535/2
PHYSICS
Paper 2
Wednesday 9th August 2023 (Afternoon)
2 hours 15 minutes

ACHOLI SECONDARY SCHOOLS EXAMINATIONS COMMITTEE

Uganda Certificate of Education

Joint Mock Examinations, 2023

PHYSICS

Paper 2

2 hours 15 minutes

INSTRUCTIONS TO CANDIDATES:

- ✓ Answer any FIVE questions.
- ✓ Any additional question(s) answered will NOT be marked.
- ✓ Mathematical tables and silent non-programmable calculators may be used
- ✓ These values of physical quantities may be useful to you:
  - Acceleration due to gravity = 10 ms^{-2}
  - Specific heat capacity of water = 4200 $Jkg^{-1} K^{-1}$
  - Specific heat capacity of copper = 400 $Jkg^{-1} K^{-1}$
  - Specific latent heat of fusion of ice = 3.4×10^5 $Jkg^{-1} K^{-1}$
  - Speed of sound in air = 330 ms^{-2}
  - Velocity of electromagnetic waves = 3.0×10^8 ms^{-1}
  - Density of water = 1000 kgm^{-3}

Question 1:

(a) An image of an object in a plane mirror is said to be virtual and laterally inverted. What do the two underlined words mean for such an image? (02 marks)

(b) (i) With the aid of diagrams, distinguish between regular and irregular reflection. (02 marks)

(ii) How does annular eclipse occur? (01 mark)

(iii) A building 150m away from a pin hole camera produces an image 5cm high. If the distance between the pin hole camera and the screen is 10cm, what is the height of the building? (02 marks)

(c) (i) You are provided with a plane mirror, a screen with a wire mesh, a concave mirror, a bulb, switch, cells in a holder and wire. Describe with the aid of a diagram how you can determine the focal length of the given concave mirror. (04 marks)

(ii) A concave mirror of focal length 15cm has an object placed 16cm. if the height of the object is 4cm, using a scale drawing, find the position of the image. (02 marks)

(iii) State any two applications of a concave mirror. (02 marks)

Question 2:

(a) Give the reason for the following:

(i) Bridges are constructed with one end fixed and the other end on a roller. (01 mark)

(ii) Frozen water cracks the building. (01 mark)

(b) (i) Describe an experiment to determine the specific heat capacity of aluminium piece of metal. (05 marks)

(ii) A tank holding 50kg of water is heated by 5kW electric immersion. Calculate the time taken for the temperature to rise from 10°C to 50°C assuming heat gained by the tank is negligible. (02 marks)

(c) (i) With the aid of relevant diagrams, explain how pressure reduces the melting point of ice. (03 marks)

(ii) Explain why a pressure cooker can cook faster than an ordinary cooker. (02 marks)

(iii) State any two factors which affect evaporation. (01 mark)

Question 3:

(a) What is meant by the following:

(i) Thermionic emission

(ii) Cathode rays (02 marks)

(b) (i) Explain how cathode rays are produced. (02 marks)

(ii) How does a cathode ray produces a sinusoidal wave signal A.C output on a screen in a cathode ray oscilloscope? (02 marks)

(iii) State how hard and soft X-rays are produced in an X-ray tube. (03 marks)

(c) A radioactive nuclide $^{232}_{90}X$ decays to nuclide Z according to the decay process:

$$^{232}_{90}X \xrightarrow{A} {}^{228}_{88}Y \xrightarrow{B} {}^{228}_{89}Z \xrightarrow{C} {}^{228}_{89}Z$$

(i) Identify radiations or particles A, B and C. (1½ marks)
(ii) State two differences between radiation A and B. (1½ marks)
(iii) State 3 uses of nuclear reactions. (03 marks)

Question 4:

(a) (i) What is linear momentum? (01 mark)
(ii) Explain how a rocket engine works. (03 marks)
(iii) A moving ball 'V' of mass 50g collides with a stationary ball 'Q' of mass 100g. After collision, V moves backward with a velocity of 2 ms^{-1} while Q moves forward with a velocity of 5 ms^{-1}. What was the initial velocity of V? (03 marks)

(b) Write down an equation of the net force acting on a person moving in a lift when the lift:
(i) moves up with acceleration 0 ms^{-2}. (01 mark)
(ii) moves with constant velocity. (01 mark)
(c) Describe an experiment to determine acceleration due to gravity 'g'. (04 marks)
(d) An object at a height of 45m above the ground falls freely from rest. What time does it take to reach the ground? (02 marks)

Question 5:

(a) (i) State Bernoulli principle of pressure in fluids. (01 mark)
(ii) Explain why water in lakes with a narrow part has less pressure than those with a wider part. (01 mark)
(b) (i) Why is it that an object in water feels less weight than that in air? (02 marks)
(ii) Describe an experiment to verify the law of floatation. (04 marks)
(iii) A wooden cube of mass 480g and density 10 gcm^{-3} is suspended by a string so that it is half immersed in oil of density 0.9 gcm^{-3}. Find the tension in the string. (03 marks)
(c) Explain how an hydrometer works. (03 marks)

Question 6:

(a) (i) State any two factors which improve the effectiveness of a direct current generator. (02 marks)
(ii) State the laws of electromagnetic induction. (02 marks)

(b) (i) What is mutual induction? (01 mark)
(ii) Explain how a step up transformer works. (03 marks)
(iii) A transformer of 200 turns of coils in secondary is supplied by 240V of electricity. If the numbers of turns in primary is 100, what is the voltage of the transformer? (02 marks)

(c) (i) State any two power losses in a transformer. (02 marks)
(ii) Explain how an alternating current can be changed to a direct current. (03 marks)

Question 7:

(a) What do we mean by the following terms in waves?
(i) Mechanical waves
(ii) Wave front (02 marks)

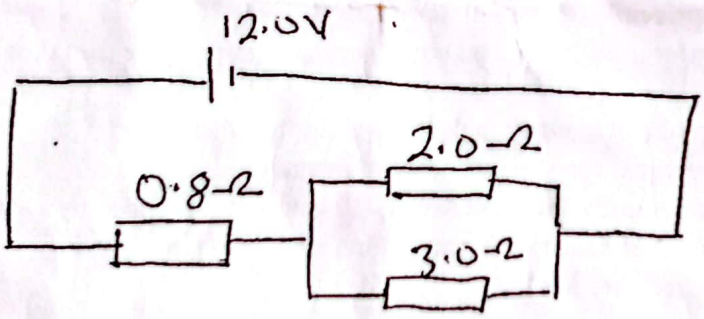
(b) (i) Explain how refraction of water ripples is caused in a ripple tank. (02 marks)
(ii) State one application of interference of waves. (01 mark)
(iii) Describe how we can measure the speed of sound in air. (03 marks)

(c) (i) How are reverberations of sound useful in life? (02 marks)
(ii) Explain using a diagram how you can obtain the first overtone in a resonance tube. (03 marks)
(iii) The frequency of the first harmonic in a closed tube is 280Hz. Find the length of the air column. (02 marks)

Question 8:

(a) (i) What is a secondary cell? (01 marks)
(ii) State any two defects of a simple cell. (02 marks)
(iii) Using a simple circuit diagram, explain how a lead acid accumulator is charged. (02 marks)

(b) A cell of E.M.F 12V supplies current through 3 resistors arranged as below:



(i) Determine the current through the 2.0Ω resistor. (03 marks)
(ii) What is the electric power in the circuit? (02 marks)
(iii) An electric bulb rated 120W / 240V. What time will it take to consume 1 unit if it is to operate continuously? (02 marks)

(c) (i) Explain why it is recommended to transmit electricity at high voltage. (02 marks)
(ii) A heater is rated 20W / 120V. State why it is not recommended to fix it to a 240V electric socket for its operation. (01 mark)

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