535/2
PHYSICS
Paper 2
July/Aug.
2023
2¼ hours

MASAKA DIOCESE EXAMINATION BOARD

UCE Joint Mock Examinations

PHYSICS

Paper 2

2 Hours 15 Minutes

INSTRUCTIONS TO CANDIDATES:

Attempt any **five** *questions.*

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

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

These physical quantities may be useful to you.

Acceleration due to gravity	=	10 ms^{-2}
Specific heat capacity of water	=	$4200 \text{ Jkg}^{-1} \text{ K}^{-1}$
Specific heat capacity of ice	=	$2100 \text{ Jkg}^{-1} \text{ K}^{-1}$
Specific heat capacity of aluminium	=	$900 \text{ Jkg}^{-1} \text{ K}^{-1}$
Specific latent heat of fusion of ice	=	340000 J kg^{-1}
Specific latent heat of vaporisation of water	=	$2260000 \text{ J kg}^{-1}$
Speed of sound in air	=	320 ms^{-1}
Velocity of electromagnetic waves	=	$3.0 \times 10^{8} \text{ ms}^{-1}$

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1. (a) (i) State the principle of conservation of energy. (1 mark)
    (ii) Illustrate the principle in (i) with reference to a simple pendulum in vacuum. (4 marks)

   (b) A pendulum bob of 200 g is pulled sideways through a vertical height of 50.0 cm. Calculate the maximum
       (i) Potential energy gained (2 marks)
       (ii) Speed of the bob reached (2 marks)

   (c) (i) Distinguish between renewable and non- renewable energy sources and state any two examples of each. (3 marks)
       (ii) Using energy transformation, explain how hydroelectric power is generated at Owen falls dam. (4 marks)

2. (a) Define force and its unit. (2 mark)

   (b) (i) What is meant by linear momentum. (1 mark)
       (ii) State the law of conservation of momentum. (1 mark)

   (c) For the safety of passengers in cars during accidental collisions or abrupt braking, cars are designed with seat belts and air bags. How do they offer safety to passengers? (3 marks)

   (d) A ball is released from rest from a height of 10 m above the ground. On reaching the ground, the ball bounces several times before it rests.
       (i) Sketch and explain a velocity time graph for the ball for the first until returns back to the ground. (3 marks)
       (ii) Explain why ball bounces back with reduced height. (2 marks)

   (e) Explain the principle of operation of the rocket. (4 marks)

3. (a) (i) Distinguish between specific heat capacity and heat capacity. (1mark)
       (ii) An aluminium can of mass 100 g contains 200 g of water, both initially at 15 °C, are placed in a freezer. Calculate the quantity of heat that has to be removed from the water and the can for their temperatures to fall to −5.0 °C. (5 marks)

   (b) Describe an experiment to determine the specific latent heat of vaporization of steam. (6 marks)

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Turn Over

(c) (i) Water and alcohol both wet the glass, bad conductors of heat and are colourless. Explain why alcohol is used as a thermometric liquid compared to water. (2 marks)

(ii) In normal working of car engines, they heat up. Explain why water is used in the process of cooling them. (2 marks)

4. (a) Define the following as applied to magnetism:
   (i) Magnetic field. (1 marks)
   (ii) Neutral point. (1 marks)

(b) Sketch the magnetic field pattern around
   (i) A bar magnet whose axis lies along the magnetic north. (2 marks)
   (ii) Two parallel wires near each other carrying current in the same direction in same direction. (2 marks)

(c) (i) State Faraday's law of electromagnetism. (1 mark)
   (ii) A stiff wire AB is held between opposite poles of two bar magnets, connected to a centre – zero galvanometer as shown in Figure 1.
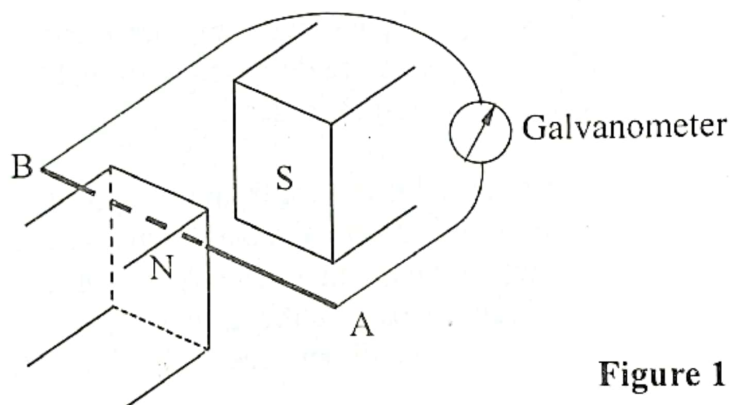

Figure 1

The wire AB is kept horizontal between two strong bar magnets above. Explain what is observed on the galvanometer, as wire is wire AB moves to and fro vertically between magnets. (4 marks)

(d) State and describe any one application of the above demonstration. (5 marks)

5. (a) Distinguish between primary and secondary colours and give one examples of each. (2 marks)

(b) Explain the colour of yellow dress in magenta light. (3 marks)

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(c) (i) What is meant by term virtual image? (1 mark)
(ii) Using illustration, show how a convex lens forms virtual image. (2 marks)

(d) An object is placed 15 cm in front of a converging lens and produces an upright image, which is magnified four times. By graphical method. determine the image position. (4 marks)

(e) With the aid of diagram, explain briefly how concave mirrors can be used as solar concentrators. (4 marks)

6. (a) What is meant by the following as applied to wave motion:
(i) Transverse waves. (1 mark)
(ii) Wave length. (1 mark)

(b) State **three** factors that affect the speed of sound in air. (3 marks)

(c) Describe an experiment to measure the speed of sound in air using echo method. (5 marks)

(d) (i) Define diffraction. (1 mark)
(ii) Two identical ball ended dippers close to each other are made to touch the surface of water simultaneous and continuously. Using diagram, explain what would be observed. (4 marks)

(e) State any **two** applications of ultrasonic sound. (1 mark)

7. (a) Distinguish between electromotive force and potential difference. (2 marks)

(b) Sketch a voltage versus current graph for;
(i) Ohmic conductor. (1 marks)
(ii) Junction diode. (1 marks)

(c) (i) State Ohm's law. (1 mark)
(ii) Describe with aid of a diagram, an experiment to measure the internal resistance of a cell. (5 marks)

4

(d) Resistors of 6 Ω, 3 Ω and 2 Ω are connected as shown in Figure 2 across a battery of e.m.f. 12 V and internal resistance of 0.5 Ω.
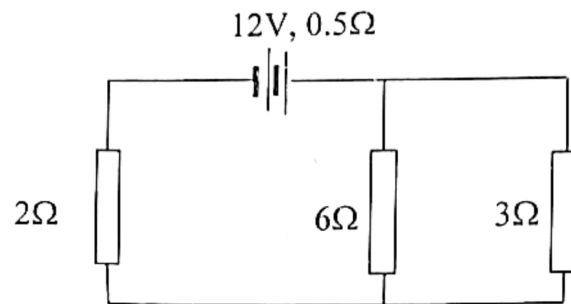
12V, 0.5Ω

Figure 2

2Ω   6Ω   3Ω

Calculate the current through the 3 Ω. (4 marks)

(e) State **two** ways necessary to prolong the life of a lead acid accumulator be prolonged. (2 marks)

8. (a) What is meant by;
   (i) Radioactivity. (1 mark)
   (ii) Radioisotope. (1 mark)

   (b) A material is wrapped in a photographic film and kept in a lead box. The lead box is also wrapped in a photographic film. When the photographic films are removed later, it is found that the film inside the lead box is darkened and the outer one unaffected.
   (i) Identify the kind of material in the lead box. (1 mark)
   (ii) Explain the observations. (3 marks)

   (c) State three precautions taken when handling radioactive materials. (3 marks)

   (d) (i) What are cathode rays (1 mark)
   (ii) With the aid a diagram, explain how cathode rays produced by thermionic effect. (5 marks)
   (iii) State two properties of cathode rays. (1 mark)

END