ICSE 2025 EXAMINATION

Sample Question Paper - 4

Physics

Time: 2 hours. **Total Marks: 80**

General Instructions:

1. Answers to this paper must be written on the paper provided separately.

*2. You will **not** be allowed to write during the first **15** minutes.*
This time is to be spent in reading the question paper.

3. The time given at the head of the paper is the time allotted for writing the answers.

*4. **Section A** is compulsory. Attempt **any four** questions from **Section B**.*

5. The intended marks of questions or parts of questions are given in brackets [ ].

SECTION A (40 Marks)

Attempt *all* Questions from this Section

Question 1

(i) The pitch of a screw gauge means
a) The distance moved ahead by it in rotation of circular scale by one division.
b) The length of screw in it.
c) The thickness in it.
d) The separation between two consecutive threads on its screw

(ii) If an object is dropped from a height and it hits the ground with a velocity of 50 m/s, then its initial velocity is taken as
a) Zero
b) 50 m/s
c) -50 m/s
d) 500 m/s

(iii) If a body covers equal distances in equal intervals of time, its motion is:
a) uniform motion
b) non uniform motion
c) static
d) none of the above.

(iv) The physical quantity that remains zero for an object moving with a uniform velocity (in ideal case) is
a) momentum
b) velocity
c) external force
d) mass

(v) **Assertion:** An object can change its state by itself.
Reason: The property of an object by virtue of which it tends to retain its state of rest or of motion, is called inertia.
a) Both A and R are true and R is the correct explanation of A
b) Both A and R are true and R is not the correct explanation of A
c) Assertion is false but reason is true.
d) Assertion is true reason is false.

(vi) Calculate the mass of air in a room of dimensions 4.5 m × 3.5 m × 2.5 m if the density of air at N.T.P is 1.3 kgm^{-3}.
a) 51.19 kg
b) 0.03 kg
c) 31.29 kg
d) 50 kg

(vii) Food chains generally consist of only three or four step. Why?
a) Only four trophic levels can be formed.
b) All organisms are covered in these steps
c) Very little usable energy is left after fourth step
d) The food chain will break down

(viii) What will be the angle of reflection if light rays fall normally on a reflecting surface?
a) -180°
b) 180°
c) 90°
d) 0°

(ix) Which one of the following correctly defines the amplitude of a wave:
a) The distance the wave moves in one second.
b) The maximum distance moved by the particles of a medium on either side of the mean position
c) The distance equal to one wavelength.
d) The distance the wave moves in one time period of the wave.

(x) An ammeter is a resistance device and it is always connected in with the circuit.
a) high, series
b) high, parallel
c) low, series
d) low, parallel

(xi) Which amongst the following is best insulator
a) paper
b) carbon
c) graphite
d) ebonite

(xii) A small magnet is suspended by a silk thread from a rigid support such that magnet can freely swing. How will it rest?

a) It will rest with its north pole towards geographic north in a perfect straight line
b) It will rest with its north pole towards geographic south, making some angle with the horizontal.
c) It will rest with its south pole towards geographic north, making some angle with the horizontal.
d) It will rest in geographic north-south direction with north pole towards geographic north, making some angle with the horizontal.

(xiii) Which of the following statement concerning magnetic field is correct?

(1) The part of a bar magnet, at which the magnetic field is the strongest, is called its pole.
(2) A magnetic field is present near a compass needle.
(3) There is no magnetic field inside a current-carrying solenoid.

a) (1) only
b) (2) only
c) (1) and (2) only
d) (2) and (3) only

(xiv) A substance floats in water, but sinks in coconut oil. The density of the substance

a) is less than the density of water and equal to the density of oil
b) is greater than the density of oil and equal to the density of water
c) is less than the density of water and greater than the density of oil
d) cannot be decided based on the given information

(xv) The expression for the magnification of a spherical mirror in terms of focal length (f) and the distance of the object from the mirror (u) is:

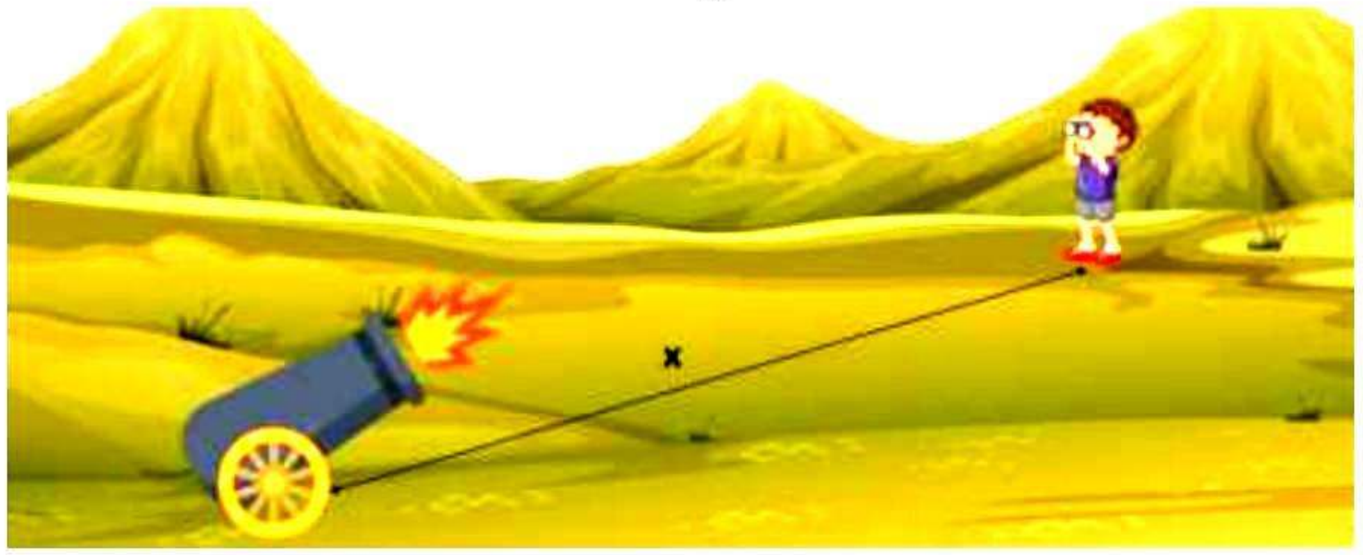
a) -f/(u-f)
b) f (u + f)
c) -f/ (u + f)
d) f/ (u - f)

Question 2

(i) Complete the following by choosing the correct answers from the bracket: [6]

a) _____ [Watt/Newton meter^2/Joule] is the unit of power.
b) SONAR stands for _____.
c) _____ are obtained on plotting the field line of the magnetic field of a magnet.
d) The length of a seconds pendulum where g = 9.8 m/s^2 is nearly _____ [1 m/10 m/1 cm].
e) Sound is a _____ wave and it travels through _____.

(ii) During a military drill Raju saw a cannon fired at some distance, he noticed that the sound was heard after 10 seconds after seeing the flash.



Assume the speed of sound in air 320 m/s and x is the distance between the body and cannon.

a) Why do we see flash of cannon fire before hearing its sound?
b) Compared to the speed of sound how fast does light travel in the air? [2]

(iii) It is said that "virtual image cannot be caught on a screen." Yet, when we are seeing a virtual image, we are obviously bringing it onto the screen i.e., the retina of our eyes. Is the said statement wrong? [2]

(iv) What is the difference between the virtual images produced by [2]

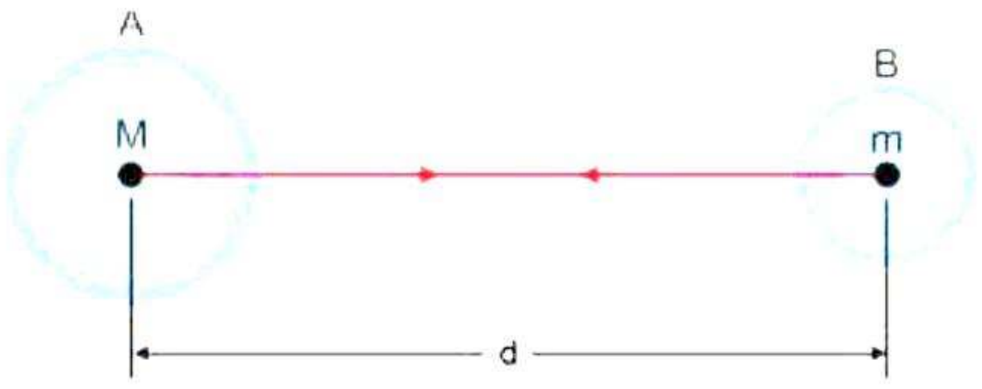
a) plane mirror
b) concave mirror
c) convex mirror

Question 3

(i) Give one example of each of the following forces which [3]

a) Attract
b) squeeze
c) Stretch

(ii) Let two objects A and B of masses M and m lie at a distance 'd' from each other. Let the force of attraction between two objects be F.



According to the universal gravitational law, what will be the force between two objects? Give equation. [2]

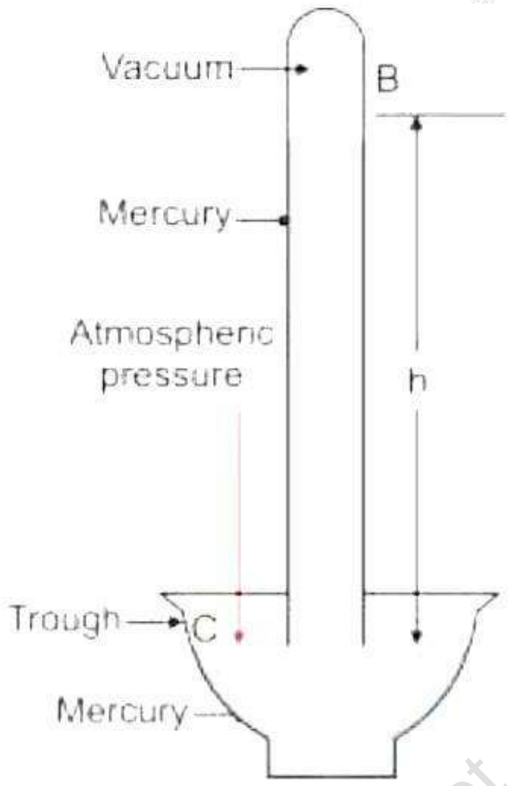
(iii) Why one cannot suck lemonade on the surface of the moon with a soda straw? [2]

(iv) State the use of graph in physics. [2]

(v) A boy throws a ball vertically upwards. It rises to a height 'h' and then returns to the point from where it was thrown. What is the total distance moved by the ball? Also, find its displacement. [2]

(vi) On what factors does the time period of a simple pendulum depend? [2]

(vii) Observe the below image and answer the following questions based on it.



(a) What does the above diagram represent? What is it used for?

(b) What is the empty space above the empty column called? [2]

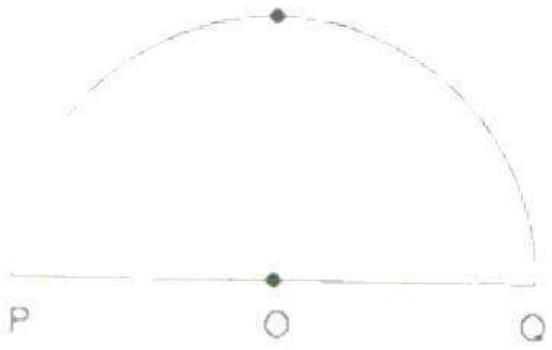
SECTION B (40 Marks)

Attempt *any four* Questions from this Section

Question 4

(i) The focal length of a convex lens obtained by six students is 38.3 cm, 37.8 cm, 38.0 cm, 37.9 cm, 38.1 cm, and 37.2 cm. Express the mean focal length of the convex lens up to one place of the decimal. [3]

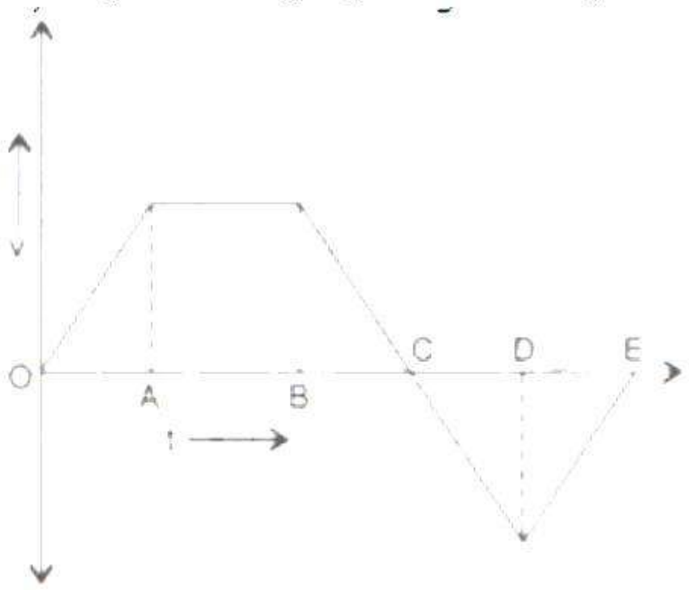
(ii) A particle moves from P to Q. Find the ratio of the distance to the displacement of the particle. [3]



(iii) What do you mean by order of magnitude? A person takes 15 breaths per minute. Find the order of magnitude of number of breaths taken by him in his life, if the person survives for 70 years. [4]

Question 5

(i) Velocity - time graph of a body is shown in the figure. [4]



Locate the time intervals during which the body moves with

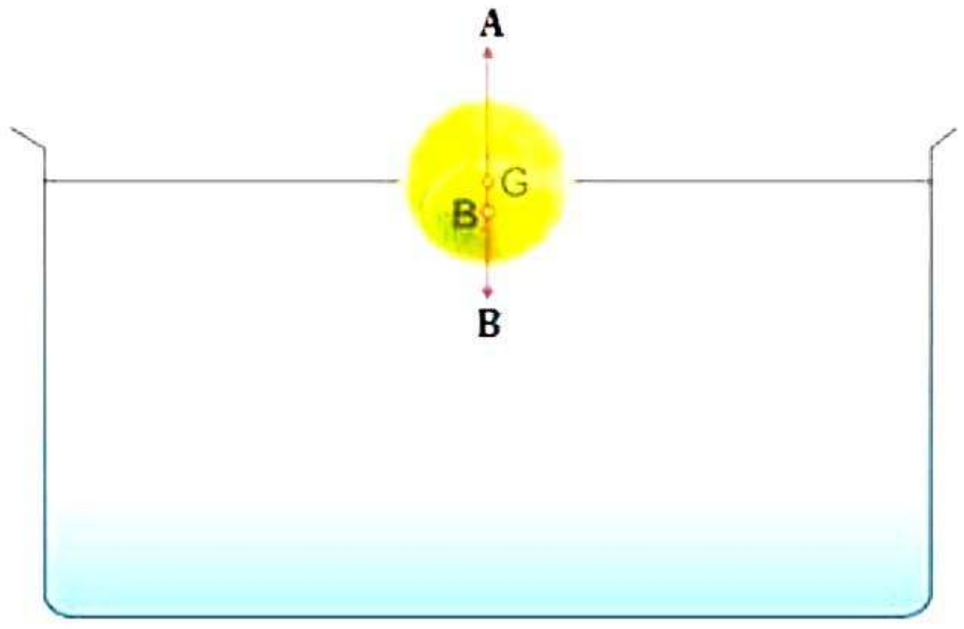
i. Acceleration
ii. Retardation
iii. Uniform velocity
iv. Positive velocity
v. Negative velocity.

(ii) What do you mean by acceleration due to gravity? What is its value in SI and CGS units?[3]

(iii) From the top of a building, a ball is dropped, while another is thrown horizontally, at the same time. Which ball will hit the ground first? [3]

Question 6

(i) A and B are the forces acting on a body floating in water with its some part submerged.



(a) Name these forces (A and B) which are acting on the object.

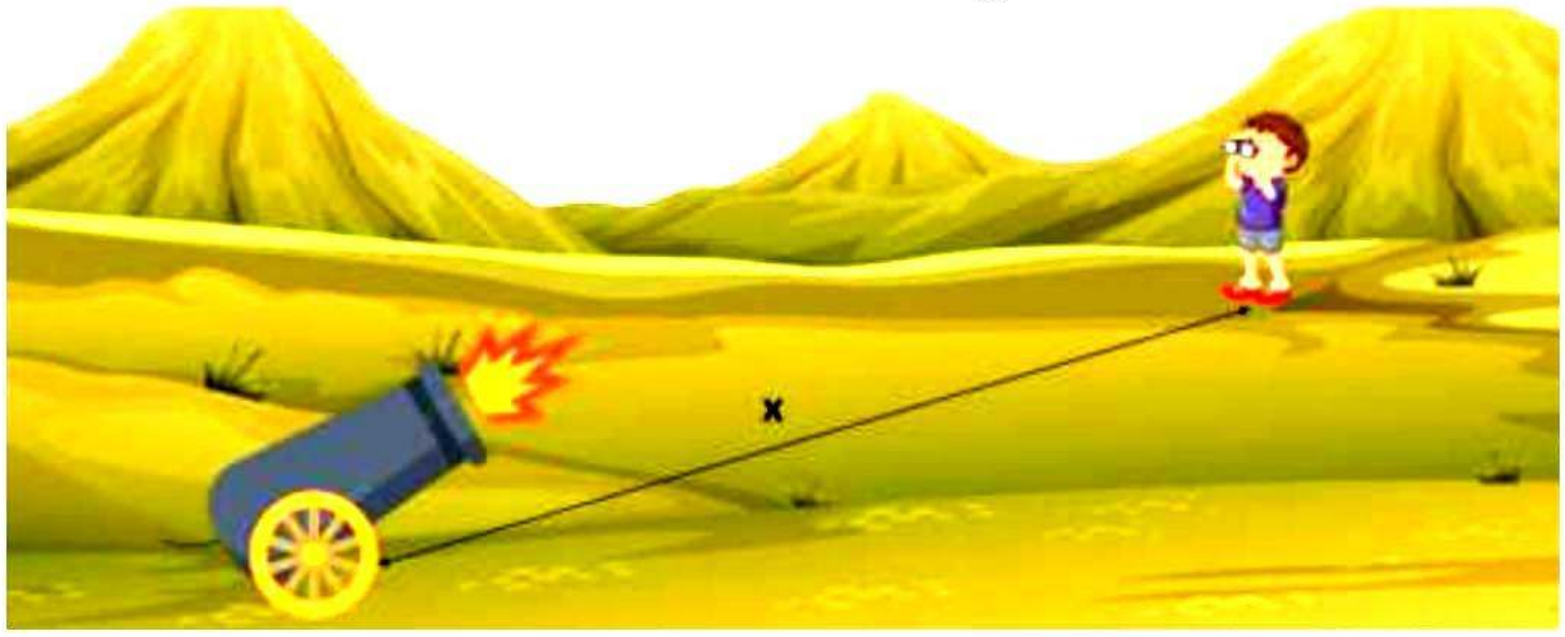
(b) How will the weight of water be displaced by the floating body related to the weight of the body itself? [3]

(ii) By drawing a ray diagram, show why shaving mirrors are concave while rear view mirrors are convex. [3]

(iii) Why are forests considered as one of the most important carbon dioxide sinks? [4]

Question 7

(i) During a military drill Raju saw a cannon fired at some distance, he noticed that the sound was heard after 10 seconds after seeing the flash.



Assume the speed of sound in air 320 m/s and x is the distance between the body and cannon. [4]

a) Why do we see flash of cannon fire before hearing its sound?
b) Compared to the speed of sound how fast does light travel in the air?
c) Find the distance x for the given case.
d) Will there be difference in speed of sound if cannon is fired during day and night? When will sound travel fastest through air?

(Assume that temperature during day is 40° C and night is 25° C)

(ii) Why are mud houses with thatched roofs more comfortable than concrete houses? [3]

(iii) Complete the following: [3]

(i) $l_t = l_o(.....)$ (ii) $\alpha = ...\beta$ (iii) $\gamma = ...\alpha$

Question 8

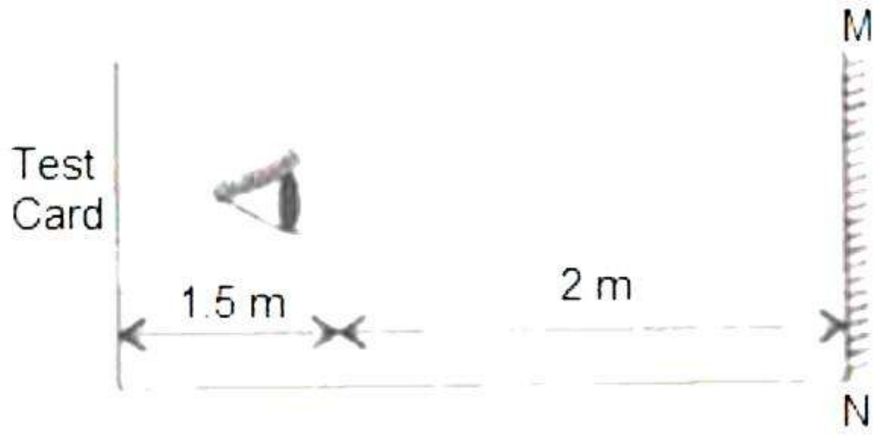
(i) Why does the interior of a car become too hot when parked in the sun as compared to the temperature outside? [3]

(ii) Define the terms: [3]

i. Mechanical waves
ii. Electromagnetic waves
iii. Sound waves.

(iii) [4]

i. A test card of an optician is situated 1.5 m behind the eyes of a patient who is looking through a plane mirror 2 m away from him. What is the distance between him and the image of the test card?



ii. Define the terms: (1) Principal axis (2) Focus.

Question 9

(i) Two metal spheres A and B are suspended from two silk threads and a positively charged glass rod is held near A. [3]

i. Describe what you will observe.

ii. What charges are obtained on A and B?

iii. Explain the appearance of charges on the basis of electron movement.

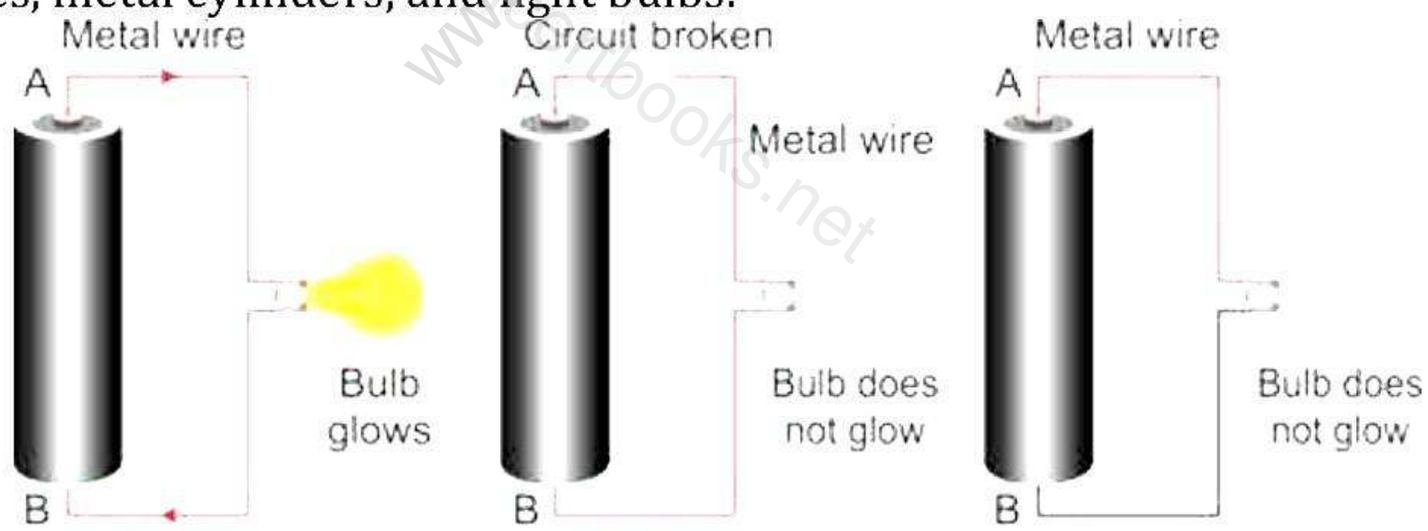
(ii) [3]

i. What does the voltage of a battery cell tell us about the electric charge on the terminals of the battery?

ii. From which terminal do electrons leave, to flow through the wire?

iii. In what direction, does the conventional current flow through the wire?

(iii) Three students, Rohan, Aryan and Riya, are conducting an experiment in their science class to learn about electric circuits. They have set up three different circuits using metal wires, metal cylinders, and light bulbs. [4]



In the first setup, Rohan has created a complete circuit and the light bulb is glowing. In the second setup, Aryan has created a broken circuit and the light bulb is not glowing. In the third setup, Riya has used a thread instead of a metal wire to connect the two metal cylinders, so the circuit is incomplete, and the light bulb is not glowing.

a) What is the difference between a complete circuit and an incomplete circuit?

b) Why does the light bulb glow in Rohan's setup but not in Aryan's or Riya's setups?

c) What is the role of the metal wire in completing the circuit?

d) Distinguish between a closed circuit and an open circuit, with the use of suitable labelled diagrams.

Solution

SECTION A

Solution 1

(i) Correct option – d) The separation between two consecutive threads on its screw

The pitch is the separation between two consecutive threads of the screw and is equal to the linear distance moved by the screw along its axis in one complete rotation

(ii) Correct option – a) zero

When an object is dropped from some height its initial velocity is taken as zero

(iii) Correct option – a) uniform motion

If a body covers equal distance in equal interval of time, then its motion is called uniform motion

(iv) Correct option – c) external force

When the external force is zero a body continues to move with a uniform velocity.

(v) Correct option – c) Assertion is false, but reason is true.

The assertion is false because an object cannot change its state without the application of an external force as explained by Newton's first law of motion. The reason is correct because inertia is a property of an object that causes it to retain its state of rest or motion.

Hence assertion is false, but reason is true.

(vi) Correct option – a) 51.19 kg

Mass = Volume × Density

= (4.5 × 3.5 × 2.5) × 1.3 =51.19 kg

(vii) Correct option c) - Very little usable energy is left after fourth step

Plants are able to trap only 1% of energy when sunlight falls on them as the amount of usable energy is quite low and also 10% of it is available to pass on further (next trophic level).

(viii) Correct option -d) 0°

The angle of incidence is the angle between the incident ray and the normal. For light incident normal on the reflecting surface the angle of incidence is zero. According to the law of reflection, the angle of incidence is always equal to the angle of reflection. Thus, the angle of reflection is also zero.

(ix) Correct option – b) The maximum distance moved by the particles of a medium on either side of the mean position

The amplitude of a wave is the maximum distance moved by the particles of a medium on either side of the mean position. The loudness or softness of a sound is determined by its amplitude.

(x) Correct option – c) low, series
An ammeter is a low resistance device and it is always connected in series with the circuit.

(xi) Correct option – d) ebonite
Ebonite is the best insulator out of the above.

(xii) Correct option – d) It will rest in geographic north-south direction with north pole towards geographic north, making some angle with the horizontal
It will rest in geographic north-south direction with north pole towards the geographic north making same angle with the horizontal

(xiii) Correct option – a) (1) only
The magnetic field strength of a bar magnet is maximum at its poles.

(xiv) Correct option – c) is less than the density of water and greater than the density of oil
A substance floats in water because its density is less than the density of water. The substance sinks in coconut oil because its density is greater than the density of oil.

(xv) Correct option- a) -f/(u-f)
Magnification, m= - v/u
Mirror formula is 1/f =1/v + 1/u
or 1/v= 1/f - 1/u or
v = uf/ (u-f)
Therefore m = - v/u = - f/(u-f)

Solution 2

(i)

a) **Watt** is the unit of power.
b) SONAR stands for, **sound Navigation and Ranging.**
c) **Neutral points** are obtained on plotting the field lines of a magnet.
d) The length of a seconds pendulum where g = 9.8 m/s^2 is nearly **1m.**
e) Sound is a **mechanical** wave and it travels through **any material medium.**

(ii)

a) Speed of light (3×10^8 m/s) is far greater than speed of sound (320 m/s), hence we see flash before hearing cannon fire.
b) Light travels in the air, about a million times faster than sound.

(iii) Both forces will be equal in magnitude but opposite in direction as gravitational force between two bodies is a mutual force.

(iv)

a) In a plane mirror, virtual image is of the same size as the object.
b) In a concave mirror, the virtual image is magnified.
c) In a convex mirror, the virtual image is always diminished in size.

Solution 3

(i)

a) A magnet attracts iron nails.

b) Squeezing of a toothpaste tube.

c) Stretching of a spring.

(ii) According to the universal law of gravitation, the force between two objects is directly proportional to the product of their masses and the force is also inversely proportional to the square of the distance between them.

$$F = G\frac{Mm}{d^2}$$

Here, G is the constant of proportionality and is known as universal constant of gravitation.

(iii) On the surface of earth, when lemonade is sucked with a soda straw, the pressure falls within the straw and the outside atmospheric pressure forces the lemonade up the straw. However, on the surface of the moon, there is no atmospheric pressure and hence, lemonade cannot be sucked with a soda straw.

(iv) Graph is useful in physics for finding and confirming the relationship between different variables e.g., stretching of a piece of metal wire and the load applied to it.

(v) Total distance moved by the ball = Actual length of the path covered

= h +h = 2h.

Displacement of the ball = Shortest distance between its final and initial positions

= 0

(vi) The time period of a simple pendulum is

a) directly proportional to the square root of its length (l), i.e., $T \propto \sqrt{l}$.

b) inversely proportional to the square root of acceleration due to gravity (g), i.e., T $\propto \frac{1}{\sqrt{g}}$

(vii)

a) The diagram represents simple barometer. A barometer is an instrument which is used to measure the atmospheric pressure.

b) The empty space above the mercury column is called the 'Torricellian vacuum'.

SECTION B

Solution 4

(i) Mean focal length $= \frac{(38.3 + 37.8 + 38.0 + 37.9 + 38.1 + 37.2)}{6} = 37.9$ cm

(ii) Distance = Circumference of the semi-circular path = $\pi \times r$

Displacement = Twice of radius = $2 \times r$

Ratio of distance to displacement of the particle = $\frac{\pi \times r}{2 \times r} = \frac{\pi}{2}$

(iii) Order of magnitude of a physical quantity is its magnitude in powers of ten when that physical quantity is expressed in powers of ten with one digit to the left of the decimal.

70 years = $70 \times 365 \times 24 \times 60 = 36792000$ min

No. of breaths per minute = 15

No. of breaths in 70 years = 36792000 x 15

$= 551880000 = 5.5 \times 10^8$

Since 5.5 > 3.2, the order of magnitude is 10^9.

Solution 5

(i)

a) Acceleration is shown by time interval OA and DE.
b) Retardation is shown by time interval BC and CD.
c) Uniform velocity is shown by time interval AB.
d) Positive velocity is shown by time interval OC.
e) Negative velocity is shown by time interval CE.

(ii) Acceleration due to gravity is the constant acceleration produced in a body when it falls freely under the effect of gravity alone. Its value in SI unit is 9.8 m/s^2 and in CGS unit is 980 cm/s^2.

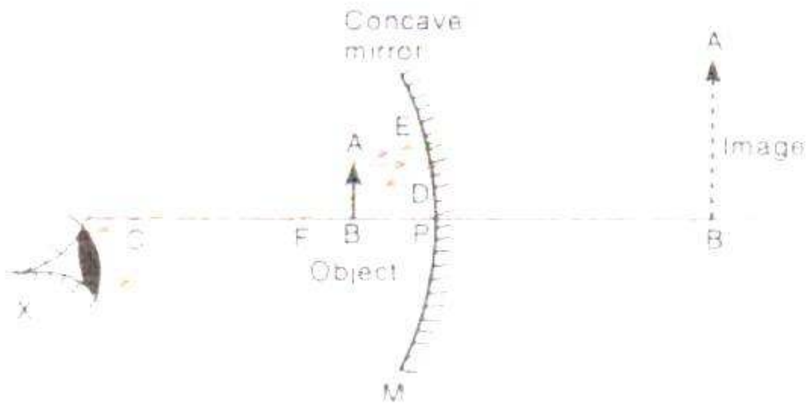
(iii) Both the balls will take the same time to hit the ground, because the vertical distance travelled by them is the same. The initial velocity in vertical direction for both of them is same i.e. 0. So, the time taken to reach the ground will be the same as both of them have the same acceleration 'g' in the vertical direction.

Solution 6

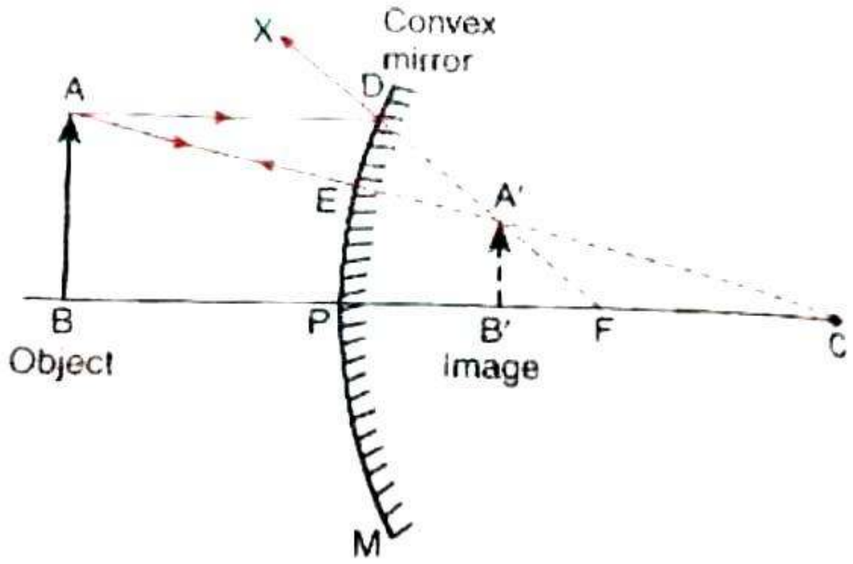
(i)

(a) The forces acting are as listed below:
(i) Weight of the body acting downwards.
(ii) Upthrust due to water acting upwards.
(b) Weight of water displaced by the floating body = Weight of the body

(ii) Concave mirrors are used as shaving mirrors. This is because when the face is placed close to a concave mirror (so that, the face is within its focus); the concave mirror produces a magnified and erect image of the face. Since a large image of the face is seen in the concave mirror, it becomes easier to make a smooth shave.



Convex mirrors are used as rear-view mirrors because they always produce an erect image of the object and have a wider field of view.



(iii) Forests are considered as the most important carbon dioxide sinks because the trees in the forests take up carbon dioxide and convert it into oxygen; thus, reducing the amount of carbon dioxide in the atmosphere and bringing them under control. This helps in maintaining the Earth's temperature within a limit and prevents the greenhouse gas from damaging the environment.

Solution 7

(i)

a) Speed of light (3×10^8 m/s) is far greater than speed of sound (320 m/s), hence we see flash before hearing cannon fire.

b) Light travels in the air, about a million times faster than sound.

c) Given that,
Speed of sound, v = 320 m/s
Time, t = 10 sec
Distance, x =?
Now,
$Speed\ (v) = \frac{Distance\ (x)}{Time\ (t)} \Rightarrow x = 320 \times 10 = 3200\ or\ 3.2\ km$

d) The speed of sound increases by 0.61 m s^{-1} for each 1°C rise in temperature. Hence the speed of sound will be greater during the time of day compared to night.

(ii) Mud is a bad conductor of heat and so is the air trapped in the thatch of the roof. Thus, in summer, the heat from outside does not flow in and, hence, it keeps the inner side cool. Conversely, in winter, the heat from within does not flow out and it keeps the interior warm.
The concrete houses are somewhat more conducting than mud houses. Thus, the heat in summer flows in and makes it hot inside. Conversely, the heat from within flows out in winter and keeps it cool.

(iii)

i. $l_t = l_o (1 + \alpha T)$
   Where, T is the temperature and α is the coefficient of linear expansion.
ii. $\alpha = ½ \beta$
iii. $\gamma = 3 \alpha$

Solution 8

(i) Interior of a car becomes hot after being parked in the sun because the heat entering the car through the windows, after reflection, cannot escape back due to greenhouse effect.

(ii)

a) Mechanical wave is a wave that needs a medium to travel. The oscillating material does not move from its initial equilibrium position, as only the energy is transferred by connected particles.
b) Electromagnetic wave is a wave of energy having a frequency within the electromagnetic spectrum and propagates as periodic oscillation of electric and magnetic fields perpendicular to each other.
c) Sound is a mechanical wave that is an oscillation of pressure transmitted through solid, liquid, or gas.

(iii)

a) Distance of image from the mirror = Distance of object from the mirror = 3.5 m
b) The patient is sitting 2 m away from the mirror; so, the distance of the image from the patient = 2 + 3.5 = 5.5 m
c)

1. Principal axis - It is an imaginary straight line passing through the centre of curvatures of a spherical mirror.
2. Focus is the point on the principal axis where all the rays travelling parallel to the principal axis, after reflection from the mirror, converge or appear to converge.

Solution 9

(i)

a) Negative charge is induced in the near end of A; so, there will be attraction. A will be attracted towards the rod.
b) Negative on A and positive on B.
c) Due to attraction of the positive charge of the rod, electrons move towards A. So, there will be positive charge on B owing to the deficiency of electrons and negative charge on A owing to excess of electrons.

(ii)

a) Voltage of a battery cell tells us about the difference of static charge available on the two terminals of a battery cell.
b) Electrons leave from the negative terminal of the battery.
c) The conventional current flows from the positive terminal to the negative terminal of the battery.

(iii)

a) A complete circuit is a closed loop of conductive material that allows electric current to flow through it, while an incomplete circuit is an open loop that does not allow electric current to flow.
b) The light bulb glows in Rohan's setup because he has created a complete circuit, which allows electric current to flow through the metal wire, metal cylinders, and light bulb, causing the bulb to glow. Whereas in Aryan's setup, the circuit is broken, so no electric current can flow, and the light bulb does not glow. And finally in Riya's setup, the thread is not a conductor, so it does not allow electric current to flow, and the circuit is incomplete, causing the light bulb to not glow.
c) The metal wire plays a crucial role in completing the circuit by providing a conductive path for electric current to flow between the two metal cylinders. Without the metal wire, there would be no closed loop for electric current to flow and the circuit would be incomplete.
d) A circuit is said to be closed when every part of it is made of a conductor and on plugging in the key or on being complete, current flows through the circuit.
A circuit is said to be open when no current flows through it. It can happen when the key is not plugged in or when any one of its components is not made of a conductor or when the circuit is broken.