Bridge Course
Physical Science

(A Complete Book)

Upcoming 10th Class Students

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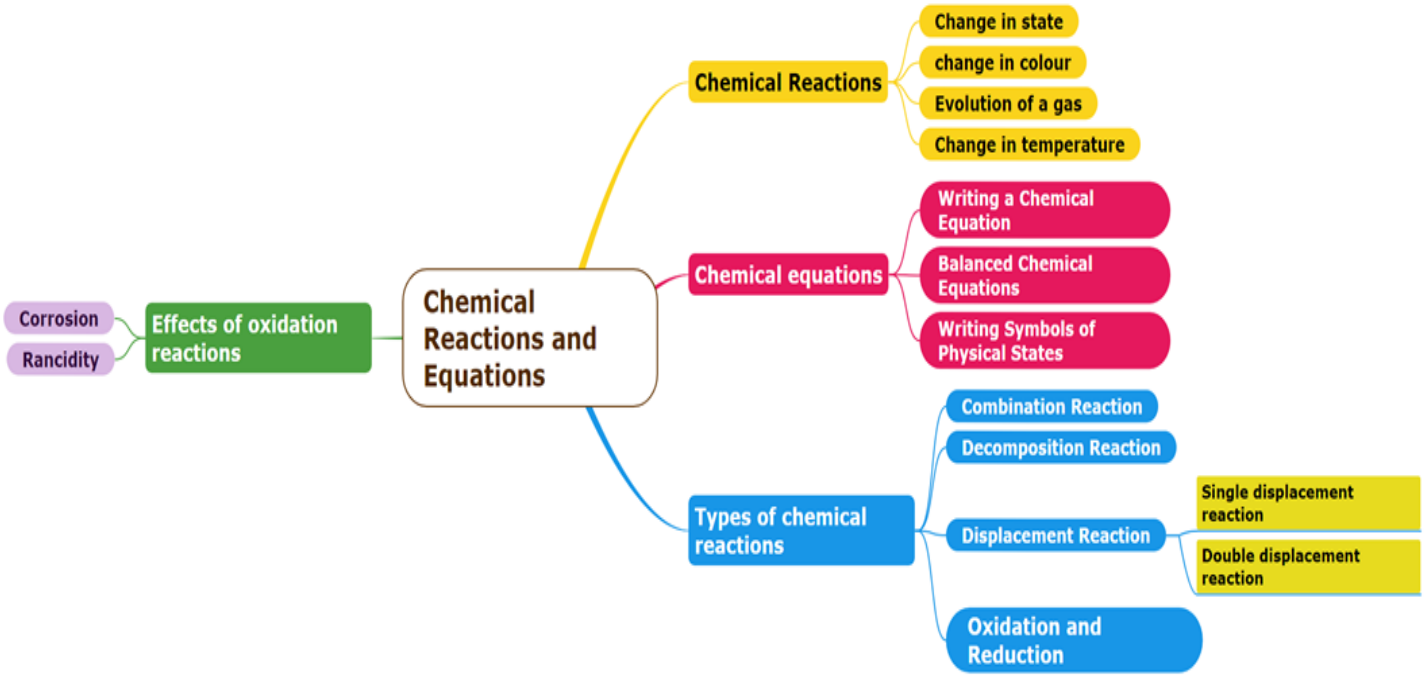
Chapter – 1

Chemical Reactions and Equations

Mind map



Definitions:

1. **Chemical Equation:** The symbolic representation of a true chemical change or reaction is called a chemical equation.
2. **Conservation of mass:** Mass can neither be created nor destroyed in a chemical reaction. The total mass of the elements present in the products of a chemical reaction has to be equal to the total mass of the elements present in the reactants.
3. **Skeletal equation:** If the no.of atoms of any elements in a chemical equation is not equal on both sides, then it is a skeletal equation.
4. **Combination reaction:** A reaction in which a single product is formed from two or more reactants is known as a combination reaction.
5. **Decomposition reaction:** A reaction in which a single substance decomposes to give two or more substances is known as decomposition reaction.
6. **Thermal decomposition:** When a decomposition reaction is carried out by heating, it is called thermal decomposition.
7. **Displacement reaction:** The reaction in which an element has displaced or removed another element from the molecule is called displacement reaction.
8. **Double displacement reaction:** The reaction in which there is an exchange of ions between the reactants are called double displacement reactions.
9. **Precipitate:** Insoluble substance formed in the reaction is known as a precipitate.
10. **Precipitation reaction:** Any reaction that produces a precipitate can be called a precipitation reaction.
11. **Exothermic reaction:** Reaction in which energy is given out along with the products is called exothermic reaction.
12. **Endothermic reaction:** Reaction in which energy is absorbed is known as endothermic reaction.
13. **Oxidation-reduction or redox reaction:** A chemical reaction in which one substance is oxidized and other is reduced is called a redox reaction.

14. **Oxidised:** If a substance gains oxygen during a reaction, it is said to be oxidized.
15. **Reduced:** If a substance loses oxygen during a reaction, it is said to be reduced.
16. **Corrosion:** When a metal is attacked by substances around it such as moisture, acids etc. it is said to corrode and this process is called corrosion.
17. **Rancidity:** When fats/oils containing food materials for long time, they become rancid and their smell and taste change. This is called rancidity.

Main Points:

1. Whenever a chemical change occurs, a chemical reaction has taken place.
2. When a chemical reaction occurs, one or more of the following changes take place.
   a) change in state b) change in colour c) evolution of a gas d) change in temperature
3. The simplest way to write reaction in the form of a word-equation.
4. The reactants are written on the left-hand side of the chemical reaction.
5. The products are written on the right-hand side of chemical reaction.
6. A complete chemical reaction represents the reactants, products and their physical states symbolically.
7. A balance chemical equation must be obey the law of conservation of mass.
8. Combination reaction, decomposition reaction, displacement reaction, double displacement reaction, oxidation-reduction reaction etc. are the types of chemical reactions.
9. In exothermic reaction, energy is released.
10. In endothermic reaction, energy is absorbed.
11. Decomposition reactions are opposite to combination reactions.
12. Respiration considered an exothermic reaction.
13. Calcium oxide is called lime or quick lime.
14. Precipitation reactions produce insoluble salts.
15. Corrosion and rancidity are the effects of oxidation-reduction reactions.
16. Corrosion causes damage to car bodies, bridges, iron railings, ships and to all objects made of metals.
17. Reactions involve the gain or loss of oxygen or hydrogen by substances.
18. Oxidation is the gain of oxygen or loss of hydrogen.
19. Reduction is the loss of oxygen or gain of hydrogen.

Textual Questions - Answers

1. Which of the statements about the reaction below are incorrect?
   $2PbO(s) + C(s) \rightarrow 2Pb(s) + CO_2(g)$
   (a) Lead is getting reduced.
   (b) Carbon dioxide is getting oxidised.
   (c) Carbon is getting oxidised.
   (d) Lead oxide is getting reduced.
   (i) (a) and (b) (ii) (a) and (c) (iii) (a), (b) and (c) (iv) all

Ans: (i) (a) and (b)

2. $Fe_2O_3 + 2Al \rightarrow Al_2O_3 + 2Fe$
   The above reaction is an example of a
   (a) combination reaction.
   (b) double displacement reaction.
   (c) decomposition reaction.
   (d) displacement reaction.

Ans: (d) displacement reaction.

3. What happens when dilute hydrochloric acid is added to iron fillings? Tick the correct answer.
   (a) Hydrogen gas and iron chloride are produced.
   (b) Chlorine gas and iron hydroxide are produced.
   (c) No reaction takes place.
   (d) Iron salt and water are produced.

Ans: (a) Hydrogen gas and iron chloride are produced.

4. What is a balanced chemical equation? Why should chemical equations be balanced?

Ans: Number of atoms of different elements have balanced on the both sides of chemical equation is called a balanced chemical equation.

According to the law of conservation of mass, every chemical equation must be balanced.

5. Translate the following statements into chemical equations and then balance them.

(a) Hydrogen gas combines with nitrogen to form ammonia.

(b) Hydrogen sulphide gas burns in air to give water and sulpur dioxide.

(c) Barium chloride reacts with aluminium sulphate to give aluminium chloride and a precipitate of barium sulphate.

(d) Potassium metal reacts with water to give potassium hydroxide and hydrogen gas.

Ans: (a) Chemical equation: $H_2 + N_2 \rightarrow NH_3$

Balanced chemical equation: $3H_2 + N_2 \rightarrow 2NH_3$

(b) Chemical equation: $H_2S + O_2 \rightarrow H_2O + SO_2$

Balanced chemical equation: $2H_2S + 3O_2 \rightarrow 2H_2O + 2SO_2$

(c) Chemical equation: $BaCl_2 + Al_2(SO_4)_3 \rightarrow AlCl_3 + BaSO_4$

Balanced chemical equation: $3BaCl_2 + Al_2(SO_4)_3 \rightarrow 2AlCl_3 + 3BaSO_4$

(d) Chemical equation**:** $K + H_2O \rightarrow KOH + H_2$

Balanced chemical equation: $2K + 2H_2O \rightarrow 2KOH + H_2$

6. Balance the following chemical equations.

(a) $HNO_3 + Ca(OH)_2 \rightarrow Ca(NO_3)_2 + H_2O$

(b) $NaOH + H_2SO_4 \rightarrow Na_2SO_4 + H_2O$

(c) $NaCl + AgNO_3 \rightarrow AgCl + NaNO_3$

(d) $BaCl_2 + H_2SO_4 \rightarrow BaSO_4 + HCl$

Ans: (a) $2HNO_3 + Ca(OH)_2 \rightarrow 2Ca(NO_3)_2 + H_2O$

(b) $2NaOH + H_2SO_4 \rightarrow Na_2SO_4 + 2H_2O$

(c) $NaCl + AgNO_3 \rightarrow AgCl + NaNO_3$

(d) $BaCl_2 + H_2SO_4 \rightarrow BaSO_4 + 2HCl$

7. Write the balanced chemical equations for the following reactions.

(a) Calcium hydroxide + Carbon dioxide → Calcium carbonate + Water

(b) Zinc + Silver nitrate → Zinc nitrate + Silver

(c) Aluminium + Copper chloride → Aluminium chloride + Copper

(d) Barium chloride + Potassium sulphate → Barium sulphate + Potassium chloride

Ans: (a) $2Ca(OH)_2 + 2CO_2 \rightarrow 2CaCO_3 + 2H_2O$

(b) $Zn + 2AgNO_3 \rightarrow Zn(NO3)_2 + 2Ag$

(c) $2Al + 3CuCl_2 \rightarrow 2AlCl_3 + 3Cu$

(d) $BaCl_2 + K_2SO_4 \rightarrow BaSO_4 + 2KCl$

8. Write the balanced chemical equation for the following and identify the type of reaction in each case.

(a) Potassium bromide(aq) + Barium iodide(aq) → Potassium iodide(aq) + Barium bromide(s)

(b) Zinc carbonate(s) → Zinc oxide(s) + Carbon dioxide(g)

(c) Hydrogen(g) + Chlorine(g) → Hydrogen chloride(g)

(d) Magnesium(s) + Hydrochloric acid(aq) → Magnesium chloride(aq) + Hydrogen(g)

Ans: (a) $2KBr(aq) + BaI_2(aq) \rightarrow 2KI(aq) + BaBr_2(s)$ Double Displacement Reaction

(b) $ZnCO_3(s) \rightarrow ZnO(s) + CO_2(g)$ Decomposition Reaction

(c) $H_2(g) + Cl(g) \rightarrow 2HCl(q)$ Combination Reaction

(d) $Mg(s) + 2HCl(aq) \rightarrow MgCl_2(aq) + H_2(g)$ Displacement Reaction)

9. What does one mean by exothermic and endothermic reactions? Give examples.

Ans:Exothermic reactions: Reaction in which energy is given out along with the products is called exothermic reaction.

Ex: Formation of carbon dioxide is an exothermic reaction.

$$C\ (s) + O_2\ (g) \rightarrow CO_2\ (g) + 393.7\ kJ$$

Endothermic reactions: Chemical reactions in which energy is absorbed are known as endothermic reactions.

Ex: Formation of nitric oxide is an endothermic reaction.

$$N_2\ (g) + O_2\ (g) \rightarrow 2NO\ (g) - 180.5\ kJ$$

10. Why is respiration considered an exothermic reaction? Explain.

Ans: During digestion, food is broken down into simpler substances. Food made up of carbohydrates. These carbohydrates are further broken into glucose. Glucose during respiration is oxidized with the liberation as shown below

$$C_6H_{12}O_6 + 6O_6 \rightarrow 6CO_2 + 6H_2O + Energy$$

So, respiration is an exothermic process.

11. Why are decomposition reactions called the opposite of combination reactions? Write equations for these reactions.

Ans: In a decomposition reaction, a single substance decomposes to give two or more substances.

Ex: $CaCO_3 \rightarrow CaO + CO_2$

Whereas in a combination two or more substances combine to form a single substance.

Ex: $2\ Mg + O_2 \rightarrow 2MgO$

Due to this reason, a decomposition reaction is called opposite of combination reaction.

12. Write one equation each for decomposition reactions where energy is supplied in the form of heat, light or electricity.

Ans: heat

$$CaCO_3\ (s) \rightarrow CaO\ (s) + CO_2\ (g)$$

light

$$2AgBr\ (s) \rightarrow 2Ag\ (s) + Br_2\ (g)$$

Electricity

$$2H_2O\ (l) \rightarrow 2H_2\ (g) + O_2\ (g)$$

13. What is the difference between displacement and double displacement reactions? Write equations for these reactions.

Ans:

Displacement reaction	Double displacement reaction
The reaction in which an element has displaced or removed another element from the molecule is called displacement reaction.	The reaction in which there is an exchange of ions between the reactants are called double displacement reactions.
More active element displaces a less active element.	Two different atoms or ions are exchanged.
Generally reaction time is slow.	Generally reaction time is fast.
Ex: $Mg\ (s) + 2HCl\ (aq) \rightarrow MgCl_2\ (aq) + H_2\ (g)$	$NaSO_4(aq) + BaCl(aq) \rightarrow BaSO_4\ (s) + 2\ NaCl(aq)$

14. In the refining of silver, the recovery of silver from silver nitrate solution involved displacement by copper metal. Write down the reaction involved.

Ans: $2AgNO_3\ (aq) + Cu\ (s) \rightarrow Cu(NO_3)_2\ (aq) + 2Ag\ (s)$

15. What do you mean by a precipitation reaction? Explain by giving examples.

Ans: Any reaction that produces a precipitate can be called a precipitation reaction.

Ex: Sodium sulphate react with barium chloride, produces a precipitate of barium sulphate and sodium chloride.

$$NaSO_4 + BaCl \rightarrow BaSO_4 + 2\ NaCl$$

(Precipitate)

16. Explain the following in terms of gain or loss of oxygen with two examples each.

(a) Oxidation

(b) Reduction

Ans: (a) **Oxidation:** A chemical reaction in which a substance gains oxygen is called oxidation.

$2Cu + O_2 \rightarrow 2CuO$ (Cu is oxidized to CuO)

$2Mg + O_2 \rightarrow 2MgO$ (Mg is oxidized to MgO)

(b) **Reduction:** A chemical reaction in which a substance loses oxygen is called reduction.

$ZnO + C \rightarrow Zn + CO$ (ZnO is reduced to Zn)

$CuO + H_2 \rightarrow Cu + H_2O$ (CuO is reduced to Cu)

17. A shiny brown coloured element 'X' on heating in air becomes black in colour. Name the element 'X' and the black coloured compound formed.

Ans: Element X is Copper and Compound is Copper oxide.

$2Cu + O_2 \rightarrow 2CuO$

Copper Copper oxide

18. Why do we apply paint on iron articles?

Ans: By applying paint on iron articles, they can be prevented from corrosion. Paint does not allow air and moisture to come in contact with the surface of iron.

19. Oil and fat containing food items are flushed with nitrogen. Why?

Ans: Avoid rancidity because oil and fat containing food items are oxidised, they become rancid and their smell and taste change. So, oil and fat containing food items are flushed with nitrogen.

20. Explain the following terms with one example each.

(a) Corrosion

(b) Rancidity

Ans: **(a) Corrosion:** When a metal is attacked by substances around it such as moisture, acids etc. it is said to corrode and this process is called corrosion.

The black coating on silver and the green coating on copper are examples of corrosion.

(b) Rancidity: When fats/oils containing food materials for long time, they become rancid and their smell and taste change. This is called rancidity.

Keeping food in air tight containers helps to slow down oxidation. The chips manufactures usually flush bags of chips with gas such as nitrogen to prevent the chips from getting oxidized.

Questions

1. Why should a magnesium ribbon be cleaned before burning in air?

Ans: Magnesium is metal and formation of white layer of magnesium oxide on its surface.

2. Write the balanced equation for the following chemical reactions.

(i) Hydrogen + Chlorine → Hydrogen chloride

(ii) Barium chloride + Aluminium sulphate → Barium sulphate + Aluminium chloride

(iii) Sodium + Water → Sodium hydroxide + Hydrogen

Ans: (i) $H_2 + Cl_2 \rightarrow 2HCl$

(ii) $3BaCl_2 + Al_2(SO_4)_3 \rightarrow 3BaSO_4 + 2AlCl_3$

(iii) $2Na + 2H_2O \rightarrow 2NaOH + H_2$

3. Write a balanced chemical equation with state symbols for the following reactions.

(i) Solutions of barium chloride and sodium sulphate in water react to give insoluble barium sulphate and the solution of sodium chloride.

(ii) Sodium hydroxide solution (in water) reacts with hydrochloric acid solution (in water) to produce sodium chloride solution and water.

Ans: (i) $BaCl_2\,(aq) + Na_2SO_4\,(aq) \rightarrow BaSO_4\,(s) + 2NaCl(aq)$

(ii) $NaOH\,(aq) + HCl\,(aq) \rightarrow NaCl\,(aq) + H_2O\,(l)$

4. A solution of a substance 'X' is used for whitewashing.

(i) Name the substance 'X' and write its formula.

(ii) Write the reaction of the substance 'X' named in (i) above with water.

Ans: (i) The substance X is Calcium oxide and Formula is CaO.

(ii) $CaO + H_2O \rightarrow 2Ca(OH)_2$

5. Why is the amount of gas collected in one of the test tubes in Activity 1.7 double of the amount collected in the other? Name this gas.

Ans: During electrolysis, water decomposes to form hydrogen and oxygen gases in the ratio of 2:1 by volume.

$$2H_2O\,(l) \xrightarrow{\text{Electricity}} 2H_2\,(g) + O_2\,(g)$$

6. Why does the colour of copper sulphate solution change when an iron nail is dipped in it?

Ans: When an iron nail is dropped in blue colour of Copper sulphate solution. Iron is more active than Copper and Copper displaces by iron.

7. Give an example of a double displacement reaction other than the one given in Activity 1.10.

Ans: $AgNO_3\,(aq) + NaCl\,(aq) \rightarrow AgCl\,(s) + NaNO_3\,(aq)$

8. Identify the substances that are oxidized and the substances that are reduced in the following reactions.

(i) $4Na\,(s) + O_2\,(g) \rightarrow 2Na_2O\,(s)$

(ii) $CuO\,(s) + H_2\,(g) \rightarrow Cu\,(s) + H\,O$

Ans: (i) Na has gained oxygen and form Na_2O

Na is oxidised and O_2 is reduced

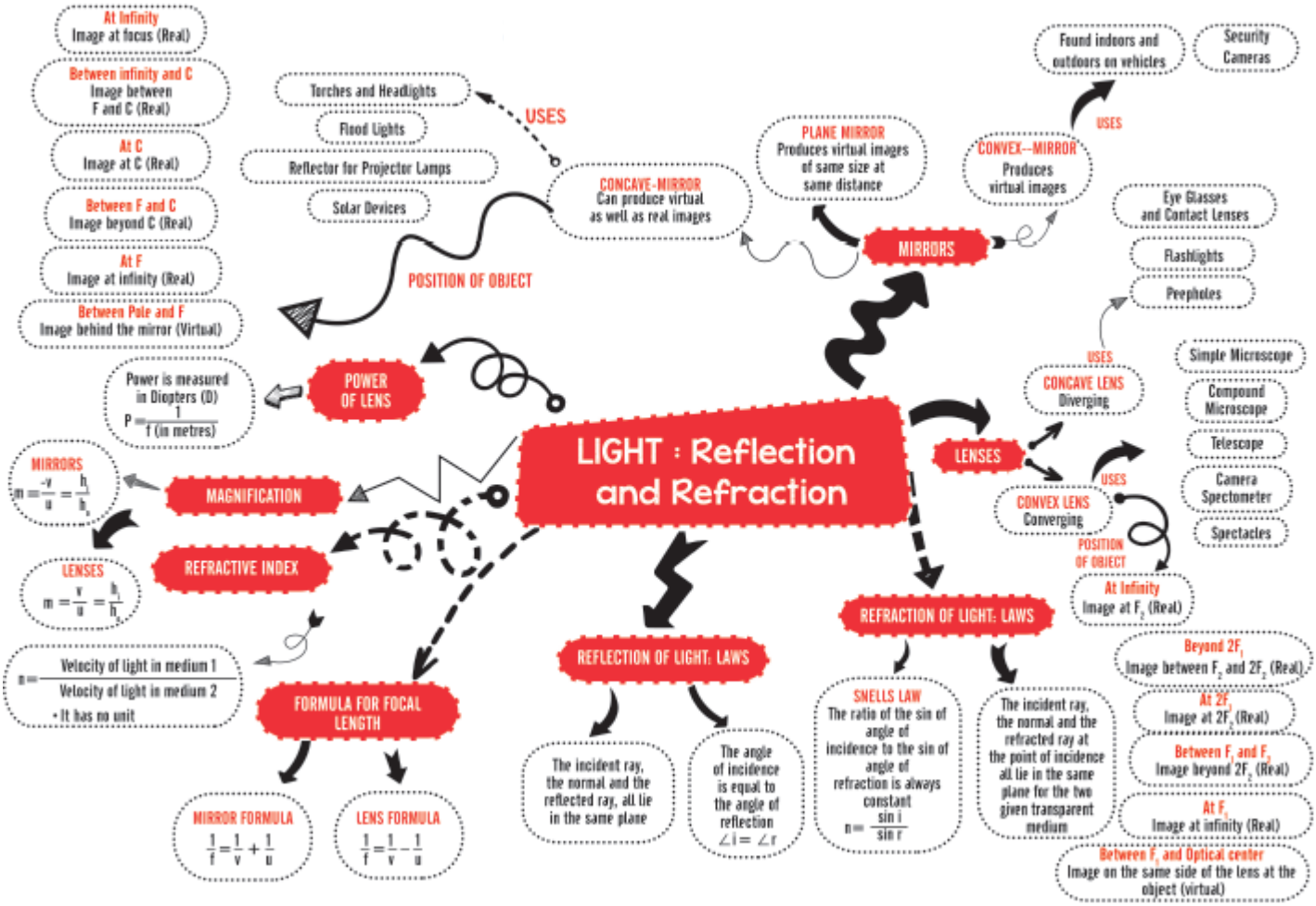
(ii) CuO has lost oxygen and form Cu

CuO is reduced and H_2 is oxidised.

Chapter – 9

Light – Reflection and Refraction

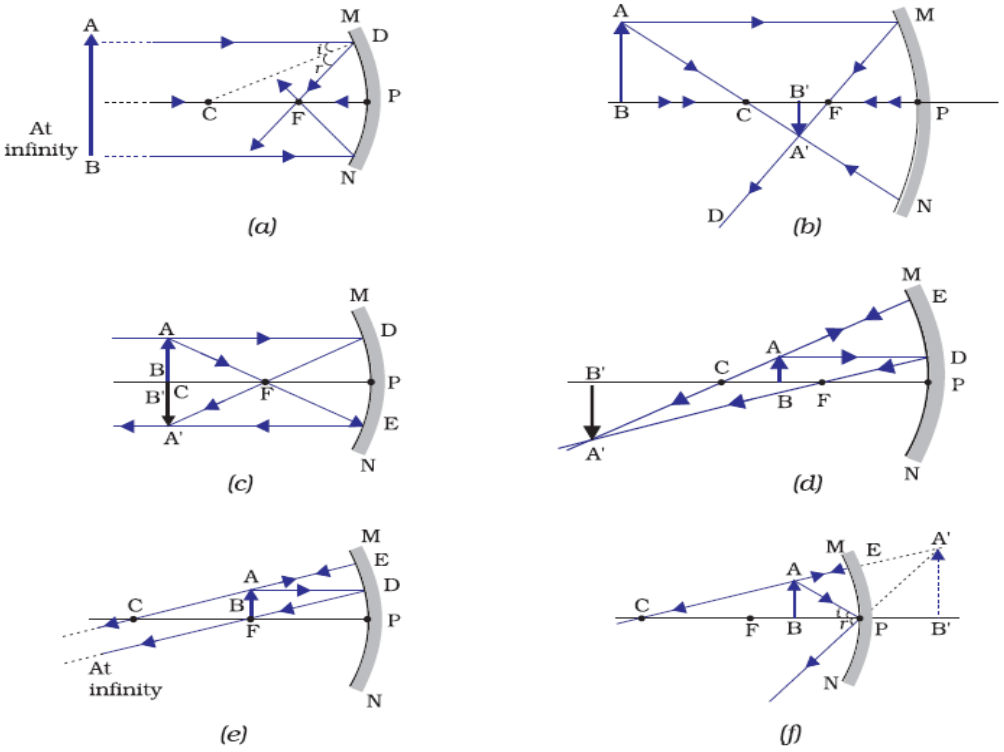
Mind map



Main Points:

1. Light seems to travel in straight lines.
2. A small light source casts an opaque object's sharp shadow.
3. The laws of reflection of light are (i) The angle of incidence is equal to the angle of reflection
   (ii) The incident ray, the normal and the reflected ray lie in the same plane.
4. Laws of reflection applicable to all types of reflecting surfaces.
5. Image formed by a plane mirror is always virtual, erect, same size of the object, laterally inverted.
6. Centre of curvature is not a part of the mirror.
7. The Centre of curvature of a concave mirror lies in front of it.
8. The Centre of curvature of a convex mirror lies behind of it.
9. The principal axis is normal to the mirror at its pole.
10. The relation between the radius of curvature R and focal length *f* is R = 2*f*.
11. The radius of curvature of plane mirror is zero.
12. Image formation by a concave mirror for different positions of the object.

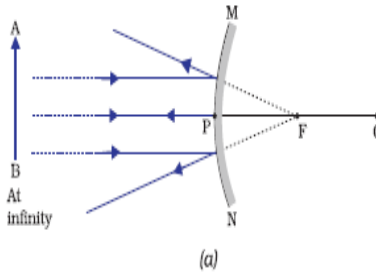
Position of the object	Position of the image	Size of the image	Nature of the image
At infinity	At the focus F	Highly diminished, point-sized	Real and inverted
Beyond C	Between F and C	Diminished	Real and inverted
At C	At C	Same size	Real and inverted
Between C and F	Beyond C	Enlarged	Real and inverted
At F	At infinity	Highly enlarged	Real and inverted
Between P and F	Behind the mirror	Enlarged	Virtual and erect



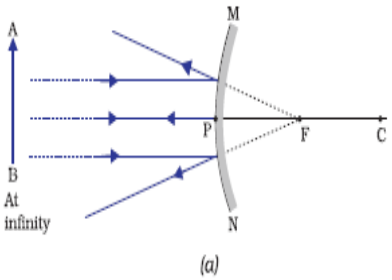
13. A ray parallel to the principal axis, after reflection, will pass through the principal focus in case of a concave mirror or appear to diverge from the principal focus in case of a convex mirror.
14. A ray passing through the principal focus of a concave mirror or a ray which is directed towards the principal focus of a convex mirror, after reflection, will emerge parallel to the principal axis.
15. A ray passing through the centre of curvature of a concave mirror or directed in the direction of the centre of curvature of a convex mirror, after reflection, is reflected back along the same path.
16. A ray incident obliquely to the principal axis, towards a point P (pole of the mirror), on the concave mirror or a convex mirror, is reflected obliquely.
17. Concave mirrors are commonly used in torches, search-lights and vehicles headlights, shaving mirrors, E.N.T doctors.

18. Image formation by a convex mirror for different positions of the object.

Position of the object	Position of the image	Size of the image	Nature of the image
At infinity	At the focus F, behind the mirror	Highly diminished, point-sized	Virtual and erect
Between infinity and the pole P of the mirror	Between P and F, behind the mirror	Diminished	Virtual and erect



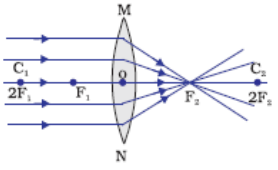
(a)



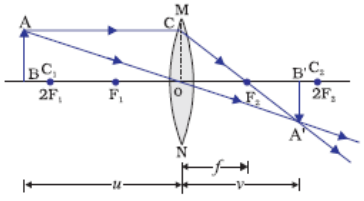
(a)

19. Convex mirrors are commonly used as rear-view mirrors in vehicles.
20. Focal length of a concave mirror is taken as –ve.
21. Focal length of a convex mirror is taken as +ve.
22. Mirror formula is $\frac{1}{f} = \frac{1}{v} + \frac{1}{u}$
23. Magnification of mirror (m) = h^1/h= -v/u
24. – m indicates that the image is real. + m indicates that the image is virtual.
25. A light ray travelling obliquely from a denser medium to a rarer medium bends away from the normal.
26. A light ray bends towards the normal when it travels obliquely from a rarer to a denser medium.
27. Light travels in vacuum with an enormous speed of 3×10^8 m s^{-1}.
28. During the refraction, light follows Snell's law.
29. Refractive index (n) = $\frac{Speed\ of\ light\ in\ vacuum(C)}{Speed\ of\ lught\ in\ medium\ (v)}$
30. An optically denser medium may not possess greater mass density.
31. Image formation by a convex lens for different positions of the object.

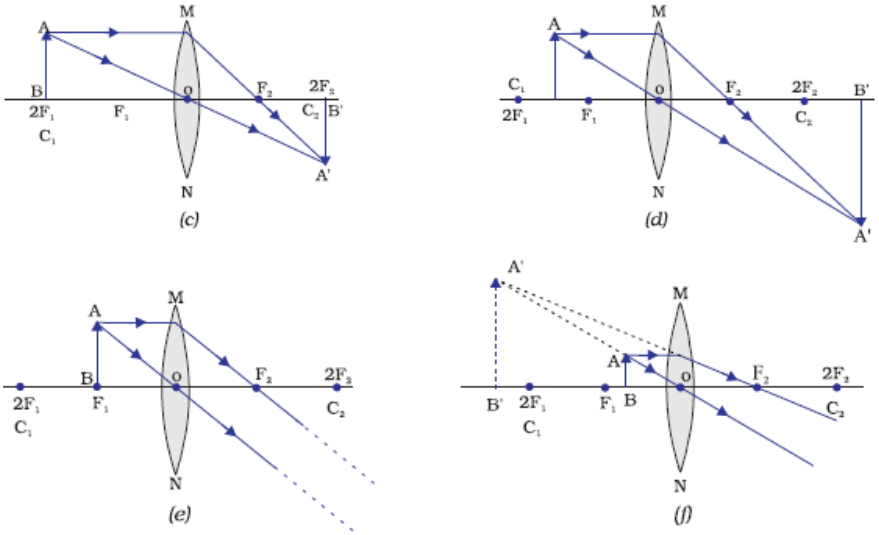
Position of the object	Position of the image	Relative Size of the image	Nature of the image
At infinity	At the focus F_2	Highly diminished, point-sized	Real and inverted
Beyond 2F	Between F_2 and $2F_2$	Diminished	Real and inverted
At $2F_1$	At $2F_2$	Same size	Real and inverted
Between F_1 and $2F_1$	Beyond $2F_2$	Enlarged	Real and inverted
At Focus F_1	At infinity	Infinitely large or Highly enlarged	Real and inverted
Between P and and optical centre O	Behind the mirror of the lens as the object	Enlarged	Virtual and erect



(a)

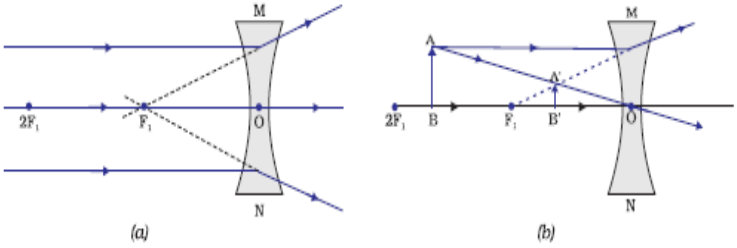


(b)



32. Image formation by a concave lens for different positions of the object.

Position of the object	Position of the Image	Relative Size of the image	Nature of the image
At infinity	At focus F_1	Highly diminished, point-sized	Virtual and erect
Between infinity and optical centre O of the lens	Between focus F_1 and optical centre O	Diminished	Virtual and erect



33. Lens formula is $\frac{i}{f} = \frac{1}{v} - \frac{1}{u}$

34. Magnification of lens (m) = h^1 / h = v/u

35. The degree of convergence or divergence of light rays achieved by a lens is expressed in terms of its power.

35. Power of lens, $P = \frac{1}{f}$ (if f in metre)

36. The SI unit of power of a lens is 'dioptre'.

37. The net power (P) of the lenses placed in contact is given by the algebraic sum of the individual powers $P_1, P_2, P_3, \ldots$ as $P = P_1 + P_2 + P_3 + \ldots$

Definitions:

1. **Ray of light:** The direction or path along which light energy travels in a medium is called a ray of light.
2. **Beam of light:** A group of rays is called a beam of light.
3. **Reflection of light:** The bouncing back of light when it strikes a smooth or polished surface is called reflection.
4. **Plane mirrors**. Whose reflecting surfaces are plane are called Plane mirrors.
5. **Spherical mirrors**: Whose reflecting surfaces are spherical are called Spherical mirrors
6. **Convex mirror:** A spherical mirror whose reflecting surface is curved inwards is called convex mirror.
7. **Concave mirror**: A spherical mirror whose reflecting surface is curved outwards is called concave mirror.
8. **Pole(P):** The centre of the reflecting surface of a spherical mirror is a point called the pole.
9. **Centre of Curvature (C):** It is the centre of the sphere of which the mirror forms a part.
10. **Radius of Curvature (R):** The distance between the pole/optic centre and centre of curvature is called the radius of curvature.

11. **Principal axis:** The line passing through the pole/optic centre and the centre of curvature of the mirror is called its principal axis.
12. **Principal focus(F):** It is point on the principal axis where a beam of light parallel to the principal axis either actually converges into or appears to diverge from after reflection from the mirror/lens.
13. **Focal length(*f*):** The distance between pole/optic centre and focus is called the focal length.
14. **Aperture:** The diameter of the reflecting surface of spherical mirror is called its aperture.
15. **Magnification:** Magnification is expressed as the ratio of the height of the image to the height of the object.
16. **Refraction:** The phenomenon of change in the direction of light when it passes from one transparent medium to another is called refraction of light
17. **Refractive index:** The ratio of the speed of light in vacuum to the speed of light in that medium is called refractive index of a medium. This is also called as absolute refractive index of a medium.
18. **Relative refractive index:** The relative refractive index of medium 2 with respect to medium 1 is the ratio of speed of light in medium 1 to the speed of light in medium 2.
19. **Power of a lens:** The power of a lens is defined as the reciprocal of its focal length.

Textual Questions - Answers

1. Which one of the following materials cannot be used to make a lens?

(a) Water (b) Glass (c) Plastic (d) Clay

Ans: (d) Clay

2. The image formed by a concave mirror is observed to be virtual, erect and larger than the object. Where should be the position of the object?

(a) Between the principal focus and the centre of curvature
(b) At the centre of curvature
(c) Beyond the centre of curvature
(d) Between the pole of the mirror and its principal focus.

Ans: (d) Between the pole of the mirror and its principal focus.

3. Where should an object be placed in front of a convex lens to get a real image of the size of the object?

(a) At the principal focus of the lens
(b) At twice the focal length
(c) At infinity
(d) Between the optical centre of the lens and its principal focus.

Ans: (b) At twice the focal length

4. A spherical mirror and a thin spherical lens have each a focal length of –15 cm. The mirror and the lens are likely to be

(a) both concave.
(b) both convex.
(c) the mirror is concave and the lens is convex.
(d) the mirror is convex, but the lens is concave.

Ans: (a) both concave.

5. No matter how far you stand from a mirror, your image appears erect. The mirror is likely to be

(a) only plane.
(b) only concave.
(c) only convex.
(d) either plane or convex.

Ans: (d) either plane or convex.

6. Which of the following lenses would you prefer to use while reading small letters found in a dictionary?

(a) A convex lens of focal length 50 cm.
(b) A concave lens of focal length 50 cm.
(c) A convex lens of focal length 5 cm.

(d) A concave lens of focal length 5 cm.

Ans: (c) A convex lens of focal length 5 cm.

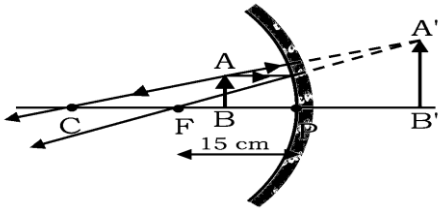
7. We wish to obtain an erect image of an object, using a concave mirror of focal length 15 cm. What should be the range of distance of the object from the mirror? What is the nature of the image? Is the image larger or smaller than the object? Draw a ray diagram to show the image formation in this case.

Ans: (a) The range of distance of the object from the mirror is 0 to 15 cm.

(b) The image is virtual, erect and lies behind the mirror.

(c) Larger image

(d)



8. Name the type of mirror used in the following situations.

(a) Headlights of a car.

(b) Side/rear-view mirror of a vehicle.

(c) Solar furnace. Support your answer with reason.

Ans: (a) Concave mirror

(b) Convex mirror

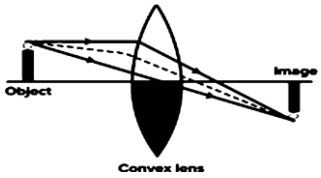
(c) Concave mirror

9. One-half of a convex lens is covered with a black paper. Will this lens produce a complete image of the object? Verify your answer experimentally. Explain your observations.

Ans: Every part of a lens forms an image.

When one-half of a convex lens is covered with a black paper, it still forms the complete image of the object as remaining part of lens.

But intensity of the image is reduced.



10. An object 5 cm in length is held 25 cm away from a converging lens of focal length 10 cm. Draw the ray diagram and find the position, size and the nature of the image formed.

Ans: Object distance (u) = - 25 cm

Focal length (*f*) = + 10 cm

Image distance (v) = ?

Lens formula, $\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$

$\frac{1}{v} = \frac{1}{f} + \frac{1}{u}$

$\frac{1}{v} = \frac{1}{10} + \frac{1}{-25} = \frac{5-2}{50} = \frac{3}{50}$

$v = \frac{50}{3} = 16.67\ cm$

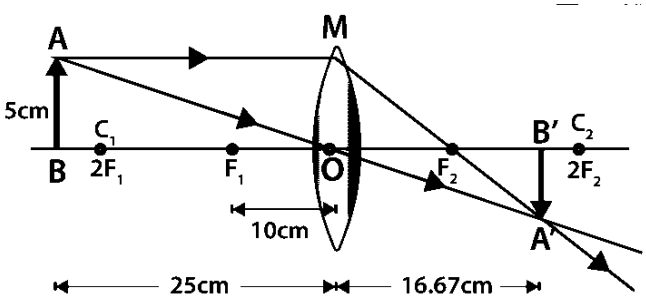
Object height (h) = 5 cm

Image height (h^1) = ?

Magnification, $m = \frac{h1}{h} = \frac{v}{u}$

$\frac{h1}{5} = \frac{\frac{50}{3}}{-25}$

$h^1 = \frac{50}{-15} = -3.33\ cm$



The image is real, inverted, diminish and is formed at a distance of 16.67 cm on the other side of the lens.

11. A concave lens of focal length 15 cm forms an image 10 cm from the lens. How far is the object placed from the lens? Draw the ray diagram.

Ans: Image distance (v) = - 10 cm
Focal length (*f*) = -15 cm
Object distance (v) = ?

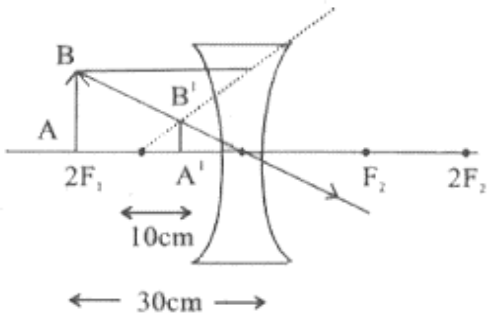
Lens formula, $\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$

$\frac{1}{u} = \frac{1}{-15} - \frac{1}{-10}$

$\frac{1}{u} = \frac{1}{-10} + \frac{1}{15} = \frac{-3+2}{30} = \frac{-1}{30}$

u = -30 cm

The object is placed at a distance of 30 cm from the lens.



12. An object is placed at a distance of 10 cm from a convex mirror of focal length 15 cm. Find the position and nature of the image.

Ans: Object distance (u) = - 10 cm
Focal length (*f*) = + 15 cm
Image distance (v) = ?

Mirror formula, $\frac{1}{f} = \frac{1}{u} + \frac{1}{v}$

$\frac{1}{v} = \frac{1}{15} - \frac{1}{-10}$

$\frac{1}{v} = \frac{1}{15} + \frac{1}{10} = \frac{2+3}{30} = \frac{5}{30} = \frac{1}{6}$

v = 6 cm

The image is virtual, erect and diminish.

13. The magnification produced by a plane mirror is +1. What does this mean?

Ans: It means that the size of the image is equal to the size of the object. The positive sign indicates the image is virtual and erect.

14. An object 5.0 cm in length is placed at a distance of 20 cm in front of a convex mirror of radius of curvature 30 cm. Find the position of the image, its nature and size.

Ans: Object distance (u) = - 20 cm
Radius of curvature (R) = 30 cm.
Focal length (*f*) = $\frac{R}{2} = \frac{30}{2} = 15\ cm$

Now $\frac{1}{f} = \frac{1}{u} + \frac{1}{v}$

$\frac{1}{v} = \frac{1}{f} - \frac{1}{u}$

$\frac{1}{v} = \frac{1}{15} - \frac{1}{-20} = \frac{4+3}{60} = \frac{7}{60}$

v = $\frac{60}{7}$ = 8.6 cm

Object size (h) = 5 cm
Image size (h^1) = ?

Magnification, $m = \frac{h1}{h} = -\frac{v}{u}$

$\frac{h1}{5} = -\frac{8.6}{-20}$

$h1 = \frac{8.6x5}{20}$

h^1 = 2.15 cm

The image is real, erect and 2.15 cm height

15. An object of size 7.0 cm is placed at 27 cm in front of a concave mirror of focal length 18 cm. At what distance from the mirror should a screen be placed, so that a sharp focused image can be obtained? Find the size and the nature of the image.

Ans: Object distance (u) = - 27 cm
Focal length (*f*) = - 18 cm
Image distance (u) = ?

Now $\frac{1}{f} = \frac{1}{u} + \frac{1}{v}$

$\frac{1}{v} = \frac{1}{f} - \frac{1}{u}$

$\frac{1}{v} = \frac{1}{-18} - \frac{1}{-27} = \frac{-3+2}{54} = -\frac{1}{54}$

v = -54 cm

Object size (h) = 7 cm
Image size (h^1) = ?

Magnification, $m = \frac{h1}{h} = -\frac{v}{u}$

$\frac{h1}{7} = -\frac{-54}{-27}$

$\frac{h1}{7} = -2$

h^1 = -14 cm

Image is real, inverted and enlarged

The screen should be placed at a distance of 54 cm.

16. Find the focal length of a lens of power – 2.0 D. What type of lens is this?

Ans: Power of lens (P) = - 2.0 D

Focal length of the lens (f) = $\frac{1}{R} = \frac{1}{-2} = -0.5\ m$

If focal length of the lens is negative, then it is a concave lens.

17. A doctor has prescribed a corrective lens of power +1.5 D. Find the focal length of the lens. Is the prescribed lens diverging or converging?

Ans: Power of lens (P) = + 1.5 D

Focal length of the lens (f) = $\frac{1}{R} = \frac{1}{1.5} = \frac{10}{15} = 0.6667\ m = +66.67\ cm$

If focal length of the lens is positive, then it is a converging.

Questions

1. Define the principal focus of a concave mirror.

Ans: A number of rays parallel to the principal axis are falling on a concave mirror and reflected rays are meeting/intersecting at a point on the principal axis of the mirror. This point is called the principal focus of the concave mirror.

2. The radius of curvature of a spherical mirror is 20 cm. What is its focal length?

Ans: Given R = 20 cm

Focal length of a spherical mirror (f) = $\frac{R}{2} = \frac{20}{2}$ = 10 cm

3. Name a mirror that can give an erect and enlarged image of an object.

Ans: Concave mirror

4. Why do we prefer a convex mirror as a rear-view mirror in vehicles?

Ans: Convex mirror always forms an erect, virtual and diminished image of an object placed anywhere in front of it and it has wider field of view.

5. Find the focal length of a convex mirror whose radius of curvature is 32 cm.

Ans: Radius of curvature (R) = 32 cm.

Focal length of a convex mirror (f) = $\frac{R}{2} = \frac{32}{2} = 16\ cm$

6. A concave mirror produces three times magnified (enlarged) real image of an object placed at 10 cm in front of it. Where is the image located?

Ans: Object distance, u = - 10 cm

If real image, then magnification must be negative.

m = $-\frac{v}{u} = -3$

v = 3u

v = 3(-10) = - 30 cm

Thus the image is located at a distance of 30 cm from the mirror on the object side.

7. A ray of light travelling in air enters obliquely into water. Does the light ray bend towards the normal or away from the normal? Why?

Ans: Light travels from rarer medium (air) to denser medium (water). So speed of light decreases. The light ray bend towards the normal.

8. Light enters from air to glass having refractive index 1.50. What is the speed of light in the glass? The speed of light in vacuum is 3×10^8 m s^{-1}.

Ans: Given refractive index of glass = 1.50 = 3/2

Speed of light in vacuum = 3×10^8 m s^{-1}.

Speed of the glass = c/n = $\frac{3\ x\ 10^8}{\frac{3}{2}} = 2\ x\ 10^8$ m s^{-1}

9. Find out, from Table 9.3, the medium having highest optical density. Also find the medium with lowest optical density.

Ans: Refractive index of medium is directly proportional to optical density.
Diamond has highest optical density and air has lowest optical density.

10. You are given kerosene, turpentine and water. In which of these does the light travel fastest? Use the information given in Table 9.3.

Ans: Refractive index of the medium is inversely proportional to speed of the light.
Water has lowest refractive index (1.33), so light travels fastest in water.

11. The refractive index of diamond is 2.42. What is the meaning of this statement?

Ans: The speed of light in diamond is lowest.The ratio of speed of light in air to diamond is 2.42

12. Define 1 dioptre of power of a lens.

Ans: 1 dioptre of power of a lens whose focal length is 1 metre.

13. A convex lens forms a real and inverted image of a needle at a distance of 50 cm from it. Where is the needle placed in front of the convex lens if the image is equal to the size of the object? Also, find the power of the lens.

Ans: Image distance (v) = 50 cm
If the image size is equal to the object size

Magnification, m = $\frac{v}{u} = -1$

v = -u = - 50 cm

focal length of convex lens (f) = $\frac{uv}{u-v} = \frac{-50x50}{-50-50}$ = 25 cm = 0.25 m

Power of convex lens (P) = $\frac{i}{f} = \frac{1}{0.25} = 4\ D$

14. Find the power of a concave lens of focal length 2 m.

Ans: Focal length of a concave lens (f) = - 2 m

Power of a concave lens (P) = $\frac{1}{f} = \frac{1}{-2}$ = - 0.5 D

1. Chemical Reactions and Equations

Structure: 1(8 Marks) + 1(1 Mark) = 9 Marks

Section -1	1 Mark Questions	Q.No: 1 - 8

1. A magnesium ribbon is burnt in the presence of Oxygen to give Magnesium oxide. Rewrite the above reaction as Chemical equation.

Ans: $2Mg + O_2 \rightarrow 2MgO$

2. Suggest one method to prevent corrosion.

Ans: Painting or Oiling or Greasing

3. Predict, Exhalation air is hotter than Inhalation air in respiration process.

Ans: Exhalation air is hotter than Inhalation air because it absorbs heat from the respiratory system and the body during gas exchange.

4.Why do we apply paint on iron articles?

Ans: By applying paint on iron articles, they can be prevented from corrosion. Paint does not allow air and moisture to come in contact with the surface of iron.

5. Why, keeping food in air tight containers?

Ans: Oxidation of food can be slow down.

6. Why does the colour of copper sulphate solution change when an iron nail is dipped on it?

Ans: When an iron nail is dropped in blue colour of Copper sulphate solution. Iron is more active than Copper and Copper displaces by iron.

7. Why is respiration considered an exothermic reaction?

Ans: During digestion, food (carbohydrates) is broken down into glucose. During respiration, glucose is oxidized and liberated CO_2. So, respiration is an exothermic process.

8. What happened when iron nail is exposed in air or atmosphere? Predict

Ans: Iron reacts with oxygen and moisture, forming iron oxide (rust)

9. Oil and fat containing food items are flushed with nitrogen. Why?

Ans: Avoid rancidity because oil and fat containing food items are oxidised, they become rancid and their smell and taste change. So, oil and fat containing food items are flushed with nitrogen.

10. Why hydrogen peroxide is kept in coloured bottle?

Ans: In the presence of light, hydrogen peroxide decomposes into water and oxygen. So it is kept in coloured bottle.

11. Why do silver, gold and platinum not corrode in moist air?

Ans: They have very low in the reactivity series of metals.

12. Why is photosynthesis considered an endothermic reaction?

Ans: Photosynthesis is an endothermic reaction as it takes energy from sun or light.

13. Why cannot we stir silver nitrate solution with copper spoon?

Ans: Because copper is more reactive than silver.

14. Why should a magnesium ribbon be cleaned before burning in air?

Ans: Magnesium is metal and formation of white layer of magnesium oxide on its surface.

15. Name one observation that helps determine if a chemical reaction has occurred.

Ans: An evolution of a gas helps determine that a chemical reaction has occurred.

16. What is the new substance formed during a chemical reaction called?

Ans: The new substance formed during a reaction is called a product.

17. State the law of conservation of mass in a chemical reaction.

Ans: Mass can neither be created nor destroyed in a chemical reaction.

18. What is the common name for calcium oxide (CaO)?

Ans: The common name for calcium oxide is quick lime.

19. What type of reaction occurs in the digestion of food in our body?

Ans: Decomposition reaction.

20. What type of reaction occurs when an iron nail is placed in copper sulphate solution?
Ans: A displacement reaction
21. What is the general term for the process where a metal is attacked by moisture or acids?
Ans: Corrosion.
22. What is the main cause of damage to objects made of iron?
Ans: Corrosion of iron, also known as rusting, is a serious problem causing damage.
23. Name two effects of oxidation in daily life.
Ans: (i) Corrosion (ii) Rancidity
24. Name the gas that can be used for storage of fresh sample of chips for a long time.
Ans: Nitrogen.
25. What type of reaction takes place during respiration?
Ans: Exothermic reaction
26. Write two conditions of corrosion.
Ans: (i) Presence of moisture. (ii) Presence of air (oxygen).

Section -1V	8 Marks Questions	Q.No: 16

1. Explain the following with an example.
i) Chemical combination ii) Chemical decomposition
iii) Chemical displacement iv) Chemical double displacement
(or)
State and explain four types of chemical reactions with an example each.
Ans: i) Combination reaction: A reaction in which a single product is formed from two or more reactants is known as a combination reaction.
Ex: Calcium oxide reacts vigorously with water to produce slaked lime.
$CaO + H_2O \rightarrow Ca(OH)_2$
ii) Decomposition reaction: A reaction in which a single substance decomposes to give two or more substances is known as decomposition reaction.
Ex: Decomposition of calcium carbonate to calcium oxide and carbon dioxide on heating.
$CaCO_3 \xrightarrow{heat} CaO + CO_2$
iii) Displacement reaction: The reaction in which an element has displaced or removed another element from the molecule is called displacement reaction.
Ex: Iron has displaced another element copper from copper sulphate solution.
$Fe + CuSO_4 \rightarrow FeSO_4 + Cu$
iv) Double displacement reaction: The reaction in which there is an exchange of ions between the reactants are called double displacement reactions.
Ex: Sodium sulphate and Barium chloride are reacting and exchange their ions.
$Na_2SO_4 + BaCl_2 \rightarrow BaSO_4 + 2NaCl$

2. Balance the following chemical equations
i) $HNO_3 + Ca(OH)_2 \rightarrow Ca(NO_3)_2 + H_2O$
ii) $NaOH + H_2SO_4 \rightarrow Na_2SO_4 + H_2O$
iii) $NaCl + AgNO_3 \rightarrow AgCl + NaNO_3$
iv) $BaCl_2 + H_2SO_4 \rightarrow BaSO_4 + HCl$
Ans: (i) $HNO_3 + Ca(OH)_2 \rightarrow Ca(NO_3)_2 + H_2O$
$2HNO_3 + Ca(OH)_2 \rightarrow Ca(NO_3)_2 + 2H_2O$
(ii) $NaOH + H_2SO_4 \rightarrow Na_2SO_4 + H_2O$
$2NaOH + H_2SO_4 \rightarrow Na_2SO_4 + 2H_2O$
(iii) $NaCl + AgNO_3 \rightarrow AgCl + NaNO_3$
$NaCl + AgNO_3 \rightarrow AgCl + NaNO_3$
(iv) $BaCl_2 + H_2SO_4 \rightarrow BaSO_4 + HCl$
$BaCl_2 + H_2SO_4 \rightarrow BaSO_4 + 2HCl$

3. Balance the following chemical equations

i) $Fe + H_2O \rightarrow Fe_3O_4 + H_2$

ii) $Pb(NO_3)_2 \rightarrow PbO + NO_2 + O_2$ (on heating)

iii) $CH_4 + O_2 \rightarrow CO_2 + H_2O$

iv) $Zn + HCl \rightarrow ZnCl_2 + H_2$

Ans: i) $3Fe + 4H_2O \rightarrow Fe_3O_4 + 4H_2$

ii) $2Pb(NO_3)_2 \rightarrow 2PbO + 4NO_2 + O_2$

iii) $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$

iv) $Zn + 2HCl \rightarrow ZnCl_2 + H_2$

4. Write the balanced chemical equations for the following reactions.

(a) Calcium hydroxide + Carbon dioxide → Calcium carbonate + Water

(b) Zinc + Silver nitrate → Zinc nitrate + Silver

(c) Aluminium + Copper chloride → Aluminium chloride + Copper

(d) Barium chloride + Potassium sulphate → Barium sulphate + Potassium chloride

Ans: (a) Calcium hydroxide + Carbon dioxide → Calcium carbonate + Water

$Ca(OH)_2 + CO_2 \rightarrow CaCO_3 + H_2O$

(b) Zinc + Silver nitrate → Zinc nitrate + Silver

$Zn + 2AgNO_3 \rightarrow Zn(NO3)_2 + 2Ag$

(c) Aluminium + Copper chloride → Aluminium chloride + Copper

$2Al + 3CuCl_2 \rightarrow 2AlCl_3 + 3Cu$

(d) Barium chloride + Potassium sulphate → Barium sulphate + Potassium chloride

$BaCl_2 + K_2SO_4 \rightarrow BaSO_4 + 2KCl$

5.What are the differences between displacement and double displacement reactions? Write equations for these reactions.

Ans:

Displacement reaction	Double displacement reaction
The reaction in which an element has displaced or removed another element from the molecule is called displacement reaction.	The reaction in which there is an exchange of ions between the reactants are called double displacement reactions.
More active element displaces a less active element.	Two different atoms or ions are exchanged.
Generally reaction time is slow.	Generally reaction time is fast.
Ex: $Mg\ (s) + 2HCl\ (aq) \rightarrow MgCl_2\ (aq) + H_2\ (g)$	$NaSO_4(aq) + BaCl(aq) \rightarrow BaSO_4\ (s) + 2\ NaCl(aq)$

6. Explain the following terms with one example each.

i) Corrosion ii) Rancidity iii) Oxidation iv) Reduction

Ans: i) Corrosion: When a metal is attacked by substances around it such as moisture, acids etc. it is said to corrode and this process is called corrosion.

The black coating on silver and the green coating on copper are examples of corrosion.

ii) Rancidity: When fats/oils containing food materials for long time, they become rancid and their smell and taste change. This is called rancidity.

Keeping food in air tight containers helps to slow down oxidation. The chips manufactures usually flush bags of chips with gas such as nitrogen to prevent the chips from getting oxidized.

iii) Oxidation: A chemical reaction in which a substance gains oxygen is called oxidation.

$2Cu + O_2 \rightarrow 2CuO$ (Cu is oxidized to CuO)

$2Mg + O_2 \rightarrow 2MgO$ (Mg is oxidized to MgO)

iv) Reduction: A chemical reaction in which a substance loses oxygen is called reduction.

$ZnO + C \rightarrow Zn + CO$ (ZnO is reduced to Zn)

$CuO + H_2 \rightarrow Cu + H_2O$ (CuO is reduced to Cu)

9. Light - Reflection and Refraction

Structure: 2(4 Marks) + 1(2 Marks) + 1(1 Mark) = 11 Marks

Section -1	1 Mark Questions	Q.No: 1 - 8

1. The radius of curvature of a spherical mirror is given as 20 cm then Determine it's focal length.

Ans: Focal length of a spherical mirror (f) = $\frac{R}{2} = \frac{20}{2}$ = 10 cm

2. Find the Power of a Convex lens having a focal length of 50cm.

Ans: Focal length of a convex lens (f) = 50 cm = 0.5 m

Power of a convex lens (P) = $\frac{1}{f} = \frac{1}{0.5}$ = 2 D

3. Find the focal length of a lens of power – 2.0 D?

Ans: Power of lens (P) = - 2.0 D

Focal length of the lens (f) = $\frac{1}{R} = \frac{1}{-2} = -0.5\ m$

4. A doctor has prescribed a corrective lens of power +1.5 D. Find the focal length of the lens.

Ans: Power of lens (P) = + 1.5 D

Focal length of the lens (f) = $\frac{1}{R} = \frac{1}{1.5} = \frac{10}{15} = 0.6667\ m = +66.67\ cm$

5. Find the focal length of a convex mirror whose radius of curvature is 32 cm.

Ans: Focal length of a convex mirror (f) = $\frac{R}{2} = \frac{32}{2} = 16\ cm$

6. Find the power of a concave lens of focal length 2 m.

Ans: Focal length of a concave lens (f) = - 2 m

Power of a concave lens (P) = $\frac{1}{f} = \frac{1}{-2}$ = - 0.5 D

7. The refractive index of diamond is 2.42. What is the meaning of this statement?

Ans: The speed of light in diamond is lowest.The ratio of speed of light in air to diamond is 2.42

8. A lens has a power of +2.0 D. What type of lens is it?

Ans: Convex lens.

9. The power of a lens is - 4.0 D. What is the nature of the lens?

Ans: Diverging lens.

10. If the magnification of a lens is -1, what is the nature of the image?

Ans: The image is real, inverted, and of the same size as the object.

11.What is the net power of two lenses of power +2.0 D and +0.25 D placed in contact?

Ans: The net power is +2.25 D.

Section -II	2 Marks Questions	Q.No: 9 - 11

1. Predict and Write about the world without lenses

Ans: In a world without lenses, vision correction, photography and scientific exploration would be impossible. Humans would rely on alternative tools to compensate for impaired vision and optical challenges.

2. A ray of light travelling in air enters obliquely into water. Predict and write weather that light ray bends towards the normal or away from the normal? Why?

Ans: It bends towards the normal. Because light ray travelling from an optically rarer medium into an optically denser medium.

3. Why do we prefer a convex mirror as a rear-view mirror in vehicles?

Ans: Convex mirror always forms virtual, erect and diminished images irrespective of distance of the object and also enables a driver to view large area of the traffic behind him.

4. One-half of a convex lens is covered with a black paper. Will this lens produce a complete image of the object? Verify your answer (or)
What happens to the image formed by a convex lens if its lower part is blackened?

Ans: Every part of a lens forms an image. When one-half of a convex lens is covered with a black paper, it still forms the complete image of the object as remaining part of lens. But intensity of the image is reduced.

5. The magnification produced by plane mirror is +1. What does this mean?

Ans: It means that the size of the image is equal to the size of the object. The positive sign indicates the image is virtual and erect.

6. A ray passing through the centre of curvature of a concave mirror, after reflection, is reflected back along the same path. Why?

Ans: The incident rays fall on the concave mirror along the normal to the reflecting surface.

7. If A, B are optical medium of their refractive indices are nearly same, then light travel from A to B, What happens? (or) What happens to a ray of light when it travels from one medium to another medium having equal refractive indices?

Ans: There is no refraction of light when it travels from one medium to another.

8. If you want to see an enlarged image of your face, which type of mirror will you see? Where will you place your face?

Ans: Concave mirror. The face should be placed between the pole and the focus of the mirror.

9. What happens when a ray of light strikes the surface of separation between the two media at right angle?

Ans: The ray of light passes undeviation from one medium to another. Because $\angle I = \angle r = 0^0$

10. What happens to a ray of light that passes through the principal focus of a concave mirror after reflection?

Ans: It will emerge parallel to the principal axis after reflection.

11. What happens to a light ray travels from denser medium to rarer medium?

Ans: A light ray travelling obliquely from a denser medium to a rarer medium bends away from the normal.

12. Write any two applications of lenses.

Ans: Lenses are commonly used in vision correction, Magnifying objects, photography and Medical equipment.

13. List two important uses of concave mirrors. (or) Write any two applications of concave mirrors.

Ans: Concave mirrors are commonly used in Torches, Searchlights, Vehicle Headlights, Shaving Mirrors, Dentist's Mirrors, Solar Furnaces. (Write any two uses)

14. List two important uses of convex mirrors. (or) Write any two applications of convex mirrors.

Ans: Convex mirrors are commonly used as rear-view mirrors in vehicles, Surveillance and security.

15. Write any two applications of mirrors.

Ans: Concave mirrors are commonly used in Torches, Searchlights, Vehicle Headlights, Shaving Mirrors, Dentist's Mirrors, Solar Furnaces. Convex mirrors are commonly used as rear-view mirrors in vehicles, Surveillance and security. (Write any two uses)

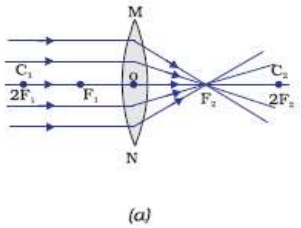
Section -1II	4 Marks Questions	Q.No: 12

1. Draw the ray diagrams of image formed when the object is placed infront of a bi-convex lens in the following positions.

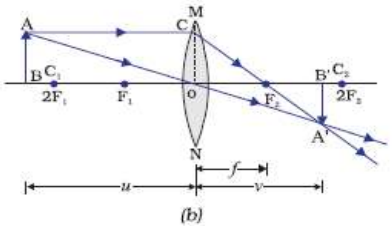
(a) At infinity **(b) Beyond $2F_1$** **(c) At $2F_1$**

(d) Between F_1 and $2F_1$ **(e) At F_1** **(f) Between F and Optical centre O**

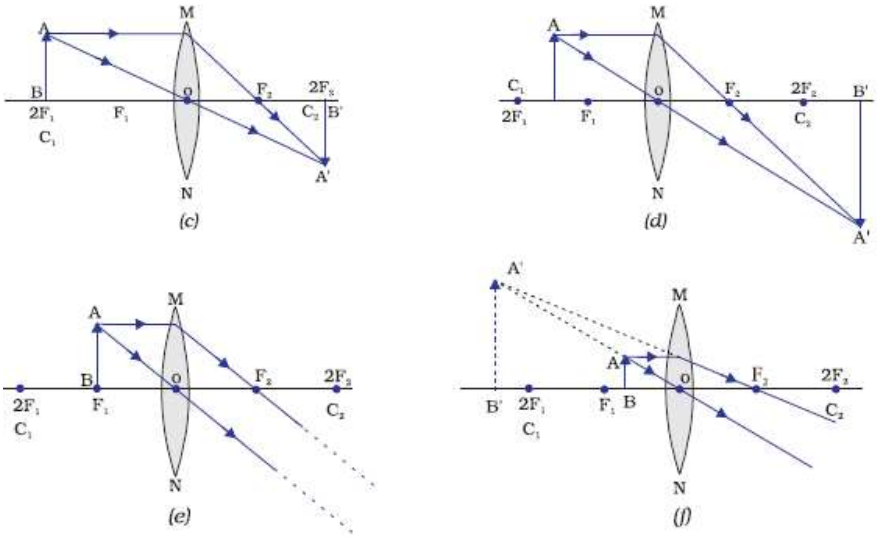
Ans:



(a)



(b)

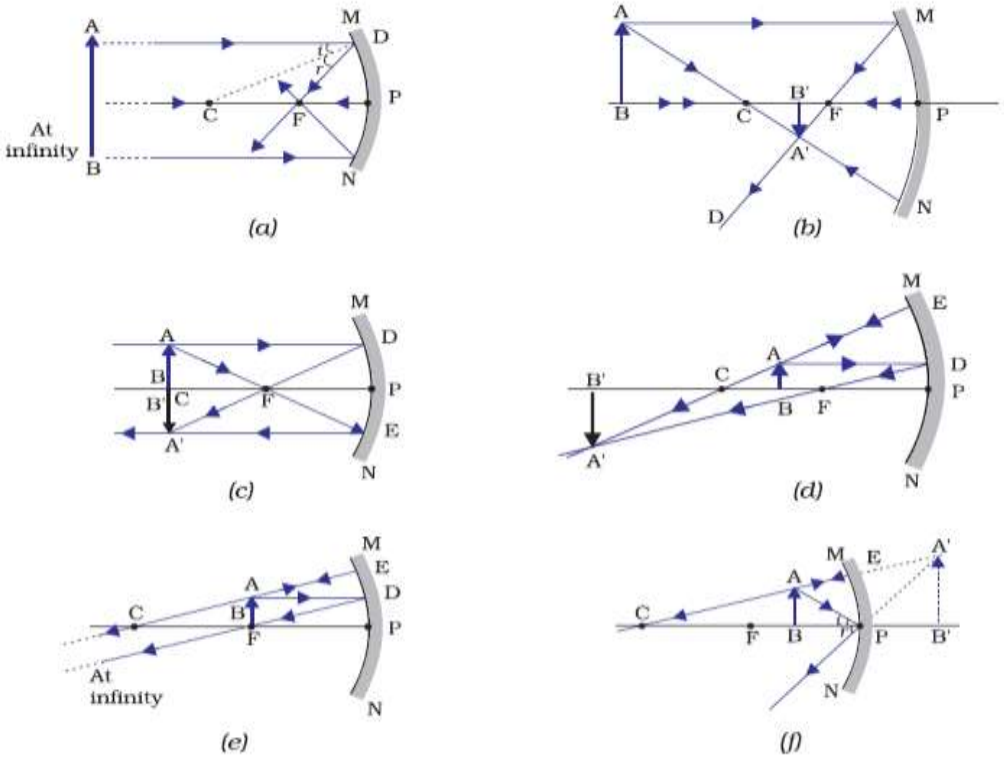


2. Draw the ray diagrams of image formed when the object is placed infront of a concave mirror in the following positions.

(a) At infinity **(b) Beyond C** **(c) At C**

(d) Between C and F **(e) At F** **(f) Between P and F**

Ans:



Section - III	4 Marks Questions	Q.No: 14

1.

Material medium	Air	Ice	Rubby	Benzene
Refractive Index	1.0003	1.31	1.71	1.50

Observe the table and answer the following questions.

i) Which material medium light travels faster?

ii) In which material medium the speed of light is least?

iii) What is the speed of light in air?

iv) Calculate the speed of light in Benzene? (Speed of light in vacuum is 3×10^8 ms^{-1})

Ans: i) Air
ii) Ruby
iii) 3×10^8 m/s
iv) Speed of light in Benzene (v) = C/n= $3 \times 10^8/1.5 = 2 \times 10^8$ m/s

2.

Material medium	Air	Ice	Rubby	Benzene
Refractive Index	1.0003	1.31	1.71	1.50

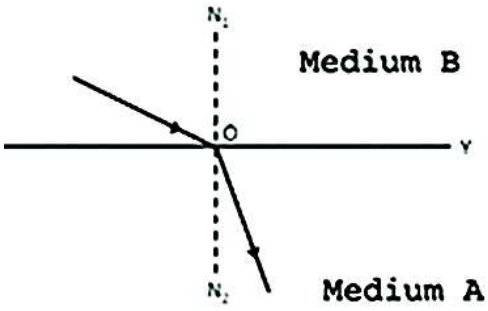
Observe the table and answer the following questions.

i) Which material medium is optically rarer?
ii) Which material medium is optically denser?
iii) Write the relation between refractive index and speed of light in the medium?
iv) What is the SI unit of Refractive Index?
v) Arrange the above material media in the ascending order with respect to the speed of light.

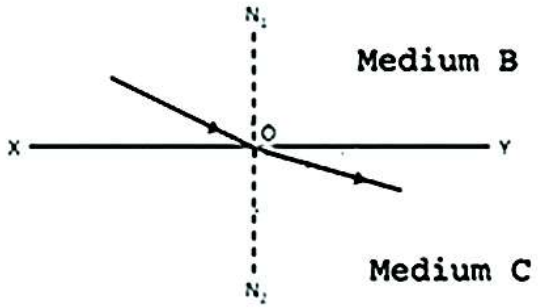
Ans: i) Air
ii) Ruby
iii) $n \propto 1/v$ (or) Inversely proportional
iv) No unit
v) Ruby, Benzene, Ice, Air

3. Following diagrams show refraction of light in two cases. Answer the questions given below based on the diagrams given

Case-1



Case-2



i) Which medium is optically rarer among A, B and C?
ii) Which medium is optically denser among A, B and C?
iii) Arrange A,B and C in ascending order with respect to speed of light.
iv) Arrange A,B and C in ascending order of their refractive indices.

Ans: i) Medium C
ii) Medium A
iii) A < B < C
iv) C < B < A

4.

Material medium	Air	Water	Benzene	Diamond
Speed of light in the medium	3×10^8	$\frac{9}{4} \times 10^8$	2×10^8	$\frac{5}{4} \times 10^8$

Observe the table and answer the following questions.

i) Which material medium light travels faster?
ii) Which material medium light travels lowest?
iii) In which material medium the refractive index is least?
iv) In which material medium the refractive index is greatest?
v) Calculate the refractive index of Benzene? (Speed of light in vacuum is 3×10^8 ms^{-1})

Ans: i) Air
ii) Diamond

iii) Air
iv) Diamond
v) Refractive index of Benzene (n) = C/V= 3 x 10^8/2 x 10^8 = 1.5

5.

Material medium	Air	Ice	Water	Kerosene	Benzene	Rock salt	Diamond
Refractive Index	1.0003	1.31	1.31	1.44	1.50	1.54	2.42

Observe the table and answer the following questions.

i) What happens to the speed of light when light is passing from Water to Rock salt?
ii) Whether the refracted ray bends towards normal or away from the normal when light ray travelled from Benzene to Air?
iii) The refractive index of Diamond is 2.42. What is the meaning of this statement?
iv) What is reason, refractive index of kerosene is more than the refractive index of water?

Ans: i) Decreases
ii) Increases
iii) The ratio of speed of light in air to speed of light in diamond is 2.42
iv) Optical density of kerosene is more than the optical density of water.

6.If radius of curvature of the mirror is double times of the focal length, then complete the following table

f (in cm)	R (in cm)
12	
24	
	15
	20

Ans:

f (in cm)	R (in cm)
12	**24**
24	**48**
7.5	15
10	20

7. Fill the table following, which is related to convex lens.

Position of the Object	Position of the Image	Relative Size of the image	Nature of the image
Beyond $2F_1$			**Inverted**
	At $2F_2$	**Same size**	
Between F_1 and $2F_1$		**Enlarged**	
	Behind the lens		**Erected**

Ans:

Position of the Object	Position of the Image	Relative Size of the image	Nature of the image
Beyond $2F_1$	**Between F_2 and $2F_2$**	**Diminished**	Real and inverted
At $2F_1$	At $2F_2$	Same size	**Real and inverted**
Between F_1 and $2F_1$	**Beyond $2F_2$**	Enlarged	**Real and inverted**
Between F_1 and optical centre O	Same side of the lens	**Enlarged**	Erected

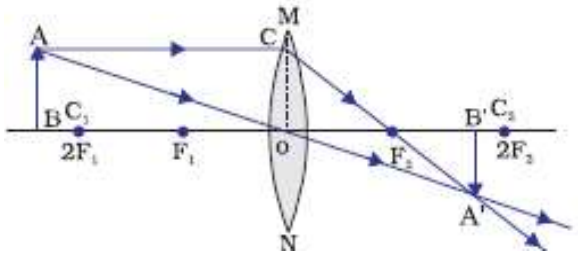
8. Fill the table following, which is related to concave mirror.

Position of the Object	Position of the Image	Size of the image	Nature of the image
At infinity		**Highly diminished, point-sized**	
	At C		**Real and inverted**
Between C and F			**Real and inverted**
At F		**Highly enlarged**	

Ans:

Position of the Object	Position of the Image	Size of the image	Nature of the image
At infinity	**At the focus F**	Highly diminished, point-sized	**Real and inverted**
At C	At C	**Same size**	Real and inverted
Between C and F	**Beyond C**	**Enlarged**	Real and inverted
At F	**Behind the mirror**	Highly enlarged	**Virtual and erect**

9.



Observe the ray diagram and answer the following questions.

i) Which lens used in this ray diagram?
ii) Where is the position of the object?
iii) Where the position of the image?
iv) What is the nature of the image?
v) If focal length of the lens is 10 cm, then what is the radius of curvature of this lens?
vi) Is magnification being less than 1 or greater than 1?
vii) If the height of the object is 10cm at $2F_1$, then what is the height of the image?

Ans: i) Convex lens
ii) Beyond $2F_1$
iii) Between F_2 and $2F_2$
iv) Real, Inverted and diminished
v) 20 cm
vi) Less than 1
vii) 10 cm

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