

535/2

PHYSICS

Paper 2

2 ¼ HOURS

**UGANDA CERTIFICATE OF EDUCATION
PHYSICS**

Paper 2

2 hours 15 minutes

INSTRUCTIONS TO CANDIDATES:

Answer **five** questions.

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

These values of physical quantities may be useful to you;

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

Specific heat capacity of water= $4,200\text{Jkg}^{-1}\text{K}^{-1}$

Specific heat capacity of copper= $400\text{Jkg}^{-1}\text{K}^{-1}$

Specific latent heat of fusion of water= $3,400,000\text{JK}^{-1}$

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

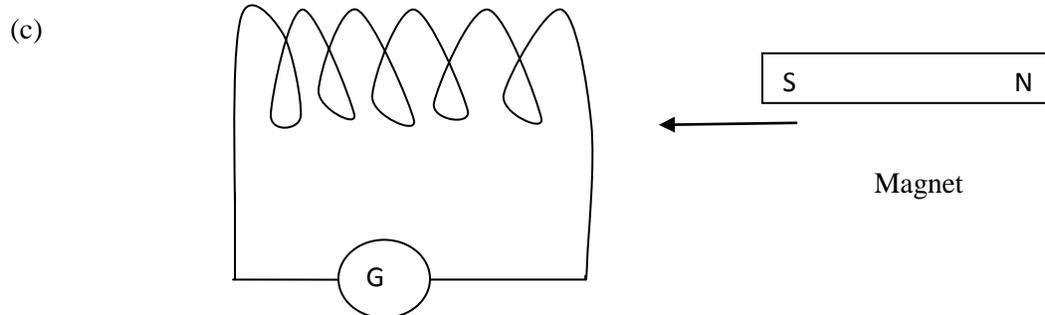
Density of water= $1,000\text{kgm}^{-3}$

Turn over

1 (b) (i) State Faraday's law of electromagnetic induction. (1mk)

(ii) Outline the factors which affect the magnitude of the emf induced in a conductor cutting the magnetic field at right angles. (3mks)

(b) Describe, with the aid of labeled diagrams how the emf is generated in the coil of a simple ac generator. (5mks)



The diagram above shows a coil connected to a centre-zero galvanometer, G.

Explain what happens when the bar magnet is quickly moved towards and away from the coil. (2mks)

(d) An alternating current of 2A flows in the 100 turn primary coil of a transformer when connected to a 240V ac supply. If the secondary coil has 8000 turns, calculate the

(i) emf induced across the secondary coil. (2mks)

(ii) Maximum current that could flow in the secondary coil if the efficiency of the transformer is 90%.

(2mks)

(e) Give a reason for not using a transformer to step up a direct current.

(1mk)

2. (A) Explain **one** major defect of a simple cell and suggest a possible remedy for it. (2mks)

(b) Describe with the aid of a circuit diagram the process of charging an accumulator. (2mks)

(c) Sketch the electric field patterns for :

(i) two negatively charged points near one another. (2mks)

- (ii) two oppositely charged parallel plates near one another. (2mks)
- (d) Differentiate between lightning and lightning conductor. (3mks)
- (e) Describe how an electroscope can be used to determine the charge on a charged rod. (3mks)
- (f) Explain why the leaf of a negatively charged gold electroscope collapses when an uncharged body is brought near the cap of the electroscope. (2mks)
3. (a) State **two** differences between cathode rays and X-rays. (2mks)
- (b) With reference to a given element, explain the existence of isotopes. (2mks)
- (c)(i) Define the term radioactivity. (1mk)
- (ii) Describe the type and nature of the radiations produced during radioactivity. (4mks)
- (d) A radioactive atom of cobalt, ${}_{27}^{60}\text{Co}$, with the half life of 5.24 years emits a beta particle and a gamma ray to form Nickel.
- (i) What is meant by half life? (1mk)
- (ii) Write a balanced nuclear equation for the decay process. (2mks)
- (iii) What fraction of Cobalt atoms decay after 26.2 years? (3mks)
- (e) State **one** industrial use of X-rays. (1mk)
4. (a)(i) State the laws of refraction of light. (2mks)
- (ii) Describe a simple experiment to verify the laws of refraction of light. (6mks)
- (b) Define the following terms as applied to lenses:
- (i) principal axis. (1mk)
- (ii) focal length. (1mk)
- (c) A object 5cm high is placed 30cm away from a diverging lens of focal length 15cm. By construction determine the position and size of the image. (3mks)

(d) State **one** application of

(i) a convex lens. (1mk)

(ii) a concave lens. (1mk)

(e) Draw a diagram to show the formation of a solar eclipse. (1mk)

5. (a) Explain what is meant by **Brownian motion**. (1mk)

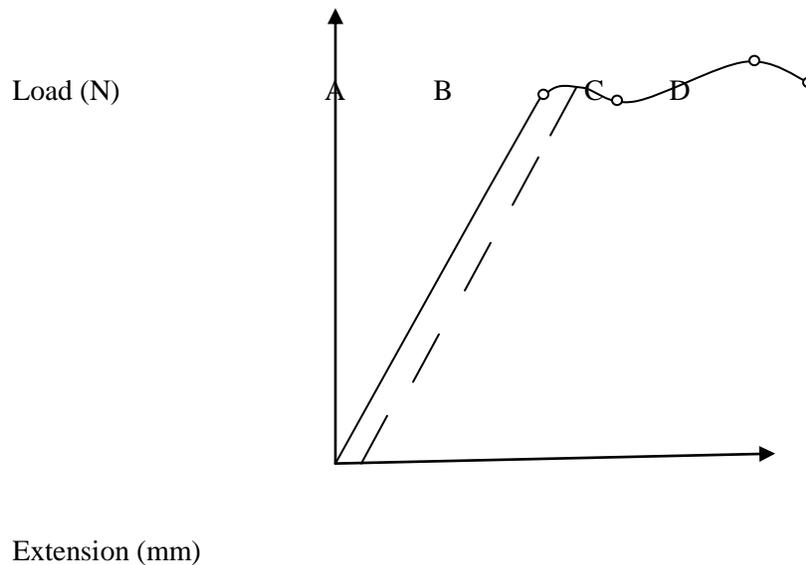
(b) A vessel containing air is sealed. Explain the effect of heat on the

(i) Average speed of the molecules. (1mk)

(ii) Air pressure inside the vessel. (1mk)

(c) (i) State Hooke's law. (1mk)

(ii) The sketch below shows a graph of load against extension for a copper wire.



Explain the features of the graph. (2mks)

(iii) A 150kg mass is suspended at the end of a 40cm long wire of cross sectional area 20mm^2 causes an extension of 10mm. Calculate the tensile stress and the tensile strain. (4mks)

(d) Explain why a steel needle can be made to float on the surface of water. (2mks)

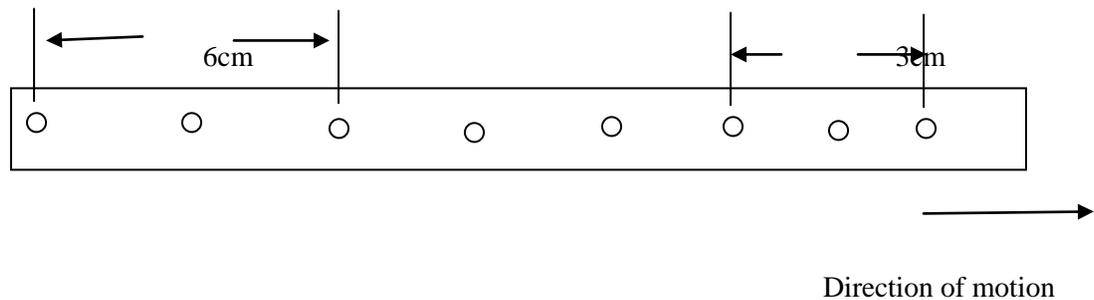
(e) In an oil film experiment, $7.7 \times 10^{-3} \text{ cm}^3$ of oil forms a circular patch one molecule thick on a clean water surface. If the thickness of an oil molecule is 10^{-4} cm ,

(i) find the area of the oil patch on the water surface. (3mks)

(ii) state one assumption made. (1mk)

6.(a) Define acceleration due to gravity and state its SI unit. (2mks)

(b) The diagram below shows a section of a tape obtained when pulled by a trolley through a ticker timer vibrating at 40Hz.



Use the diagram to explain how the acceleration of the trolley may be obtained. (3mks)

(c) Sketch the velocity-time graph for the motion of the trolley in (b) above. (2mks) x

(d) (i) State the principle of conservation of momentum and explain its application. (2mks)

(ii) Distinguish between elastic and inelastic collisions. (2mks)

(e) A body of mass 500g moving at 40 ms^{-1} collides with another stationary body of mass 1000g placed on a smooth horizontal surface. If the bodies move together after collision, calculate the

(i) common velocity of the two bodies after collision. (2½ mks)

(ii) kinetic energy lost by the moving body. (2 ½ mks)

7. (a) Define the term frequency and state its SI unit. (2mks)

(b) (i) What is an electromagnetic wave? (1mk)

(ii) Give two examples of electromagnetic waves. (2mks)

(c) A local FM radio station in Uganda transmits on a frequency of 100MHz, calculate the wavelength of the wave signal. (3mks)

- (d) (i) Explain how a stationary wave is formed. (3mks)
- (ii) Sketch diagrams of stationary waves showing formation of a fundamental note and first overtone in a closed pipe. (2mks)
- (e) (i) Distinguish between an echo and reverberation. (2mks)
- (ii) State one way by which reverberation is reduced in a cinema hall. (1mk)
- 8.(a) What is meant by the terms :
- (i) temperature? (1mk)
- (ii) lower fixed point of a thermometer? (1mk)
- (b) Briefly describe an experiment to determine the lower fixed point of a thermometer. (4mks)
- (c) State two advantages and two disadvantages of using mercury as a thermometric liquid. (2mks)
- (d) Explain how the boiling point of a liquid depends on altitude. (2mks)
- (e) A copper block of mass 100g is heated to a temperature 200°C and then transferred to a copper calorimeter of mass 300g containing 400cm^3 of water at 25°C .
- (i) Calculate the maximum temperature attained by the water in the calorimeter. (3mks)
- (ii) Sketch the graph to show the variation of temperature with time. (1mk)
- (iii) Explain one application of heat capacity. (2mks)

END