GREENHILL ACDEMY

HOLIDAY WORK FOR TERM 3-2024

S5 PHYSICS PAPER 2

INSTRUCTIONS TO STUDENTS

Attempt **all** questions.

All answers should be typed out in Microsoft word and diagrams drawn using an appropriate computer and then saved as pdf file with your name as the filename.

Mathematical tables, non – programmable scientific calculators and squared papers may be used.

Assume where necessary:

Acceleration due to gravity, g	=	$9.81 ms^{-2}$
Speed of light in vacuum, c	=	$3.0 \times 10^{8} ms^{-1}$
Speed of sound in air	=	$320 ms^{-1}$
Electron charge, e	=	$1.6 \times 10^{-19} C$
Permittivity of free space ε_o	=	$8.85 \times 10^{-12} Fm^{-1}$
The constant $\frac{1}{4 \pi \varepsilon_o}$	=	$9.0 \times 10^{9} F^{-1}m$

QUESTION	SCORE
TOTAL	

Answers to the holiday work should be sent by e-mail to the address below: jpkatesigwa@greenhillacademy.ac.ug on or before 13th September, 2024.

Scanned copies will not be marked.

1. (a) Distinguish between real and virtual images. (2marks)

(b) A finite object placed at a distance, in front of concave mirror a virtual image.

(i) Draw a ray diagram to show how the virtual image is formed. (2 marks)

(ii) using the ray diagram in (b) (i) only, derive an expression for the focal length of the mirror. (5marks)

(c) Describe an experiment to determine the focal length of a convex mirror using two pins and no parallax method including graphical analysis. (5 marks)

(d) A concave mirror forms a real image which is three times the size of the real object. When the object is moved towards the mirror, the real image formed is now four times the linear size of the object. Given that the distance between the two positions of the image is 20.0cm find the;

(i) focal length of the mirror (3 marks)

(ii) new position of the object (3 marks)

2. (a) (i) Define phase angle. (1 mark)

(ii) A wave of frequency 256Hz travels with a speed of 330ms^{-1} through a medium. Find the phase difference at any instant of time, between two particles which are 20.0cm apart. (4 marks)

(b) (i) Define forced oscillations. (1 mark)

(ii) Describe how the amplitude of forced oscillations builds up to a constant value. (4 marks)

(c) The displacement of a particle for the wave is given by y=0.02sin(120πt - $\frac{3\pi}{8}x$) where x and y are in meters and time t is in seconds. Determine the

(i) write the equation of the progressive wave which would give rise to a stationary wave if superimposed on the one above. (1mark)

(ii) find the equation of the stationary wave and hence determine its amplitude of vibration (3 marks)

(iii) determine the frequency and velocity of the stationary wave (3marks)

(e) (i) Define a wave front (1 mark)

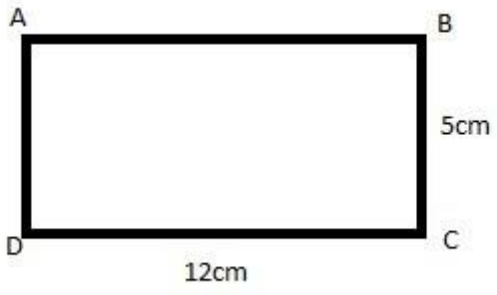
(ii) Draw a sketch diagram showing the reflection of plane waves by a concave reflector. (2 marks)

4. (a) (i) Define work function of a material. (1 mark)

(ii) Explain why the surface of a charged conductor is an equipotential surface. (4marks)

(b) With the aid of a diagram, describe how a gold leaf electroscope can be used to determine whether a charged body is a conductor or an insulator. (4marks)

(d) Charges of +6μC, −2μC, and +5μC are situated on the vertices of a rectangle ABC respectively whose dimensions are 5cm by 12cm,as shown in the figure below.



Calculate the resultant

(i) Electric field intensity at vertex D. (5marks)

(ii) Electric potential energy of a charge of +2μC when placed at vertex D (4marks)

(e) Sketch the electric field pattern due to the charge distribution in (d) above (2marks)

END