CH:1 **FORCE**

1) *State the condition when on applying a force, the body has:*
(a) the translational motion (b) the rotational motion

Ans:- (a)Translational motion takes place when the body is free to move.
(b) Rotational motion takes place when the body is pivoted at a point.

2) *Define moment of force and state its S.I. unit.*

Ans:- The turning effect of force produced in a body about a fixed point or axis is known as moment of force or torque. It is equal to the product of the magnitude of the force and the perpendicular distance of the line of action of force from the axis of rotation.

$\tau = F \times d$ where *F* = magnitude of Force and
d= perpendicular distance between line of action of force and axis of rotation
The S.I. unit of moment of force is Nm.

3) *State the two factors affecting the turning effect of a force.*

Ans:- The two factors affecting the turning effect of force are:
(1) The magnitude of force applied
(2) The perpendicular distance of the line of action of force from the axis of rotation.

4) *What do you mean by positive and negative moment of force?*

Ans:- If force acting on a pivoted body makes it turn anticlockwise then a positive moment of force is said to be produced. Similarly if force acting on a pivoted body makes it turn clockwise then a negative moment of force is said to be produced.

5) *Why is it easier to open a door by applying the force at the free end of it?*

Ans:- The free end of the door is at the maximum perpendicular distance from the hinge or the point of pivot. So the moment of force required to turn the door can be produced by applying force of least magnitude at the free end. Therefore the door can be opened easily.

6) *A spanner (or wrench) has a long handle. Explain why.*

Ans:- A spanner or wrench is used to tighten or loosen a nut by turning it. As it has a long handle, the perpendicular distance between the line of action of force and the axis of rotation of the nut is more. Therefore a force of less magnitude is sufficient to produce the moment of force required to turn a nut bolt using this spanner or wrench. Hence the nut can be tightened or loosened easily.

7) *A jackscrew is provided with a long arm. Explain why.*

Ans:- A jackscrew is used to lift a heavy load such as a vehicle by applying a very less force. As it has a long arm so the perpendicular distance between the line of action of force and the axis of its rotation is long. This helps to apply a less effort to produce the necessary moment of force.

8) *What do you understand by the term couple? State its effect. Give some examples in our daily life where couple is applied.*

Ans:- A couple is a pair of equal, opposite and parallel forces not acting along the same line.
Its effect is to produce rotation. The examples of couple action in our daily life are:
Turning a water tap, tightening the screw cap of a bottle, turning a key in a lock etc.

9) *Define moment of couple. Write its S.I. unit.*

Ans:- The moment of couple is defined as the product of magnitude of either force and the perpendicular distance between the lines of action of the two forces (couple arm). Its S.I. unit is Nm.

10) *What do you mean by equilibrium of a body? Name its two kinds.*

Ans:- When a number of forces acting on a body produce no change in its state of rest or of motion then the body is said to be in equilibrium. It is of two kinds namely static equilibrium and dynamic equilibrium.

11) *What do you mean by static equilibrium and dynamic equilibrium?*

Ans:- When a body remains in the state of rest under the influence of several forces, the body is said to be in static equilibrium. Similarly when a body remains in the same state of motion under the influence of the several forces, the body is said to be in dynamic equilibrium.

12) *State the two conditions for a body acted upon by several forces to be in equilibrium.*

Ans:- Following are the two conditions for a body to remain in equilibrium.

(1) The algebraic sum of all the forces acting on the body should be zero.
(2) The algebraic sum of moments of all the forces acting on the body about the point of rotation should be zero.

13) *A book is lying at rest on the surface of horizontal table top. State the kind of equilibrium possessed by the book. Name and state the direction of different forces acting on the book.*

Ans:- The book is at static equilibrium.

The forces acting on the book are:

(1) The weight of the book or force of gravity acting in vertically downward direction.
(2) The force of normal reaction of the table surface acting in vertically upward direction.

14) *State the kind of equilibrium possessed by a rain drop falling through the atmosphere. Name and state the direction of different forces acting on the rain drop.*

Ans:- A rain drop falling through the atmosphere possesses dynamic equilibrium.

The different forces acting on the rain drop are as follows:

1) Weight of the raindrop or force of gravity on the raindrop in downward direction.
2) Buoyant force of air in upward direction.
3) Viscous force of air in upward direction.

15) *State the principle of moments. Name one device based on it.*

Ans:- The principle of moments states that at equilibrium the sum total of anticlockwise moments is equal to the sum total of clockwise moments of forces produced in a body about a point of rotation.

A beam balance works on the principle of moments.

16) *Define the term centre of gravity of a body.*

Ans:- The centre of gravity of a body is the point about which the algebraic sum of moments of weights of all the particles constituting the body is zero. The entire weight of the body can be considered to act at this point, howsoever the body is placed.

17) *Can centre of gravity of a body be situated outside its material? Give an example.*

Ans:- Yes, the centre of gravity of a body can be situated outside its material.

e.g. ring, hollow cylinder etc

18) *Can centre of gravity of a body be situated outside it? Give an example.*

Ans:- Yes, the centre of gravity of a body can be situated outside it.

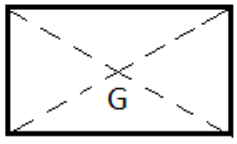
e.g. L-shaped body, boomerang

19) *State the position of centre of gravity of the following with the aid of diagram.*

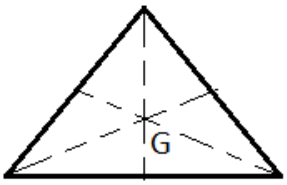
(a)Rectangular lamina, (b) triangular lamina, (c) circular lamina/circular disc, (d)ring

Ans:-

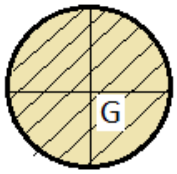
a) Rectangular lamina	Point of intersection of diagonals
b) Triangular lamina	Point of intersection of medians
c) Circular lamina	Geometric centre of the circle
d) Ring	Geometric centre of the ring



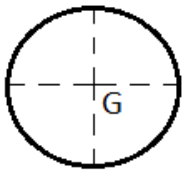
rectangular lamina



triangular lamina



circular disc



ring

20) *State the position of centre of gravity of the following.*

(a)straight rod, (b)cylinder, (c)sphere,(d)solid cone, (e) hollow cone

Ans:-

a) Straight rod	Mid-point of the rod
b) cylinder	Mid-point of axis of the cylinder
c) sphere	Geometric centre of the sphere
d) solid cone	At a height h/4 from the base, on its axis where h is vertical height of the cone
e) hollow cone	At a height h/3 from the base, on its axis where h is vertical height of the cone

21) *State a factor on which the position of centre of gravity of a body depends. Explain your answer with an example.*

Ans:- The position of centre of gravity of a body of given mass depends on its shape i.e. on the distribution of mass.

For example the centre of gravity of a uniform wire is at the middle of its length but if the same wire is bent into the form of a circle then its centre of gravity will then be at the centre of the circle.

22) *State the position of the point with respect to centre of gravity of a body at which the body can be balanced freely.*

Ans:- If a body balances freely about any point then this point of balancing lies on the same vertical line passing through the centre of gravity of the body.

CH:2 WORK,ENERGY,POWER

1. *Define the term Work.*

Ans:- Work is said to be done if a force acting on a body causes it to displace and the displacement has a component in the direction of force.

2. *How do you measure the amount of work done by a force in the following cases:*

(i) Force and displacement are in same direction.

(ii) Direction of displacement is at an angle to the direction of force.

Ans:- (i) When force and displacement are in same direction then the amount of work is measured as $W = FS$ where F = Force, S = Displacement

(ii) When force and displacement are not in same direction then the amount of work is measured as $W = FS\cos\theta$ where F = Force

S= Displacement

θ = Angle between force and displacement

3. *State the two conditions when no work is done by a force.*

Ans:- Amount of work done by a force is zero in the following two situations:

(1) When there is no displacement.

(2) When the displacement is normal to the direction of force.

4. *Give any two examples when no work is done by a force as there is no displacement of the body.*

Ans:- (1) A man pushing a wall, (2) A boy sitting on a chair and reading newspaper

5. *A coolie carrying a load on his head walks on a horizontal road. How much work is done by the force of gravity on him? Explain with reason.*

Ans:- No work is done by force of gravity on him. The force of gravity i.e. the weight of the load acts on the coolie in vertically downward direction whereas the direction of his displacement is horizontal. So the angle between the force and the displacement is 90^0. Therefore the work done is zero.

$W = FS \cos 90^0 = FS \times 0 = 0$

6. *When a body moves in a circular path, how much work is done by centripetal force? Explain with reason.*

Ans:- No work is done by the centripetal force when a body moves in a circular path. The centripetal force acts on the body in radial direction towards the centre of the circular path whereas the instantaneous direction of displacement of the body is tangential to the circular path. So the angle between the force and the displacement is 90^0. Hence the work done is zero. $W = FS \cos 90^0 = FS \times 0 = 0$

7. *State the conditions for (i) maximum work, (ii) minimum work done by a force.*

Ans:- (i) when the angle between force and displacement is 0^0 then maximum positive work is said to be done by the force.

(ii) when the angle between force and displacement is 90^0 then minimum work(i.e. zero) is said to be done by the force.

8. *What do you mean by positive work? Write any two examples of it.*

Ans:- When force and displacement are in the same direction then the work done by the force is said to be a positive work.

$W = FS \cos 0^0 = FS \times 1 = FS$

Ex-1 : If a force applied on a table pushes it in the direction of force by some distance the work done by the force is a positive work.

Ex-2: When a body falls freely under gravity then the work done by force of gravity is a positive work.

9. *What do you mean by negative work? Write any two examples of it.*

Ans:- When force and displacement are in the opposite direction then the work done by the force is said to be a negative work.

$W = FS \cos 180^0 = FS \times (-1) = -FS$

Ex-1 : the work done by the resistive force applied by the hand to stop a moving ball is a negative work because the resistive force and the displacement of the ball are in opposite direction.

Ex-2: When a body is thrown upwards against gravity then the work done by force of gravity is a negative work.

10. *Write the expression for work done by force of gravity.*

Ans:- $W = mgh$ where m = mass of the body
g = acceleration due to gravity
h = displacement of the body in vertical direction

11. *State and define the S.I. unit of work.*

Ans:- The S.I. unit of work is joule (J) . Work done is said to be one joule if a force of 1 newton displaces a body by 1 meter in its own direction.

$1 \text{ joule} = 1 \text{ Nm} = 1 \text{ kgm}^2 \text{ s}^{-2}$

12. *Name the S.I. and C.G.S. units of work and derive a relation between them.*

Ans:- The S.I. unit of work is joule (J) and the C.G.S. unit of work is erg.

$1 \text{ J} = 1\text{N} \times 1\text{m}$
$= 10^5 \text{ dyne} \times 10^2 \text{ cm}$
$= 10^7 \text{ dyne.cm}$
$= 10^7 \text{ erg}$

13. *Define the term power.*

Ans:- The rate of doing work is called power.

$$Power = \frac{work}{time}$$

$Power = Force \times velocity$

14. *State and define the S.I. unit of power.*

Ans:- The S.I. unit of power is watt (W). If 1 joule work is done in 1 second then the power is said to be 1 watt. $1 \text{ watt} = 1 \text{ Js}^{-1} = 1 \text{ Nms}^{-1} = 1 \text{ kgm}^2 \text{ s}^{-3}$

15.*How is the unit horse power related to the S.I. unit of power?*

Ans:- 1 horse power = 746 watt

16. *Differentiate between work and power.*

Ans:-

work	power
1) Work done by a force is equal to the product of force and the displacement in the direction of force. 2) Work done does not depend on time. 3) S.I. unit of work is joule.	1) Power of a source is the rate of doing work by it. 2) Power varies inversely as the time in which work is done. 3) S.I. unit of power is watt.

17.*Define the term energy of a body. What is S.I. unit?*

Ans:- Energy of a body is its capacity to do work. Its S.I. unit is joule.

18.*Name the physical quantity measured by the following unit.*

(a) Kilowatt hour (b) electron volt (c) calorie

Ans:- Energy

19.*Define the unit kilowatt hour and write its S.I. equivalent value.*

Ans:- One kilowatt hour or 1 kWh is the energy spent or work one by a source of power 1 kw in 1 hour .

$1\ kWh = 3.6 \times 10^6\ J$

20.*What is the difference between kilowatt and kilowatt hour?*

Ans:- 'kilowatt' is a bigger unit of power but 'kilowatt hour' is a bigger unit of energy.

21.*Define the unit electron volt and write its S.I. equivalent value.*

Ans:- 1 electron volt or 1 eV is the energy gained by an electron when it is accelerated through a potential difference of 1 volt.

$1\ eV = 1.6 \times 10^{-19}\ J$

22.*Define the term potential energy of a body. Name its different types.*

Ans:- The mechanical energy possessed by a body at rest due to its changed position and/or changed configuration is called potential energy of the body. It is of two types namely gravitational potential energy and elastic potential energy.

23.*Define gravitational potential energy of a body and state how it is measured? Give any two examples of bodies possessing this form of energy.*

Ans:- The potential energy possessed by a body due to its position at a height above the ground is called gravitational potential energy. It is measured by calculating the amount of work done to raise the body to the given height above the ground against the force of gravity.

$U = mgh$ where m = mass of the body

g = acceleration due to gravity

h = height of the body above the ground

Examples: (1) energy possessed by a stone kept on a roof top,
(2) energy possessed by water stored in a over head tank

24. *Define elastic potential energy of a body and state how it is measured? Give any two examples of bodies possessing this form of energy.*

Ans:- The potential energy possessed by a body in the deformed state due to change in its size and shape is called the elastic potential energy. It is measured by calculating the amount of work done in deforming the body against the restoring force.

Examples: (1) energy possessed by a stretched rubber string
(2) energy possessed by a compressed spring

25. *Define kinetic energy of a body. Write the expression for kinetic energy.*

Ans:- The mechanical energy possessed by a body by virtue of its state of motion is called the kinetic energy.

$K = \frac{1}{2} mv^2$ where m= mass and v = velocity of the body

26. *Write the relation between kinetic energy and momentum of a body.*

Ans:- $K = \frac{p^2}{2m}$ or $p = \sqrt{2mK}$

Where K = kinetic energy, *m* = mass , *p*= momentum of the body

27. *State the work-energy theorem.*

Ans:- According to the work-energy theorem, the work done by a force on a moving body in the same direction is equal to the increase in its kinetic energy.

W= $\frac{1}{2} mv^2 - \frac{1}{2} mu^2$ where W= work done

m = mass, *u* = initial velocity, *v*= final velocity

28. *State the law of conservation of energy.*

Ans:- The law of conservation of energy states that energy is neither created nor is destroyed but it only changes from one form to another form.

29. *State the law of conservation of mechanical energy.*

Ans:- The law of conservation of mechanical energy states that whenever there is an interconversion of potential energy and kinetic energy takes place, the sum total of both these forms of energy i.e. the total mechanical energy of the body remains a constant assuming that no energy loss takes place due to any frictional forces.

CH:3 **MACHINES**

1) *What is a machine?*

Ans:- A machine is a device which makes our work easier in either of the following ways:

(i) By multiplying force

(ii) By multiplying speed

(iii) By changing the direction of application of force

(iv) By changing the point of application of force

2) *Give examples of machines with the following usefulness.*

(i) *Multiplication of force:-* crow bar, screw jack, nut cracker, inclined plane, movable pulley

(ii) *Multiplication of speed:-* gear system, a pair of scissors, oar of a boat, knife

(iii) *Changing the direction of force:-* a single fixed pulley

(iv) *Changing the point of application of force:-* fire tong, bicycle, sewing machine

3) *Define the terms Load and Effort with respect to a machine.*

Ans:- (i) Load—The resistive or opposing force to be overcome by a machine is called the load.

(ii) Effort—The force applied on the machine to overcome the load is called the effort.

4) *Define the terms Mechanical Advantage(M.A.) and Velocity Ratio (V.R.) of a machine.*

Ans:- (i) Mechanical Advantage:- The ratio of the load to the effort is called mechanical advantage of the machine.

$$\text{M.A.} = \frac{L}{E}$$

(ii) Velocity Ratio:- The ratio of velocity of effort point to the velocity of load point is called velocity ratio.

It is also equal to the ratio of displacement of effort point to the displacement of load point.

$$\text{V.R.} = \frac{VE}{VL} = \frac{dE}{dL}$$

5) *Differentiate between Force multipliers and Velocity multipliers.*

Ans:-

Force multipliers	Velocity multipliers
(i) A force multiplier is a machine in which a greater load is overcome by applying a lesser effort.	(i) A velocity multiplier is a machine in which a small displacement of effort causes a greater displacement of load.
(ii) A force multiplier has M.A.>1 and V.R.>1	(ii) A velocity multiplier has M.A.<1 and V.R.<1
(iii) e.g. crow bar, screw jack, nut cracker, inclined plane, movable pulley	(iii) e.g. gear system, a pair of scissors, knife, oar of a boat,

6) *State the principle of a machine. What is the significance of this principle?*

Ans:- When energy is supplied to a machine (i.e. input work is done) by applying the effort, it overcomes the load by doing some useful work (or output work) on it. According to principle of machine:

For an ideal machine: output work = input work

For an actual machine: output work < input work

The significance of the principle of a machine is that it is a form of law of conservation of energy.

7) *Define the term Efficiency of a machine. Explain why efficiency of a machine is always less than 100%.*

Ans:- Efficiency of a machine is defined as the ratio of output work obtained from the machine to the input work done on it.

$$\text{Efficiency } \eta = \frac{work\ output}{work\ input} \times 100\%$$

Efficiency of a machine is always less than 100 % as there is some loss of input energy in a machine due to the following reasons:

(i) The moving parts of a machine are not frictionless.

(ii) The moving parts of a machine are not weightless.

(iii) The parts of a machine are not perfectly rigid.

(iv) The string if used is not perfectly elastic.

8) *Write the relation between M.A. V.R. and Efficiency of a machine. Derive the relation.*

Ans:- $\mathrm{M.A.} = V.R. \times \eta$

By definition; efficiency $\eta = \frac{work\ output}{work\ input}$

$$\Rightarrow \quad \eta = \frac{L \times dL}{E \times dE} = \left(\frac{L}{E}\right) \mathrm{X} \left(\frac{dL}{dE}\right) = \left(\frac{L}{E}\right) \div \left(\frac{dE}{dL}\right) = \frac{M.A.}{V.R.}$$

$$\Rightarrow \mathrm{M.A.} = V.R. \times \eta$$

9) *Differentiate between an ideal machine and an actual machine.*

Ans:-

Ideal Machine	Actual Machine
(i) An ideal machine is the one in which the output work obtained from the machine is equal to the input work done on the machine.	(i) An actual machine is the one in which the output work obtained from the machine is less than the input work done on the machine.
(ii) No loss of input energy takes place.	(ii) A part of the input energy is wasted.
(iii) No frictional forces are present.	(iii) Frictional forces are present.
(iv) In an ideal machine; M.A. =V.R. & Efficiency= 100%	(iv) In an actual machine; M.A. <V.R. & Efficiency< 100%

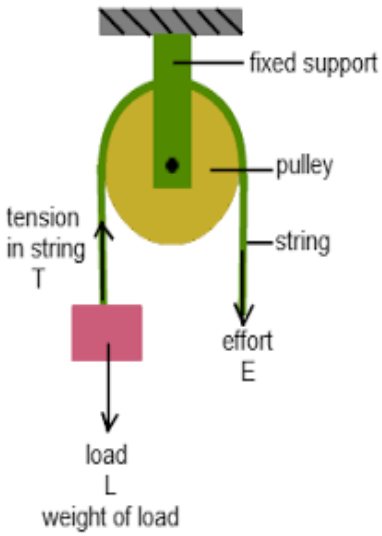
10) *Differentiate between single fixed pulley and single movable pulley.*

Ans:-

Single fixed pulley	Single movable pulley
(i) It has a fixed axis of rotation. (ii) It is used to apply effort in a convenient direction i.e. the direction of gravity. (iii) Its M.A. is 1 i.e. the effort applied is equal to the load in ideal case. (iv) Its V.R. is 1 i.e. the displacement of load is equal to the displacement of effort. (v) Effort is applied in the direction of gravity.	(i) It has a movable axis of rotation. (ii) It is used as force multiplier. (iii) Its M.A. is 2 i.e. the effort applied is equal to half of the load in ideal case. (iv) Its V.R. is 2 i.e. the displacement of load is equal to half of the displacement of effort. (v) Effort is applied opposite to the direction of gravity.

11) *Draw the diagram of a single fixed pulley and find its M.A. and V.R. .Write the advantage and disadvantage of this pulley.*

Ans:-



T = Tension in each segment of the string
L = Load
E = Effort
L = T
E = T
M.A.= 1
=> E = L

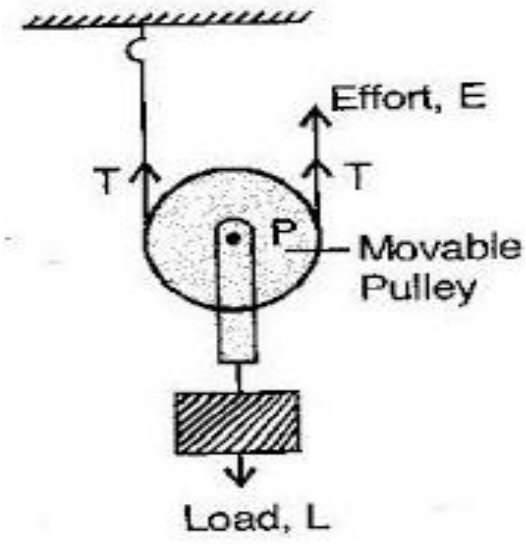
In ideal case , the effort aplied is same as the load.

V.R. = 1
=> Load is displaced same as the effort.

Single fixed pulley is neither a force multiplier nor a velocity multiplier. However it is used as a machine as it helps to apply effort conveniently in the direction of gravity.

12) *Draw the diagram of a single fixed pulley and find its M.A. and V.R. .Write the advantage and disadvantage of this pulley.*

Ans:-



T = Tension in each segment of the string
L = Load
E = Effort
L = T+T =2T
E = T
M.A.=2
$\Rightarrow E = \frac{L}{2}$

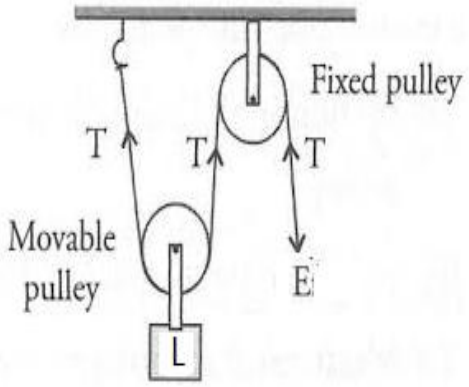
*The Advantage is that the Effort applied is equal to half of the load in ideal case. So a movable pulley is a force multiplier.

*The disadvantage is that the effort is to be applied against the gravity which is inconvenient.

V.R. = 2
=> Load is displaced half as the effort.

13) *Draw the diagram of the combination of single fixed pulley and single movable pulley. Find its M.A. and V.R. .*

Ans:-



Movable pulley acts as the foce multiplier.
Fixed pulley is used to apply effort in a convenient direction i.e. in the direction of gravity.

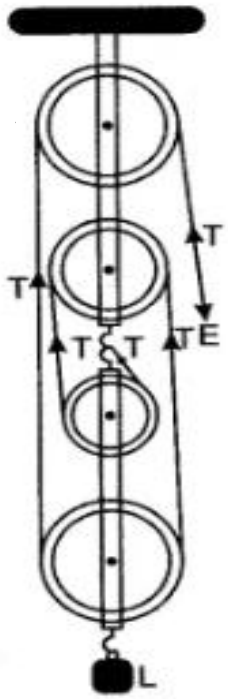
T = Tension in each segment of the string
L = Load
E = Effort
L = T+T =2T
E = T
M.A.=2
$\Rightarrow E = \frac{L}{2}$

*The Advantage is that the Effort applied is equal to half of the load in ideal case. So a movable pulley is a force multiplier.

V.R. = 2
=> Load is displaced half as the effort.

14) *Draw the diagram of a block and tackle system consisting of four pulleys.*

Ans:-



CH:4 **CALORIMETRY**

1) *Define calorimetry.*

Ans:- Calorimetry is the process of measurement of heat energy absorbed or given out by a substance.

2) *Differentiate between heat and temperature.*

Ans:-

Heat	Temperature
(i) Heat is a form of energy which can flow from a hot substance to a cold substance on account of a temperature difference the two.	(i) Temperature is a physical quantity which determines the degree of hotness or coldness of a body.
(ii) Its S.I. unit is joule.	(ii) Its S.I. unit is kelvin.
(iii) It is measured by using the principle of calorimetry.	(iii) It is measured by a device called the thermometer.

3) *Define one calorie heat. What is its S.I. equivalent value?*

Ans:- 1 calorie is defined as the heat energy absorbed by 1 gram water to raise its temperature by 1^0C i.e. from 14.5 ^{0}C to 15.5 ^{0}C.

1 calorie = 4.2 joule

4) *Define heat capacity and specific heat capacity.*

Ans:- Heat Capacity:- Heat capacity of a body is defined as the quantity of heat required to increase the temperature of whole mass of the body by 1 ^{0}C or 1 K.

Specific Heat Capacity:- Specific Heat capacity of a substance is defined as the quantity of heat required to increase the temperature of unit mass of the substance by 1 ^{0}C or 1 K.

5) *Differentiate between heat capacity and specific heat capacity.*

Ans:-

Heat Capacity	Specific Heat Capacity
(i) Heat capacity of a body is defined as the quantity of heat required to increase the temperature of whole mass of the body by 1 ^{0}C or 1 K.	(i) Specific Heat capacity of a substance is defined as the quantity of heat required to increase the temperature of unit mass of the substance by 1 ^{0}C or 1 K
(ii) It depends on the mass of the body.	(ii) It does not depend on the mass of the body.
(iii) Its S.I. unit is JK^{-1}	(iii) Its S.I. unit is J kg^{-1} $^0C^{-1}$

6) *What is the relation between heat capacity and specific heat capacity?*

Ans:- Heat Capacity = Mass X Specific Heat Capacity

7) *What do you mean by the following statements?*

a) Heat capacity of a piece of copper is 500 JK^{-1}.
   Ans:- The quantity of heat required to raise the temperature of whole mass of the given piece of copper by 1K is 500 J.

b) Specific heat capacity of water is 4200 $Jkg^{-1}K^{-1}$.
   Ans:-The quantity of heat required to raise the temperature of 1 kg water by1K is 4200 J.

c) Specific heat capacity of iron is 0.483 $Jg^{-1}\,{}^{0}C^{-1}$.
   Ans:- The quantity of heat required to raise the temperature of 1 g iron by1^{0}C is 0.483 J.

8) *Write the expression for quantity of heat absorbed by a body.*

Ans:- $Q = mC\Delta t$ where m = mass of the body
C = specific heat capacity of its material
Δt = increase in temperature of the body

9) *Name and explain the factors affecting the quantity of heat absorbed by a body.*

Ans:- The quantity of heat absorbed by a body depends on the following three factors:

1) It varies directly as the mass of the body.
2) It varies directly as the increase in temperature of the body.
3) It depends on the nature of material of the body. More the specific heat capacity of the material, more is the quantity of heat absorbed and vice-versa.

10) *Write the significance of specific heat capacity of a substance.*

Ans:-

1) A substance with a high value of specific heat capacity absorbs a large quantity of heat on heating and also releases a large quantity of heat on cooling than a substance with a lesser value of specific heat capacity of equal mass and for the same change of temperature.
2) Good conductors of heat(e.g. meals) have low value of specific heat capacities than that of bad conductors of heat(e.g. water).

11) *Name the substance which has the highest value of specific heat capacity and what is that value in S.I.?*

Ans:- Water has the highest value of specific heat capacity among all other substances. It is 4200 $Jkg^{-1}K^{-1}$.

12) *Explain how water is a good coolant as well as a good reservoir of heat.*

Ans:- Specific heat capacity of water is of very high value i.e. 4200 $Jkg^{-1}K^{-1}$. So water can absorb a large quantity of heat from its surrounding thereby making the surrounding effectively cool but the temperature of water does not rise much. So water acts as a good coolant. Similarly hot water can release a large quantity of heat while cooling and thus it is a good supplier of heat or a heat reservoir.

13) *Give reasons for the following:*

a) Water is sprayed in front of houses, shops etc in summer afternoon.

Ans:- The specific heat capacity of water is very high i.e. 4200 $Jkg^{-1}K^{-1}$.Therfore water sprayed on the ground can absorb a large quantity of heat from there and keeps the surrounding soothingly cool. For this reason, water is sprayed in front of houses, shops etc in summer afternoon.

b) Water is used as coolant in car radiators.

Ans:- The specific heat capacity of water is very high i.e. 4200 $Jkg^{-1}K^{-1}$.So water put in the radiator can absorb a large quantity of heat produced in the engine but its own temperature does not rise appreciably. Hence water can regulate the temperature of the engine more effectively and hence used as the coolant in car radiators.

c) Water is the best fluid to quench thirst.

Ans:- The specific heat capacity of water is very high i.e. 4200 $Jkg^{-1}K^{-1}$.So water can absorb a large quantity of heat produced in the stomach and suppresses the thirst for a longer time. Hence water is the best fluid to quench thirst.

14) *Give reasons for the following:*

a) Hot water is used for fomentation.

Ans:- The specific heat capacity of water is very high i.e. 4200 $Jkg^{-1}K^{-1}$.So hot water can release a large amount of heat to the swollen part of the body but does not cool down quickly. Hence it is preferred to any other liquid to be used for fomentation.

b) In cold countries, wine bottles are preserved in water bath at winter night to prevent freezing.

Ans:- The specific heat capacity of water is very high i.e. 4200 $Jkg^{-1}K^{-1}$.So water in the tub keeps on releasing a large quantity of heat at a cold night but its own temperature does not fall to the freezing level. The heat thus released by water is taken up by the wine bottle kept immersed in the water bath and hence the freezing of wine is prevented.

c) *In cold countries, farmers fill their fields with water to save crops from frost in winter nights.*

Ans:- The specific heat capacity of water is very high i.e. 4200 $Jkg^{-1}K^{-1}$.So water standing in the field keeps on releasing a large quantity of heat at a cold night but its own temperature does not fall to the freezing level. The heat thus released by water is absorbed by the surrounding and hence the temperature of the surrounding cannot fall to the level suitable for formation of frost. Thus frost formation is avoided and crops are saved from getting rotten. This is why farmers fill their fields with water to save crops from frost in winter nights.

15) *Explain the role of specific heat capacity of water in keeping the climate of coastal area moderate.*

Ans:- The Specific heat capacity of water is nearly five times of that of the soil/sand. So during the day time, the sand in the coastal area absorbs comparatively less quantity of heat from the sun than the sea water and becomes hot quicker than sea water. So the air above land becomes warm and rises up causing a low pressure area over there. Hence to occupy the space, air blows over sea towards the land causing the formation of sea breeze. Similarly in the night time, land releases heat much quickly than sea water to cool down. So sea water remains comparatively warmer than land. This causes air over sea water to become warm and to rise up. Hence to occupy the space, air blows over the land towards the sea causing the formation of land breeze. In this way the blowing of sea breeze and land breeze in turn around the year keeps the climate of coastal area moderate. Thus the high specific heat capacity of water has the significant role in this regard.

16) *Why is the base of a cooking pan made thicker?*

Ans:- As the base of a cooking pan is thick, it possesses a large heat capacity. So the pan absorbs a large amount of heat from the flame and passes it slowly to the food for its proper cooking. After cooking also, the food can remain warm for a longer time as the cooking pan cannot release all that heat quickly due to high heat capacity.

17) *State the principle of calorimetry/ principle of mixture. Write the significance of this principle.*

Ans:- It states that at thermal equilibrium, the amount of heat given out by the hot substance is equal to the amount of heat absorbed by the cold substance in a mixture assuming that no heat is either absorbed from or released to the surrounding.

The significance of the principle of calorimetry is that it is a form of law of conservation of energy.

18) *What is a calorimeter? Name the material it is made from. Why this material is used?*
Ans:- A calorimeter is a specially constructed vessel used to keep the mixture of hot and cold substances in it to attain thermal equilibrium for calorimetry.It is made from copper because copper has a very low specific heat capacity. This makes the calorimeter to exchange a negligible heat with its contents to reach thermal equilibrium.

19) *Why is a calorimeter made from thin sheet of copper?*
Ans:- Copper has a low value of specific heat capacity i.e. 390 $Jkg^{-1}K^{-1}$. Due to the use of thin sheet of copper, a calorimeter also has a less mass. Therefore a calorimeter has a negligible value of thermal capacity. Due to this a calorimeter can exchange a negligible amount of heat from its contents to attain thermal equilibrium along with them.

20) *State how the heat loss due to following modes from the contents of a calorimeter is minimized. (a) Conduction, (b) convection, (c) radiation.*
Ans:-
(a) The space between the walls of the calorimeter and the wooden box is packed with insulating materials like cotton, glass wool etc. This prevents the heat loss due to conduction from a calorimeter.
(b) The top of the calorimeter is provided with an insulating lid which prevents the warm air to escape. Thus heat loss due to convection is prevented.
(c) The wall of the calorimeter is made shiny polished to prevent heat loss by radiation.

21) *Define latent heat and specific latent heat. State their S.I. unit.*
Ans:-
Latent Heat:- The amount of heat either absorbed or given out by whole mass of a substance to cause a change of state without the change of temperature is called the latent heat of the substance. Its S.I. unit is joule(J).
Specific Latent Heat:- The amount of heat either absorbed or given out by unit mass of a substance to cause a change of state without the change of temperature is called the specific latent heat of the substance. Its S.I. unit is Jkg^{-1}.

22) *Write the expression for heat absorbed by a substance during its change of state at a constant temperature.*
Ans:- $Q = mL$ where Q = latent heat, m = mass, L= specific latent heat

23) *Why latent heat is named so?*
Ans:- Though heat is invisible, temperature is the external manifestation of heat. That means whether heat is absorbed or released by a substance can be known from the change of temperature of the substance. However during the change of state, the heat absorbed or released by the substance is not manifested as change of temperature as the temperature of

the substance remains unchanged. Hence it is thought as if heat is hidden within the substance. Hence this heat is particularly known as latent heat or hidden heat.

24) *A substance on heating undergoes (i) a rise in its temperature, (ii) a change in its state without change in its temperature. In each case, state the change in energy of molecules of the substance.*

Ans:- (i) During the rise in temperature, average kinetic energy of molecules increases.
(ii) During the change of state at constant temperature, average potential energy of molecules increases.

25) *How does the (a) average kinetic energy (b) average potential energy of molecules of a substance change during its change in phase at a constant temperature, on heating?*

Ans:- (a) Average kinetic energy of molecules remains unchanged.
(b) Average potential energy of molecules increases.

26) *The latent heat supplied to a substance during its change of state, does not cause any rise in its temperature. Give reason.*

Ans:- Temperature of a substance changes if the heat supplied to the substance causes the average kinetic energy of its molecules to change. But during the change of state, the heat supplied to a substance changes the average potential energy of the molecules and <u>not the average kinetic energy</u> of them. Therefore temperature does not change during the change of state of a substance.

27) *Define specific latent heat of fusion and specific latent heat of vaporization.*

Ans:-

Specific latent heat of fusion:- The quantity of heat absorbed by unit mass of a substance to undergo change of state from solid to liquid at its melting point is called specific latent heat of fusion of that substance.

Specific latent heat of vaporization:- The quantity of heat absorbed by unit mass of a substance to undergo change of state from liquid to vapour at its boiling point is called specific latent heat of vaporization of that substance.

28) *What do you mean by the following statements:*

a) Specific latent heat of fusion of ice is 336000 Jkg^{-1}.

Ans:- 1 kg ice absorbs 336000 J of heat at 0^0C to change into 1 kg water at the same temperature.

b) Specific latent heat of vaporization of steam is 2268000 Jkg^{-1}.

Ans:- 1 kg steam releases 2268000 J of heat at 100^0C to change into 1 kg water at the same temperature.

29) *Which is more cold: 1 g ice at 0^0 C or 1 g water at 0^0 C. Give reason.*

Ans:- 1 g ice is more cold than 1 g water both being at 0^0 C. This is because 1 g water at 0^0 C contains an additional heat of amount 336 J as latent heat than 1 g ice at 0^0 C.

30) *Give reasons for the following:*

(i) Soft drinks are cooled more effectively by adding ice cubes to them and not by ice-cold water at 0^0 C.

Ans:- Every 1 gram ice added to a soft drink can extract an additional heat of 336 J as latent heat from the drink to melt but it is not done so by ice-cold water of temperature 0^0 C. That means ice cubes can extract a large amount of heat from the soft drink in compare to ice-cold water. So soft drinks are cooled more effectively by adding ice cubes to them.

(ii) Ice cream appears colder to the mouth than water at 0^0 C.

Ans:- Every 1 gram ice cream can extract an additional heat of 336 J as latent heat from the mouth to melt but it is not done so by ice-cold water of temperature 0^0 C. That means ice cream can extract a large amount of heat from the mouth in compare to ice-cold water. Hence ice cream feels colder to mouth.

(iii) The surrounding becomes pleasantly warm when water in a lake starts freezing in cold countries.

Ans:- The specific latent heat of fusion of ice is very high i.e 336000 Jkg^{-1}. So water in a lake has to release a very large amount of heat as latent heat in order to freeze. This heat mixes with the surrounding and causes the temperature to rise. Therefore the surrounding becomes warm when water in a lake starts freezing.

(iv)The surrounding becomes bitterly cold when a frozen lake stars melting.

Ans:- The specific latent heat of fusion of ice is very high i.e 336000 Jkg^{-1}. So the large mass of ice in a frozen lake absorbs a very large quantity of heat as latent heat from the surrounding to melt. So the temperature of the surrounding falls sharply and it becomes bitterly cold.

(v) It is generally cold after a hail-storm than during and before the hail-storm.

Ans:- After the hail-storm, the hail stones fallen on the ground start melting which requires a large quantity of latent heat. This is because the specific latent heat of melting of ice is very high i.e. 336 Jg^{-1}. So the ice fallen on the ground absorbs this large amount of latent heat from the surrounding. So temperature of surrounding falls and it feels to be cold.

(vi) Water in lakes and ponds do not freeze at once in cold countries.

Ans:- The specific latent heat of fusion of ice is very high i.e. 336 Jg^{-1}. So the water in lakes and ponds will have to liberate a large quantity of heat to the surrounding before freezing. The layer of ice formed over the water surface, being a poor conductor of heat, prevents the loss of heat from water at a faster rate. Hence the lake or the pond does not freeze all at once.

(vii) Snow on mountains does not melt all at once.

Ans:- Ice has a high specific latent of fusion i.e. 336000 Jkg^{-1}.So the huge mass of snow in a mountain would require heat of such a large amount to melt that it is not possible to supply this heat by any source. Therefore snow in mountains does not melt all at once and melts slowly by absorbing heat from the sun.

(viii) Steam causes a more severe burn than boiling water at 100^0C.

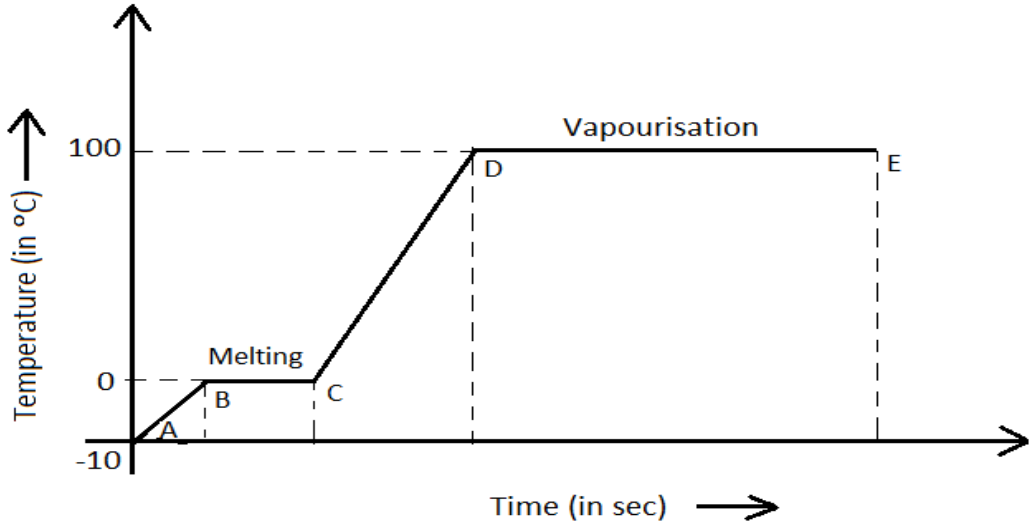
Ans:- Every 1 gram steam can release 2268 J latent heat to condense into water and then its heating effect is same as that of boiling water at 100^0C.So since steam gives out an additional heat to the skin, it causes more severe burn than boiling water at 100^0C.

(ix) In a central heating system, steam is used in metal pipes to keep the rooms warm.

Ans:- The specific latent heat of steam is very high i.e. 2268 Jg^{-1}. So steam inside the metal pipes releases a large quantity of heat to be radiated by the pipes and changes to water at 100^0C.Thus rooms become warm effectively.

31) *Ice of a certain mass at -10^0C is heated to change into steam at 100^0C and its temperature is recorded in regular intervals of time. Draw a* ***temperature-time*** *graph for the above change and lable its different parts.*

Ans:-



AB represents increase in temperature of ice up to 0^0C.

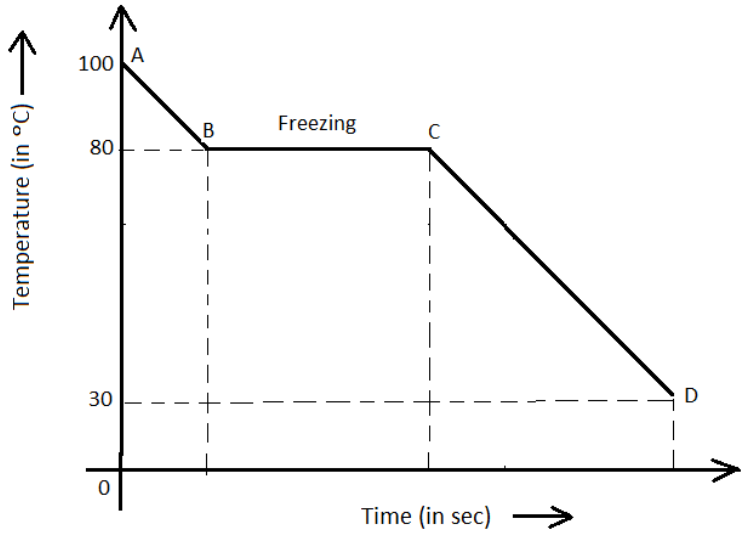
BC represents melting of ice into water at a constant temperature of 0^0C.

CD represents increase in temperature of water from 0^0C to 100^0C.

DE represents vapourisation of water into steam at a constant temperature of 100^0C.

32) *The melting point of naphthalene is 80^0C and the room temperature is 30^0C. A sample of liquid naphthalene at 100 ^{0}C is cooled down to the room temperature. Draw a temperature-time graph to represent the cooling. In the graph, mark the region which corresponds to the freezing process.*

Ans:-



CH:5(A) **REFRACTION OF LIGHT AT PLANE SURFACES**

1) ***What do you mean by refraction of light? What is its cause?***

Ans:- The change in direction of the path of light, when it passes from one transparent medium to another transparent medium is called refraction.

The speed of light is different in different medium. So when light passes obliquely from one medium to another medium, the change in speed of light causes its path to change. Hence refraction is caused.

2) ***Name one property of light which (i) changes and (ii) does not change when light passes from one medium to another medium.***

Ans:- (i) Wavelength (and speed) of light changes when light passes from one medium to another.

(ii) Frequency of light does not change when light passes from one medium to another.

3) ***How does the path of light change when***

(i) light passes obliquely from a rarer medium to a denser medium

(ii) light passes obliquely from a denser medium to a rarer medium

(ii) light is incident normally on the boundary separating two media.

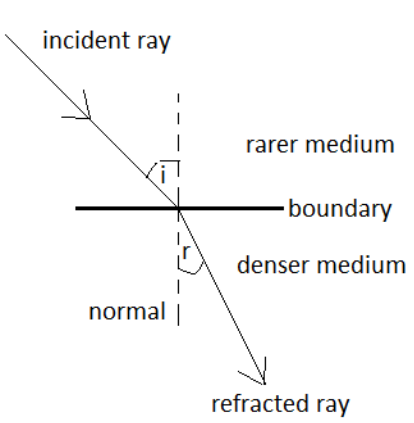
Ans:-

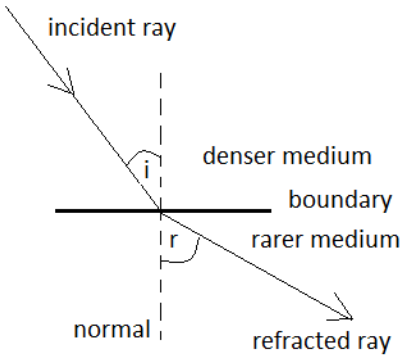
(iii) Light bends towards the normal when enters obliquely from a rarer medium to a denser medium.

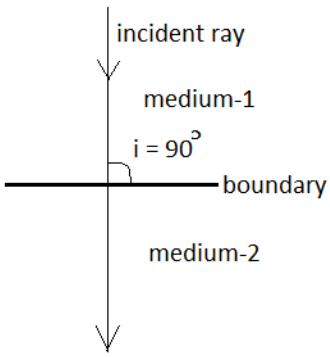
(ii) Light bends away from the normal when enters obliquely from a denser medium to a rarer medium.

(iv) Light passes undeviated when it enters normal from one medium to another.

(However the speed of light changes in this case)







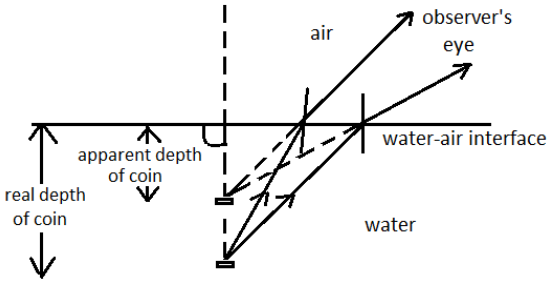
4) ***State the conditions for a light ray not to refract when passing from one medium to another.***

Ans:- A light ray does not refract in the following cases.

1. When the light ray enters normally from one medium to another medium then no refraction takes place.

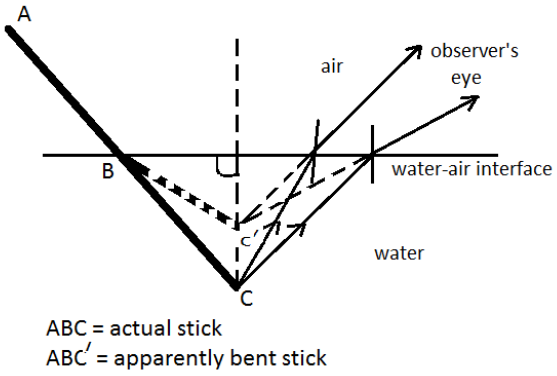
2. When the speed of light is same in both the medium then a light ray does not refract on passing from one medium to the other.

5) *A coin inside water appears to be at a lesser depth than the actual one when seen obliquely from outside. Draw a ray diagram to illustrate the observation and name the phenomenon held responsible for this.*



Ans:- Due to the phenomenon of refraction of light that a coin inside water appears to be at a lesser depth than the actual one when seen obliquely from outside.

6) *A stick partially immersed inside water appears to be bent at the surface of water when seen obliquely from outside. Draw a ray diagram to illustrate the observation and name the phenomenon held responsible for this.*



Ans:- Due to the phenomenon of refraction of light that a stick partially immersed inside water appears to be bent at the surface of water when seen obliquely from outside.

7) *Explain why a star appears to twinkle at night.*

Ans;- The atmosphere of earth has become gradually rarer towards the upper region. When light from a distant star enters the atmosphere of earth, it undergoes successive refractions from rarer to denser layers of atmosphere before reaching the earth surface. After each refraction, the light ray bends more and more towards the normal. So to an observer, the position of the star is apparently sifted from its actual position. But due to wind, convection current in air etc. the refraction pattern of light changes for which the apparent position of the star also changes rapidly. This gives an impression of a twinkling star to the observer.

8) *State the Snell's laws of refraction of light.*

Ans:- They can be stated as follows.

<u>First law:-</u> The incident ray, the refracted ray and the normal at the point of incidence, all lie on the same plane.

<u>Second law:-</u> The ratio of sine of angle of incidence to the sine of angle of refraction is constant for the pair of given media. (This constant is equal to the refractive index ($_1\mu_2$) of the second medium with respect to the first medium)

$$_1\mu_2 = \frac{\sin i}{\sin r} = \text{constant}$$

9) Define the term absolute refractive index of a medium.

Ans:- Absolute refractive index of a medium is defined as the ratio of speed of light in vacuum/air to the speed of light in the medium.

$\mu = \frac{c}{v}$ where c= speed of light in vacuum/air

and v= speed of light in the medium

10) Name and explain the factors which affect the refractive index of a medium.

Ans:- The factors affecting the refractive index of a medium areas follows.

Nature of the medium:- A denser medium has refractive index more than that of a rarer medium.

Temperature of the medium:- Refractive index decreases with the increase in temperature of the medium and vice-versa.

Colour or wavelength of light:- Longer the wavelength of light, lesser is the refractive index of a medium and vice-versa. That is why a medium has maximum refractive index for violet colour light (shortest wavelength) and minimum refractive index for red colour light (longest wavelength).

11) Which colour of light travels (i) fastest, (ii) slowest in any medium except air?

Ans:- (i) Red colour light travels fastest. (ii)Violet colour light travels slowest.

12) For which colour of white light, is the refractive index of a transparent medium (i) the least, (ii) the most?

Ans:- Refractive index of a medium is (i) least for red light and(ii) most for violet light.

13) Express refractive index of a medium in terms of the following.

1)Velocity of light, 2)Wavelength of light,3) Angle of incidence and angle of refraction

Ans:- Refractive index of a medium μ can be expressed as follows.

1) $\boldsymbol{\mu = \frac{c}{v}}$ where c= speed of light in air

and v= speed of light in the medium

2) $\boldsymbol{\mu = \frac{\lambda}{\lambda_\circ}}$ where λ = speed of light in air

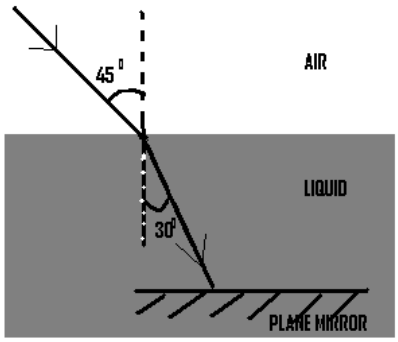
and $\lambda_\circ$= speed of light in the medium

3) $\mu = \frac{\sin i}{\sin r}$ where *i*= angle of incidence in air

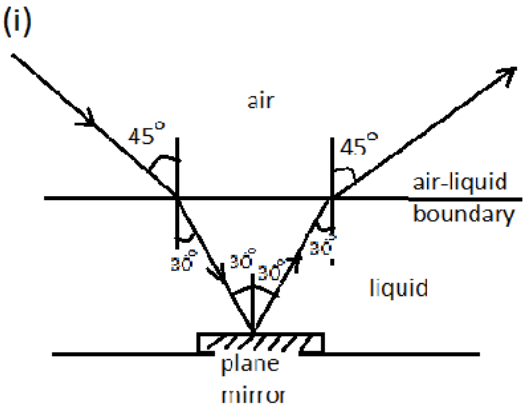
and *r*= angle of refraction in the medium

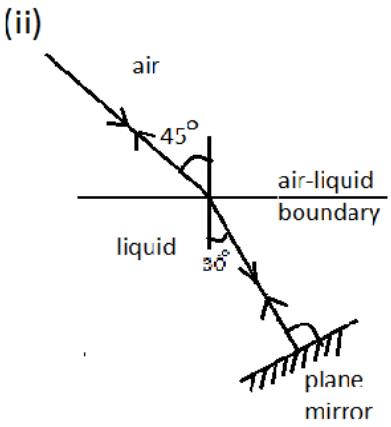
14) A ray of monochromatic light enters a liquid from air as shown in the diagram given below.

(v) Copy the diagram and show in the diagram the path of the ray of light after it strikes the mirror and re-enters the medium air. Mark in your diagram the two angles on the surface of separation when the ray of light moves out from the liquid to air.



(ii) Redraw the diagram if plane mirror becomes normal to the refracted ray inside the liquid. State the principle used.





The principle used is principle of reversibility which states that a light ray can retrace its path in opposite direction.

15) An object placed in the denser medium when seen from the rarer medium, appears to be at a lesser depth.

(i) ***Name the phenomenon responsible for this observation.***

(ii) Name and explain the two factors on which this apparent depth depends.

(iii) Write an expression for this apparent depth relating to the real depth of the object.

Ans:-

(i) An object in the denser medium appears to be at a lesser depth when seen from the rarer medium is due to the phenomenon of refraction of light.

(ii) Apparent depth depends on the following two factors:

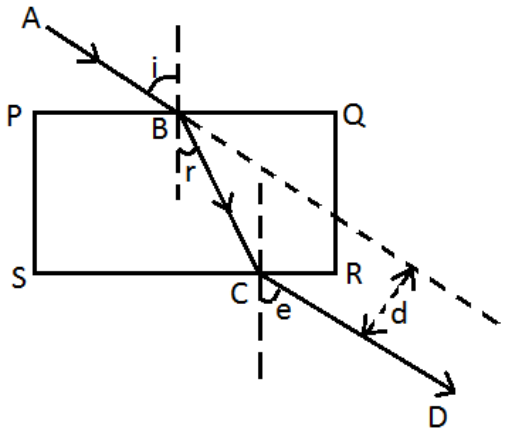
<u>Real depth of the denser medium</u>:-It is directly proportional to the real depth of the denser medium.

Refractive index of the denser medium:-It is inversely proportional to the refractive index of the medium.

(iii) $refractive\ index\ of\ the\ medium = \frac{real\ depth}{apparent\ depth}$

16) *Draw a labled ray diagram to show the path of a light ray which refracts through a rectangular glass slab and emerges out of it*.

Ans:-



PQRS= Rectangular glass slab
AB= incident ray
BC= refracted ray
CD=emergent ray
i= angle of incidence
r =angle of refraction
e = angle of emergence
d= lateral displacement produced in the path of the light ray

17) *A light ray refracts through a rectangular glass slab and emerges out.*

a) *Name the two rays which are parallel to each other.*

b) *Name the two angles equal to each other.*

Ans:- a) The incident ray and the emergent ray are parallel to each other.

(vi) The angle of incidence is equal to the angle of emergence.

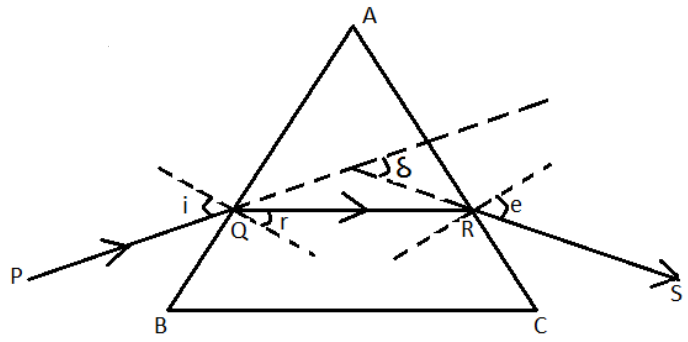
18) *What is lateral displacement? State the factors affecting lateral displacement.*

Ans:- When a light ray refracts through a rectangular glass slab and emerges out, the emergent ray remains parallel to the direction of incident ray. The perpendicular distance between the directions of incident ray and the emergent ray is called the lateral displacement produced in the path of the light ray. It depends on the following factors:

1) Thickness/ width of the glass slab:- More the thickness of the glass slab, more is the lateral displacement produced in the path of the light ray.
2) Angle of incidence:- More the angle of incidence, more is the lateral displacement produced in the path of the light ray.
3) Refractive index:- More the refractive index of glass, more is the lateral displacement produced in the path of the light ray.
4) Colour/wavelength of light:- Longer the wavelength of light, lesser is the lateral displacement produced in the path of the light ray and vice-versa. Red colour light undergoes minimum lateral displacement where as it is maximum for violet colour light.

19) Draw a ray diagram to show the path of a monochromatic light ray which refracts through a glass prism and emerges out with a minimum angle of deviation.

Ans:-



ABC=Principal section of glass prism
PQ=monochromatic incident ray
QR= refracted ray
RS=emergent ray
i= angle of incidence
r =angle of refraction
e = angle of emergence
δ= angle of deviation produced in the path of the light ray

20) How will you know whether a light ray is refracted by minimum angle of deviation through a glass prism.

Ans:- If a light ray refracts through a glass prism and undergoes minimum deviation then:

1) Refracted ray inside the prism becomes parallel to the base of the prism.
2) Angle of incidence is equal to the angle of emergence.

21) What is the difference between the refraction of light by a rectangular glass slab and that by a glass prism. What causes this difference?

Ans:- In case of refraction through a rectangular glass slab, the emergent ray remains parallel to the direction of incident ray so that the light ray undergoes a lateral displacement from its original path. On the other hand, in case of refraction of light through a glass prism, the emergent ray is not parallel to the direction of incident ray but makes an angle with it. That means an angular deviation is produced in the path of the light ray.

This is so because the two refracting surfaces of a glass slab are parallel and hence the emergent ray and the incident ray are parallel. But the two refracting surfaces of a glass prism are not parallel and there is an angle between the two. Accordingly the incident ray and the emergent ray are also having an angle between them.

22) State and explain the factors affecting the angle of deviation produced in the path of a light ray when refracted through a glass prism.

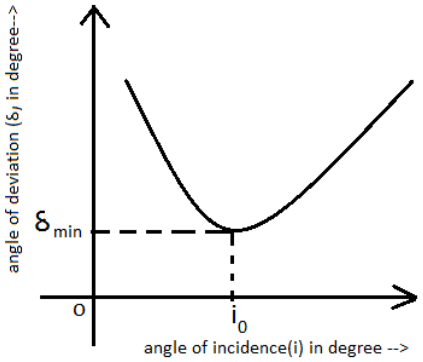
Ans:- The angle of deviation produced in the path of a light ray when refracted through a glass prism depends on the following factors:

1) <u>Angle of prism</u>: More the angle of prism, more is the angle of deviation produced in the path of the light ray.

2) Refractive index of glass: More the value of refractive index of glass of the prism, more is the angle of deviation produced in the path of the light ray.
3) Colour/wavelength of incident light: Longer the wavelength of light, lesser is the angle of deviation produced in the path of the light ray and vice-versa. Red colour light undergoes minimum deviation where as it is maximum for violet colour light.
4) Angle of incidence: As the angle of incidence increases, the angle of deviation decreases first to become minimum at a particular angle of incidence and then increases with the increase of angle of incidence.

23) Draw the sketch of i~δ graph for a prism where the symbols have their usual meanings.

Ans:-

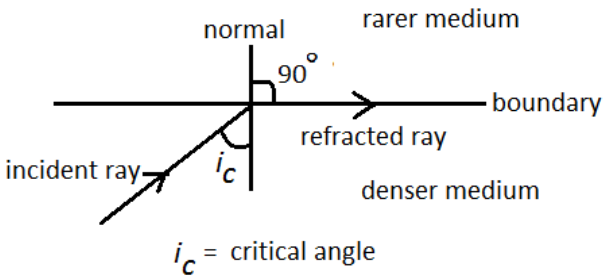


24) Define the term critical angle for a pair of media.

Ans:- The critical angle for a pair of media is the angle of incidence in the denser medium for which the angle of refraction in the rarer medium is 90^0 i.e. the refracted ray passes along the boundary separating the two media.

25) Draw a ray diagram to illustrate the meaning of critical angle for a pair of media.

Ans:-



i_c = critical angle

26) Write the relation between refractive index of a medium and the value of critical angle of light in that medium.

Ans:- $\mu = \frac{1}{\sin ic}$

where μ= refractive index

and i_c= critical angle

27) Name and explain the factors affecting the critical angle of light in a medium.

Ans:- Critical angle of light in a medium depends on the following factors.

1) Temperature of the medium:- As the temperature of a medium increases , the value of critical angle in that medium increases.
2) Colour or wavelength of light:- As the wavelength of light increase, the value of critical angle in the medium increases. Therefore the value of critical angle is maximum for red colour light (longest wavelength) and minimum for violet colour light (shortest wavelength).

28) Name the colour of light for which the value of critical angle is (i) maximum, (ii) minimum for a pair of media.

Ans:- (i) The value of critical angle is maximum for red colour light

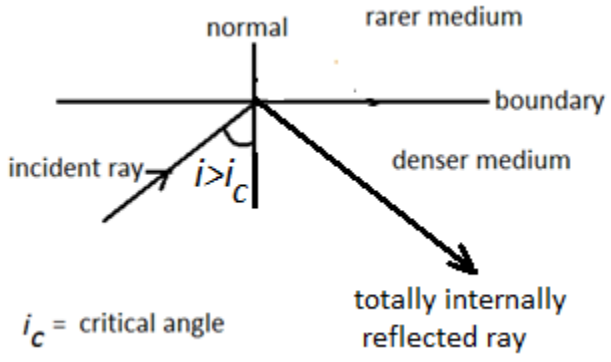
(ii) The value of critical angle is minimum for violet colour light

29) What do you mean by total internal reflection of light?

Ans:- When a ray of light travelling in a denser medium, is incident at the surface of a rarer medium at the angle of incidence greater than the critical angle for the pair of media, the ray is totally reflected back into the denser medium. This phenomenon is called total internal reflection of light.

30) Draw a ray diagram to illustrate the phenomenon of total internal reflection of light.

Ans:-



31) What are the conditions required for total internal reflection of light?

Ans:- There are two necessary conditions for the total internal reflection:

1) The light ray must travel from denser to a rarer medium.
2) The angle of incidence must be greater than the critical angle for the pair of media.

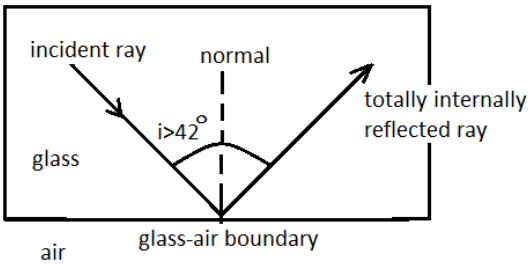
32) Differentiate between total internal reflection of light and ordinary reflection of light.

Ans:-

Total internal reflection	Ordinary reflection
(i) In this case, 100% of the incident light energy gets reflected back and nothing is absorbed b the medium.	(i) In this case, 100% of the incident light energy is not reflected back but some part gets absorbed by the reflecting surface.
(ii) The image formed due to total internal reflection of light is comparatively brighter.	(ii) The image formed due to ordinary reflection of light is comparatively less bright.
(iii) It takes place when the angle of incidence in the denser medium is greater than the critical angle.	(iii) It takes place for any value of angle of incidence at the reflecting surface.

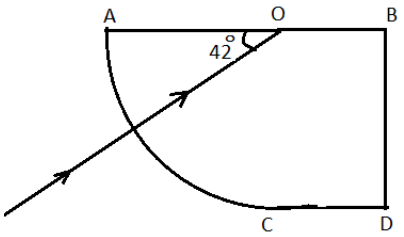
33) The critical angle for glass-air pair is 42^0. Draw a ray diagram to show the phenomenon of total internal reflection of light taking place in a rectangular glass slab.

Ans:-

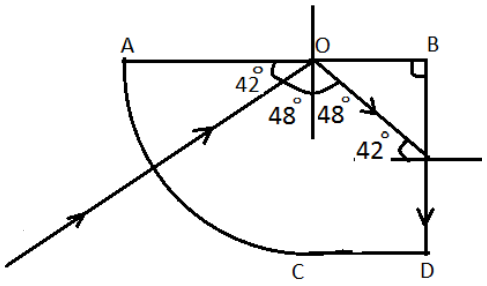


$i_C = 42^\circ$

34) A ray of light enters a glass slab ABCD as shown in the figure and strikes at the centre O of the circular part AC of the slab. The critical angle of glass is 42^0. Complete the path of the ray till it emerges out from the slab. Mark the angles in the diagram wherever necessary.



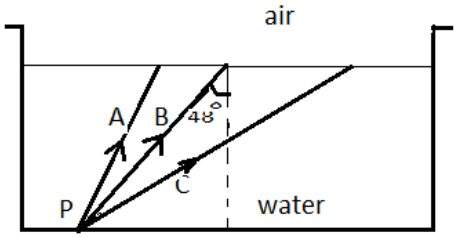
Ans:-



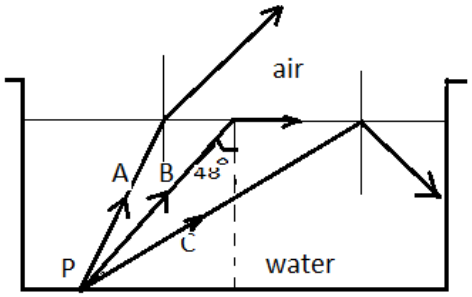
35) ***The adjacent figure shows a point source P inside a water container. Three rays A, B and C starting from the source P are shown up to the water surface.***

(a) Show in the diagram the path of these rays after striking the water surface. The critical angle for water-air surface is 48^0.

(b) Name the phenomenon which the rays A, B and C exhibit.

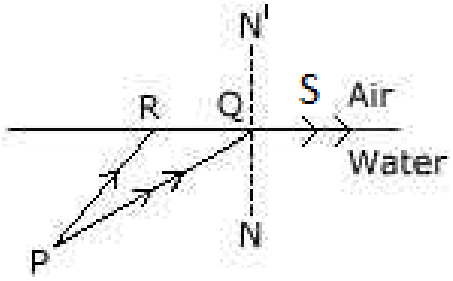


Ans:- (a)



(b) The light ray A exhibits refraction.
The light ray B also exhibits refraction.
The light ray C exhibits total internal reflection of light.

36) ***PQ and PR are two light rays emerging from an object P. The ray PQ is refracted as QS.***



(i) What is the special name given in the angle incidence (∟PQN) of ray PQ?

(ii) What is the angle of refraction for the refracted ray QS?

(iii) Name the phenomenon that occurs if the angle of incidence ∟PQN is increased still further.

(iv) The ray PR suffers partial reflection and refraction on the water-air surface. Give reason.

(v) Copy the ray diagram and complete it to show the position of the image of the object P when seen obliquely from above.

Ans:-

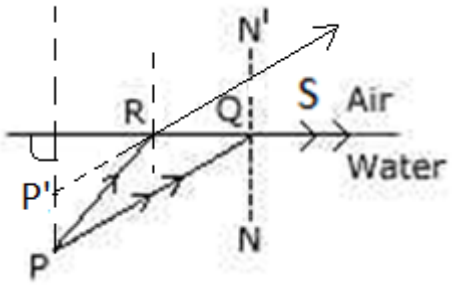
(i) critical angle is the name of angle ∟PQN.

(ii) 90^0 is the angle of refraction for QS.

(iii) total internal reflection

(iv) angle of incidence of the ray PR is less than the critical angle.

(v)



37) Write any two consequences of total internal reflection of light.

Ans:-

1) The sparkling of a piece of diamond is caused due to multiple total internal reflection of light within it.
2) The phenomenon of mirage is caused due to total internal reflection of light. A mirage is an optical illusion when a person can see a pool of water ahead of him at some distance on a very hot sunny day. A traveler in a desert, a driver on the high way etc. often see water on the ground or on the highway on a hot sunny day which is actually not water but an image of a very distant object caused due to total internal reflection of light.

38) (i) What is an optical fibre?

(ii) Give one practical use of an optical fibre.

(vii) Name the principle on which the working of an optical fibre is based upon.

Ans:- (i) An optical fibre is a regularly bent fine fibre tube used to transmit a light signal over a long distance without any loss of energy.

(ii) An optical fibre is used in the field of telecommunication and in medical science for endoscopy.

An optical fibre works on the principle of phenomenon of total internal reflection of light.

39) An empty test tube placed in water in a beaker with mouth outside the water surface, shines like a mirror when seen at certain angle.

(i) Name the phenomenon responsible for the observation.

(ii) Explain this is observed to be so when seen from a particular angle.

Ans:- (i) Total internal reflection of light is the phenomenon.

(viii) When the light rays from water entering into air inside the glass tube find the angle of incidence to be more than the critical angle for the pair of media, the rays undergo total internal reflection. So as the reflected rays enter the observer's eye, the wall of the test tube looks like a mirror from that angle only.

40) What is a total reflecting prism? State three actions that it can produce.

Ans:- A prism inside which total internal reflection can take place is called a total reflecting prism. A right angled isosceles prism (45^0-90^0-45^0 prism) is generally used as a total reflecting prism. However a 30^0-60^0-90^0 prism and an equiangular prism (60^0-60^0-60^0) can also cause total internal reflection of light.

Following are the actions of a 45^0-90^0-45^0 total reflecting prism.

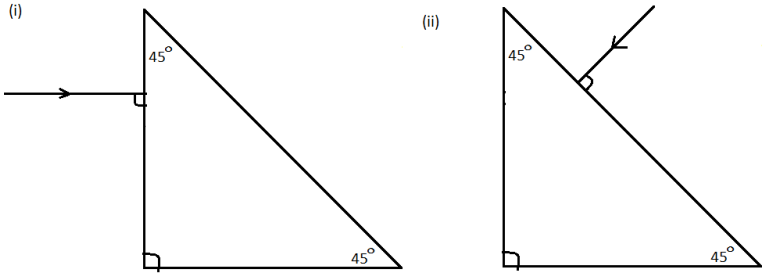
1) To deviate light ray by 90^0 angle.
2) To deviate a light ray by 180^0 angle.
3) To make an inverted image erect.

41) Differentiate between the image formed by a plane mirror and that by a total reflecting prism.

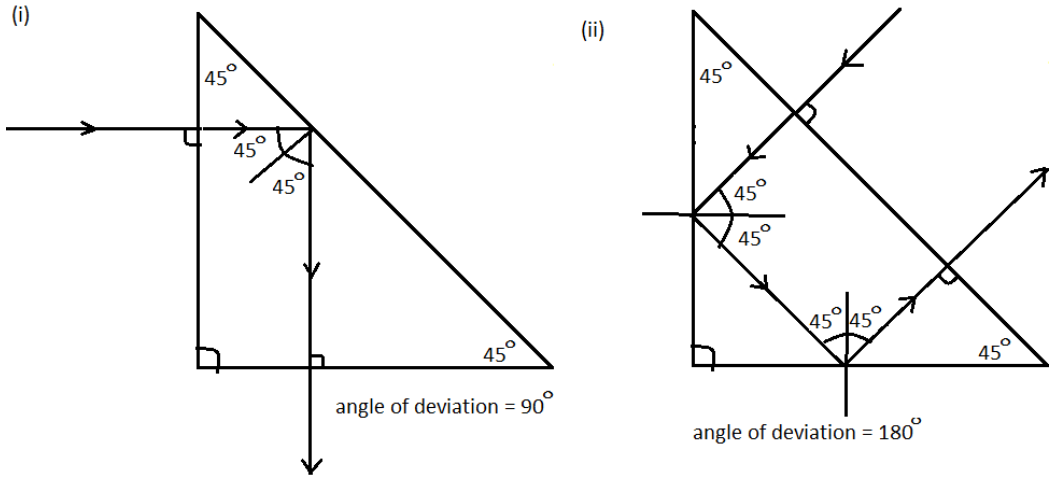
Ans:-

image formed by a plane mirror	*image formed by a total reflecting prism*
(i) The image formed by a plane mirror due to ordinary reflection of light.	(ix) The image formed by a total reflecting prism is due to total internal reflection of light.
(ii) The image formed is comparatively less bright.	(x) The image formed is comparatively brighter.

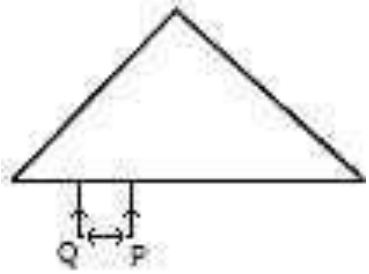
42) Complete the path of the light ray incident on a glass prism in the following cases. The critical angle for glass-air pair is 42^0.



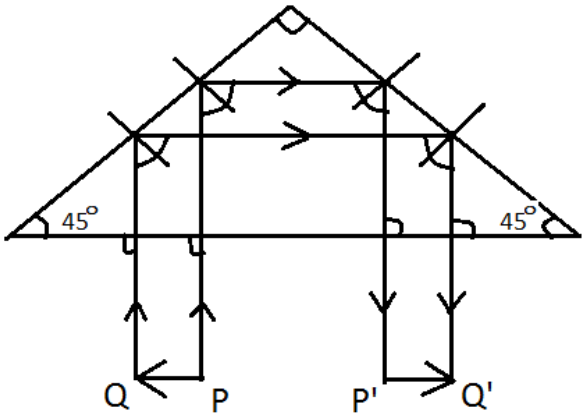
Ans:-



43) Diagram alongside shows a right-angled prism of refractive index 1·5. An object PQ is placed in front of its base BC. Copy the diagram. Complete the diagram showing the image produced by the prism. Name an instrument in which such a prism is used.

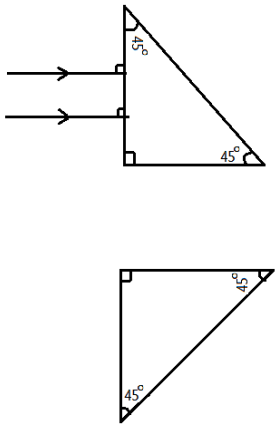


Ans:-

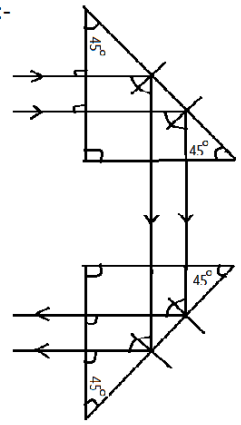


Such action of a prism is used in a prism binocular.

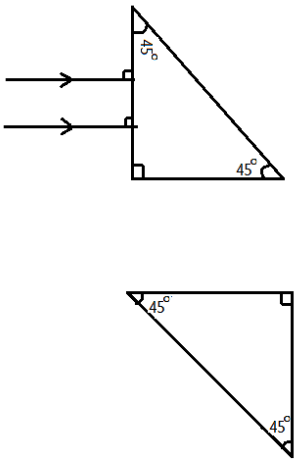
44) ***Copy the following diagram and complete the path of the two rays passing through both the prisms. The critical angle for glass-air pair is 42^0.***



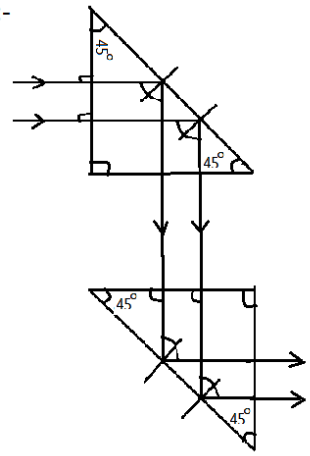
Ans:-



45) Copy the following diagram and complete the path of the two rays passing through both the prisms. The critical angle for glass-air pair is 42^0. Name an instrument in which such an action by the prisms is used.



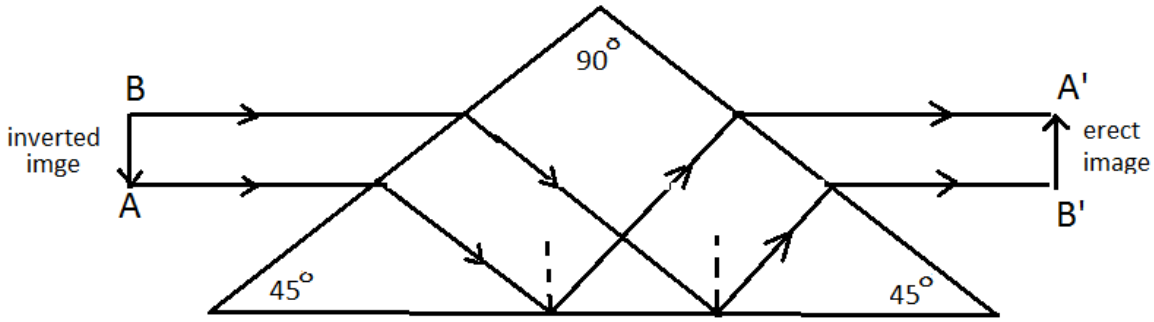
Ans:-



Name of the instrument is a prism binocular.

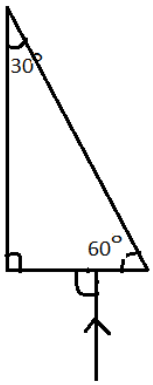
46) ***Draw a ray diagram to show the use of a total reflecting prism to make an inverted image erect.***

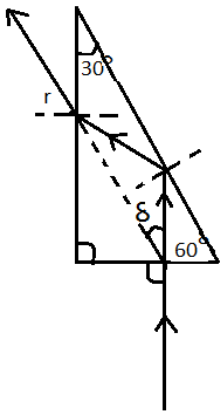
Ans:-



47) ***Copy the following diagram and complete the path of the light ray incident on a 30^0-60^0-90^0 prism. Mark the angle of deviation as δ. The critical angle for glass-air pair is 42^0.***

Ans:-

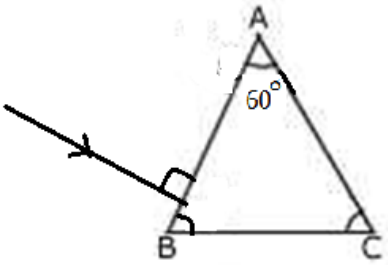




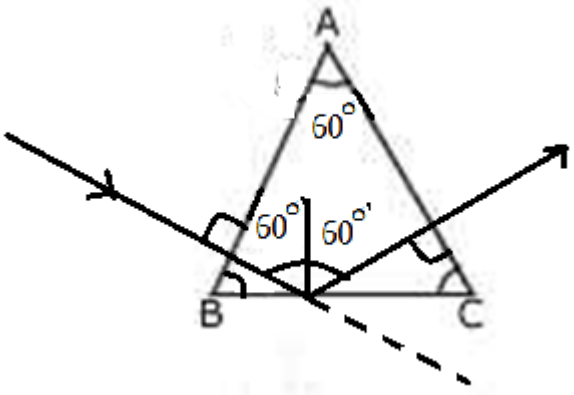
48)(i) In the adjacent diagram, a ray of light PQ is incident normally on one face AB of an equilateral glass prism. Complete the ray diagram showing its emergence into air after passing through the prism.

(ii) What are the angles of incidence at the faces AB,BC and AC?

(xi) What is the angle of deviation?



Ans:- (i)



(xii) The angle of incidence at AB is 0^0.
The angle of incidence at BC is 60^0.
The angle of incidence at AC is 0^0.

(xiii) The angle of deviation of the ray is 60^0.

CH:5(B) REFRACTION OF LIGHT THROUGH LENS

1) **What is a lens? Name its two kinds.**

   Ans: - A lens is a refracting body made from glass which has curved refracting surfaces. There are two types of lens namely: (1) convex lens and (2) concave lens.

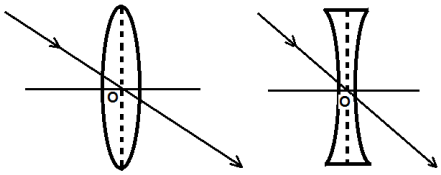
2) **Differentiate between convex and concave lens.**

   Ans: -

Convex lens	Concave lens
1. It is a converging lens i.e. light rays after refraction come closer and meet at a point.	1. It is a diverging lens i.e. light rays after refraction move away from each other and appear to be coming from a point.
2. It has the middle part comparatively thicker than the edge.	2. It has the middle part comparatively thinner than the edge.
3. It can form real as well as virtual image of an object.	3. It can form only virtual image of an object.
4. Its focal length is positive.	4. Its focal length is negative.

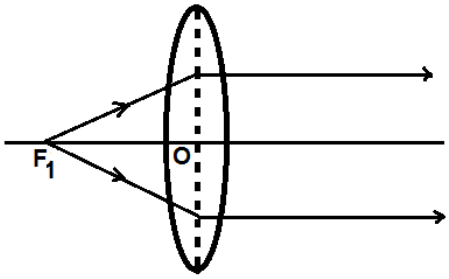
3) **When does a ray of light falling on a lens pass through it undeviated?**

   Ans: - If a light ray is incident on the lens in the direction of its optical centre then it passes undeviated through the lens.



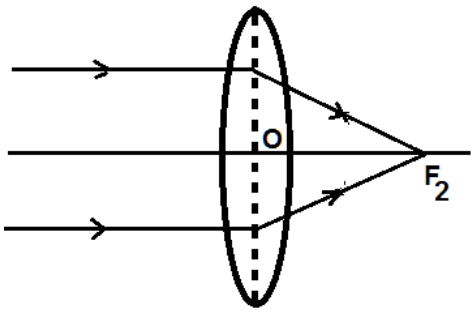
4) **Define first focus of a convex lens with the aid of a neat ray diagram.**

   Ans: - It is a point on the principal axis of a convex lens such that light rays starting from this point and incident on the lens become parallel to the principal axis after refraction through the lens.



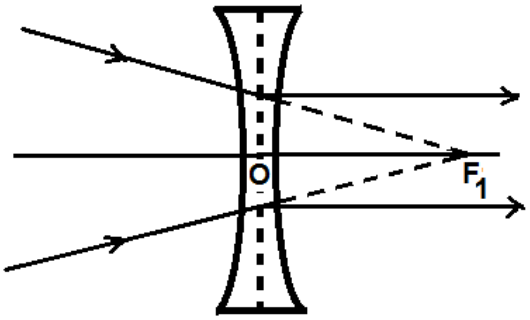
5) **Define second focus of a convex lens with the aid of a neat ray diagram.**

Ans: - It is a point on the principal axis of a convex lens such that light rays incident on the lens in the direction parallel to the principal axis, meet at that point after refraction through the lens.



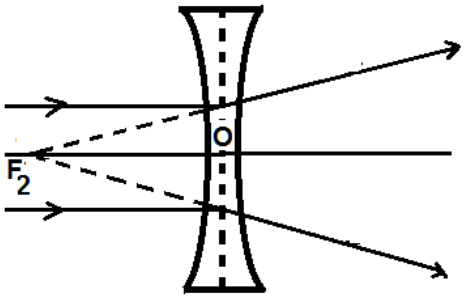
6) **Define first focus of a concave lens with the aid of a neat ray diagram.**

Ans: - It is a point on the principal axis of a concave lens such that light rays incident on the lens in the direction of this point become parallel to the principal axis after refraction through the lens.



7) **Define second focus of a concave lens with the aid of a neat ray diagram.**

Ans: - It is a point on the principal axis of a concave lens such that light rays incident on the lens in the direction parallel to the principal axis appear to be coming from this point after refraction through the lens.



8) **Define focal length of a lens. What are the factors that affect focal length of a lens?**

Ans: - The distance between focus and optical centre of a lens is called as focal length. It can be first focal length (f_1) or second focal length (f_2) depending upon the type of focus. Focal length depends on refractive index and radius of curvature.

9) **What change happens to the focal length of a convex lens if it is immersed in water?**

Ans: - If a convex lens from air is taken into water then its focal length increases.

10) Differentiate between a real image and a virtual image.

Ans: -

Real image	Virtual image
1. It can be obtained on the screen. 2. It is formed due to actual intersection of light rays. 3. It is an inverted image with respect to the object.	1. It cannot be obtained on the screen. 2. It is formed when light rays do not intersect actually but appear to do so. 3. It is an upright image with respect to the object.

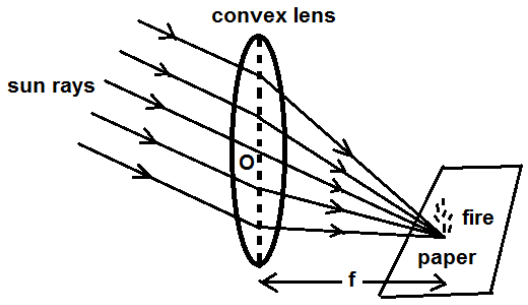
11) We can burn a piece of paper by focusing the sun rays by using a particular type of lens.

(i) Name the type of lens used for the above purpose.

(ii) Draw a ray diagram to support your answer.

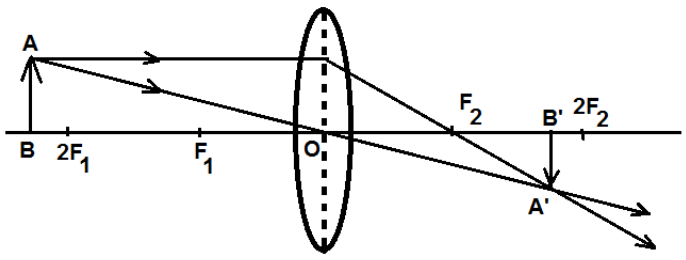
Ans: - (i) convex lens

(ii)



12) An object is placed in front of a converging lens at a distance greater than twice the focal length of the lens. Draw a ray diagram to show the formation of the image. State about the characteristics of the image.

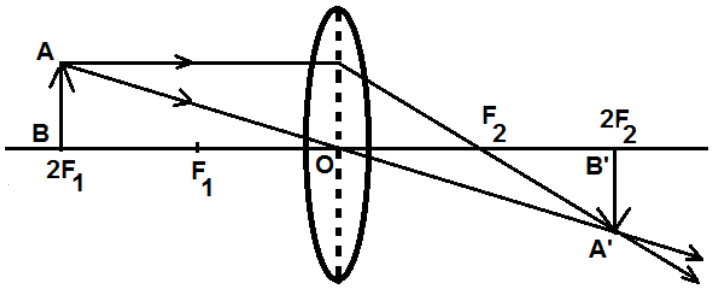
Ans: -



It is a real, inverted and diminished image.

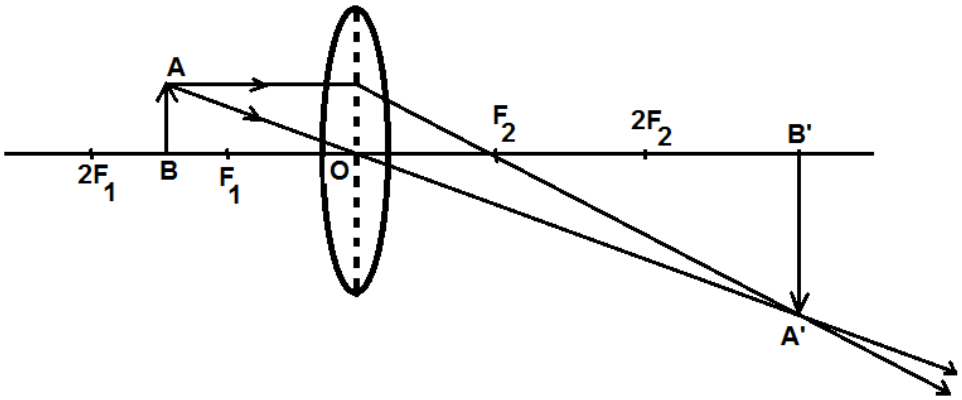
13) An object is placed in front of a convex lens such that the image formed has the same size as that of the object. Draw a ray diagram to illustrate this.

Ans: -



14) A converging lens is used to obtain an image of an object placed in between F_1 and $2F_1$. Where is the image obtained? Draw a ray diagram to illustrate the formation of the image obtained. State the nature and size of the image.

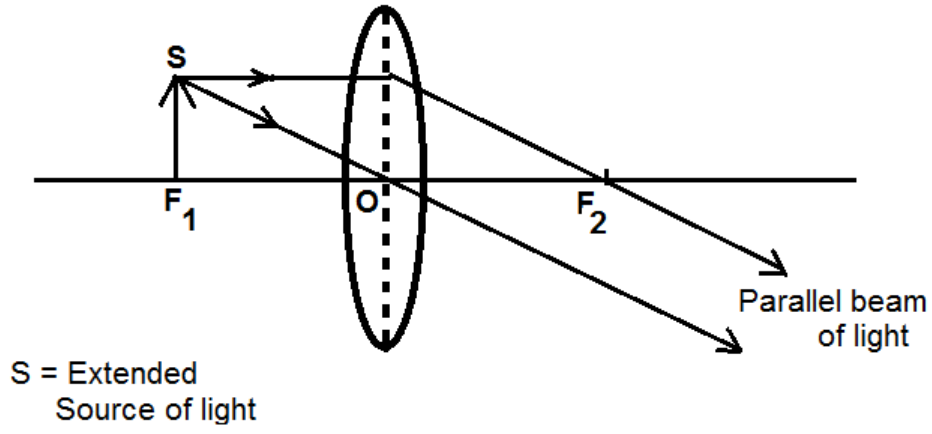
Ans: - The image is obtained beyond 2F on the other side of the lens.



The image obtained is real, inverted and magnified.

15) A convex lens is used to obtain a parallel beam of light when an extended source of light is placed at the focus. Draw a neat ray diagram to illustrate this application of a convex lens. Where is the image of the source of light formed?

Ans: -



The image of the source of light is formed at infinity.

16) An erect, magnified and virtual image is formed, when an object is placed between the optical center and principal focus of a lens.

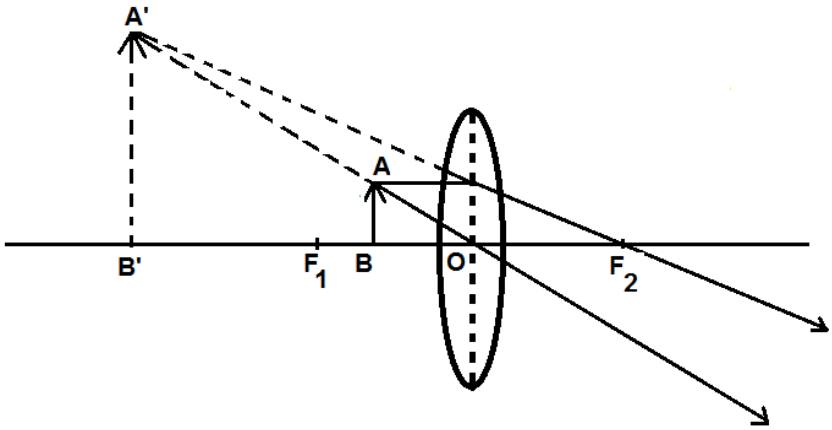
(i) Name the lens.

(ii) Draw a ray diagram to show the formation of the image with the above stated characteristics.

(iii) Name an application of this lens forming such an image.

Ans: - (i) It is a convex lens.

(ii)



(iii) A convex lens used as magnifying glass (simple microscope) forms the above image.

17) State three characteristics of the image of an extended source, formed by a concave lens.

Ans: - Virtual, erect and diminished image is formed by the concave lens.

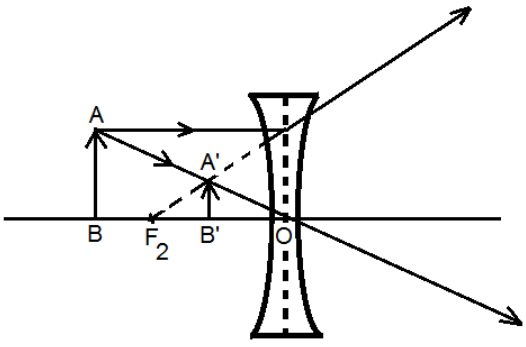
18) An object is placed in front of a lens between its optical center and the focus and forms a virtual, erect and diminished image.

(i) Name the lens which formed this image.

(ii) Draw a ray diagram to show the formation of the image with the above stated characteristics.

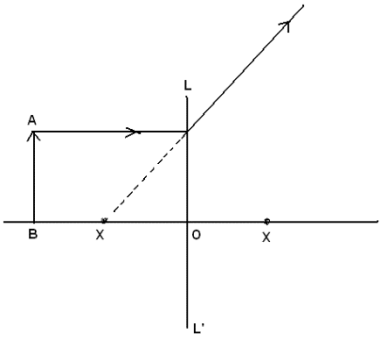
Ans:- (i) concave lens

(ii)

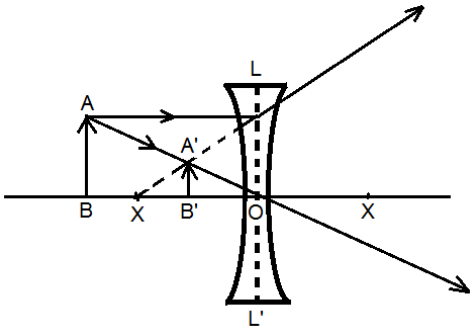


19) (i)Copy and complete the diagram to show the formation of the image of the object AB.

(ii) What is the name given to x?



Ans: -(i)



(ii) X is named focus.

20) Name the lens:

(i) Which can produce a real and inverted image of an object.

(ii) Which can produce only virtual image of an object.

(iii) Which produces only diminished image.

(iv) Which can produce magnified image.

Ans:- (i) convex lens
(ii) concave lens
(iii) concave lens
(iv) convex lens

21) You are provided with a printed piece of paper. Using this paper how will you differentiate between a convex lens and a concave lens?

Ans: - The printed paper is to be brought very close to each lens one after the other. If the image of the print in the lens is found to be erect and magnified then it must be a convex lens. And if the image of the print in the lens is found to be erect and diminished then it must be a concave lens.

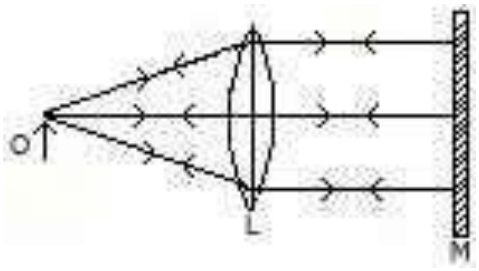
22) Copy and complete the following table:

Type of lens	**Position of object**	**Nature of Image**	**Size of Image**
Convex	**At F**		
Concave	**At infinity**		

Ans:-

Type of lens	Position of object	Nature of Image	Size of Image
Convex	At F	real	Highly magnified
Concave	At infinity	Virtual	Highly diminished

23) The ray diagram given below illustrates the experimental set up for the determination of the focal length of a converging lens using a plane mirror.



(i) State the magnification of the image formed.

(ii) Write two characteristics of the image formed.

(iii) What is the name given to the distance between the object and optical centre of the lens in the diagram?

Ans:-

(i) Magnification = 1 or same size image

(ii) Real and inverted image

(iii) Focal length

CH:6 SPECTRUM

1) ***Name the subjective property of light related to its wavelength.***
   Ans:- Colour of light
2) ***What is meant by (i)Dispersion, (ii) Spectrum of light?***
   Ans:- (i) The phenomenon of splitting of white light by a prism into its constituent colours is known as dispersion of light.
   (ii) On passing white light through a prism, the band of colours seen on a screen is called the spectrum of white light.
3) ***What is the cause of dispersion of light?***
   Ans:- The cause of dispersion of white light is the change in speed of light with wavelength. When white light enters the first surface of a prism, light of different colours due to their different speeds in glass, gets deviated through different angles towards the base of the prism. That means the dispersion or splitting of white light into its constituent colours takes place at the first surface of the prism.

   When this rays of different colours get incident on the second surface of prism, only refraction takes place from glass to air and different colours get deviated through different angles, As a result, the colours get further separated on refraction at the second surface. The light emerging out of the prism thus has different colours that spread out to form a spectrum on the screen.

4) ***What do you mean by electromagnetic spectrum?***
   Ans:- The orderly distribution of electromagnetic waves according to their wavelength or frequency is called the electromagnetic spectrum.

   The electromagnetic spectrum in the increasing order of wavelength is shown below.

   Gamma rays---------- ---------- $\lambda < 0.1Å$
   X- rays---------- $0.1 Å < \lambda < 100Å$
   Ultraviolet rays--------- $100Å < \lambda < 4000Å$
   Visible light---------- $4000Å < \lambda < 8000Å$
   Infrared radiations----- $8000Å < \lambda < 10^7 Å$
   Microwaves---------- $10^7 Å < \lambda < 10^{11}Å$
   Radio waves---------- $\lambda > 10^{11}Å$
5) ***Name the electromagnetic waves longer in wavelength than visible red colour light.***
   Ans:- Infrared radiations, microwaves and radio waves.
6) ***Name the electromagnetic waves shorter in wavelength than visible violet colour light.***
   Ans:- Ultraviolet rays, X-rays and gamma rays
7) ***Write any one use of different electromagnetic waves.***
   Ans:-
   Gamma rays----------for radiation therapy of cancer

X- rays----------for taking photograph of fractured bones
Ultraviolet rays--------- for sterilizing surgical goods
Visible light---------- for photography
Infrared radiations----- for photography in fog and night
Microwaves----------for cooking in microwave ovens
Radio waves---------- for radio and TV transmission

8) Write the common properties of all electromagnetic waves.

Ans:-

1) They all travel at equal speed i.e. 3×10^8 ms^{-1} in vacuum along straight line path.
2) They exhibit the properties of reflection and refraction.
3) They are not deflected by the electric and magnetic fields.
4) They are transverse in nature.

9) Name the different source of infrared radiations.

Ans:- sun, fire/flame, red hot iron ball

10) Write the methods to detect infrared radiations.

Ans:-

1) A blackened bulb thermometer can be used to detect infrared radiations. Infrared radiations are the heat radiations and a black surface is the best absorber of heat radiations. Therefore a blackened bulb thermometer readily absorbs infrared radiations and shows rapid rise in temperature in comparison to that done by an ordinary polished bulb thermometer.
2) A thermopile can be used to detect infrared radiations. The galvanometer connected with the thermopile shows deflection when infrared radiations fall on the thermopile.
3) A rock salt prism can detect infrared radiations by producing spectrum of these radiations.

11) Write the important properties of infrared radiations.

Ans:-

1) They are scattered very less owing to their very long wavelength.
2) They produce a strong heating effect.
3) They can pass through rock salt but are absorbed by glass. So spectrum of infrared radiations is obtained by a rock salt prism and not by a glass prism.
4) They do not affect ordinary photographic film.
5) They do not cause fluorescence.

12) Write the uses of infra red rays.

Ans:- Following are the uses of infrared rays:

1) Used for night photography and photography in foggy condition.
2) Used for sending signals during war.

3) Used by doctors for therapeutic effect.
4) Used in remote control of TV.

13) Why are infra red rays used for photography in foggy condition?

Ans:- Due to their very long wavelength, infra red rays do not scatter much in the atmosphere and they can penetrate appreciably through the atmosphere. That is why they are used for photography in foggy condition.

14) Why are infra red rays used for signals during the war?

Ans:- Infra red rays are invisible. They are also not absorbed much in the medium due to less scattering. Hence infra red rays are used for signals during the war.

15) Why are infra red lamps used in photographic dark rooms?

Ans:- Infra red rays do not affect ordinary photographic plates and films as they are chemically less reactive. So infra red lamps are used in photographic dark rooms to develop photographs as infra red rays provide some visibility without affecting the photographs.

16) Write one useful and one harmful effect of infra red radiations.

Ans:- Useful effect:- A small dose of Infra red rays are useful to produce therapeutic effect in human body.
Harmful effect:- Excessive exposure to infrared rays can cause skin burns.

17) Name the different source of ultraviolet radiations.

Ans:- sun, mercury vapour lamp, electric arc lamp etc

18) Write the methods to detect ultraviolet radiations.

Ans:-

1) Silver chloride solution can be used to detect ultraviolet radiations. The invisible ultraviolet rays can convert a white colored silver chloride solution into violet and then dark brown or black which is not so by any other electromagnetic waves.
2) A quartz prism can detect ultraviolet radiations by producing spectrum of these radiations.

19) Write the important properties of ultraviolet radiations.

Ans:-

1) They are scattered very strongly owing to their very short wavelength.
2) They are highly chemically active.
3) They can pass through quartz but are absorbed by glass. So spectrum of ultraviolet radiations is obtained by a quartz prism and not by a glass prism.
4) They strongly affect ordinary photographic film.
5) They produce fluorescence on zinc sulphide screen.

20) Write the uses of ultra violet rays.

Ans:- Following are the uses of ultra violet rays:

1) For sterilizing the surgical equipments in hospitals.
2) For detecting fake currencies.
3) For detecting the purity of gems, eggs, ghee etc.
4) For synthesizing vitamin D in food of plants and animals.

21) Write one useful and one harmful effect of ultra violet radiations.

Ans:- Useful effect:- UV rays of long wavelength are useful to produce vitamin D in human body.

Harmful effect:- Excessive exposure to UV rays of short wavelength can cause skin cancer and other skin disease in human.

CH:7 SOUND

1) *State the differences between sound waves and light waves.*

Ans:-

Sound waves	Light waves
(i) They are mechanical waves.	(i) They are electromagnetic waves
(ii) They cannot propagate through a vacuum.	(ii) They can travel through a vacuum.
(iii) They have speed much lesser than that of light. It is only 330 ms^{-1} in air.	(iii) They have speed much higher than that of sound i.e. 3 $X10^{8}$ ms^{-1} in air.
(iv) They are of long wavelength.	(iv) They are of extremely short wavelength.
(v) They are longitudinal in nature while propagating through air.	(v) They always travel as transverse waves.

2) *Define (i) amplitude, (ii) frequency, (iii) wavelength of a wave.*

Ans:-

(i) Amplitude:- The maximum displacement of a vibrating medium particle to either side of its mean position during the propagation of a wave through the medium is called amplitude of the wave.

(ii) Frequency:- The number of waves passing through a point in unit time/ per second is called the frequency of the wave.

(iii) Wavelength:- The distance travelled by a wave in one time period is called its wavelength.

3) *What is meant by an echo? State the conditions necessary for an echo to be heard distinctly.*

Ans:- The sound heard after reflection from a distant obstacle such as a cliff or a hillside after the original sound has ceased, is called an echo.

To hear an echo distinctly, following three conditions must be satisfied:

(i) The minimum distance between the source of sound and the reflector must be 17 m in air.

(ii) The size of the reflector must be large enough as compared to the wavelength of the sound wave.

(iii) The intensity or original sound must be sufficiently high so that after reflection the sound can be audible.

4) *State two applications of echo.*

Ans:- The two applications of echo are (1) sound ranging and (2) echo depth sounding.

5) *Name the waves used for sound ranging. State one reason for their use. Why are the waves mentioned by you not audible to us?*

Ans:- Ultrasonic waves are used for sound ranging. These waves are used because they can travel undeviated through a long distance without being absorbed by the medium.

Ultrasonic waves are not audible to us because they have a frequency more than 20 kHz which is beyond the normal range of audibility.

6) *What is 'SONAR'? State the principle on which it is based?*

Ans:- 'SONAR' is the abbreviated form of sound navigation and ranging and it is a device used to measure the depth of water in seas and oceans and also to detect the underwater objects.

It works on the principle of echo depth sounding. Ultrasonic waves sent by the SONAR deep inside water get reflected back by the obstacle and received by the SONAR. If 't' is the time interval between the sending of ultrasonic waves and receiving their reflected pulses back then the depth of water can be determined by the following expression.

$$d = \frac{vt}{2}$$ where *v* = velocity of ultrasonic waves in water

7) *What is 'RADAR'? State the principle on which it is based?*

Ans:- 'RADAR' is the abbreviated form of radio detection and ranging and it is a device used to locate the flying objects in the atmosphere like an aircraft.

It works on the principle of reflection of radio waves from the desired object in the atmosphere. Radio waves sent by the transmitter of the RADAR gets reflected back after striking the obstacle and its reflected waves are intercepted by the radio receiver.. If 't' is the time interval between the sending of radio waves and receiving their reflected pulses back then the distance of the obstacle from the RADAR can be determined by the following expression.

$$d = \frac{vt}{2}$$ where *v* = velocity of radio waves

8) *Define 'natural vibrations' and state their characteristics. State one condition for a body to execute the natural vibrations.*

Ans:- The periodic vibrations of a body in the absence of any external periodic force on it , are called the natural or free vibrations.

They are of following characteristics: (1)constant frequency,(2) constant amplitude

These vibrations take place in a vacuum or free space.

9) *What are damped vibrations? How do they differ from the free vibrations? Give one example of damped vibrations.*

Ans:- The periodic vibrations of a body of decreasing amplitude in presence of a resistive force of the medium are called the damped vibrations.

The amplitude of Damped vibrations decreases periodically but the amplitude of the natural vibrations does not decrease with time.

An example of damped vibrations is the vibrations of a tuning fork when stroked on a rubber pad.

10) *Differentiate between natural vibrations and damped vibrations.*

Ans:-

Natural vibrations	Damped vibrations
(i) They take place at constant amplitude. (ii) They take place at a constant frequency equal to the natural frequency of the vibrating body. (iii) There is no loss of energy of the vibrating body as there is no dissipation of energy due to absence of medium.	(i) They take place at periodically decreasing amplitude. (ii) The frequency of these vibrations is less than the natural frequency of the vibrating body. (iii) There is dissipation of energy of the vibrating body into the medium as the body has to do work to overcome the resistive forces associated with the medium.

11) *What do you mean by forced vibrations? State an example of these type of vibrations.*

Ans:-The vibrations of a body which take place under the influence of an external periodic force acting on it, are called the forced vibrations.

For example, in a guitar, when an artist plays on its strings by his fingers, the vibrations in them cause the forced vibrations in the air enclosed in its hollow box.

12) *Differentiate between natural vibrations and forced vibrations.*

Ans:-

Natural vibrations	Forced vibrations
(i) They take place without the help of an external periodic force. (ii) They take place at a constant frequency equal to the natural frequency of the vibrating body. (iii) The amplitude of these vibrations remains constant with time.	(i) They take place under the influence of an external periodic force. (ii) The frequency of these vibrations changes with the change in the frequency of the applied external force. (iii) The amplitude of vibrations depends on the difference of natural frequency of the vibrating body and the frequency of external force. Greater the difference between these two frequencies, lesser is the amplitude of forced vibrations.

13) *Define the term 'resonance'.*

Ans:- 'Resonance' is the phenomenon in which a body vibrates at a very large amplitude when the frequency of external periodic force acting on the body becomes either equal to or an integer multiple of the natural frequency of that body. These vibrations are named as resonant vibrations of the body.

14) *State the condition for the resonance to occur. How will know whether a body is in the state of resonance or not?*

Ans:- When the frequency of externally applied periodic force on a body becomes either equal to or an integer multiple of the natural frequency of that body then resonance takes place in the body. When resonance takes place, the body vibrates at a large amplitude.

15) *Differentiate between forced vibrations and resonant vibrations.*

Ans:-

Forced vibrations	Resonant vibrations
(i) They take place at relatively small amplitude.	(i) They take place at very large amplitude.
(ii) These vibrations occur when frequency of external force is different from that of natural frequency of the vibrating body.	(ii) These vibrations occur when frequency of external force is equal to the natural frequency of the vibrating body.
(iii) These vibrations of the body are not in phase with the external periodic force.	(iii) These vibrations of the body are in phase with the external periodic force.

16) *Sometimes when a vehicle is driven at a particular speed, a rattling sound is heard. Explain briefly, why does this happen and give the name of the phenomenon taking place. Suggest one way by which the rattling sound could be stopped.*

Ans:- The phenomenon due to which the rattling sound gets produced is called 'resonance'.

The vibrations produced in the engine of a vehicle get transmitted to various parts of it. The frequency of these vibrations in the engine changes with the speed of the vehicle. At a particular speed of the vehicle, when the natural frequency of vibrations of some parts of the vehicle becomes equal to the frequency of the vibrations produced in the engine, resonance occurs in that part. So the particular part of the vehicle vibrates at large amplitude and produces a kind of rattling sound.

To stop the rattling sound, the speed of the vehicle should be changed.

17) *When a troop crosses a suspension ridge, the soldiers are asked to break their steps. Why?*

Ans:- When soldiers march in steps, each soldier exerts a periodic force in same phase and therefore the bridge executes the forced vibrations. Now if the of the steps accidentally becomes equal to the natural frequency of the bridge, the bridge will vibrate with a large amplitude due to resonance. Hence the bridge may collapse. Therefore to prevent the mishap the soldiers are asked to break their steps and avoid resonance of the bridge.

18) *Why are the stringed instruments like guitar provided with a hollow sound box?*

Ans:- When the string of an instrument like guitar is made to vibrate, it sets the air molecules in the sound box to execute forced vibrations. But the box is so constructed that the column of air inside it, has a natural frequency which is same as that of the string stretched on it. Therefore the forced vibrations of the air column change to resonant vibrations and a loud sound is heard. In this way the feeble sound produced by the vibrating string gets amplified inside the hollow sound box.

19) *How do you tune your radio set to a particular station? Name the phenomenon involved in doing so.*

Ans:- The tuning of a radio set is based on the phenomenon of resonance.

Different radio stations transmit their radio signals at different frequencies. The radio receivers have electronic circuits which produce electromagnetic vibrations, the frequency of which can be changed by changing the value of the electronic components. When we want to tune a radio receiver, we merely adjust the values of the electronic components to produce vibrations of frequency equal to that of the radio waves which we want to receive. When both the frequencies match, resonance occurs and only the energy of signal of that frequency is received from the waves present in space. In this way a radio set is tuned to a particular station.

20) *Name one factor on which the frequency of sound emitted due to vibrations in an air column depends and state how.*

Ans:- Frequency of sound emitted by a vibrating air column depends on the length of air column. The frequency of vibrations of air column vary inversely as the length of the air column.

21) *State and explain the factors affecting the frequency of a vibrating string. Write an expression for the frequency of a vibrating string.*

Ans:- The frequency of a vibrating string depends on the following factors:

1) Directly proportional to the square root of tension in the string.
2) Inversely proportional to the length of the string.
3) Inversely proportional to the square root of mass per unit length of the string.

$$f = \frac{1}{2l}\sqrt{\frac{T}{m}}$$

where l= length of the string
T= tension in the string
m = mass per unit length of the string

22) *State two ways of increasing the frequency of vibrations of a stretched string.*

Ans:- The frequency of vibrations of a stretched string can be increased as follows:

1) By increasing the tension in the string.
2) By decreasing the length of the string.

23) *Name the three characteristics of a musical sound and state the factor that determines each.*

Ans:- The three characteristics of a musical sound are (1) pitch, (2) loudness and (3) quality. The factors which determine them are as follows:

1) Frequency determines pitch.
2) Amplitude determines loudness.
3) Wave form determines quality of musical sound.

24) *Name the characteristic of the sound affected due to change in its (i) amplitude, (ii) wave form and (iii) frequency.*

Ans:- (i) Loudness is affected due to change in amplitude.
(ii) Quality is affected due to change in wave form.
(iii)Pitch is affected due to change in frequency.

25) *Define pitch of a sound and name the objective property corresponding to it.*

Ans:- Pitch is that characteristic of sound by which one can distinguish between a shrill sound and a grave sound. Pitch is a subjective property of sound and its corresponding objective property is frequency.

26) *Explain why strings of different thickness are provided on a stringed instrument.*

Ans:- Natural frequency of vibrations of a stretched string is inversely proportional to the radius or thickness of string. Since a stringed musical instrument like guitar is provided with strings of different thickness, they are made to vibrate at different frequencies. So musical notes of different frequency or pitch can be produced by the same instrument.

27) *How is it possible to detect the filling of a bottle under a water tap by hearing the sound at a distance?*

Ans:- As an empty bottle is filled with water under a tap, the air column inside it begins to vibrate. But as the bottle gets filled in more and more, the length of the vibrating air column decreases and frequency of vibrations increases. Thus the pitch of sound emitted gradually increases i.e. sound tends to become shriller. Therefore by noticing the change in shrillness of sound one can easily detect the length of the bottle filled.

28) *Define loudness of a sound and name the objective property corresponding to it.*

Ans:- Loudness is that characteristic of sound by which one can distinguish between a loud sound and a soft sound. Loudness is a subjective property of sound and its corresponding objective property is intensity.

29) *Name and explain the factors affecting loudness of sound.*

Ans:- Loudness of sound depends on the following factors:

1) It is directly proportional to the square of amplitude of vibrations.
2) It is inversely proportional to the square of distance of separation between the source of sound and the listener.
3) It is directly proportional to the surface area of the vibrating body.
4) It is directly proportional to the density of the medium.
5) It depends on the presence of resonant bodies.

30) *What is the unit of loudness?*

Ans:- phon is the unit of loudness.

31) *What do you mean by quality of sound?*

Ans:- Quality of a sound is that characteristic which distinguishes the two sounds of the same loudness and same pitch, but emitted by two different instruments because of change in their wave forms.

32) *What determines the quality of a musical sound and how?*

Ans:- Quality of sound is determined from the waveform. Quality of a musical sound depends on the number of the subsidiary notes and their relative amplitudes present in it along with the principal note. The resultant vibrations obtained by the superposition of all these vibrations, gives the wave form of the sound and hence quality of sound is determined.

CH:8 CURRENT ELECTRICITY

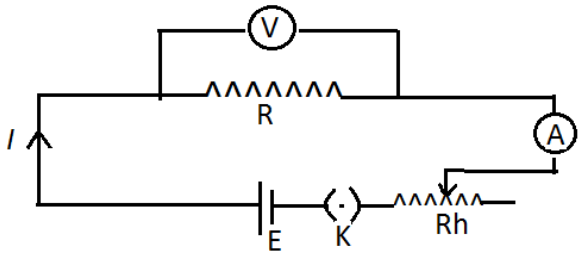
1) ***State Ohm's law and its limitations***.
Ans:- Ohm's law states that the strength of electric current passing through a conductor is directly proportional to the potential difference applied across its ends provided the physical conditions and the temperature of the conductor remain constant.

2) ***Write the mathematical form of Ohm's law.***
Ans:- $V = IR$
where V= potential difference, I= current and R= resistance of the conductor.

3) ***Name and define the S.I. unit of electrical resistance.***
Ans:- The S.I. unit of resistance is ohm (Ω). The resistance of a conductor is said to be 1 ohm if 1 ampere current flows through it when a potential difference of 1 volt is applied across the ends of the conductor, i.e.

$$1\ ohm = \frac{1\ volt}{1\ ampere}$$

4) ***Draw a labled circuit diagram to verify Ohm's Law.***
Ans:-



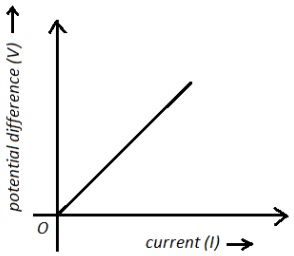
R= resistance
V= voltmeter
A= ammeter
E= DC source
K= key
Rh= rheostat

5) ***Differentiate between ohmic conductors and non-ohmic conductors. Give some examples of them.***
Ans:-

Ohmic conductor	*Non-ohmic conductor*
(i) An ohmic conductor is the one which obeys Ohm's law. e.g. metallic conductors(silver, copper, aluminum etc), nichrome	(i) A non-ohmic conductor is the one which does not obey Ohm's law. e.g. LED, filament of bulbs, semiconductors, junction diodes etc
(ii) The voltage-current relationship is linear. So the V-I graph is a straight line.	(ii) The voltage-current relationship is not linear.So the V-I graph is not a straight line.
(iii) The resistance of an ohmic conductor is static.	(iii) The resistance of a non-ohmic conductor is variable.

6) Draw the sketch of V-I- graph of an ohmic conductor. What does its slope equal to?

Ans:-



The slope of V-I graph is equal to the resistance of the conductor.

7) State and explain the factors affecting the resistance of a conductor.

Ans:- Resistance of a conductor depends on the following factors:

1) Material of the conductor:- More the concentration of free electrons in the material, lesser is the resistance.
2) Length of conductor:- Longer the length of the conductor, more is its resistance.
3) Thickness of conductor:- More the thickness (area of cross-section) of the conductor, lesser is the resistance.
4) Temperature of conductor:- More the temperature, more is the resistance of the conductor.

8) What happens to the resistance of a metallic wire in the following cases:

a) ***If the length of the wire is doubled.***

b) ***If the radius of the wire is doubled.***

c) ***If the temperature of the wire is increased.***

Ans:- **a)** Resistance of a metallic wire becomes doubled if length of the wire is doubled.

b) Resistance of the metallic wire becomes one-fourth if the radius of the wire is doubled.

c) Resistance of the metallic wire increases if the temperature of the wire increases.

9) Write an expression for resistance of a wire in terms of its dimensions.

Ans:- $R = \rho \frac{l}{a}$

where ρ= specific resistance of the material of wire

l = length of the wire

α= area of cross-section of the wire

10) Define the term specific resistance and name its S.I. unit.

Ans:- Specific resistance of a substance is defined as the resistance of a wire of unit length and unit area of cross-section made from that material.

$$\rho = \frac{Ra}{l}$$

where R= resistance, *l*= length and α= area of cross-section of the wire

The S.I. unit of specific resistance is ohm.metre (Ωm)

11) Give examples of each of the following material whose:

a) ***Resistance increases with increase in temperature.***

b) ***Resistance decreases with increase in temperature.***

c) ***Resistance remains unaffected with the change of temperature.***

Ans:-

a) Copper and aluminium have resistance increased with increase in temperature.
b) Carbon and silicon have resistance decreased with increase in temperature.
c) Constantan and manganine have resistance remaining unaffected with the change of temperature.

12) Name the material used to make connection wires. Give a reason for your answer.

Ans:- Copper is used to make connection wires. Copper has a low specific resistance and high melting point. Due to low specific resistance, copper wires can conduct electricity very easily and due to high melting point, copper wire does not melt easily due heating effect of current. Hence copper is suitable for making connection wires.

13) Name the material used to make filament of incandescent lamps. Give a reason for your answer.

Ans:- Tungsten is used to make filament of lamps. Tungsten has a high specific resistance and high melting point. Due to high specific resistance, tungsten filament becomes extremely hot on passage of current and starts emitting light. But due to high melting point, tungsten filament does not melt easily due heating effect of current. Hence Tungsten is used to make filament of lamps.

14) Name the material used to make heating coil of electric heaters. Give a reason for your answer.

Ans:- Wire of nichrome is used to make heating coil of electric heaters. Nichrome has a high specific resistance and high melting point. Due to high specific resistance, nichrome coil becomes extremely hot on passage of current and starts emitting heat. But due to high melting point, tungsten nichrome coil does not melt easily due heating effect of current. Hence nichrome is used to make heating coil of heaters.

15) Name the material used to make fuse wires. Give a reason for your answer.

Ans:- Alloy of lead and tin (called solder) is used to make fuse wires. This material has a high specific resistance and low melting point. Due to high specific resistance, the fuse wire becomes extremely hot on passage of excess current and melts instantly due to this heat as the melting point is very low.

16) Name the material used to make standard resistors. Give a reason for your answer.

Ans:- Constantan and manganine etc. are used to make standard resistors. Because this materials have their specific resistance unchanged with the change of temperature.

17) What is a superconductor? Give one example of it. What is the advantage of a superconductor?

Ans:- A substance which has zero resistance or infinite conductance at a very low temperature (nearly absolute zero temperature) is called a superconductor.

Examples: Mercury below 4.2 K, lead below 7.25 K, niobium below 9.2K etc.

The advantage of superconductor is that it can conduct electricity with almost zero loss of energy.

18) Differentiate between electromotive force and terminal voltage of an electric cell.

Ans:-

electromotive force		***terminal voltage***	
(i)	When no current is drawn from a cell i.e. when the cell is in open circuit, the potential difference between the terminals of the cell is called the electromotive force or e.m.f.of the cell.	(i)	When current is drawn from a cell i.e. when the cell is in closed circuit, the potential difference between the terminals of the cell is called the terminal voltage of the cell.
(ii)	The emf of a cell is defined as the energy spent by it per unit positive charge in moving the charge once around the complete circuit both inside and outside the cell.	(ii)	The terminal voltage of a cell is defined as the energy spent by it per unit positive charge in moving the charge once around the complete circuit only outside the cell.

19) Define internal resistance of a cell and state the factors affecting it.

Ans:- The resistance offered by the electrolyte inside the cell to the flow of current is called the internal resistance of the cell. It depends on the following factors:

(i) Distance between the electrodes
(ii) Surface area of the electrodes
(iii) Nature and concentration of electrolyte
(iv) Temperature of the electrolyte

20) Write a relation between emf, terminal voltage and internal resistance of a cell.

Ans:- EMF = terminal voltage + voltage drop inside the cell

$E = V + Ir$

21) How will you determine the resistance and the maximum safe current for an appliance from the power and voltage rating of the appliance?

Ans:- $R = \frac{V^2}{P} \quad and \quad I = \frac{P}{V}$

where P= Power rating and V= voltage rating of the appliance

22) Name and define the commercial unit of electrical energy. Write its value in S.I. unit.

Ans:- The commercial unit of electrical energy is kilowatt-hour (kWh). One kilowatt-hour is the electrical energy consumed by an electrical appliance of power 1 kilowatt when it is used for 1 hour.

1 kWh = 3.6×10^6 J

23) State and explain the factors affecting the heating effect of current in a conductor.

Ans:- The amount of heat produced in a current carrying conductor depends on the following factors.

1. It is directly proportional to square of strength of current.
2. It is directly proportional to resistance of the conductor.
3. It is directly proportional to time interval of flow of current.

24) Write the expression for heating effect of current in a conductor.

Ans:- $H = I^2Rt$

Where I = strength of current

R= resistance of the conductor

t= time interval of flow of current

CH:9 HOUSEHOLD CIRCUITS

1) ***Write down the specifications of electricity supplied to our houses.***
   Ans:- The electricity supplied to our houses is an alternating current electricity of e.m.f. 220 volt and frequency 50 Hz.
2) ***Name the three connection wires used in household circuits and state their potentials***.
   Ans:- The three wires are live wire, neutral wire and earth wire. The potential of live wire is 220 volt, neutral wire is zero volt and earth wire is also zero volt.
3) ***Write the colour code of live, neutral and earth wires.***
   Ans:-

Old system	New system
Live wire = Red Neutral wire = Black Earth wire = Green	Live wire = Brown Neutral wire = Light Blue Earth wire = Yellow/ Green

4) ***What is a fuse in an electric circuit? What is the principle of its working?***
   Ans:- An electric fuse is a safety device which is used to limit the current in an electric circuit. It works on the principle of heating effect of current.
5) ***Name and state the characteristics of the material used to make a fuse wire.***
   Ans: A fuse wire is made from an alloy of lead and tin (commonly called as solder). This material has a high value of specific resistance and a low value of melting point.
6) ***Briefly write about the working of a fuse in an electric circuit.***
   Ans:- A fuse wire is made from an alloy of lead and tin which has a high specific resistance. So accidentally if a heavy current tends to flow in a circuit, a large quantity of heat gets produced in its fuse wire due to heating effect of current. As the melting point of the material of fuse is very less, the heat thus produced causes the fuse wire to melt almost instantaneously and breaks the circuit. Thus the circuit is saved from getting burnt or damaged due to excessive flow of current.
7) ***Why is a fuse always connected in the live wire of a circuit?***
   Ans:- In an electric circuit, it is the live wire which is at high potential (i.e. 220 V) and not the neutral wire. So if the fuse connected with the live wire melts then the appliance of the circuit gets disconnected from the main live wire and hence it is harm less to touch the internal parts of this appliance. However if the fuse is connected with the neutral wire then even though it melts, the appliance remains connected to the high potential of the live wire. So it is risky to touch the internal parts of this appliance as it may cause a fatal electric shock. For this reason, fuse wire should always be connected with the live wire and not the neutral wire.
8) ***What do you mean by current rating of a fuse wire?***
   Ans:- The maximum current which can flow through a fuse wire without causing it to melt is called the current rating of the fuse wire.

9) A fuse is rated 5A. What do you mean by this?

Ans:- A fuse rated 5A means if the strength of current flowing in the given fuse wire exceeds 5A then the wire melts instantaneously.

10) Two fuse wires are rated 5A and 15A. Which wire is thicker and why?

Ans:- The 15 A fuse wire is thicker. This is so because the 15 A wire is meant for conducting a heavy current for which its resistance needs to be less. Since resistance of a wire is inversely proportional to its thickness, the 15A fuse wire is thicker in order provide a less resistance.

11) What do you mean by earthing an electric appliance?

Ans:- Earthing an electric appliance means to connect the metallic cover of the appliance to the earth by means of a good conducting wire. For this, one end of a thick copper wire is soldered to the metallic cover of the appliance at one point and the other end of the wire is buried deep in the ground.

12) Why is paint removed from the part of the appliance whwere earthing connection is to be made?

Ans:- The point where the earth wire is soldered to the metallic body of the appliance is wiped off to remove paint. This is done to ensure a good earthing connection as the layer of paint acts as in insulator of current.

13) Explain how earthing an electric appliance provides safety to the user of the appliance.

Ans:- When the live wire of a faulty appliance comes in direct contact with its metallic cover due to break of insulation, the appliance acquires the high potential of the live wire. A person touching the appliance will get a fatal shock because current flows through his body to earth. But if the metallic cover of the appliance is properly earthed, then as soon as the live wire comes in contact with the metallic cover of the appliance, a heavy current flows to the earth through the cover of the appliance as it provides an almost zero resistance path for current to flow. Hence the fuse connected in the live wire of the circuit blows off and the appliance gets disconnected from the mains supply. Thus the person touching the defective appliance does not get any shock and the appliance is also saved from being damaged.

14) What is a switch? With which wire should a switch be put in and why?

Ans:- A switch is an on-off device for current in a circuit or in an appliance. A switch is connected in the live wire.

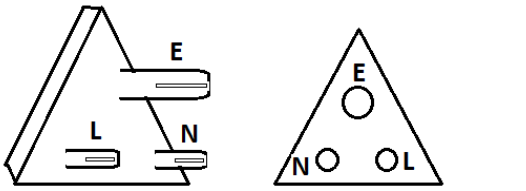
In an electric circuit, it is the live wire which is at high potential (i.e. 220 V) and not the neutral wire. So if the switch connected with the live wire is put off then the appliance of the circuit gets disconnected from the main live wire and hence it is harm less to touch the internal parts of this appliance. However if the switch is connected with the neutral wire then even though it is turned off, the appliance remains connected to the high potential of the live wire. So it is risky to touch the internal parts of this appliance as it may cause a fatal electric shock. For this reason, a switch should always be connected with the live wire and not with the neutral wire.

15) What is a double pole switch? Give an example of it.

Ans:- A double pole switch is meant for connection with both the live and neutral wire simultaneously. That means if a double pole switch is turned off then it disconnects both the live wire and the neutral wire from the electric mains supply. The main switch connected near the kWh meter on the main distribution board is an example of double pole switch.

16) Draw the simplified diagrams of a three-pin plug top and a three-pin plug socket. Lable the terminals of each.

Ans:-



three-pin plug top **three-pin plug socket**

L = live
N= neutral
E=earth

17) Why the earth pin of a three-pin plug top is thicker and longer than the other two pins?

Ans:- (1) Since the earth pin is thicker, even by mistake also it cannot be inserted in the hole a socket meant for live wire or neutral wire connection. By this the short circuit of the metallic case of the appliance is avoided.

(2) Since the earth pin is longer, the earth connection is made first on fixing the plug in the socket. So if the appliance is defective then due to earth connection, its fuse blows off and the user remains safe.

18) What is a high tension wire? Write two of its characteristics.

Ans:- A high tension wire is a special kind of wire meant for conducting a heavy current at a high voltage. It has the following two characteristics:

(1) Low resistance, (2) large surface area

19) Why a high tension wire is made effectively thicker by twisting a bunch of fine wires instead of taking a single wire of same thickness?

Ans:- A high tension wire needs to be thicker to have a less resistance as it is used to conduct a heavy current. But it is made effectively thicker by twisting a bunch of thin wires insulated from each other instead of being a single wire of same thickness. This makes the surface area of a high tension wire relatively larger than that of a single wire of same thickness. The large surface area helps in radiating the heat produced due to conduction of current at a faster rate to the surrounding.

20) Why is electricity supplied at a high voltage and low current from distribution station to supply stations?

Ans:- Electricity is supplied at a high voltage and low current in order to minimize the energy loss caused due to heating effect of current in the transmission wires. The heat produced in a current carrying wire varies directly as the square of strength of current. So to reduce the energy loss due to heating effect, the strength of current needs to be reduced. But for a given amount of electric power to be supplied, the voltage has to be increased to reduce the strength of current (since P =VI = constant). For this reason, electricity is supplied at a very high voltage from distribution station to supply stations.

21) Write the advantages of the ring system of wiring.

Ans:-

1) The cost of wiring is comparatively less. This is because the wire required for main ring is of a lower current carrying capacity and hence less costly.
2) Each appliance has a separate fuse. So if the fuse of any particular appliance blows off then it does not affect the working of other appliances connected in the ring circuit.
3) All the plugs and sockets of same size are used but with the fuse of proper rating.
4) To install a new appliance of higher current carrying capacity, no new connection from the main distribution box is required. The new appliance can be connected directly with the existing ring circuit in the room. This is convenient and cost effective.

22) Write the advantages of connecting the appliances in parallel in a household circuit.

Ans:- Following are the advantages of parallel connection:

1) Each appliance operates independently without being affected whether the other appliances are operated or not.
2) Each appliance gets a supply voltage of 220 V which happens to be the voltage rating of every appliance. So each appliance draws its maximum current from the mains for smooth working.

23) Write the disadvantages of connecting the appliances in series in a household circuit.

Ans:- Following are the disadvantages of series connection:

1) No appliance can be used independently i.e. if any appliance is switched off or out of order then all the other appliances in the series connection also remain unused.
2) The supply voltage gets divided among the individual appliances so that each appliance gets a voltage lesser than its voltage rating. So it can not draw its necessary current from the mains and cannot work properly.

CH:10 ELECTROMAGNETISM

1) ***What do you mean by magnetic effect of current? Name an application of it.***
   Ans:- When an electric current passes through a conductor, a magnetic field gets developed around it. This phenomenon is called magnetic effect of current. An electromagnet is an application of this effect of current.
2) ***Why does a magnetic needle show a deflection when brought close to a current carrying conductor?***
   Ans:- A current carrying conductor produces a magnetic field around it and the magnetic needle in this magnetic field experiences a torque due to which it deflects to align itself in the direction of magnetic field.
3) ***How is the magnetic field due to a straight current carrying wire affected if current in the wire is (a) decreased,(b) increased, (c) reversed?***
   Ans:-
   1) Strength of magnetic field decreases by decreasing the strength of current.
   2) Strength of magnetic field increases by increasing the strength of current.
   3) Direction of magnetic field gets reversed by reversing the direction of current.
4) ***State the right hand thumb rule.***
   Ans:- The right hand thumb rule states that if we hold the current carrying conductor in our right hand such that the thumb points in the direction of flow of current, then the fingers encircle the wire in the direction of the magnetic field lines.
5) ***How will you find out the polarities of a current carrying solenoid/ (or a circular current carrying loop) ?***
   Ans:- The face of the loop/coil at which the direction of current remains anticlockwise becomes a magnetic north pole. Similarly the face of the loop/coil at which the direction of current remains clockwise becomes a magnetic south pole.
6) ***What is an electromagnet? Name the material it is made from. Give a reason to use this material.***
   Ans:- An electromagnet is an artificial magnet which has a temporary but strong magnetic field. It is made from soft iron. Soft iron is used because it has a high magnetic permeability and low magnetic retentivity.
7) ***Why is steel used to make permanent magnets?***
   Ans:- Steel has a high magnetic retentivity. So a piece of steel cannot loss its magnetism so easily once it is magnetized. So it is ideal for making permanent magnets.
8) ***State the ways to increase the magnetic field of an electromagnet.***
   Ans:- Following are the two ways to increase the magnetic field of an electromagnet.
   1) By increasing the strength of current through the solenoid/coil.
   2) By increasing the number of turns of winding in the solenoid/coil.

9) Write the advantages of an electromagnet over a permanent magnet.

Ans:-

1) An electromagnet can produce a stronger magnetic field than a permanent magnet of same size.
2) The strength of an electromagnet can be increased or decreased according to the requirement which is not so in a permanent magnet.
3) The polarity of an electromagnet can be reversed according to the requirement which is not so in a permanent magnet.

10) Write any three uses of electromagnets.

Ans:-

1) Used in many electrical devices such as electric bell, telegraph, electric motor, relay switch, microphone, loud speaker etc.
2) Used in magnetic cranes to lift and transport heavy iron scrap, girders, plates etc.
3) Used to separate magnetic substances from non-magnetic substances in a mixture.

11) Write the expression for the force experienced by a current carrying conductor held normally to a magnetic field.

Ans:- $F = IlB$ $\quad where\ F = force,$

$I = current,$

$l = length\ of\ conductor,$

$B = strength\ of\ magnetic\ field\ applied$

12) What is an electric motor? What is the principle of its working?

Ans:- An electric motor is a device which converts the electrical energy into the mechanical energy.

It works on the principle that when an electric current is passed through a conductor placed normally in a magnetic field, a force acts on the conductor as a result of which the conductor begins to move .

13) What do you mean by electromagnetic induction?

Ans:- Electromagnetic induction is the phenomenon in which an e.m.f. is induced in the coil if there is a change in the magnetic flux linked with the coil.

14) What do you mean by induced e.m.f. ? State the factors affecting it.

Ans:- When there is a change in the magnetic flux linked with a coil then an e.m.f. gets produced in the coil. It is called as induced e.m.f.

The magnitude of induced e.m.f. depends on the following two factors:

1) It is directly proportional to rate of change of flux.
2) It is directly proportional to the number of turns in the coil.

15) State any two ways to increase the magnitude of induced e.m.f in a coil.

Ans:- The magnitude of induced e.m.f. in a coil can be increased by following ways:

1) By increasing the relative speed between the coil and the magnet.
2) By increasing the number of turns in the coil.

16) State Faraday's laws of electromagnetic induction.

Ans:- **First Law:** Whenever there is a change in magnetic flux linked with a coil, an e.m.f. gets induced in the coil and it lasts as long as the change takes place.

Second Law: The magnitude of e.m.f. induced is directly proportional to the rate of change of magnetic flux linked with the coil.

17) Name and state the law used to find the direction of induced e.m.f. What is the significance of this law?

Ans:- Lenz's law is used to find the direction of induced e.m.f. or induced current. It states that the direction of induced e.m.f. or induced current is such that it tends to oppose the cause which produces it. Its significance is that it is a form of law of conservation of energy.

18) What is an a.c. generator? What is the principle of its working?

Ans:- An a.c. generator is a device which converts the mechanical energy into the electrical energy.

It works on the principle of electromagnetic induction which states that whenever there is a change in magnetic flux linked with a coil, an e.m.f. gets induced in the coil and it lasts as long as the change takes place.

CH:11 NUCLEAR PHYSICS

1) ***What is meant by radioactivity?***

Ans:- Radioactivity is a nuclear phenomenon of spontaneous emission of radioactive radiations namely alpha, beta and gamma rays from the unstable nucleus of atoms of a substance during their decay.

2) ***What do you mean by radioactive substance? Name two radioactive substances.***

Ans:- The substances which disintegrate or decay by the spontaneous emission of radioactive radiations are called radioactive substances.

For example: uranium, radium

3) ***State the condition of radioactivity.***

Ans:- When the number neutrons in a nucleus becomes excessively more than the number of protons then that nucleus becomes unstable and the substance becomes radioactive.

4) ***What are radioactive rays? What are they otherwise known as?***

Ans:- Alpha, beta and gamma rays are highly energetic and penetrating rays emitted from the unstable nucleus of atoms of a radioactive substance. They are called as radioactive rays or Becquerel rays.

5) ***A radioactive substance is (i) heated, (ii) oxidized. What changes would you expect to take place in the nature of radioactivity? Explain your answer.***

Ans:- There will be no change in the nature of radio activity of a substance if it is heated or oxidized. This is because, radioactivity is a nuclear phenomenon and it is not affected by any physical change (e.g. heating) and by any chemical change (e.g. oxidation).

6) ***What is (i) an alpha particle, (ii) a beta particle, (iii) gamma ray?***

Ans:-

(i) An alpha particle is a doubly positively charged helium ion. It is an aggregation of two protons and two neutrons.

(ii) A beta particle is an energetic electron emitted from a nucleus when a neutron changes to a proton.

(iii) A gamma ray is am electromagnetic wave of wavelength shorter than 0.1Å.

7) ***A radioactive source emits three type of radiations.***

   a) ***Name the three radiations.***

   Ans:-Alpha particle, beta particle and gamma ray

   b) ***Name the radiations which are deflected by the electric field.***

   Ans:-Alpha particle and beta particle

   c) ***Name the radiation which is most penetrating.***

   Ans:-Gamma ray

   d) ***Name the radiation which travels with the speed of light.***

   Ans:-Gamma ray

   e) ***Name the radiation which has highest ionizing power.***

   Ans:-Alpha particle

f) Name the radiation consisting of the same kind of particles as the cathode rays.
Ans:-Beta radiation

g) Name the radiation of zero mass.
Ans:-Gamma ray

h) Name the radiation which has the lowest ionizing power.
Ans:-Gamma ray

i) Name the radiation which has the lowest penetrating power.
Ans:- Alpha particle

8) Arrange the α, β and ϒ- radiations in ascending order of their (i) speed, (ii) ionizing power, (iii) penetrating power, (iv) biological damaging effect.

Ans:-

(i) Speed: $\alpha<\beta<\gamma$

(ii) Ionizing power: $\gamma<\beta<\alpha$

(iii) Penetrating power: $\alpha<\beta<\gamma$

(iv) Biological damaging effect: $\alpha<\beta<\gamma$

9) An alpha particle captures (i) one electron, (ii) two electrons. In each case, what does it change to?

Ans:-

(i) By capturing one electron, an alpha particle changes to a singly positively charged helium ion.

(ii) By capturing two electrons, an alpha particle changes to a neutral helium atom.

10) What change takes place in the atomic number and mass number of a nucleus after the emission of (i) an alpha particle, (ii) a beta particle, (iii) a gamma ray?

Ans:-

(i) Atomic number decreases by two and mass number decreases by four when an alpha particle is emitted from any nucleus.

(ii) Atomic number increases by one and mass number remains unchanged when a beta particle is emitted from any nucleus.

(iii) Both the atomic number and mass number remains unchanged when a gamma ray is emitted from a nucleus.

11) What change takes place in the number of protons and the number of neutrons of a nucleus after the emission of (i) an alpha particle, (ii) a beta particle, (iii) a gamma ray?

Ans:-

(i) Number of protons decreases by two and number of neutrons decreases by two when an alpha particle is emitted from any nucleus.

(ii) Number of neutrons decreases by one and number of protons increases by one when a beta particle is emitted from any nucleus.

(iii) Both the number of protons and the number of neutrons remains unchanged when a gamma ray is emitted from a nucleus.