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PHYSICS

PAPER 2

2 HOURS: 15 MINUTES

Uganda Certificate of Education

END OF TERM III EXAMS 2022

S.3 PHYSICS

PAPER 2

2 HOURS: 15 MINUTES

INSTRUCTIONS:

*Answer **any five (5)** questions.*

*Any additional question(s) answered will **not** be marked.*

Mathematical tables and silent non-programmable scientific calculators may be used.

These values of physical quantities may be useful to you:

Acceleration due to gravity, g = $10ms^{-2}$

Speed of sound in air = $320\ ms^{-1}$

Velocity of electromagnetic waves = $3.0 \times 10^{8}\ ms^{-1}$

1.(a) (i) State two **fundamental quantities** of measurements. (2 marks)

(ii) State the S.I unit of any one of the quantities in (a) (i) above.

(1 mark)

(b) Describe a simple laboratory experiment to determine the density of a small piece of stone. (4 marks)

(c) (i) Define the term pressure and state its S.I unit. (2 marks)

(ii) Sate three applications of pascal's principle of transmission of pressure. (3 marks)

(d) A rectangular block of dimensions $4cm \times 6cm \times 9cm$ has a mass of 9.6kg. Find the maximum pressure it can exert on its support.

(4 marks)

2. (a)What is meant by **conduction of heat?** (1 marks)

(b) Describe ways the fixed points of a thermometric scale can be determined (6 marks)

(c) The ice and steam points on ungraduated thermometer are found to be 194mm apart. What temperature is recorded in ℃ when the length of the mercury thread is 68mm above the ice point mark.

(3 marks)

(d) Briefly explain the meaning of **green house effect**. (3 marks)

(e) Explain the fact that a dull surface feels hotter than a shiny surface when both are in the same environment. (3 marks)

3. (a) Define the following terms as applied to wave motion:

(i) **Nodes** (1 mark)

(ii) **Antinodes** (1 mark)

(b) What are **progressive waves?** (1 mark)

(c) A tuning fork making 200 vibrations in 2 seconds produces sound which travels at $320ms^{-1}$ through air. Find the:

(i) Frequency of the sound (2 marks)

(ii) Wave length of the sound (2 marks)

(c) Describe an experiment to show that sound is a mechanical wave.

(5 marks)

(d) What is meant by **ultrasonic sound?** (1 mark)

(e) A boat on the surface of water in a lake sends sound vertically to the bottom of the lake. If it takes 0.4 seconds to hear the echo, and the speed of sound in water is $1500ms^{-1}$, find the depth of the lake.

(3 marks)

4. (a) Define the following:

(i) **Adhesion** (1 mark)

(ii) **Cohesion** (1 mark)

(b) State the factors that affect surface tension. (3 marks)

(c) Describe an experiment to show that air exerts pressure.

(5 marks)

(d) Explain what happens to atmospheric pressure as one goes higher and higher from the ground. (3 marks)

(e)) The smaller piston of a hydraulic jack has an area of $0.2m^2$. A force of 2N is applied to the smaller piston to raise a car resting on large piston of area $2m^2$. Find the force that raises the car. (3 marks)

5 (a) (i) State the principle of reversibility of light. (1 mark)

(ii) An opaque object is placed between an extended source of light and a screen. Sketch a labelled diagram to show regions of the shadow formed when the screen is very far from the object. (2 marks)

(iii) State any two properties of images formed on a plane mirror. (2 marks)

(b) State the laws of refraction of light. (2 marks)

(c) (i) What is **critical angle** as applied to light. (1 mark)

(iii) State the conditions for total internal reflection to occur. (2 marks)

(d) A ray of light is incident on water – glass interface at angle of incidence of 41^0. Calculate the angle of refraction, if the refractive indices of glass and water are respectively 1.50 and 1.33. (3 marks)

(e)State two reasons why convex mirrors are used as driving mirrors. (2 marks)

6. (a) (i) What is meant by **inertia** of a body? (1 mark)

(ii) State **Newton's laws** of motion. (3 marks)

(b) A truck of one tonne travelling at $25ms^{-1}$ accelerates uniformly to $40ms^{-1}$ in 5 seconds. Calculate the accelerating force. (4 marks)

(c) Explain briefly how a rocket engine works. (4 marks)

(e) A small crystal of blue copper sulphate is introduced at the bottom of a breaker containing water using a straw. The set up is left undisturbed for some time.

(i) Explain what would be observed. (2 marks)

(ii) How would an increase in temperature of the setup affect your observation in (b)(i)? (2 marks)

7. (a) (i) What is the difference between **vector** and **scalar quantities**?

(2 marks)

(ii) Give **one example** of each quantity in (a) (i) above (1 mark)

(iii) Two forces of 7N and 9N act perpendicularly on a body of mass 2kg. Find the acceleration of the body. (02 marks)

(b) Describe an experiment to demonstrate surface tension in liquids.

(3 marks)

(c) (i) Define **velocity ratio** and **efficiency** as applied to machines.

(2 marks)

(iii) calculate the efficiency if the pulley system with velocity ratio 6, if an effort of 1,000N is required to raise a load of 4,500N. (3 marks)

(d) (i) What is a **first class lever?** (1 mark)

(ii) Give two examples of first class levers. (2 marks)

END