ICSE 2025 EXAMINATION

Sample Question Paper - 3

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

Choose the correct answers to the questions from the given options.
(Do not copy the question, write the correct answers only.) [15]

(i) The radius of moon is 3.84×10^6 m. It's order of magnitude is
(a) 10^5
(b) 10^6
(c) 10^7
(d) 10^8

(ii) The velocity-time equation is represented by
(a) v-u= at
(b) v=at – u
(c) $v^2-u^2=2as$
(d) $s=ut+ \frac{1}{2} at^2$

(iii) In case of accelerated motion along a straight line, the distance travelled by the body is:
(a) directly proportional to square of time
(b) directly proportional to time
(c) inversely proportional to square of time
(d) inversely proportional to time

(iv) A body weighs 48 N on the surface of the Earth, its weight at the centre of the Earth will be
(a) 24 N
(b) 48 N
(c) 96 N
(d) Zero

(v) **Assertion (A):** Thrust is a scalar quantity.
Reason (R): Thrust is a force acting normally on a surface.
(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) In which direction does the buoyant force act on a body immersed in a liquid?
(a) Vertically upward
(b) Sideways towards the walls of the container
(c) Vertically downward
(d) None of the above

(vii) Which of the following pair is the one which shows abiotic: biotic component combination?
(a) Microorganism: Plant
(b) Microorganism: Human being
(c) Soil: Temperature
(d) Temperature: Microorganism

(viii) If the magnification has a positive sign, the image formed by the concave mirror must be
(a) Real and erect
(b) Real and inverted
(c) Virtual and erect
(d) Virtual and inverted

(ix) How is the current flowing in a conductor changed if the resistance of a conductor is doubled, keeping the potential difference across it the same?
(a) doubled
(b) one-fourth
(c) halved
(d) four times

(x) A bulb is connected to a cell. How is the resistance of circuit is affected if another identical bulb is connected in series with the first bulb?
(a) Resistance is doubled
(b) resistance is halved
(c) Resistance is four times.
(d) resistance is one-fourth.

(xi) The magnetism acquired by a magnetic material when it is kept near (or in contact with) a magnet, is called

(a) temporary magnetism
(b) induced magnetism
(c) permanent magnetism
(d) Induction

(xii) State the positions of neutral points when a magnet is placed with its axis in the magnetic meridian and with its north pole pointing towards geographic south.

(a) in east-west direction
(b) in west-east direction
(c) in north-south direction
(d) in south-north direction

(xiii) A solid of mass 22 kg is immersed in water. If it loses half of its weight i water, its R.D. will be

(a) 1/2
(b) 1/4
(c) 4
(d) 2

(xiv) Population growth can be controlled through

(a) Economic measure
(b) Technological measures
(c) Women empowerment and family planning
(d) Economic growth

(xv) An inverted image can be seen by using a convex mirror under what circumstances?

(a) Under no circumstances
(b) When the object is placed at infinity
(c) When the object is at a distance equal to the radius of curvature of the mirror
(d) When the distance of the object from the mirror is equal to the focal length of the mirror.

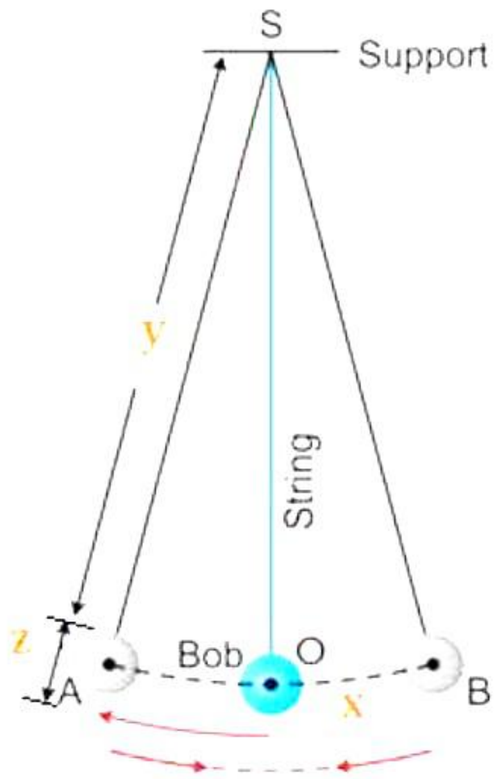
Question 3

(i)

(a) There are _____ [One/two/three] types of inertia.
(b) The slope of a straight-line graph gives the value of _____ [constant of proportionality/ Distance between x-axis and y axis/Angle of inclination].
(c) The ratio of buoyant forces experienced by a solid body when immersed in two liquids whose relative densities are 1 and 0.5 respectively is _____ [2:1/1:2/1:1].
(d) 1 ml= _____ [10^{-6} /10^{-3}/1000] m^3.

(e) The magnetic field lines of the earth are _____ [Normal/Diagonal/Vertical] to earth's surface near the magnetic poles and _____ [Perpendicular/Parallel/Horizontal] to earth's surface near the magnetic equator.

(ii)

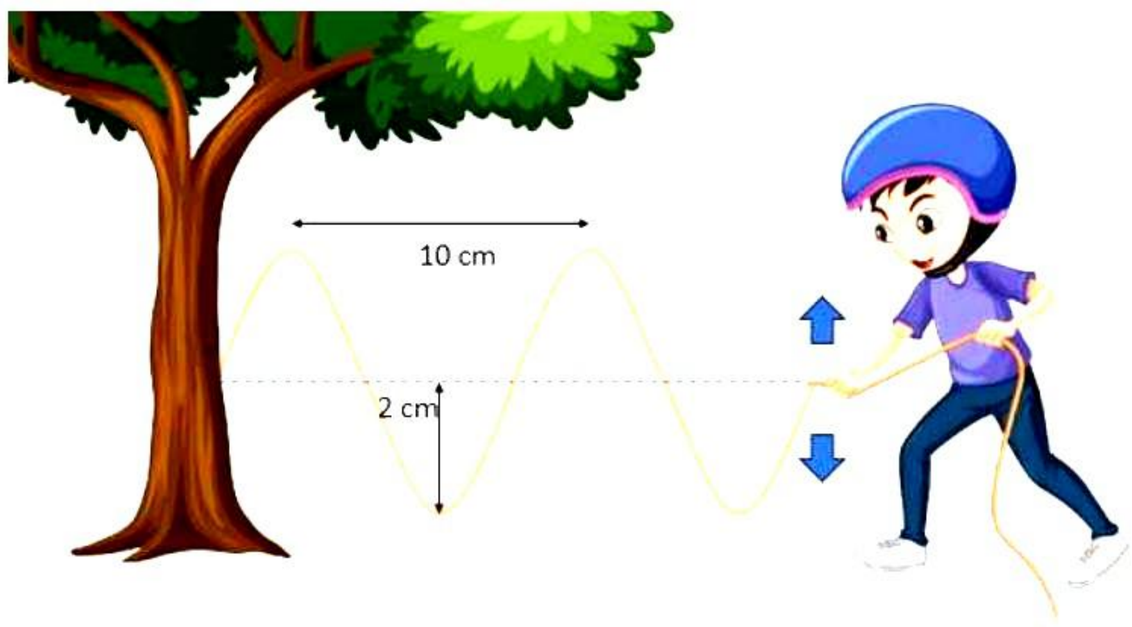


Above diagram represents a simple pendulum. A simple pendulum is a heavy point mass suspended from a rigid support by a massless and inextensible string. Answer the following questions: [2]

(a) What is the length of given simple pendulum?

(b) What is the value of amplitude of this simple pendulum?

(iii) Raghu tied a rope to a tree and started shaking it such that oscillation produce periodic waves of time period 10 seconds. [2]



Answer the following question based on the given information.

(a) Define the term amplitude of a wave. What will the maximum amplitude of wave for the given case? State it in S.I system.

(b) How is the frequency of a wave related to its time period?

Question 2

(i) [3]

(a) Express one day in milliseconds.

(b) Why are the passengers' cabins in an aeroplane pressurised?

(c) What does a straight-line graph signify?

(ii) The following table gives the distance travelled by a particle at different times.

Time (s)	0	0.25	0.5	0.75	1	1.25	1.5
Distance (cm)	0	2	5	9	16	25	36

Draw a distance-time graph representing the motion of the particle. [2]

(iii) What will be the magnitude and direction of the reaction force acting on a coin of 10 g lying on the surface of the floor? Take $g = 9.8\ m/s^2$ [2]

(iv) Distinguish between fundamental units and derived units. (Any 2 points) [2]

(v) The earth attracts an apple. Does the apple also attract the earth? If it does, why does the earth not move towards the apple? [2]

(vi) An empty truck and a loaded truck are moving with the same velocity. On applying brakes, which truck will stop first and why? [2]

(vii) In cold countries, ponds freeze only at the surface. Why? [2]

SECTION B (40 Marks)

Attempt *any four* Questions from this Section

Question 4

(i) A Vernier scale has 40 divisions and its main scale is divided in millimeters. It has an error of +0.0125 cm. While measuring the length of a cylinder, the reading on the main scale is 75 mm and the 12th Vernier scale division coincides with the main scale. Calculate the corrected length. [4]

(ii) Draw a graph between effective length 'l' and square of time period 'T^2' of a simple pendulum. How will you obtain the value of acceleration due to gravity from the graph?[3]

(iii) The mass of a block is 1.35 kg and its volume is 1.5×10^{-3} m^3. Find the density of the block. Will this block float in water? Give reason. [3]

Question 5

(i) An athlete runs around a circular track of circumference 360 m in (1/60) h and reaches the starting point. Calculate, [4]

a) The distance covered by athlete

b) The displacement

c) The average speed and

d) The average velocity.

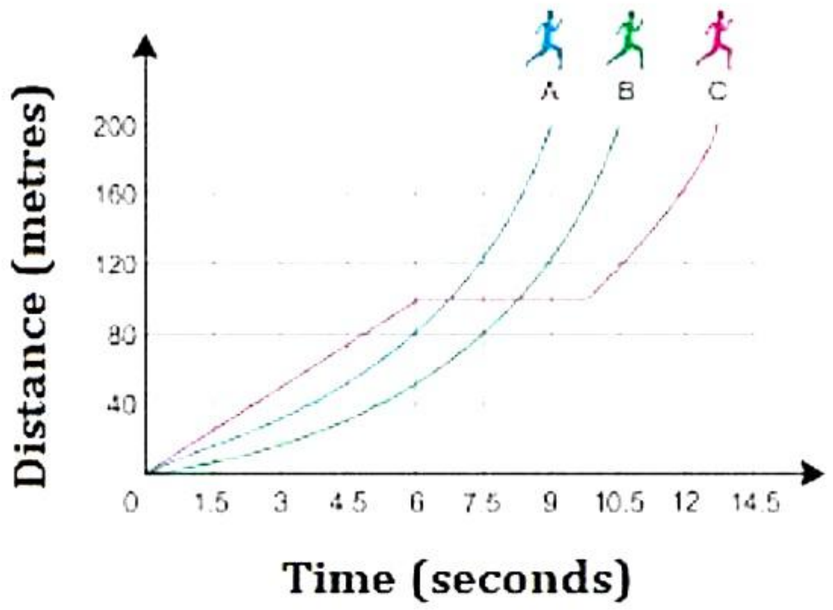
(ii) The table shows the velocity of a two-wheeler at various intervals of time. [3]

t(s)	0	5	7	10	15
V(m/s)	10	10	7	10	0

a) Plot the velocity-time graph.

b) Calculate the rate of change of velocity between 5s - 7s, 7s - 10 s and 10s - 15 s.

(iii) The graph given below shows how three runners A, B and C ran a 200-metre race. [3]



Answer the following questions:

(a) Which runner won the race?

(b) Which runner stopped for a rest and how long did he stop for?

(c) How long did the runner B take to complete the race?

Question 6

(i) Show that Newton's first law of motion can be obtained from the second law. [4]

(ii) [3]

a) The velocity of a body is continuously changing. Can its speed remain constant?

b) If the speed is changing, can the velocity of a body remain constant?

c) Is it possible for a body to have a constant speed in accelerated motion?

(iii) [3]

a) The earth attracts a ball with a force of 1 N. If this is the force of action, what would be the force of reaction and who exerts this force?

b) State two circumstances under which your weight would become zero?

Question 7

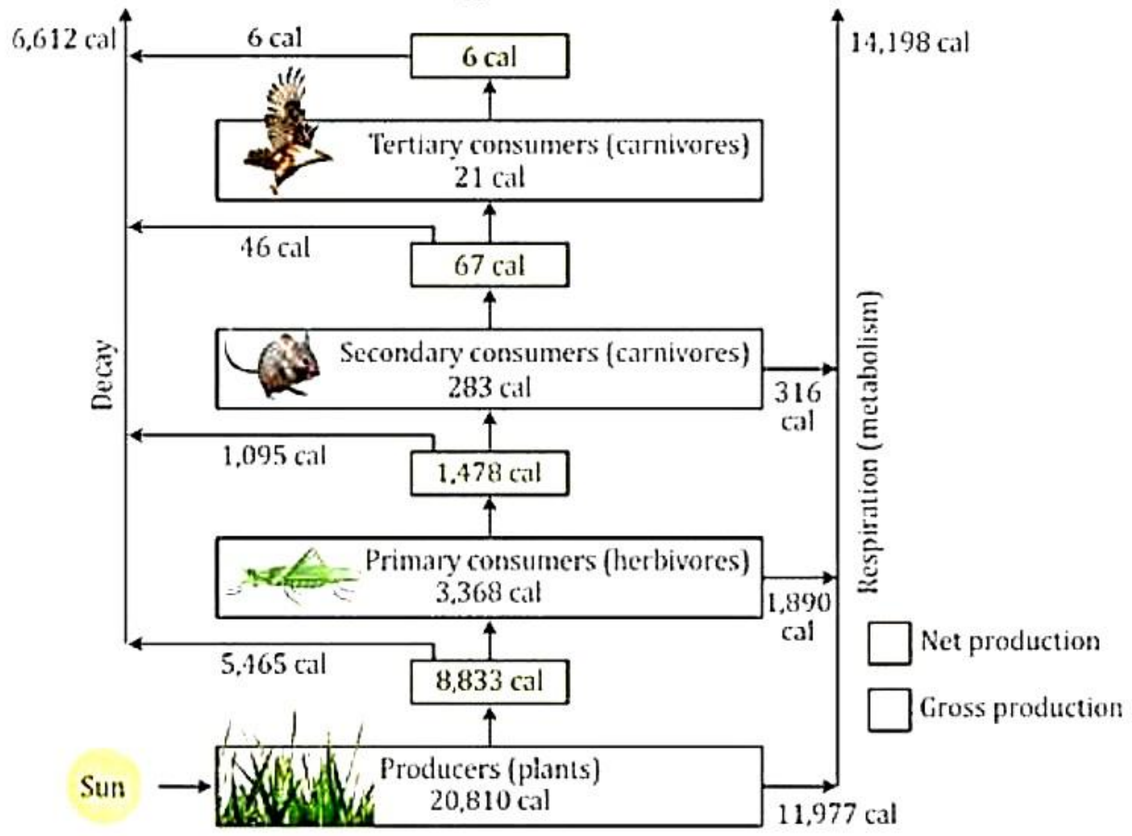
(i) [4]

a) What is second's pendulum? What is its approximate effective length?

b) A second's pendulum is set up on the surface of the moon, where acceleration due to gravity is $\frac{1}{6}$th of that of the earth. How is the time period of the pendulum affected? Give a reason in support of your answer.

(ii) Indicate on a graph how the density of water at ($0^{o}C$) changes when it is gradually heated up to $10^{o}C$. [3]

(iii) The below diagram shows that the energy flow in an ecosystem. [3]



Answer the following questions based on the given information.

a) State the law of which governs the energy flow in an ecosystem.

b) State the importance of green plants in ecosystems.

c) What is the difference between primary, secondary, and tertiary consumers? Given 2 examples of each.

Question 8

(i) The angle between the incident ray and the mirror is 30°. [3]

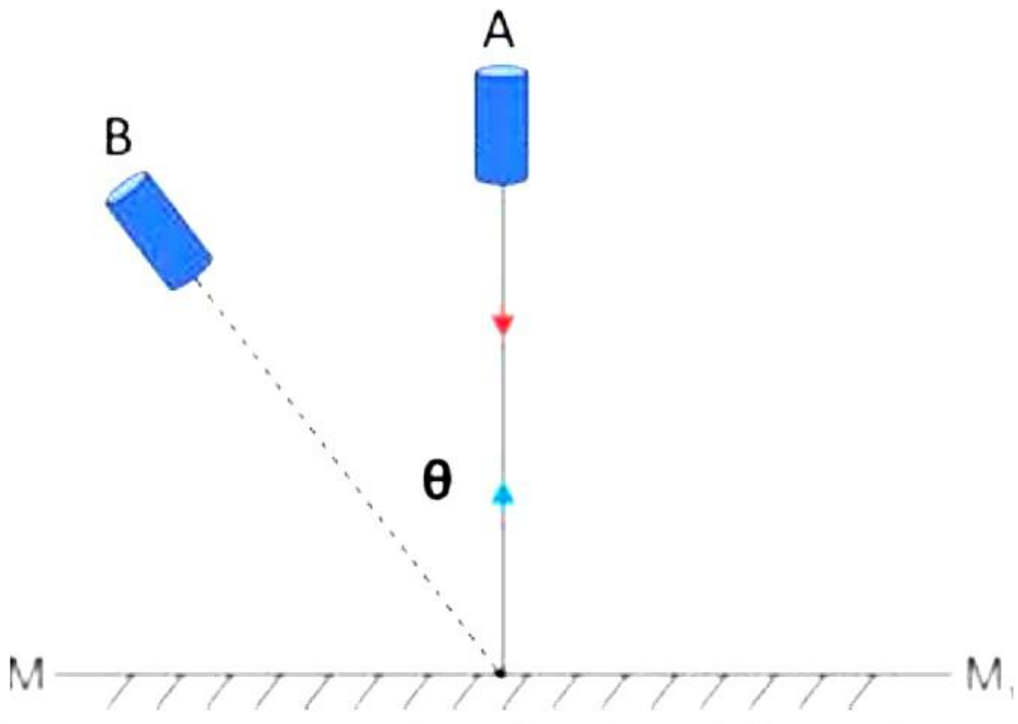
a) What is the angle of incidence?

b) What is the angle of reflection?

c) What is the total angle turned by the ray of light?

(ii) Where will the image form if the object is placed at the centre of curvature in front of the concave mirror? Also, state the nature of the image. [3]

(iii) Seema used a laser pointer and kept it normal to a plane mirror at position A as shown below, now after some time she shifted it to position B at some angle θ from its initial point.



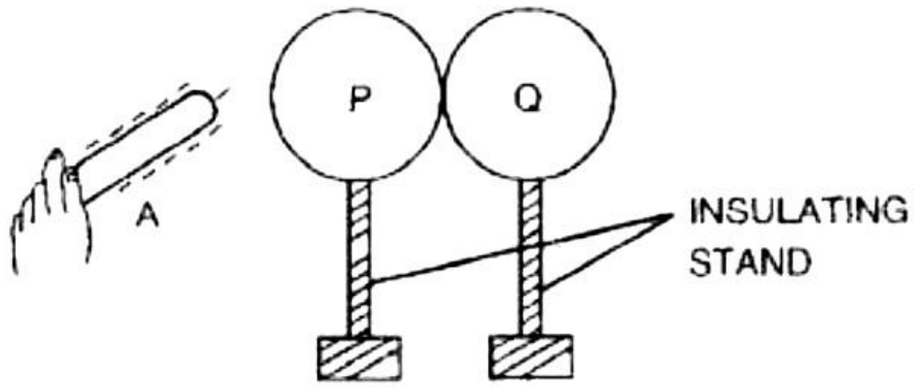
Answer the following questions based on the given information.

(i) What is its angle of incidence when the laser pointer is at point A?

(ii) Define the reflection of light.
(iii) What is the direction of the reflected ray when the laser pointer is at point A? Show it on a diagram.
(iv) What will the angle of reflection be if the value of θ is 60°? Show it on a diagram. [4]

Question 9

(i) The figure shows a negatively charged ebonite rod A which is brought near an uncharged metal sphere P touching the other uncharged metal sphere Q. Both the spheres stand on separate insulating stands. [3]

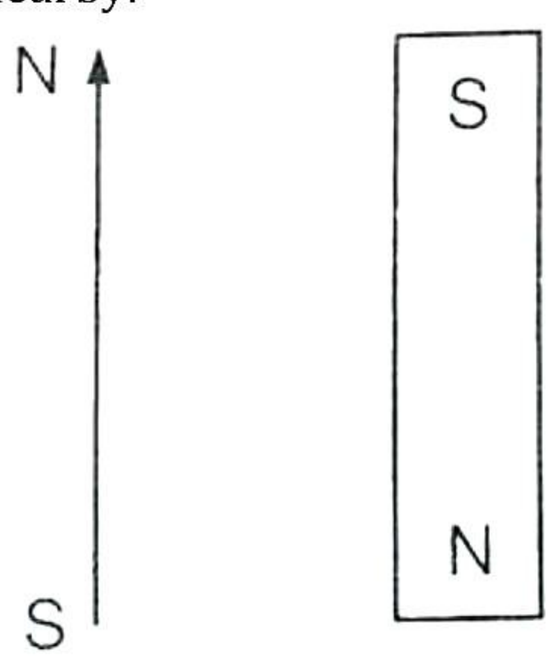


a) If keeping the rod A in position, the sphere Q is removed by holding the insulating stand of it, state the kind of charge on them and give reason to support your answer.
b) If the rod A is removed first and then the sphere Q is removed by holding the insulating stand of it, what kind of charges will be on the spheres P and Q? Explain.

(ii) [3]

a) Why will heating the magnet strongly remove its magnetism?
b) What are neutral points?

(iii) Sameer placed a bar magnet placed on the top of a flat table with its north pole pointing towards south. The arrow shows the north-south direction. There are no other magnets or magnetic materials nearby.



(i) Insert two magnetic field lines on either side of the magnet using arrowhead to show the direction of each field line.
(ii) Indicate by crosses, the likely positions of the neutral points.
(iii) What is the magnitude of the magnetic field at each neutral point? Give a reason for your answer.
(iv) Explain the method of plotting the magnetic field lines by using a small compass needle.

Solution

SECTION A

Solution 1

(i) Correct Solution – c) 10^7

Since the magnitude (3.84) is greater than 3.2. Therefore, order of magnitude will be $10^6 \times 10^1 = 10^7$

(ii) Correct Solution – a) v-u= at

The first equation of motion v=u + at of v-u=at is the equation which relates velocity and time and hence is also known as velocity-time relation

(iii) Correct Solution – a) directly proportional to square of time

In case of accelerated motion along a straight line the distance traveled by the body is directly proportional to square of time

(iv) Correct Solution – d) zero

The body will weigh zero at the centre of the earth because the acceleration due to gravity 'g' is zero there.

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

Because thrust is a normal force acting on a surface, the given reason is correct.
Whereas since force is a vector quantity, thrust will be as well.
As a result, we can conclude that the assertion is false, but the reason is correct.
Hence assertion is false, but reason is true.

(vi) Correct Solution – a) Vertically upward

When a body is immersed in a liquid, the buoyant force balances the weight of the body due to which floats This buoyant force acts in the upward direction due to which the object floats in the liquid

(vii) Correct Solution – d) Temperature: Microorganism

Temperature is an example of abiotic (non-living) component of an environment while microorganisms are treated as the biotic (living) component.

(viii) Correct Solution – c) virtual and erect

Magnification produced by a concave mirror is positive when the image is virtual and erect.

(ix) Correct Solution – c) halved

According to Ohm's law, $I = V/R$ Therefore, if R becomes twice, $I=V/2R = (½)\ I$

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

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

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

(b) Applying $V = u + at$

$t = \frac{v - u}{a} = \frac{0 - 98}{-98} = 10\ s$

Solution 6

(i)

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

(b) Wall exerts a force of 20 N towards West.

(c)

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.

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

(a) uprooting people from their native place

(b) disruption of plant and animal life

(c) disruption of ecosystem.

(iii) 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.

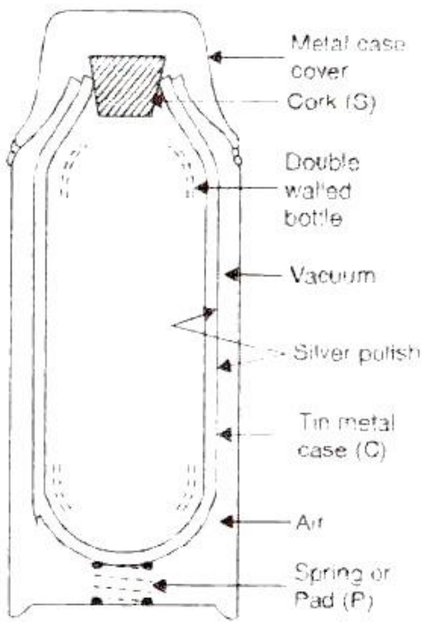
Solution 7

(i) 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.

(ii)

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

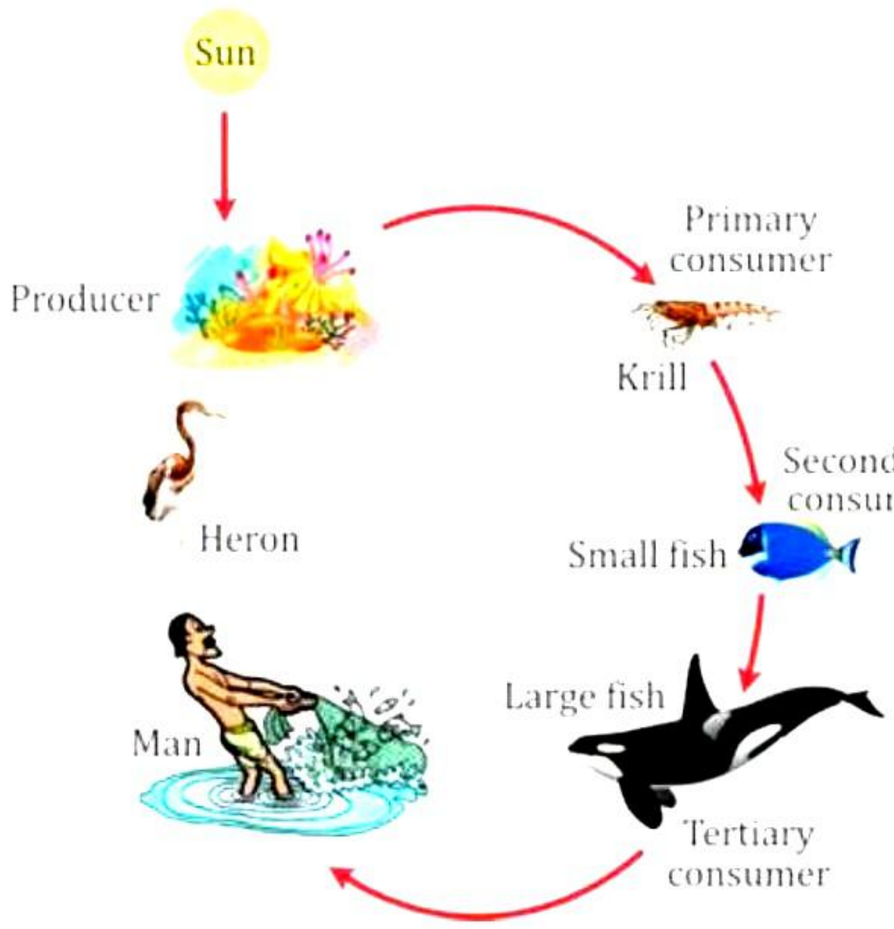
(b)



Thermos flask.

(c) The vacuum between the two walls checks the heat transfer by conduction.
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.

(iii)



Solution 8

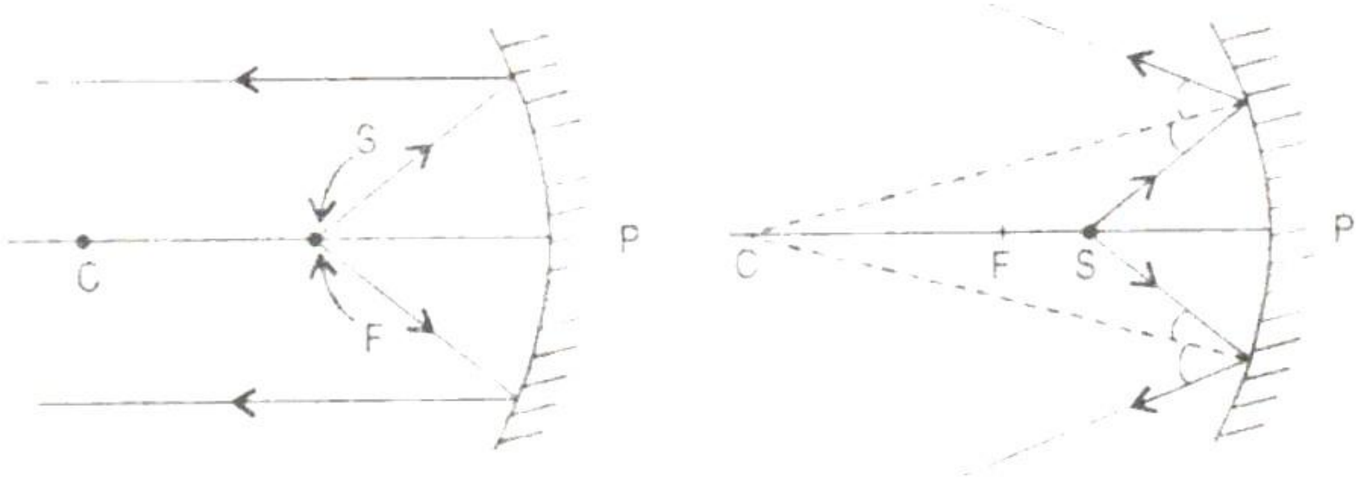
(i)

(a) Candle flame, stars, red hot wire of heater, firefly.

(b) The room is illuminated due to diffused reflection.

(c) Black

(ii)



(iii) $\lambda_X = 25\text{m},\ V_X = 5\times10^3\ \text{m/s}$

$\lambda_y = 20\text{m},\ V_y = 4\times10^3\ \text{m/s}$

$\nu_X : \nu_y = ?$

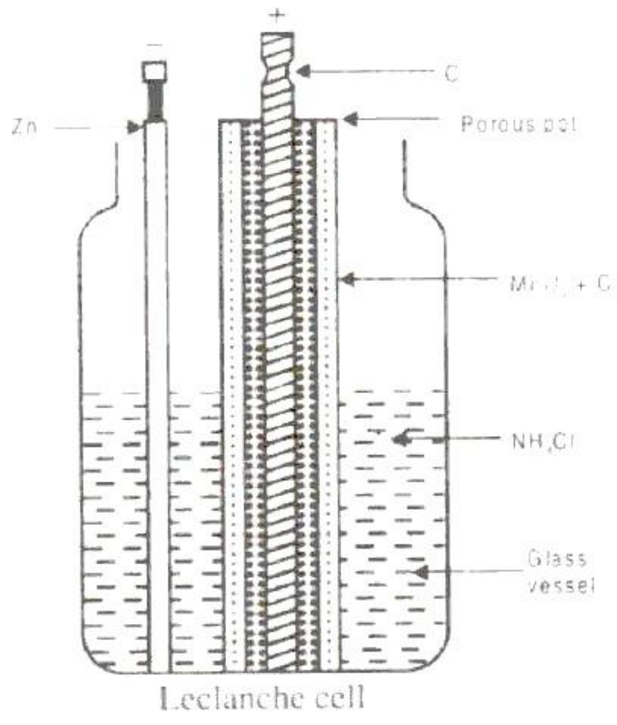
$$\frac{\nu_X}{\nu_y} = \frac{V_X\lambda_y}{V_y\lambda_X} = \frac{5\times10^3\times20}{4\times10^3\times25} = \frac{1}{1}$$

$\nu_X : \nu_y = 1$

Solution 9

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

(ii)



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 some time so that MnO_2 oxidizes the excess hydrogen to water

(iii)

(a) Like poles repel and unlike poles attract each other.

(b) The direction of the magnetic field at any point is the direction of force experienced by a north pole (hypothetical) placed at that point.

(c) The middle region of a bar magnet is unmagnetized.

(d) Iron, Steel, Nickel, Cobalt.

SECTION B

Solution 4

(i) No. of divisions on the vernier scale, n = 40

Value of one main scale division, x = 1 mm

Least count, LC = $\frac{x}{n} = \frac{1}{40} = 0.025\,\text{mm}$

Main scale reading, MSR = 75 mm

Since 12th vernier scale division coincides with the main scale division, p = 12

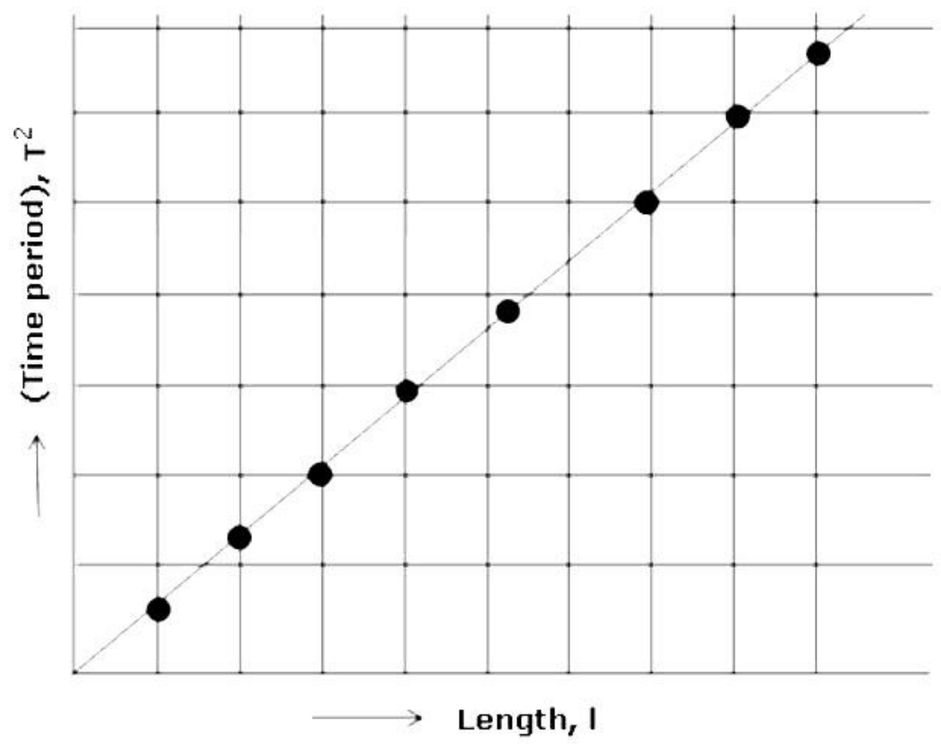
Vernier reading = p × LC = 12 × 0.025 = 0.3 mm

Total reading = MSR + Vernier reading

= 75 + 0.3 = 75.3 mm

Corrected reading = 75.3 mm - 0.125 mm = 75.175 mm

(ii) The graph between the effective length and (time period)^2 of a simple pendulum is shown in the figure given below:



The value of acceleration due to gravity can be calculated by using the following relation:

$$g = \frac{4\pi^2}{(\text{Slope of } T^2 \text{ vs } l \text{ graph})}$$

(iii)

Mass of block = 1.35 kg

Volume of the block = 1.5 × 10^{-3} m^3

$$\text{Density} = \frac{\text{mass}}{\text{volume}} = 1.35/1.5 \times 10^{-3} = 0.9 \times 10^3 = 0.9 \times 10^3 \text{kg/m}^3$$

Yes, it will float on water because it has density less than that of water (1000 kg/m^3).

Solution 5

(i)

a) Distance covered = 360 m = 0.36 km.

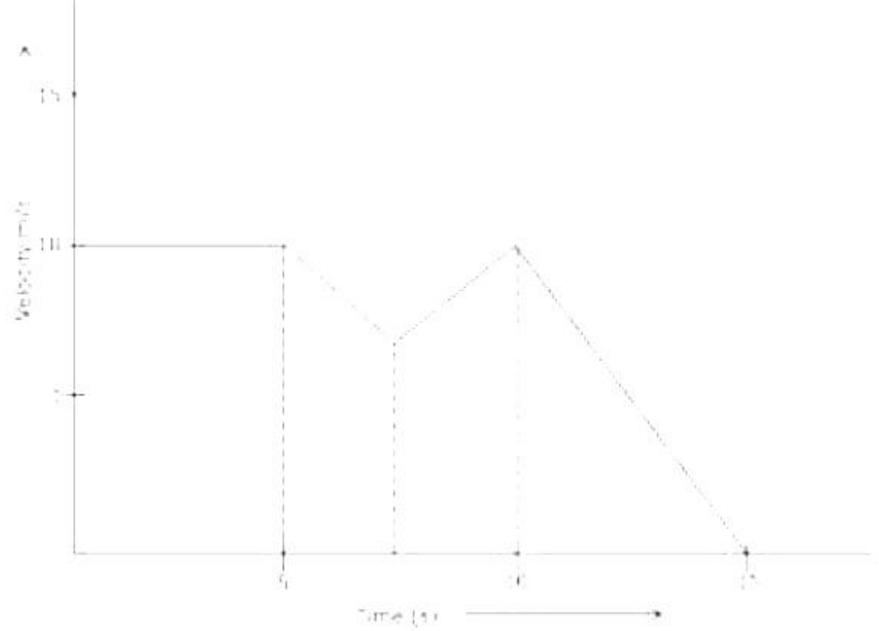
b) Displacement = 0 m; because the athlete has returned to his initial position.

c) Average speed = Total distance/time = $\frac{0.36}{1/60}$ = 21.6 km/hr.

d) Average velocity = Total displacement/time = $\frac{0}{1/60}$ = 0 km/hr.

(ii)

a) Velocity-time graph is shown in the figure below.



b) For time interval of 5 - 7 s,
Change in velocity = 7 - 10 = -3m/s
Time = 7 - 5 = 2 s
Rate in change of velocity = -3/2 = -1.5 m / s^2
For time interval 7 - 10 s,
Change in velocity = 10 - 7 = 3 m/s
Time = 10 - 7 = 3 s
Rate of change in velocity = 3/3 = 1 m/s^2
For time interval of 10 - 15 s,
Change in velocity = 0 - 10 = -10 m/s
Time = 15 - 10 = 5 s
Rate of change of velocity = -10/5 = -2m/s^2

(iii)

a) Runner A won the race. He reached 200 m in the fastest time.
b) Runner C stopped for a rest at 100 m. He stopped for 3.75 seconds.
c) Runner B finished the race in 10.5 seconds.

Solution 6

(i) Newton's first law states that a body at rest or in uniform motion continues to be in its state of rest or motion unless an unbalanced force acts upon it.
According to Newton's second law, the rate of change of momentum produced in body is directly proportional to the net external force applied on it, i.e.

$$F = \frac{k(v-u)}{t}$$

where k is the constant of proportionality,
F is the net force applied
v is the final velocity
u is the initial velocity
t is the time
If no force acts on a body,

$$0 = \frac{k(v-u)}{t}$$

v = u
This means that in the absence of an applied force, a body continues in its previous state of rest or motion.

(ii)

a) Yes, for example, in uniform circular motion, speed is constant but the direction of motion and hence, the velocity keeps on changing continuously.
b) No, this is not possible.
c) Yes, it is possible if the body is moving uniformly on a circular path. In such a motion, speed remains constant, but the motion is accelerated due to change in the velocity because of the change in the direction of motion.

(iii)

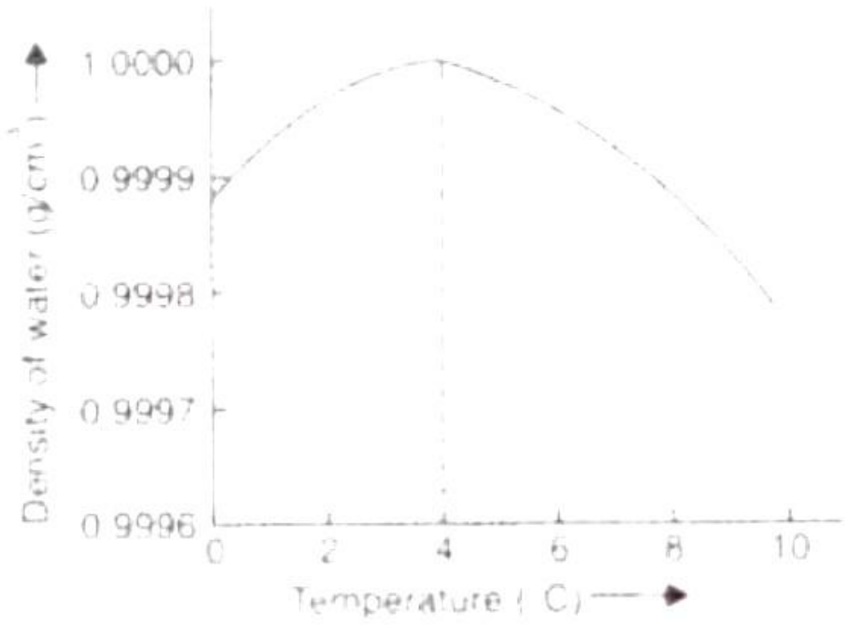
a) As the earth is attracting the ball with a force of 1 N, the ball will also attract the earth with the same force i.e., 1 N.
The ball exerts a force of reaction on the earth.
b) When a body is lying in a free-falling lift or when the body is taken at the centre of the earth, its weight becomes zero.

Solution 7

(i)

a) A pendulum which has a time period of 2 s is called a second's pendulum. Its effective length is 1 m.
b) The time period increases on the surface of the moon.
It is because $T \propto \frac{1}{\sqrt{g}}$. Thus, as 'g' on moon decreases, the time period increases.

(ii) The graph below depicts how the density of water changes with a change in the temperature from 0°C to 10°C. The water shows anomalous behavior from 0°C to 4°C.



(iii)

a) The laws of thermodynamics govern the energy flow in the ecosystem.
According to the first law of thermodynamics, energy can be transformed from one form to the other form, but it can neither be created nor destroyed.
According to the second law of thermodynamics, when energy is put to work, a part of it is always converted in un-useful form such as heat mainly due to friction and radiation.

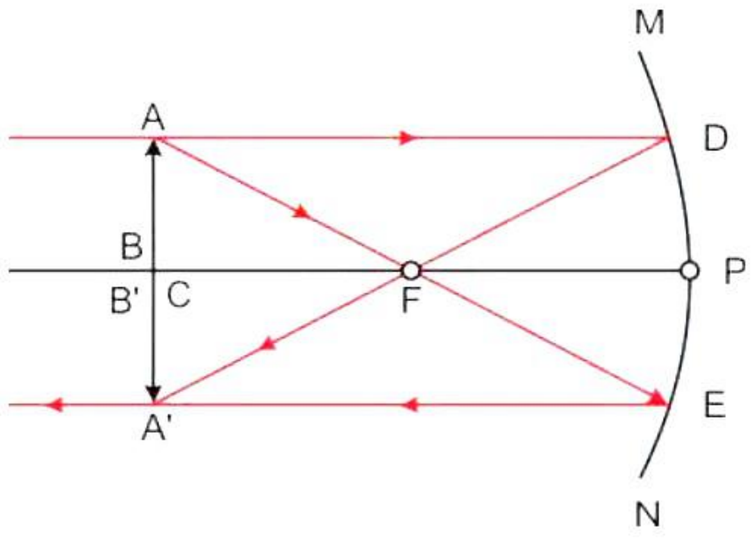
b) This energy is then used by the plants to grow and produce food, which is consumed by herbivores, known as primary consumers. In this way, photosynthesis enables the transfer of energy from the sun to other organisms in the ecosystem.

c) The key difference between primary, secondary, and tertiary consumers are:
- Primary consumers: The primary consumers are those which feeds on producers such as plants and bacteria. Example: Deer, rabbit etc.
- Secondary consumers: Secondary consumers are those which feeds on primary consumers and are eaten by tertiary consumers. Examples: tiger, wolf etc.
- Tertiary consumers: Tertiary consumers are those which feeds on secondary consumers. Example: Snake, owl etc.

Solution 8

(i) Angle of incidence = 90° – 30° = 60°
Angle of reflection = Angle of incidence = 60°
Total angle turned by the ray of light = angle of reflection + angle of incidence
= 60° +60° = 120°

(ii)



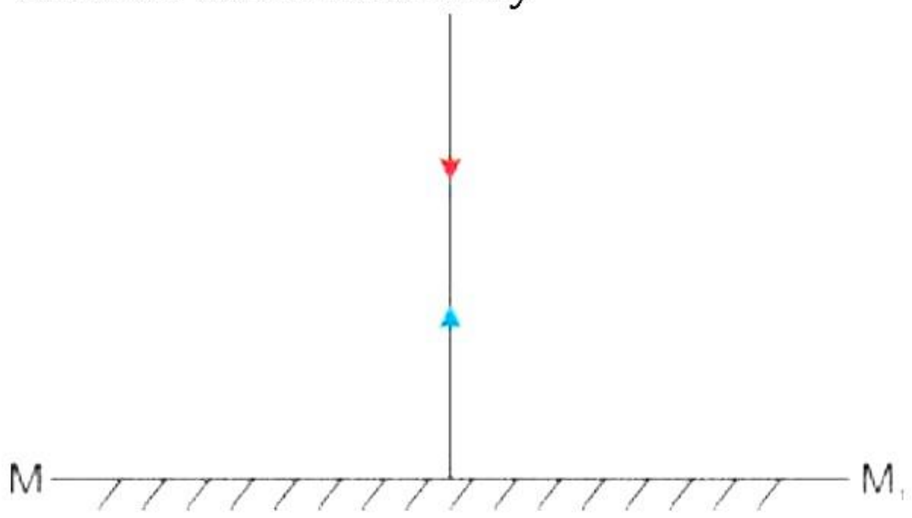
The image forms at the centre of curvature itself. The image is real, inverted and of the same size as the object.

(iii)

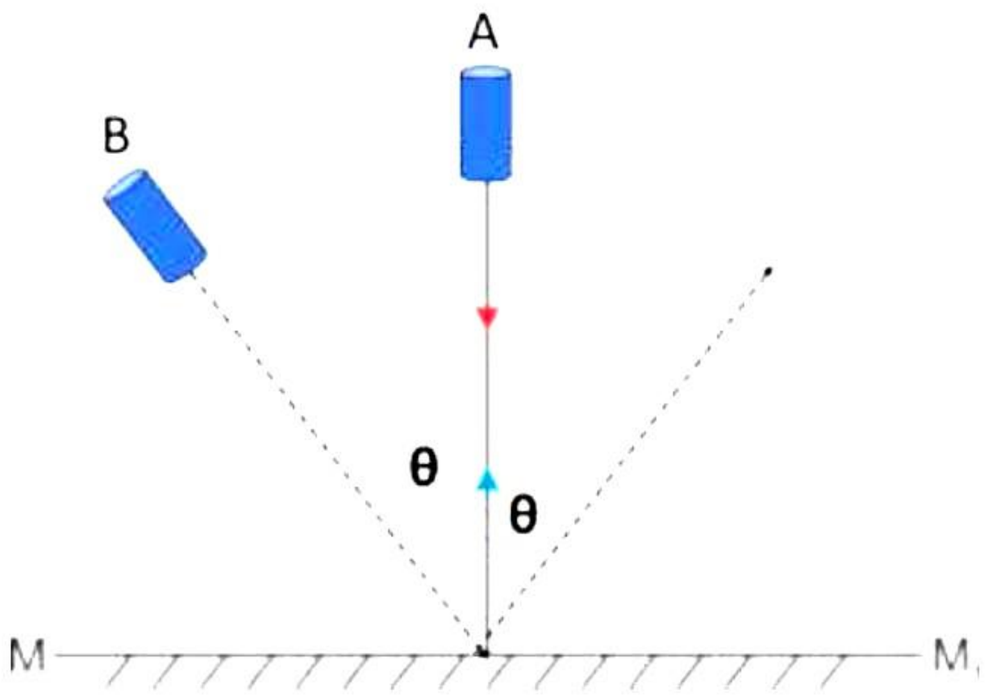
a) 0^o

b) The phenomenon of bouncing back of light or change in the path of light rays into the same medium after striking a polished surface is called reflection of light.

c) Same as the incident ray



d) As we know according to law of reflection:
Angle of incidence, ∠i = angle of reflection, ∠r
i.e., ∠r = θ ... (∵ ∠i = θ)



Solution 9

(i)

a) The sphere Q has negative charge and the sphere P has positive charge because due to repulsion, the electrons move from P to Q. These charges are developed due to electrostatic induction.

b) None of the sphere has any charge because electrons redistribute themselves as soon as rod A is removed and both the spheres regain their original uncharged condition.

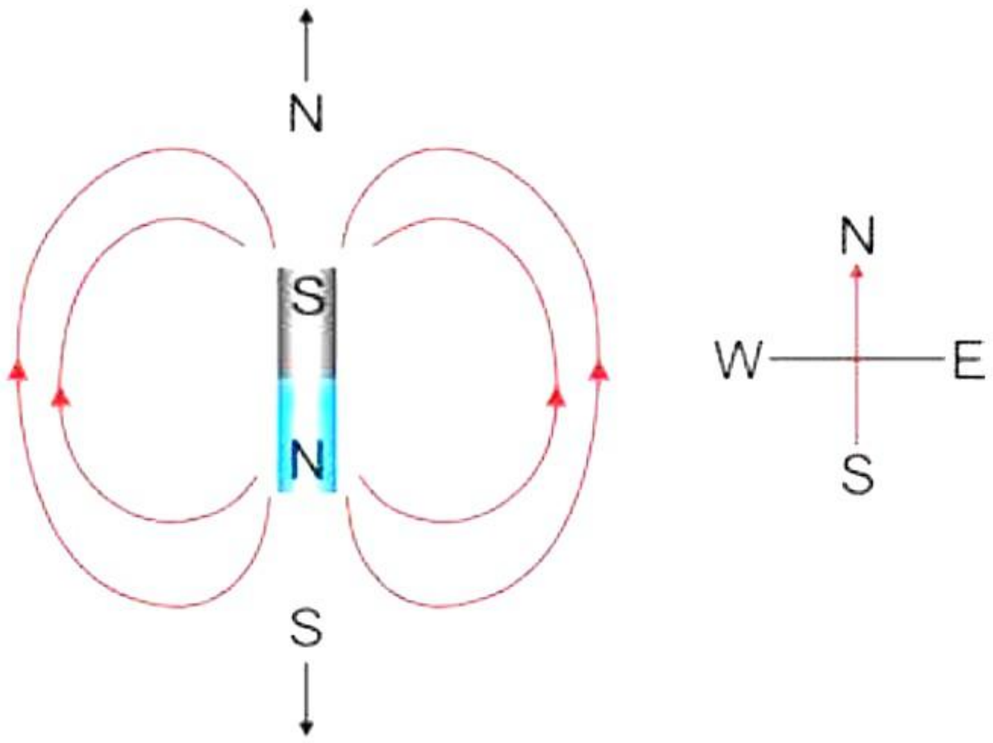
(ii)

a) On heating the magnet, the molecular magnets present in the magnet start vibrating and move out of the magnetic alignment. Hence, the magnet loses its magnetism.

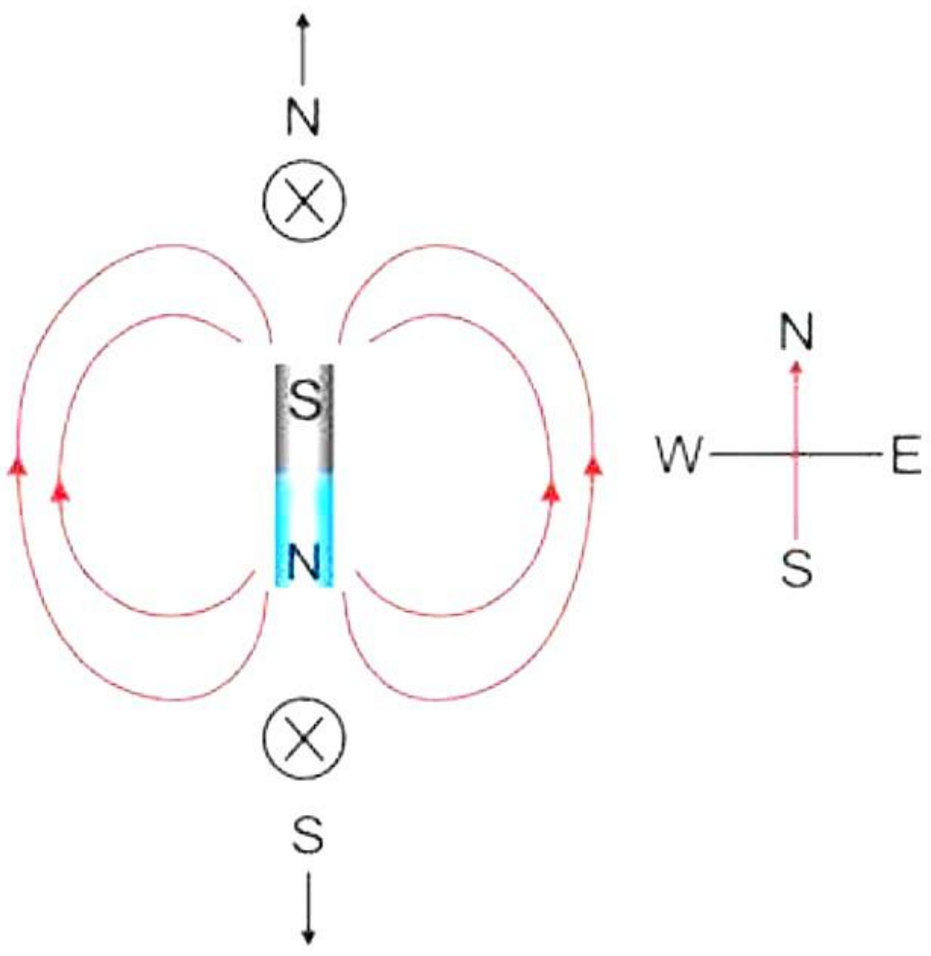
b) Neutral points are the points where the magnetic field of the magnet is equal in magnitude to the earth's horizontal magnetic field, but in the opposite direction. Thus, the resultant (or net) magnetic field at the neutral points is zero.

(iii)

(i)



(ii)

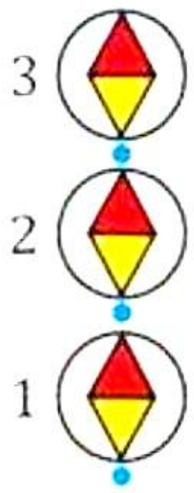


(iii) Magnitude of magnetic field at neutral points is zero. It is so because at these points, the magnetic field of the magnet is equal in magnitude to the earth's horizontal magnetic field, but it is in opposite direction. Hence, they cancel each other.

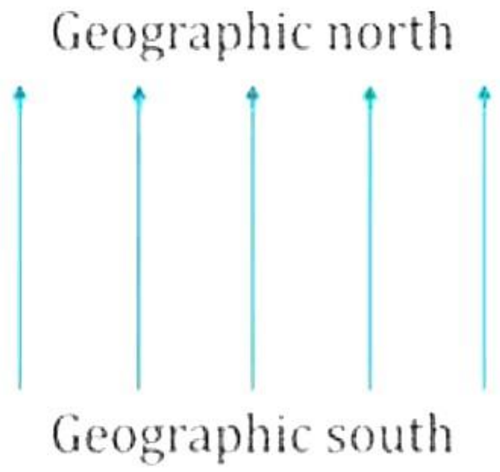
(iv) Method of plotting the magnetic field lines using a compass needle:

Fix a sheet of paper on a drawing board by means of board pins. Place a small compass needle at position 1 as shown in fig (a) and looking from the top of the needle, mark two pencil dots exactly at two ends of the needle. Then move the compass needle to position 2 in such a way that one end of needle coincides with the second pencil dot. Repeat the process of moving the compass needle to positions 3, 4...to obtain several dots.

On joining the different dots, you will get a straight line. Thus, one line of magnetic field of earth is traced.



(a) Plotting a field line with a compass needle



(b) Lines of uiform magnetic field of earth

This process is repeated starting from a different point and tracing out another line of magnetic field. In this manner, several lines of magnetic field can be drawn. Each line should be labeled with an arrow from the south pole of the needle towards the north pole to indicate the direction of the magnetic field. Fig (b) shows several magnetic lines so obtained.