MAYFLOWER SECONDARY SCHOOL

YEAR 2025 WEIGHTED ASSESSMENT 1
SEC 4EX PHYSICS 6091

/40

Duration: 00h 50m
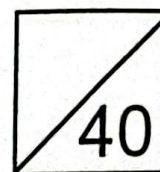
Name: _____ (   )

Class: _____   Date: _____   Parent's Signature: _____

Instructions
1. Answer **all** questions.
2. Answer multiple choice questions in the boxes provided at the end of **Section A**.
3. Answer **Sections B and C** in the spaces provided after each question.
4. Show all workings. Omission of essential workings will result in the loss of marks.
5. Use of approved calculator and mathematical sets allowed.
6. This paper consists of **11** pages.

Section A: Multiple Choice Questions

1   In which diagram is the path of the light ray **not** correct?
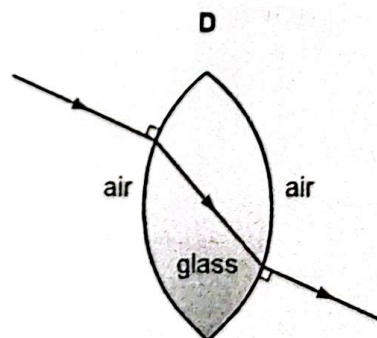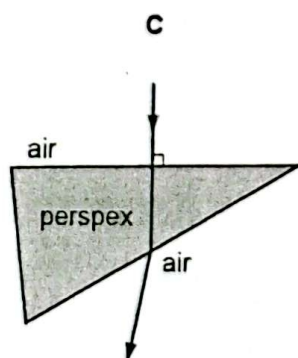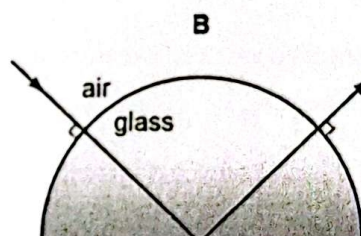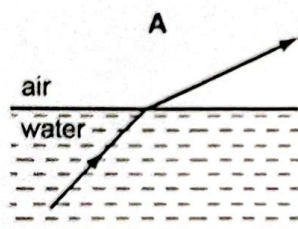
2 Two rays of light from an object **O** are reflected from a plane mirror.
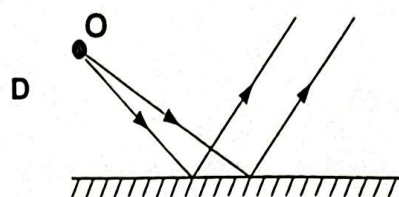
Which is the correct ray diagram?

A

B

C

D
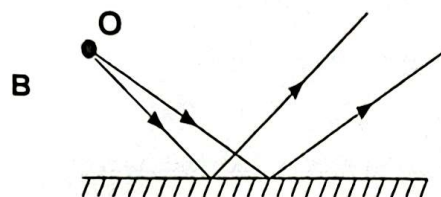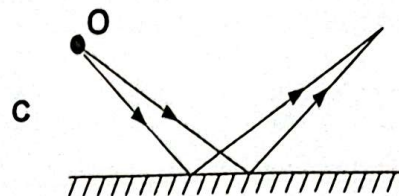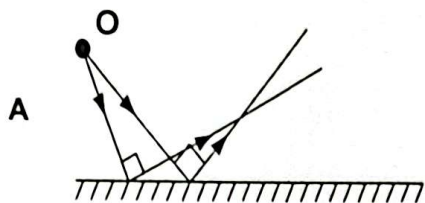
3 Diagram shows how a ray of light travelling from vacuum to medium **X** is refracted.

normal

33°

vacuum

medium **X**

19°
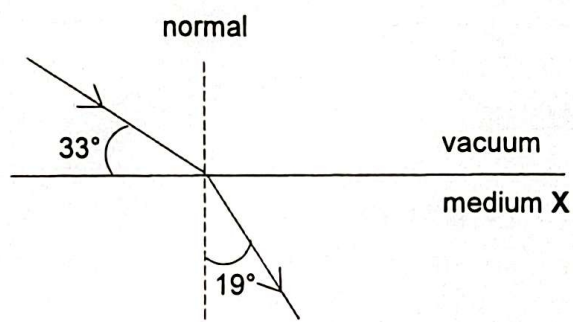
Calculate the refractive index of medium **X**.

| **A** 0.39 | **B** 0.60 | **C** 1.67 | **D** 2.58 |

4 Which diagram shows the correct arrangement of a lamp, a lens, a screen and a film in a photograph enlarger system?

A

screen

film

lamp   lens

C

screen

film

lamp   lens

B

screen

film

lamp   lens

D

screen

film

lamp   lens
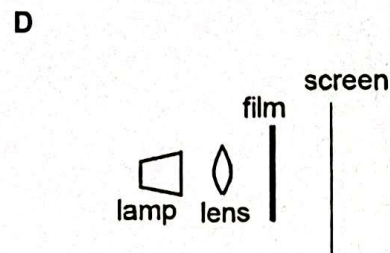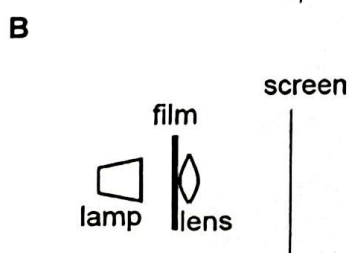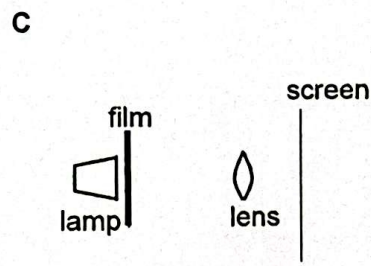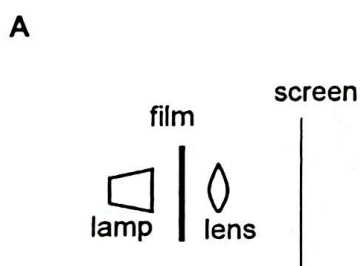
5   A wave passes along a spring.

Which statement about the frequency of the wave is **correct**?

A   It is the distance between two consecutive wave particles of the same phase.

B   It is the number of oscillations each second.

C   It is the speed of the wave divided by period.

D   It is the time taken for one oscillation.

6   Which row correctly shows examples of transverse and longitudinal waves?

	transverse waves	longitudinal waves
A	gamma	sound
B	infra-red	water wave
C	light	radio
D	sound	x-rays

7   Which graph correctly represents how the wavelength, λ, of water waves in a ripple tank varies with its frequency, f?

A

C

B

D
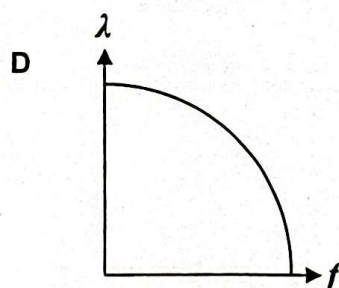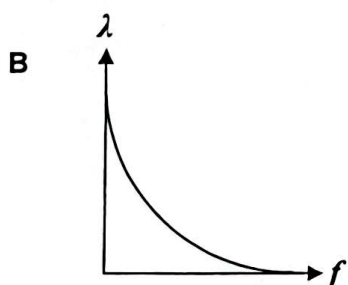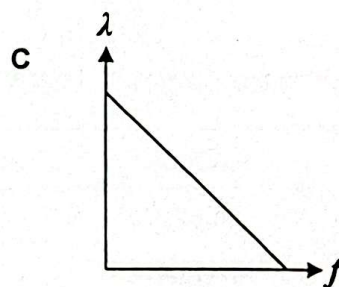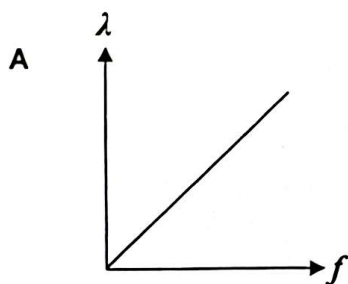
8   Astronauts in space communicate with each other using radio waves instead of sound waves.

Which statement correctly explains why sound waves are **not** used in space?

A   Sound waves become distorted in space.

B   Sound waves cannot travel in space.

C   Sound waves travels very slowly in space.

D   Sound waves will be absorbed by their spacesuit.

9   A negatively charged rod is brought near two neutral isolated balls X and Y.

X is then earthed momentarily as shown in the diagram below.
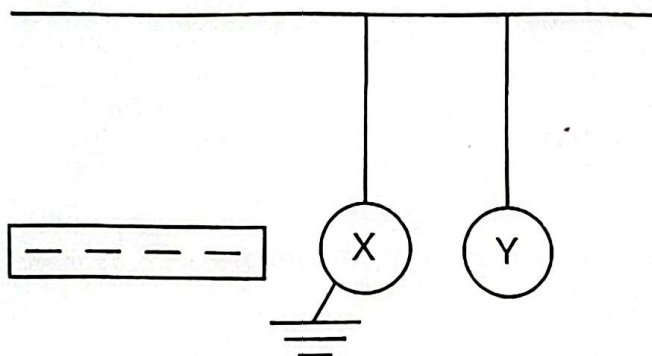
If the rod is then removed, how would the balls be charged?

	Ball X	Ball Y
A	negative	neutral
B	Negative	positive
C	positive	neutral
D	positive	negative

10   Two uncharged conducting spheres are placed at a small distance apart.

Which figure correctly represents the charge distribution when a negatively charged rod is placed near one of them?
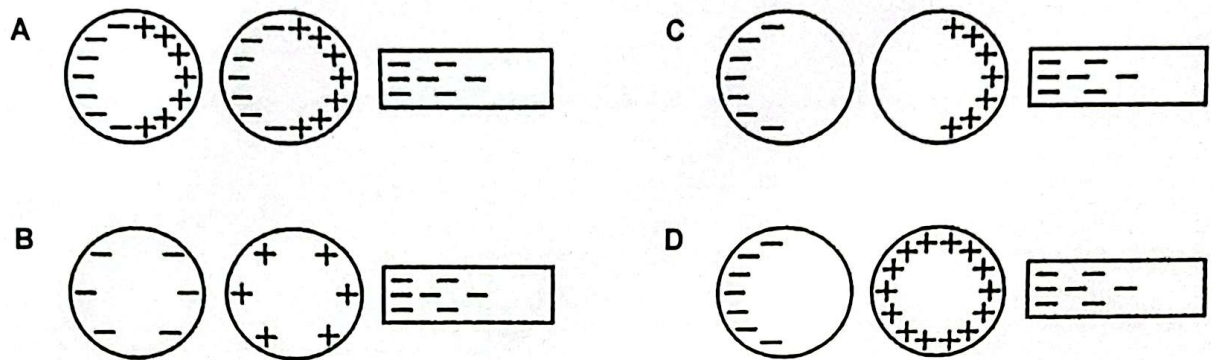
Enter your answer for Section A below:

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10

----- End of Section A -----

11   Diagram shows the view from the top of a room **WXYZ** which measures 10 m by 9 m.

Kathy stands at the centre of the room facing **WX**.
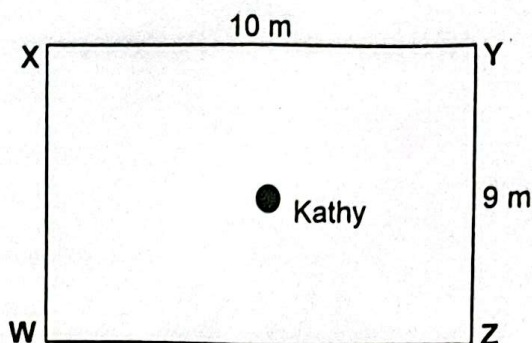
(a)   A plane mirror is installed at eye level across wall **WX**.

Draw and label the image of wall **YZ** in this mirror.

Draw at least two sets of light rays to show how Kathy sees the whole image of wall **YZ** in this mirror.

[2]

(b)   Kathy says that there is no need to install such a long mirror and waste money.

Calculate the minimum width of the plane mirror could be placed at eye level on wall **WX** for Kathy to be able to see the whole image of wall **YZ**.

minimum width = ... [2]

12   Diagram shows a glass prism with a ray of light incident on **Surface 1**.

The incident ray is adjusted such that angle **r** is the minimum angle where the light ray hitting **Surface 2** just experiences *total internal reflection* instead of emerging out of the glass prism from **Surface 2**.
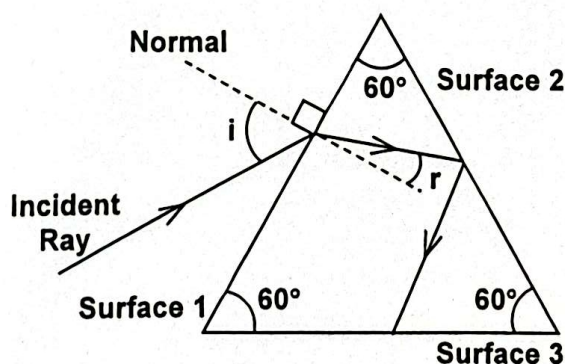
(a) Given that the refractive index of the glass prism is 1.58, determine the critical angle of the glass.

critical angle = ... [2]

(b) State and explain why there is a Total Internal Reflection happening at **Surface 2**.

....

....

....

.... [2]

(c) The light ray that reflected off **Surface 2** goes through a refraction at **Surface 3**.

Draw the light ray that emerges from the glass prism at **Surface 3**. [1]

13 Diagram shows a thin converging lens being used to produce an image **X'** of an object **X**.

converging lens

principal axis

X'   X
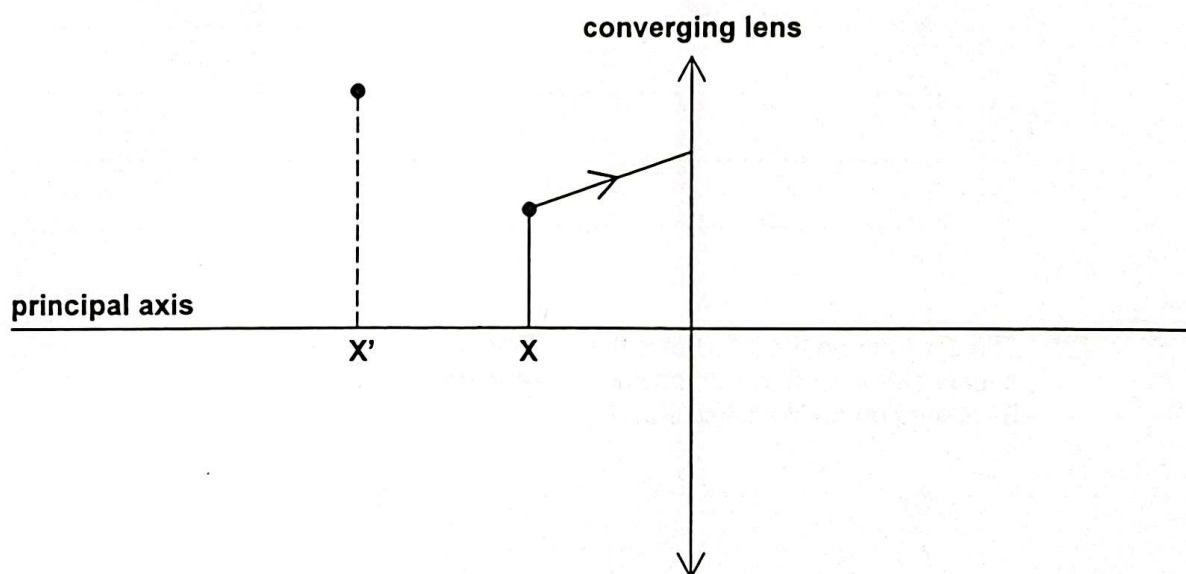
(a) Show on the diagram how the given light ray will travel after passing through the converging lens.

[1]

(b) Complete the diagram with suitable light rays to locate and label the position of the principal focus **F**.

[2]

(c) Give one common application for the lens set-up shown above.

.... [1]

14 (a) (i) State a method to electrostatically charge an insulator.

....

[1]

(ii) The diagram shows a pair of isolated positive charges placed in close proximity without touching.

Draw the electric field lines between the pair of isolated positive charges.

[2]

(iii) Electrostatic spray painting is an efficient technique that is used to spray paint vehicles. During the process, the car to be painted is usually connected to earth, and the spray paint is electrically charged before it is sprayed out of the nozzle.

With reference to electric charge, explain how spray painting can spread the fine droplets of paint evenly on the surface of vehicles.

....

....

....

....

[2]

(b) The diagram on the left shows the position of rest of a small charged metal sphere **A**, suspended from **S**, on an insulating thread near a fixed positively charged metal sphere **B**, resting on an insulating stand.
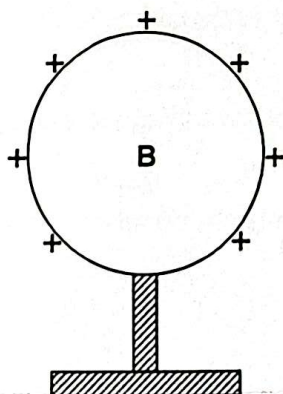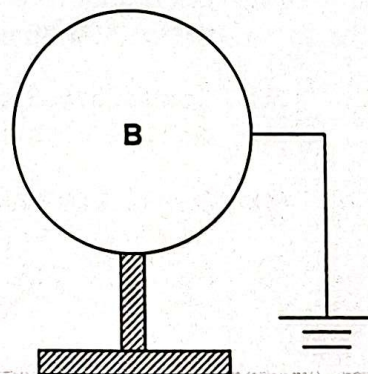
(I) Deduce the sign of the charge on the sphere A.

....
[1]

(ii) Sphere B is then earthed as shown in the diagram on the right.

On the right diagram above, draw the new final position of Sphere A.

[1]

----- End of Section B -----

15   A fishing boat uses sounding equipment to detect shoals of fish below the boat.

Pulses of sound waves are sent out from the boat and the shoals of fish reflect the sound back to the boat.

The equipment picks up a reflection of sound from a shoal of fish 0.1 seconds after it leaves the boat.

(a)   Sound waves travel through water at a speed of 1500 m/s.

Calculate the distance of the shoal of fish below the boat.

distance = ... [2]

(b)   Describe how sound waves are transmitted through the water.

....

....

....

....
[2]

(c)   Captain of the fishing boat can adjust the pulses of sound waves being sent out to vary the characteristics of the sound used.

(i)   State how the volume of sound changes when he increases the amplitude of the sound waves.

....
[1]

(ii)   Suggest what the Captain should adjust if there is a need to send out pulses of higher pitch.

....
[1]

(d) Sound waves are very different from water waves.

    (i) State one difference between sound waves and water waves.

    ....

    ....
    [1]

The diagram represents a water wave travelling through points **A** and **B**.

The distance between points **A** and **B** is 0.40 m.

Note: Diagram not drawn to scale
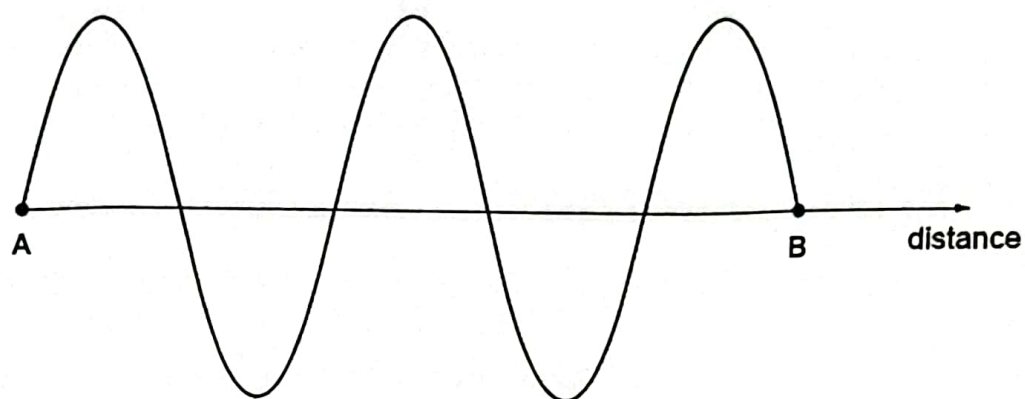
    (ii) Determine the wavelength of the water wave represented by the diagram.

                                                         wavelength = ... [1]

    (iii) Calculate the frequency of the water wave given its speed is 7.88 m/s.

                                                     frequency = ... [2]