# ICSE Board
Class IX Physics
Paper – 1 Solution

SECTION I

Answer 1

(a) One day = (24 x 60 x 60) s

= 86400 s = 8600000 ms = 8.64 x 10^7 ms

(b) Passengers' cabins in an aircraft are pressurized because as it suddenly gains height, pressure outside falls rapidly as compared to the pressure of dissolved oxygen in the blood. The difference in pressure may burst the fine capillaries within the nose causing it to bleed. This is why the passengers' cabins in an aeroplane are pressurized.

(c) A straight line graph shows that the changes in the values of the quantities represented on both the axes are proportional to each other; e.g. in case of simple pendulum l vs T^2 is a straight line graph which means that $l \propto T^2$ or l/T^2 is constant.

(d)
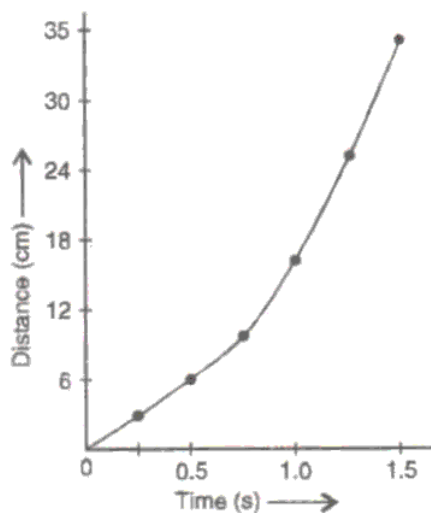
(e) m = 10 g = 0.01 kg

Weight, W = mg = 0.01 kg × 9.8 m/s^2

= 0.098 N (in downward direction)

Reaction force, R = 0.098 N (in upward direction)

1

Answer 2

(a) Fundamental units are independent units while derived units are obtained by the combination of fundamental units.

(b) An apple also attracts the earth with the same force that the earth exerts on the apple. However, due to the large mass of the earth, its acceleration is negligibly small. That is why, the movement of the earth towards the apple is not noticeable.

(c) An empty truck will stop first. As both are moving with the same velocity, the momentum of the empty truck will be less. On applying brakes, the change in the momentum of the empty truck will be less.

(d) Ice on the surface is a bad conductor of heat; so, it prevents the heat of water (under the layer of ice) from going out. Hence, it stops the freezing of water which is under the layer of ice.

(e) Woolen clothes have fine pores filled with air. The wool and the air both, are bad conductors of heat. Therefore, in winter, we wear woolen clothes as they check the conduction of heat from the body to the surroundings and thus, keep the body warm.
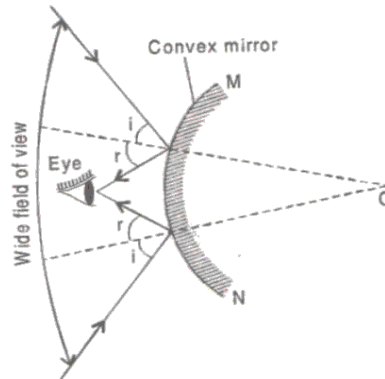
Answer 3

(a)
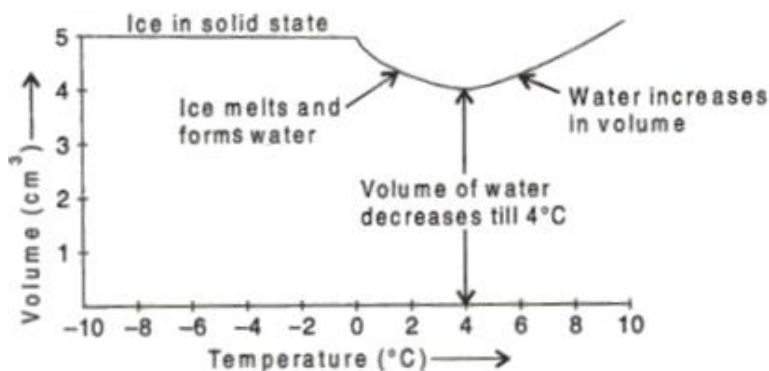
(b) The system has to be cooled. As $\alpha_{brass} > \alpha_{steel}$, the brass disc contracts more than the hole in the steel plate and hence, gets loose.

(c) Convex mirror forms the image of a wider region

(d) A plane mirror and a convex mirror can produce a real image if the object is virtual, i.e. the rays converging to a point behind a plane or convex mirror are reflected to a point in front of another mirror.

(e) No, the size of the mirror does not affect the nature of the image.

Answer 4

(a) All the mechanical waves require a medium which has the property of elasticity and inertia.

(b)
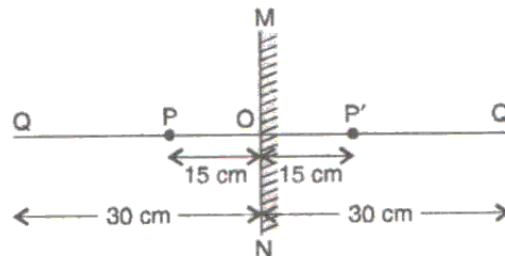
From the figure, distance between object P and image of Q, i.e. Q' = OP + OQ'
= 15 cm + 30 cm
= 45 cm.

(c) 15 Hz and 30000 Hz.

(d) By connecting the given resistances in parallel, we can obtain small resistance and by connecting them in series, we can obtain high resistance.

(e) Iron rod gets magnetised when placed near a bar magnet by magnetic induction while a copper rod does not get magnetised.

3

Answer5

(a)

i. The least count of the screw gauge $= \dfrac{\text{Pitch}}{\text{Total number of divisions on circular scale}}$

$= \dfrac{1\,\text{mm}}{50} = 0.02\,\text{mm} = 0.002\ \text{cm}$

ii. Final reading of measurement = MSR + CSR = 17 mm + 40 × 0.02 mm

= 17 mm + 0.80 = 17.8 mm.

iii. Back-lash error is the error due to the wear and tear of the threads of the screw. Owing to which, on reversing the direction of rotation of the thimble, the tip of the screw does not move in the opposite direction immediately but remains stationary for a part of the rotation.

(b)

i. It works on the principle of moments i.e. in equilibrium, the clockwise moment due to standard masses is equal to the anti-clockwise moment due to unknown mass.

ii. Physical balance (or beam balance) is used to measure the mass of a body by comparing it with a known standard mass.

iii. When the plumb line is set just above the pointer projection, the base board becomes horizontal.

iv. The role of base screws is to make the base board horizontal.

Two requirements for a good balance are:

1. Both arms must be of equal length.
2. Both pans must be of equal weight.

(c)

i. Mass of hydrogen in the balloon = Volume × Density of H_2

$= 15\ \text{m}^3 \times 0.09\ \text{kg/m}^3 = 1.35\ \text{kg}$

Mass of hydrogen and balloon = (1.35 + 7.15) kg

= 8.50 kg

ii. Mass of equipment, hydrogen and the balloon = (x + 8.5) k

iii. Volume of air displaced = 15 cm^3

∴ Mass of air displaced = Volume × Density of air displaced

$= 15\ \text{m}^3 \times 1.3\ \text{kg/m}^3 = 19.5\ \text{kg}$

iv. Mass of equipment, hydrogen and balloon = Mass of air displaced

x + 8.5 = 19.5

x = 19.5 - 8.5 = 11.0 kg

∴ Mass of equipment = 11.0 kg

Answer 6

(a) Given

$u = 5 \times 10^4$ m/s

$a = 10^{15}$ m/s²

$v = 2u = 2 \times 5 \times 10^4$ m/s $= 10^5$ m/s

t =? s =?

Applying $v = u + at$

$$t = \frac{v - u}{a} = \frac{2u - u}{a} = \frac{u}{a} = \frac{5 \times 10^4 \text{ m/s}}{10^{15} \text{ m/s}^2} = 5 \times 10^{-11} \text{s}$$

Applying $s = ut + \dfrac{1}{2}at^2$

$= (5 \times 10^4$ m/s$) \times (5 \times 10^{-11}$ s$) + 1/2 \times 10^{15}$ m/s² $\times (5 \times 10^{-11}$ s$)^2$

$= 25 \times 10^{-7}$ m $+ 12.5 \times 10^{-7}$ m

$= 37.5 \times 10^{-7}$ m $= 3.75 \times 10^{-6}$ m

(b)

i. Velocity provides the direction of motion of the body, e.g. during upward motion of a body, both the direction of motion and the velocity are in the upward direction but acceleration due to gravity is in the downward direction.

ii. Displacement of the body in 6 s = Sum of areas of portions 1, 2 and 3 of figure with proper signs

$= 4 \times 2 - 2 \times 2 + 2 \times 2 = 8$ m

Distance travelled by the body in 6 s = Sum of areas of portions 1, 2 and 3 of figure, ignoring signs

$= 4 \times 2 + 2 \times 2 + 2 \times 2 = 16$ m

(c)

i. Given, $u = 98$ m/s, $a = g = -9.8$ m/s², $v = 0$, $s = ?$, $t = ?$

Applying $v^2 = u^2 + 2as$

$0 = (98$ m/s$)^2 + 2 (-9.8$ m/s²$) \times s$

$s = \dfrac{98 \times 98}{2 \times 9.8} = 490$ m

ii. Applying $V = u + at$

$t = \dfrac{V - u}{a} = \dfrac{0 - 98}{-98} = 10\,s$

Answer 7

(a)

    i. Newton's third law of motion: To every action, there is always an equal and opposite reaction.

    ii. Wall exerts a force of 20 N towards West.

    iii.

        1. Force exerted by block on the thread will be 10 N in the downward direction.

        2. 10 N of force will be exerted by a thread on the block in the upward direction.

(b) Disadvantages of construction of large dams for generating hydroelectric power:

    i. uprooting people from their native place

    ii. disruption of plant and animal life

    iii. disruption of ecosystem.

(c) A physical balance measures the mass of the body. When a physical balance is used, it measures the same mass at the pole and at the equator, because mass is a constant. Spring balance is used to measure the weight of the body. The weight of the body will be maximum at the pole because the value of acceleration due to gravity 'g' is maximum at the pole.

Answer 8

(a) The ozone layer serves as a protective shield of the troposphere and saves the earth's surface from most of the ultraviolet solar radiations by absorbing them. Due to ozone depletion, the increased ultraviolet solar radiations would raise the temperature of the earth which would cause global warming at the regional and global levels. Excess of incoming ultraviolet radiations will cause skin cancer and diseases of the eye.

(b)

    i. It is used for keeping the hot liquid hot and the cold liquid cold, for a sufficiently long time.

    ii.
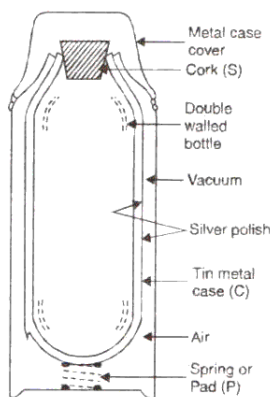
Thermos flask.

iii. The vacuum between the two walls checks the heat transfer by conduction.

iv. The outer shining surface of the inner wall prevents transfer of inner heat by radiation and the inner shining surface of outer wall reflects the heat received from the inside.

(c) The wall of an ordinary glass test tube is thick. Due to bad conductivity of glass, its different layers expand differently on plunging into hot water. Fused silica has very low expansivity; hence, different layers of fused silica test tube do not expand/contract differently. Therefore, it can be safely plunged into water even when it is red hot.

Answer 9

(a)

i. Candle flame, stars, red hot wire of heater, firefly.

ii. The room is illuminated due to diffused reflection.

iii. Black

(b)
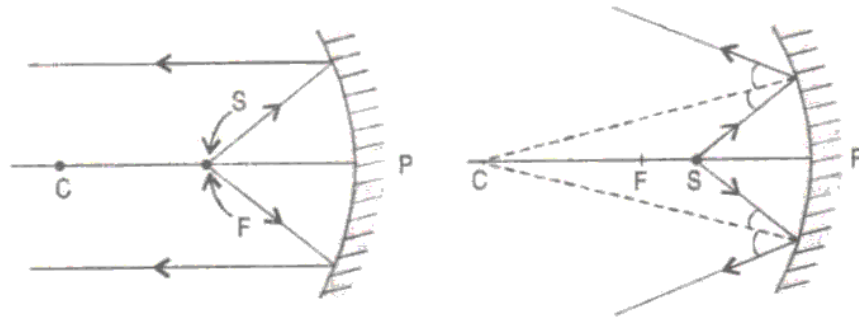
(c) $\lambda_X = 25\,m, \quad V_X = 5 \times 10^3 \ m/s$

$\lambda_y = 20\,m, \quad V_y = 4 \times 10^3 \ m/s$
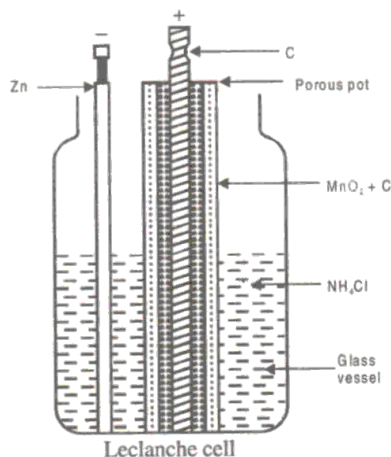
$v_X : v_y = ?$

$$\frac{v_X}{v_y} = \frac{V_X \lambda_y}{V_y \lambda_X} = \frac{5 \times 10^3 \times 20}{4 \times 10^3 \times 25} = \frac{1}{1}$$

$v_X : v_y = 1$

Answer 10

(a) Conductor B will lose charge. The reason is that there is greater concentration of electrons (since B is negatively charged) at its pointed ends.

(b)

Leclanche cell

It is not suitable for continuous use as MnO_2 being solid is a slow depolarizer. It does not oxidize hydrogen gas to water as fast as it is formed in the reaction. Therefore, if it is used for a long period, polarization starts after sometime due to deposition of excess of hydrogen on the anode which could not be converted into water. This is why, it is allowed to rest after using for sometime so that MnO_2 oxidizes the excess hydrogen to water

(c)
  i. Like poles repel and unlike poles attract each other.
 ii. The direction of the magnetic field at any point is the direction of force experienced by a north pole (hypothetical) placed at that point.
iii. The middle region of a bar magnet is unmagnetized.
 iv. Iron, Steel, Nickel, Cobalt.