

535/2
PHYSICS
PAPER 2
AUG 2023
2 1/4 HOURS



NATIONAL EDUCATION RESEARCH & EXAMINATIONS BEREAU
UCE NEREB NATIONAL MOCKS 2023
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 electronic calculators may be used.
- These physical quantities may be useful to you.

Acceleration due to gravity	=	10ms^{-2}
Specific heat capacity of water	=	$4200\text{Jkg}^{-1}\text{K}^{-1}$
Specific heat capacity of copper	=	$400\text{Jkg}^{-1}\text{K}^{-1}$
Specific latent heat of fusion of water	=	340000Jkg^{-1}
Speed of sound in air	=	320ms^{-1}
Velocity of electromagnetic waves	=	$3.0 \times 10^8\text{ms}^{-1}$

- 1.(a) Define the followings: (01 mark)
 (i) The joule (J) as a unit of work. (01 mark)
 (ii) Power. (03 marks)
- (b) A girl of mass 50kg runs up a flight of stairs of 20 steps in 10s. If each step is 25cm high, determine the power developed by the girl. (01 mark)
- (i) Define efficiency as applied to simple machines. (04 marks)
 (ii) Describe an experiment to investigate the relation between efficiency and load using a block and tackle pulley system. (04 marks)
- (iii) A block and tackle pulley system has 3 pulley wheels in the upper fixed block and 2 pulley wheels in the lower movable block. Determine the load that can be lifted by an effort of 350N if the efficiency of the system is 80%. (02 marks)
- (c) Why is the efficiency of machines always less than 100%? (02 marks)
- 2.(a)(i) What is a soft magnetic material? Give one example of such a material (02 marks)
 (ii) Explain with the aid of a diagram, how a steel bar can be magnetised by single touch method specifying the polarity of the resultant magnet. (04 marks)
 (iii) Explain where the energy stored in the magnet in (a)(ii) above comes from. (02 marks)
- (b) Explain with the aid of a diagram what happens when two vertical parallel conducting wires are placed near one another carrying current in (03 marks)
 (i) the same direction. (03 marks)
 (ii) opposite direction. (02 marks)
- (c) Sketch the magnetic field around a solenoid in which current, I , is flowing. Indicate the polarity. (02 marks)

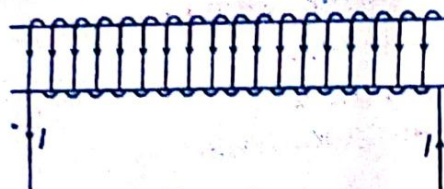


Figure 1

- 3.(a)(i) Define wave length of a wave. (01 mark)
 (ii) Differentiate between transverse and longitudinal wave and give one example of each. (02 marks)
- (b) Figure 2 shows a section of a progressive wave after 2.5 seconds from the start.

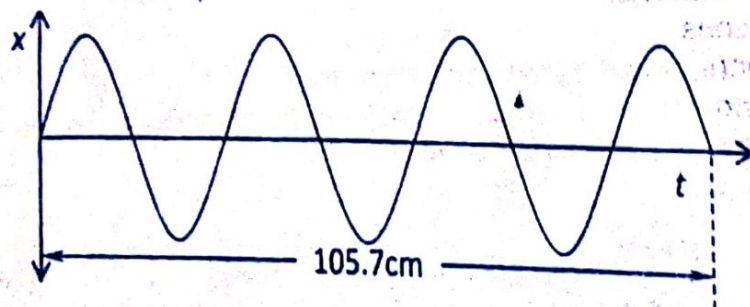


Figure 2

- Calculate
- (i) The wavelength of the wave. (02 marks)
 (ii) The period of the wave. (02 marks)
- (c) Describe an experiment to determine the speed of sound in air by echo method. (06 marks)
- (d) A student stands between two cliffs and makes a loud sound. If he hears the first echo after 1.5s and the second echo after 2.0s, find the distance between the cliffs. (03 marks)
- 4.(i) What is light? (01 mark)
 (ii) State the laws of reflection. (02 marks)
- (b) With the aid of a diagram, differentiate between diffused and regular reflection. (04 marks)

- (c) Figure 3 shows light incident at A one side of a semi-circular glass block and is refracted critically at B.

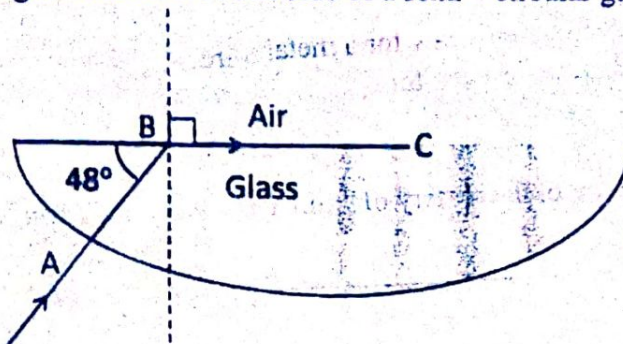


Figure 3

- (i) Why does the light ray enter the glass block at point A without deviation? (01 mark)
(ii) Find the refractive index of the glass. (03 marks)
(d)(i) State one possible cause of short-sightedness. Illustrate your answer with a diagram. (03 marks)
(ii) Explain how short-sightedness can be corrected. (02 marks)

- 5.(a) Distinguish between scalar and vector quantities, giving two examples of each. (03 marks)

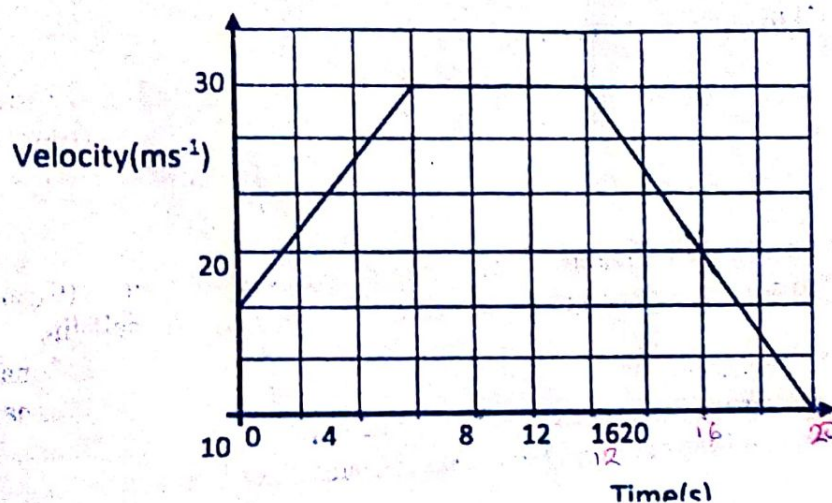


Figure 4

- (b) Figure 4 represents a velocity time graph of a body in motion.
(i) Describe the motion of the body (05 marks)
(ii) Calculate the total distance travelled. (04 marks)

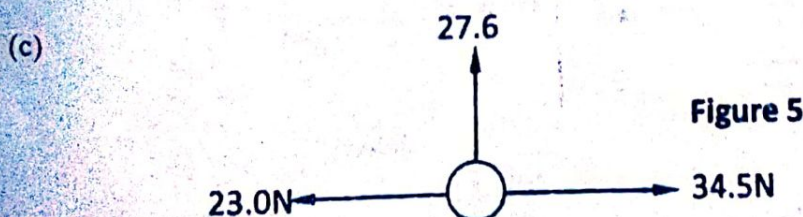


Figure 5

Forces of 23.0N, 27.6N and 34.5N act on a body of mass of 4.0kg, initially at M.
Find the magnitude of the acceleration with which the body moves. (04 marks)

- 6.(a)(i) Differentiate between a saturated and unsaturated vapour. (01 mark)
(ii) Explain why it is advisable to use a pressure cooker when cooking beans at high altitudes. (06 marks)
(b)(i) Define specific latent heat of vaporisation of a substance. (01 mark)
(ii) Describe an experiment to determine the specific latent heat of fusion of ice. (04 marks)
(iii) Dry steam at 100°C is passed into a container of negligible heat capacity containing 400g of water at 0°C. The mixture is well stirred and the steam supply is cut off when the temperature of the can and its contents reaches 20°C. Neglecting heat losses, find the mass of steam condensed.

- 7.(a)(i) State Ohm's law. (04 marks)
 (ii) Describe an experiment to verify Ohm's law for a metal wire. (01 mark)
 (b) Sketch the current-voltage characteristics for (06 marks)
 (i) a filament bulb, (01 mark)
 (ii) metal wire. (01 mark)
 (c) In the circuit diagram in Figure 6, the battery of e.m.f 12.0V has negligible internal resistance. (01 mark)

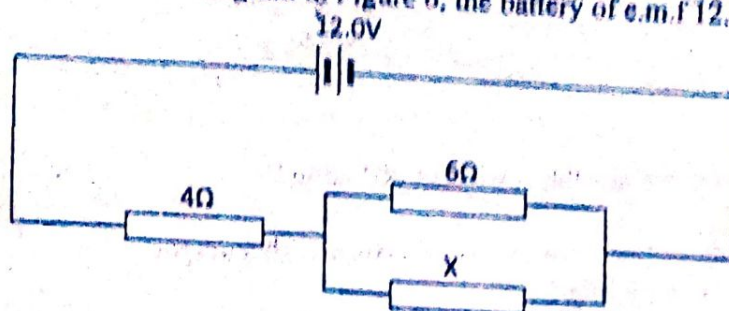


Figure 6

If the p.d across the resistor of 4.0Ω is 8.0V, calculate

- (i) The current from the battery. (02 marks)
 (ii) The value of the resistor, X. (04 marks)
 (iii) The current through resistor X. (01 mark)
8. (a) Define the term radioactivity. (01 mark)
 (b)(i) A radioactive gas sample has a half-life of 16 hours. What is meant by this statement? (01 mark)
 (ii) A radioactive substance decays to an $\frac{1}{8}$ th of its original mass after 24 years. Find its half-life. (03 marks)
 (c)(i) State two uses of radioactivity in medicine. (02 marks)
 (ii) State two methods of producing electrons from metals. (02 marks)
 (d) A beam of cathode rays is directed mid-way between two parallel plates X and Y as shown in Figure 7 below.

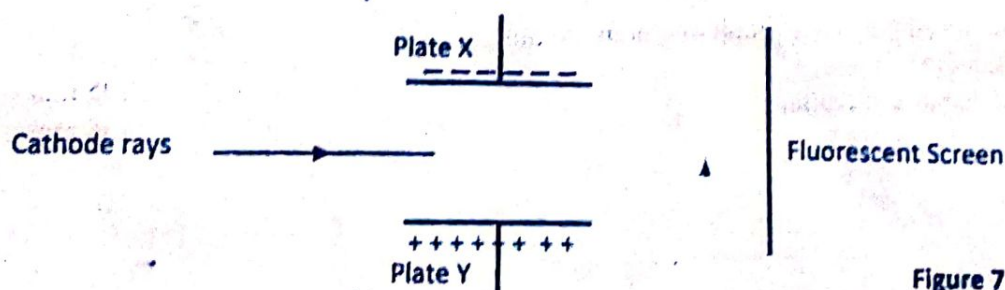


Figure 7

- (i) Draw and explain the behaviour of the beam. (04 marks)
 (ii) Explain what would happen if a beam of x-rays is used instead of cathode rays. (03 marks)

END