This question paper consists of 6 printed pages and 2 blank pages.

[Turn over

*Answer **question 1** and **any other 2** from the remaining questions.*

1 (a) (i) List **six** base quantities and their units.

(ii) Distinguish between *derived* and *base* units.

(iii) Express the units of *coefficient of viscocity* in terms of base units. [7]

(b) (i) Define simple harmonic motion.

(ii) Show that for simple oscillations, the acceleration is given by $-\omega^2 x$, where symbols have their usual meanings. [6]

(c) (i) State the *principle of conservation of linear momentum.*

(ii) A particle O, of mass, U, travelling with a velocity of $3.0\times10^{7}\,\text{ms}^{-1}$, collides elastically with another particle, P, of mass $16U$, initially at rest. After collision particle O moves in a direction at 90° from its original path.

Using resolution of vectors and the principle of conservation of momentum, calculate the speed of P after collision. [7]

2 (a) (i) Give **one** example of a *systematic error.*

(ii) State how the error in (i) can be minimised. [2]

(b) The electric potential, V, is given by the formula, $V = \dfrac{Q}{4\pi\varepsilon_o r}$.

Values of Q and r are $(3.2\pm0.1)\times10^{-16}\,\text{C}$ and $(1.3\pm0.02)\times10^{-17}\,\text{m}$ respectively.

Calculate the error in the electric potential. [2]

(c) (i) Explain the term *vector quantity.*

(ii) A sign post of mass 5.0 kg is hung from the end B of a uniform bar AB, of mass 2.0 kg as shown in **Fig.2.1**. The bar is hinged to a wall at A and held horizontally by a wire joining B to a point C.

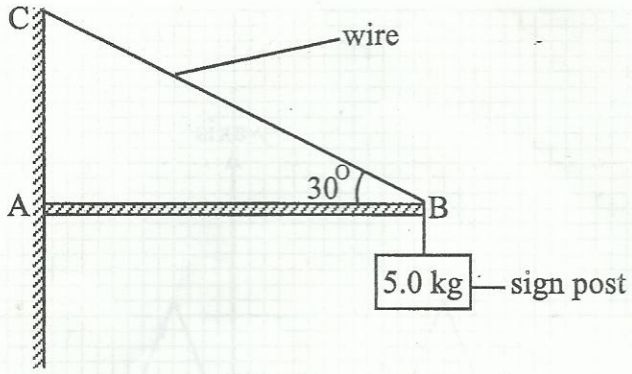

Fig. 2.1

Find

1. the force in the wire,

2. the force exerted by the hinge. [6]

3 (a) Show that the gravitational field strength, g, at any point inside the earth is given by

$$g = 2.8 \times 10^{-10} \rho r,$$

if the earth is assumed to be a perfect sphere of uniform density ρ.(r is the distance from the earth's centre to the point). [3]

(b) Determine the value of g at a point 250 km below the earth's surface. (Take the radius of the earth as 6.36×10^6 m).

Suggest why this value is less than the true value at this point. [3]

(c) Sketch a graph to show the variation of g with displacement from the earth's centre to a 500 kg satellite that is orbiting the earth at a height of 350 km. [4]

4 (a) Two lengths were recorded as (1.873 ± 0.005) mm and (1.582 ± 0.005) mm.

Calculate the fractional uncertainty in the sum and the difference of the lengths. [3]

(b) Explain how a cathode ray oscilloscope can be used to measure time-interval. [3]

(c) **Fig. 4.1** shows the display on the screen of a C.R.O used to measure some properties of a triangular wave. The voltage gain was set at 5 V per division and the time-base at 5 ms per division.

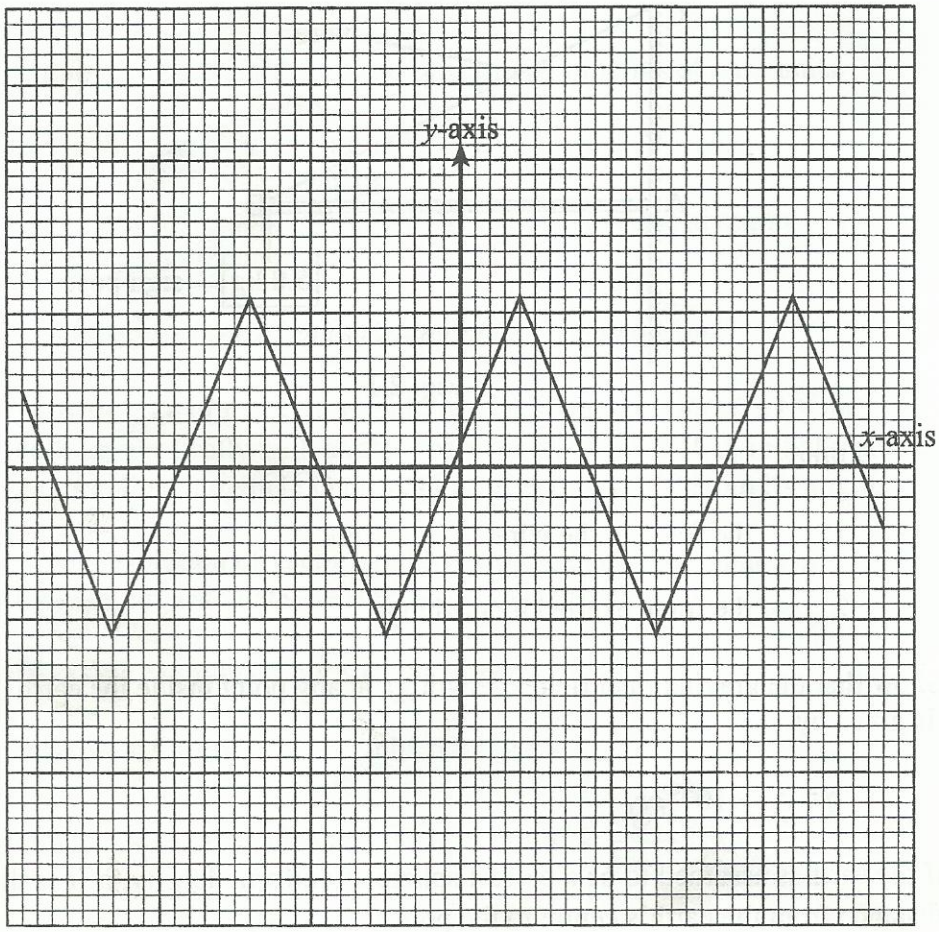

Fig. 4.1

(i) Determine the period and the amplitude of the wave.

(ii) The time-base is now set at 2.5 ms per division.

Explain any changes that will be observed on the C.R.O. [4]