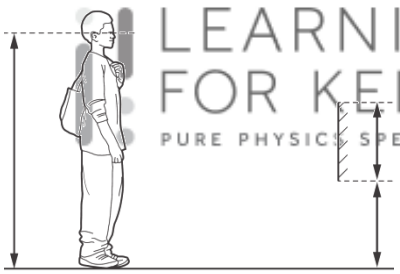
O Level MCQ – Revision 6 (ANS) [19 v 1.0]

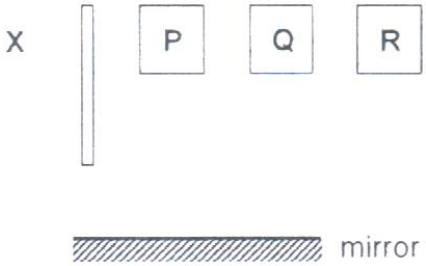
1. A shoe shop puts a mirror on the wall so that customers can look at their shoes.
The length of the mirror is 50 cm. A customer has eyes 150 cm above ground level.



The bottom of the mirror is at height h above the ground. What is the smallest value of h that allows the customer to see an image of his shoes in the mirror?

A 0 **B** 25 cm **C** 50 cm **D** 75 cm (**B**)

2. Which box(es) can be seen in the mirror by the observer at **X**?

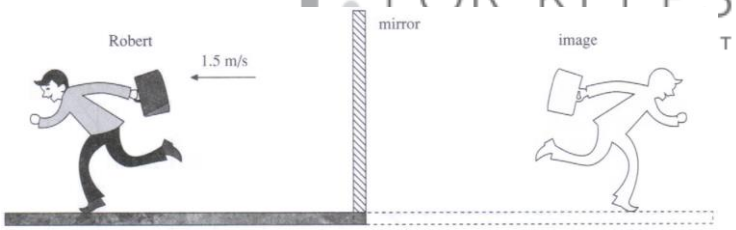


A **P** only
B **P** and **Q**
C **Q** and **R**
D **R** only

(**A**)

3. Robert is running away from a mirror as shown below. Given that his speed is 1.5 m/s, what is the speed at which his image is departing from him?

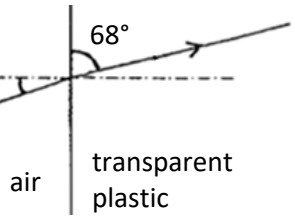
A 0.75 m/s
B 1.5 m/s
C 3.0 m/s
D 4.0 m/s



(**C**)

4. The diagram shows a light ray travels in air at a speed of 3.0 x 10^8 m/s.
Find the speed of light as it travels through transparent plastic.

A 1.3 x 10^8 m/s
B 2.2 x 10^8 m/s
C 2.8 x 10^8 m/s
D 3.6 x 10^8 m/s



(**B**)

Angle of incident, i = 30°
Angle of refraction, r = 90° − 68° = 22°

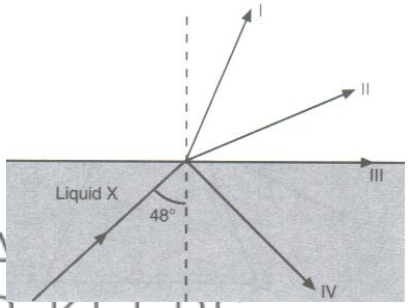
$$n = \frac{\sin i}{\sin r} = \frac{\sin 30°}{\sin 22°} = 1.334$$

But refractive index, n, is defined as

$$n = \frac{c}{v}$$
$$1.334 = \frac{3.0 \times 10^8}{v}$$
$$v = 2.24 \times 10^8$$
$$v = 2.2 \times 10^8 \text{ //}$$

5. A ray of light passing from liquid **X** into air makes an angle of incidence of **48°** as shown in the diagram.
If the refractive index of the liquid is **1.40**, **which is the most probable emergent ray** of light?

A I
B II
C III
D IV

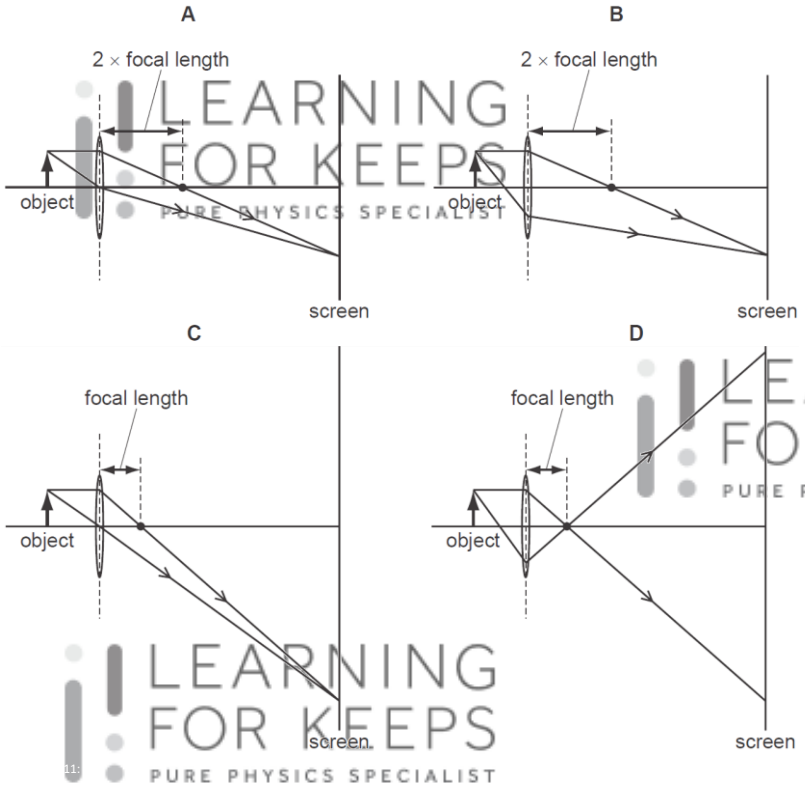


(**D**)

$$\sin c = \frac{1}{n}$$
$$\sin c = \frac{1}{1.40}$$
$$c = 45°$$

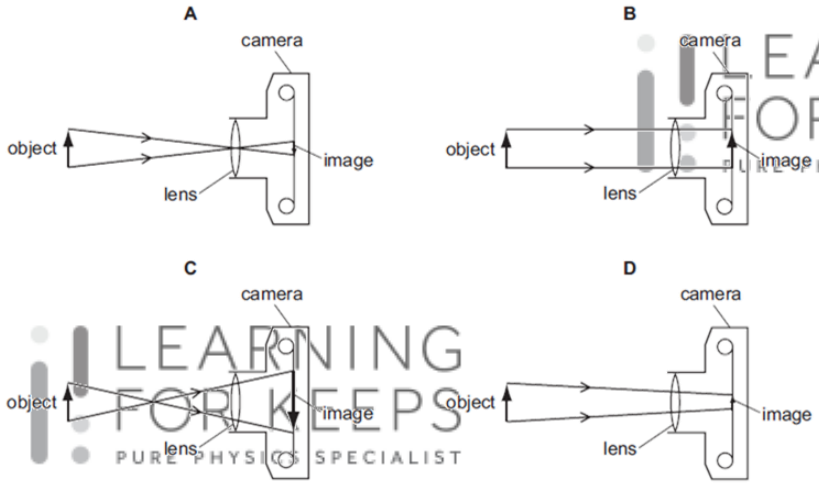
Since $\angle i > c$, the ray will undergo TIR. Thus, emergent ray is IV.

6. Which diagram shows how an image of an object is formed on a screen by a converging lens?



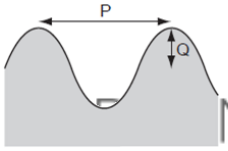
(**C**)

7. Which diagram correctly represents rays of light passing through a converging lens in a camera?

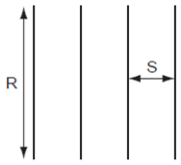


(**A**)

8. The diagrams show different views of a water wave in a ripple tank.



cross-section of wave



crests seen from above

Which letters represent a wavelength and a wavefront?

	wavelength	wavefront
A	P	R
B	P	S
C	Q	R
D	Q	S

(**A**)

9. Which of the following statements about **radio waves is/are correct**?

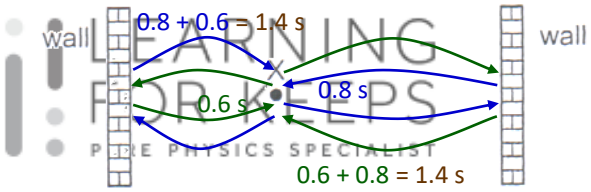
I They **travel slower than microwaves in vacuum.**
II They **travel faster than ultrasound.**
III They have **higher frequencies than microwaves.**
IV They have **lower frequencies than gamma rays.**

A I, II and IV only
B II, III and IV only
C I and III only
D **II and IV only**

(**D**)

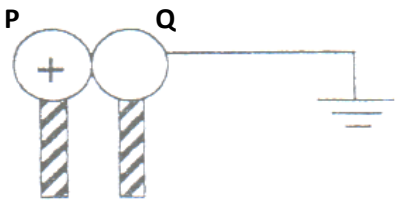
10. A man who is standing at a point X between two parallel walls (as shown in the diagram) fires a starting pistol. He hears the first echo after 0.6 s and another one after 0.8 s.

How long after firing the pistol will he hear the next echo?



A 1.2 s **B** 1.4 s **C** 1.6 s **D** 2.4 s (**B**)

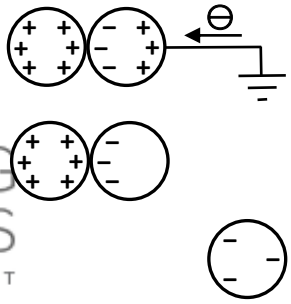
11. **A positively-charged sphere** and an **uncharged sphere Q**, each mounted on an insulating stand, are placed in contact. **Q is also connected to earth** by a wire. When **the wire is removed** and **then P and Q are separated**, **Q is found to be negatively-charged**. What is the nature of materials P and Q?



	P	Q	
A	**conductor**	**conductor**	**Both will be discharged**
B	conductor	**insulator**	**Q would not be charged**
C	insulator	conductor	
D	Insulator	**insulator**	**Q would not be charged**

(**C**)

P	Q
Insulator	conductor

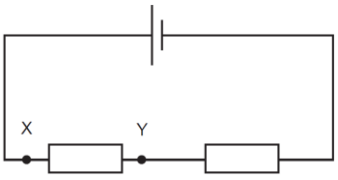


12. Which of the following is/are method(s) to produce a charged sphere?

I By friction
II By contact
III By induction

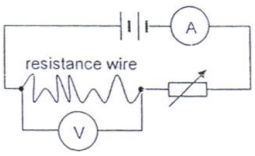
A III only **B** I and II only **C** I and III only **D** I, II and III (**D**)

13. The diagram shows two resistors connected in series with a cell. Which statement defines the potential difference across XY?

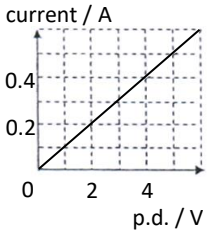


A the power needed to drive a unit charge through the cell
B the power needed to drive a unit charge between X and Y
C the work done in driving a unit charge through the cell
D the work done in driving a unit charge between X and Y (**D**)

14. An experiment is set up to investigate how the potential difference ***V*** across a resistance wire varies with the current ***I*** through it.



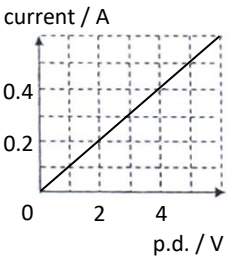
From the experiment, the graph on the right is obtained.



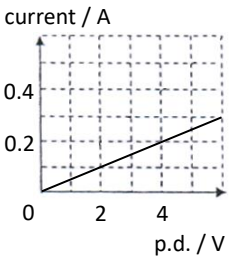
The experiment is repeated with another resistance wire of the same material but its **length and diameter are doubled**.

Which of the following graphs represents the expected result?

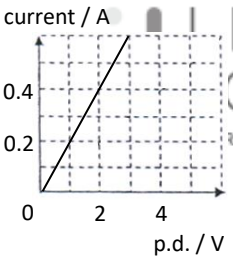
A



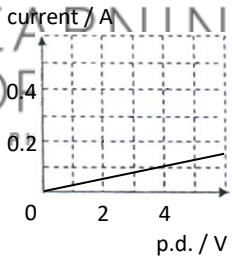
B



C



D



(**C**)

$$R \propto \frac{l}{A}$$

$$(l_2 = 2l_1) \Rightarrow \quad (R_2 = 2R_1)$$

$$(d_2 = 2d_1) \Rightarrow$$

$$A = \pi r^2$$

$$A = \pi \left(\frac{d}{2}\right)^2$$

$$A = \frac{\pi}{4} d^2$$

$$A \propto d^2$$

$$\Downarrow$$

$$(A_2 = 4A_1) \Rightarrow \quad \left(R_2 = \frac{1}{4}R_1\right)$$

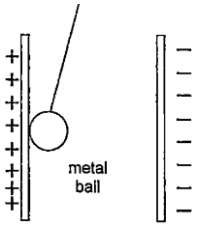
$$(R_2 = \frac{1}{2}R_1$$

$$R = \frac{V}{I} \Leftrightarrow I = \frac{V}{R} \Leftrightarrow I \propto \frac{1}{R}$$

$$\left(R_2 = \frac{1}{2}R_1\right) \Rightarrow \quad (I_2 = 2I_1)$$

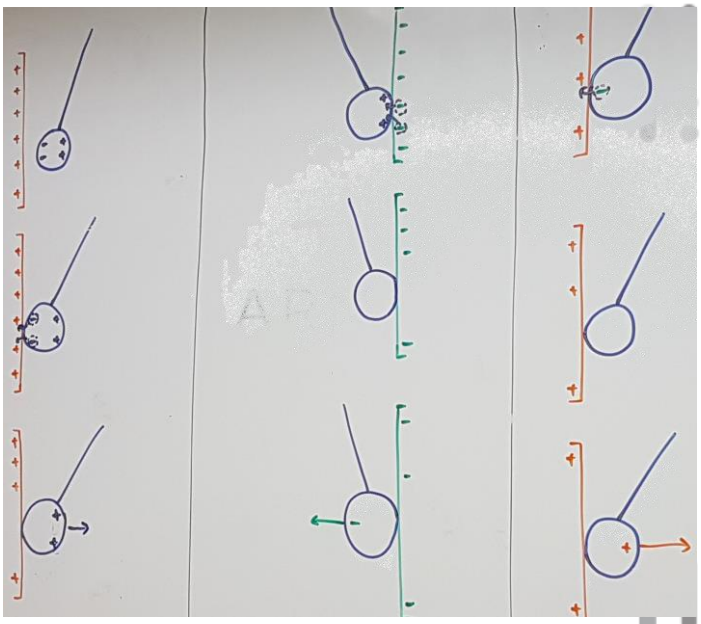
Extended Practice

1. A neutral metal ball of negligible weight, suspended between two conducting charged plates, touches the positively charged plate as shown.

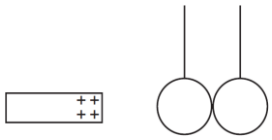


What will be the subsequent motion of the metal ball between the positively charged conducting plate and the negatively charged conducting plate?

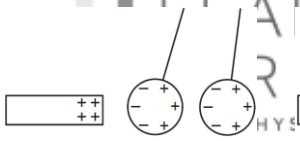
A The metal ball will remain attracted to the positive plate.
B The metal ball will be attracted to the negative plate.
C The metal ball will oscillate to and fro between the conducting plates.
D The metal ball will stay at the centre of the two conducting plates. (**C**)



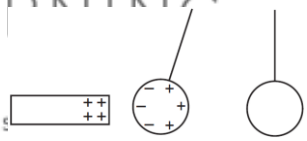
2. Two uncharged metal spheres, **touching each other**, are suspended by means of cotton thread. A positively charged rod is brought near. Which diagram shows **what happens to the spheres**?



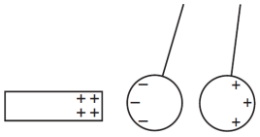
A



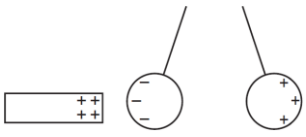
B



C



D



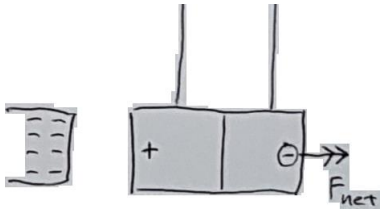
(**D**)

Why does the positive charge experience a net force to the right?

To answer this qn, it is easier to consider the case of a negative charged rod instead.

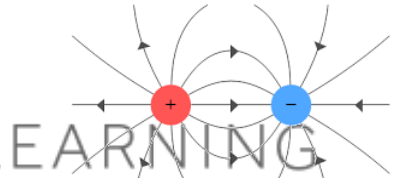
1) The negative charge experiences a repulsion force, pushing it to the right.

2) When the negative charge reaches the right end of the conductor, it still experiences the repulsion force pushing it to the right.
This repulsion force causes right conductor to be pushed to the right.



Alternatively, it can be explained by electric field.

1) Note that electric field lines are under tension. They are like stretched rubber bands pulling the two ends towards each other.
Thus, an electric field line pulls the charges at the two ends towards each other (figure on the right).



2) In figure on the right, the electric field lines on the right conductor pulls the conductor to the right.