Section A

1. In the presence of oxygen in the air, the fats present in the fatty food are oxidised to compounds which have a bad smell i.e. the food becomes rancid. Flushing with nitrogen cuts off the contact of food with oxygen and protects the food from rancidity.

2. The new compound formed is copper(II) chloride ($CuCl_2$), which imparts blue-green colour to the solution.

$$\underset{\text{Copperoxide}}{CuO} + 2HCl \rightarrow \underset{\text{(Bhue-green)}}{\overset{\text{CuCl}_2}{\text{Copper (II) Chloride}}} + H_2O$$
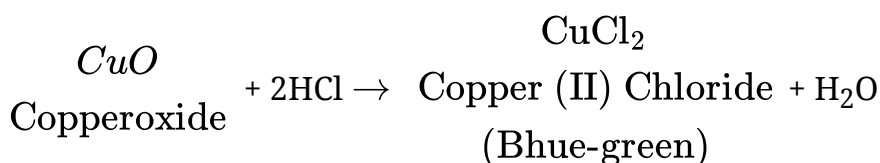
3. A protective coating of aluminium oxide (Al_2O_3) is formed on the surface of the foil which prevents it from getting corroded in the presence of air and water. Hence, food items are saved from getting spoilt when packed in aluminium foils.

4. A chemical equation is defined as a symbolic representation of reactants and products taking part in a chemical reaction. In chemical reaction reactant entities are given on the left hand side and the product entities on the right hand side.

   For example: $2Ca + O_2 \rightarrow 2CaO$

5. Displacement reaction is a chemical reaction in which a more reactive element displaces a less reactive element from its compound. Both metals and non-metals take part in displacement reactions.

   Example : Reaction of iron nails with copper sulphate solution.

   $Mg(s) + CuSO_4(aq) \rightarrow MgSO_4(aq) + Cu(s)$
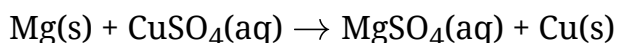
6. No, hydrogen gas is not evolved when silver metal reacts with dil. H_2SO_4 because silver is less reactive than hydrogen and cannot displace it.

 $Ag (s) + $ dil. H_2SO_4 à No reaction

7. The substance (atom, ion or molecule) that gains electrons and is thereby reduced to a low valency state is called an oxidising agent, while the substance that loses electrons and is thereby oxidised to a higher valency state is called a reducing agent.

   $2Mg + O_2 \rightarrow 2MgO$
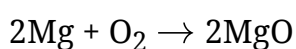
Oxidizing agent : O_2

Reducing agent : Mg

8. Hydrogen + Chlorine → Hydrogen chloride

$H_2 + Cl_2 \rightarrow 2HCl$
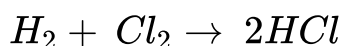
9. A group of light rays originating from a source and travelling in some definite direction is known as a beam of light.

10. A medium in which light travels comparatively faster than the other medium is called an optically rarer medium.

11. The bending of a ray of light falling obliquely on a surface when it passes from one medium to another is called refraction.
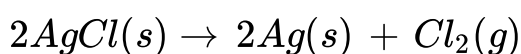
12. A lens is a piece of transparent medium bounded by two spherical surfaces.

13. (a) - ve, and (b) + ve.

14. Refractive index of a medium with respect to vacuum is called absolute refractive index.

15. At infinity.

16. When silver chloride is exposed to light, it decomposes to form silver metal and chlorine gas.

$2AgCl(s) \rightarrow 2Ag(s) + Cl_2(g)$

Therefore, it is stored in dark coloured bottles.

17. $H_2S + Cl_2 \rightarrow 2HCl + S$

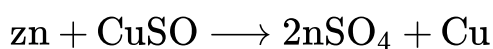The substance which oxidised is called reducing agent. Hence the H_2S is reducing agent.

The substance which reducing is called oxidised agent. Hence the Cl_2 is oxidised agent.

18. The solution becomes colourless in I and grayish coloured iron metal gets deposited, in II, blue colour changes to pale green and reddish brown copper metal gets deposited.
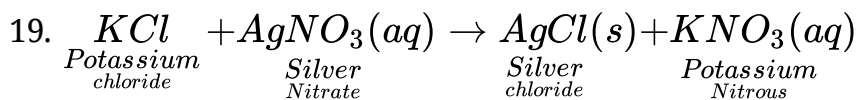
$2 \text{ Al } + 3FeSO_4 \rightarrow Al_2(SO_4)_3 + 3Fe$
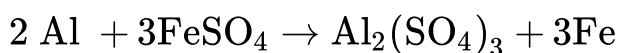
silvery white pale green colourless Greyish black

Al is more reactive than Fe.

$zn + CuSO \longrightarrow 2nSO_4 + Cu$

green pale green reddish brown

Fe is more reactive than Cu.

19. $$\underset{\substack{Potassium \\ chloride}}{KCl} + AgNO_3(aq) \rightarrow AgCl(s) + \underset{\substack{Potassium \\ Nitrous}}{KNO_3(aq)}$$

$$\underset{\substack{Silver \\ Nitrate}}{} \quad \underset{\substack{Silver \\ chloride}}{}$$
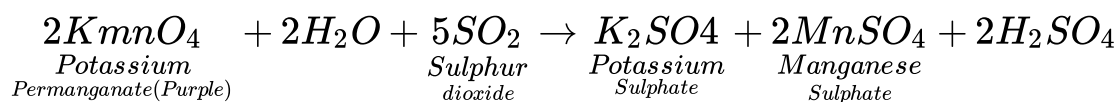
This reaction is an example of double displacement and precipitation reaction in which a precipitate of silver chloride is obtained.

$$\underset{\substack{Ferrous\,Sulphate \\ (Green)}}{FeSO_4(s)} \xrightarrow{Heat} \underset{\substack{Ferric\,Oxide \\ (Reddishbrown)}}{Fe2O_3(s)} + SO_2(g) + SO_3(g)$$
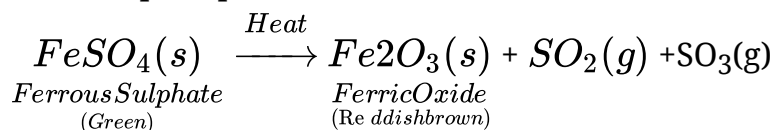
This reaction is an example of decomposition (thermal decomposition) reaction because a single substance ($FeSO_4$) breaks down into three substances (Fe_2O_3, SO_2 and SO_3). Here, SO_2 gives the smell of burning sulphur.

20. Sulphur dioxide (SO_2) gas when passed through acidic potassium permanganate solution (purple in colour) turns it colourless because SO_2 is a strong reducing agent.

$$\underset{\substack{Potassium \\ Permanganate(Purple)}}{2KmnO_4} + 2H_2O + \underset{\substack{Sulphur \\ dioxide}}{5SO_2} \rightarrow \underset{\substack{Potassium \\ Sulphate}}{K_2SO4} + \underset{\substack{Manganese \\ Sulphate}}{2MnSO_4} + 2H_2SO_4$$

21. (a) Sodium is highly reactive metal and reacts vigorously with hydrochloric acid. Hence, this reaction is highly explosive.

(b) Lead reacts with hydrochloric acid to produce hydrogen gas. Bubbles are made because of hydrogen gas.

22. Reaction of some combustible matters with oxidizing elements like oxygen is called combustion reactions.After these reactions oxidized products are produced. In general, these reactions are exothermic.To have combustion reaction we must have; combustible matters, oxidizing element and necessary temperature.

$CH_4(g) + 2O_2(g) \rightarrow CO_2(g) + 2H_2 O(g) +$ heat

$C_2H_5OH(l) + 3O_2(g) \rightarrow 2CO_2(g) + 3H_2O(g) +$ Heat
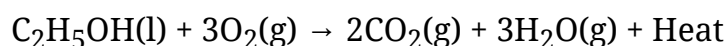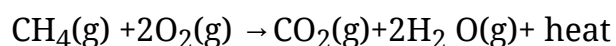
It is an exothermic reaction.

23. **a) Oxidation:** It is a chemical reaction in which gain of oxygen or loss of hydrogen takes place. For example in the first reaction copper is oxidised to become copper oxide and in second Magnesium is oxidised to become Magnesium Oxide.

$2Cu + O_2 \xrightarrow{Heat} 2CuO$, Cu is oxidized to CuO.

$2Mg + O_2 \xrightarrow{Burn} 2MgO$, Mg is oxidized to MgO.
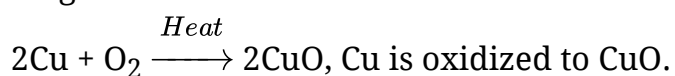
b) Reduction : It is a chemical reaction in which loss of oxygen or gain of hydrogen takes place. For example in the first reaction copper oxide is reduced

to become copper and in second Zinc Oxide is reduced to become Zinc.

$CuO + H_2 \rightarrow Cu + H_2O$, CuO is reduced to Cu.
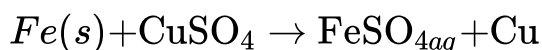
$ZnO + C \rightarrow Zn + CO$, ZnO is reduced by Zn.

24. Barium chloride + Potassium sulphate $\rightarrow$ Barium sulphate + Potassium chloride.

$BaCl_2 + K_2SO_4 \rightarrow BaSO_4 + 2KCl$
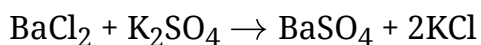
Barium chloride react with potassium sulfate to produce barium sulfate and potassium chloride.

25. Displacement Reaction

$Fe(s) + CuSO_4 \rightarrow FeSO_{4aq} + Cu$

Oxygen and is being oxidized.

26. The refractive index for the light going from medium ' 1' to medium '2' is e to the reciprocal of the refractive index for light going from medium '2' medium '1'.

$1^u2 = \frac{1}{2^u1}$

27. $n = \frac{c}{v} = \frac{3 \times 10^8}{1.2 \times 10^8} = 2.5$

28. We know that pencil appears to be bent at the interface of air and water because of refraction of light. The degree of refection depends on refractive index of a given liquid. Refraction indices of kerosene, water and other liquids would be different. Hence, degree of bend would be different in case of different liquids.

29. The positive (+) sign of magnification m indicates that the image is virtual and erect. The magnification, m = 1 indicates that the image is of the same size as that of object. Thus, the magnification of + 1 produced by a plane mirror means that the image formed in a plane mirror is virtual, erect and of the same size as the size of the object.

30. Concave mirrors are convergent mirrors. That is why they are used to construct solar furnaces. Concave mirrors converge the light incident on them at a single point known as principal focus. Hence, they can be used to produce a large amount of heat at that point.

31. Object distance, u = - 15 cm

Focal length, = - 10 cm

Object size, h = 1 cm

Image distance, v = ?

(i) Position of image

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

We have, $\frac{1}{v} = \frac{1}{f} - \frac{1}{u}$

Putting values, we get $\frac{1}{v} = \frac{1}{-10} - \frac{1}{-15}$

$= \frac{-3-(-2)}{3} = -\frac{1}{30}$

The image is formed at a distance 30 cm on the side of the object Negative sign indicates that object and image are on the same side.

(ii)Nature of image: The image is in front of the mirror, its nature is real and inverted.

Size of image: From the expression for magnification,

m = $\frac{h'}{h} = -\frac{v}{u}$

We have h' = $-h \times \frac{v}{u}$

putting values, we get h' = $-1 \times \frac{-30}{-15}$

= -2

The image formed has size 2 cm and negative sign means inverted and real and enlarged.

32. Magnification of a spherical mirror is the ratio of size of the image formed by the size of the object.

Magnifying power m = $\frac{size\ of\ the\ image(h_2)}{size\ of\ the\ object(h_1)}$

Since $\angle$ i = $\angle$r So, ABP and A'B'P' are similar

$\therefore \frac{A'B'}{AB} = \frac{PB'}{PB}$ ......(i)

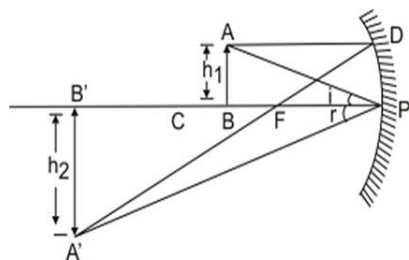Now AB = + h_1 (Measured upward)

A'B' = -h_2 (Measured downward)

PB = - u (Measured against incident light)

PB' = - v

Substituting these values in equation (i) we have

$-\frac{h2}{h1} = \frac{-v}{-u} or\ m = \frac{h_2}{h_1} = \frac{-v}{u}$

Similarly for convex mirror $m = \frac{h_2}{h_1} = \frac{-v}{u}$

Magnification is positive when image is erect and virtual. Magnification, m is negative when image is inverted and real.

Magnification of convex, as well as plane mirror, is positive. Magnification of plane mirror is + 1 since the image is erect.

33. Rule 1. Incident rays parallel to the principal axis after refraction through concave lens appear to diverge from principal focus F on the same side of the lens.
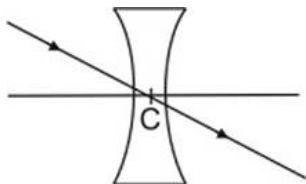
Rule 2. An incident ray passing through optical centre of a concave lens goes straight after passing through the concave lens.
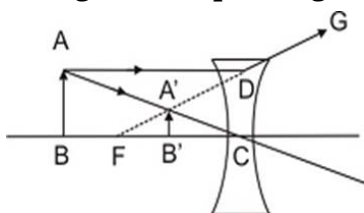
Formation of images

a. Object at infinity. In this case, all the rays from infinity will come parallel and appear to diverge from F.

b. Object anywhere except at Infinity. Let the object AB be at point B. A ray of light from A parallel to the principal axis after refraction diverges towards DG. On producing back, it appears to diverge from the principal focus F. Another ray from A through C, goes undeviated.

The two rays appear to meet at A'. Thus a virtual, erect, diminished image of AB is formed at A'B' i.e. between C and F.

34. Object height, h= +2 cm

Image height, h' = - 3 cm (real image hence inverted)

Object distance, u = -16 cm

Image distance, v -?

Focal length, f=?

(i) Position of image

From the expression for magnification

$m = \dfrac{h'}{h}$

$= \dfrac{v}{u}$

We have, $v = -u\dfrac{h'}{h}$

Putting values, we get $v = -(-16) \times \dfrac{-3}{2}$

v = -24 cm

The image is formed at distance of 24 cm in front of the mirror (negative sign means object and image are on the same side).

(ii) Focal length of mirror

Using mirror formula, Putting values, we get

Using mirror formula,

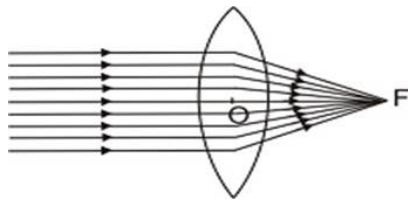$$\frac{1}{f} = \frac{1}{u} + \frac{1}{v}$$

Putting values, we get $\frac{1}{f} = \frac{1}{-16} + \frac{1}{-24}$
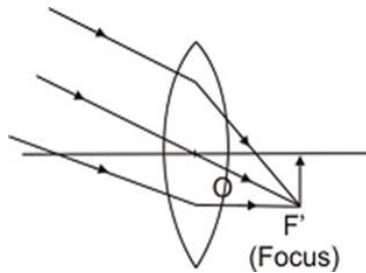
$$= -\frac{3+2}{48}$$

or f $= -\frac{48}{5}$

= -9.6 cm

35. Object at Infinity. When object is at infinity, a real image is formed at F on the other side of the lens

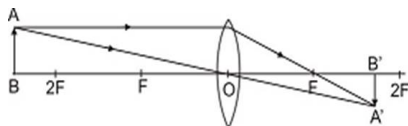Object at infinity. Image at F on the other side of lens.

However if the rays are parallel to themselves but not parallel to principal axis, then these rays after refraction will form image at focus F' and not at principal focus F.


(Focus)

Object at infinity, rays parallel to themselves but not parallel to principal axis. Image is formed at F', the focus on the other side of lens. Object beyond 2F. When the object is beyond 2F, a real, inverted, diminished image is formed between F and 2F.

Object beyond 2F, real, inverted, diminished image between F and 2F. Object at 2F. When the object is at 2F, a real, inverted image of the same size is formed on the other side of the lens at 2F as given in Fig.
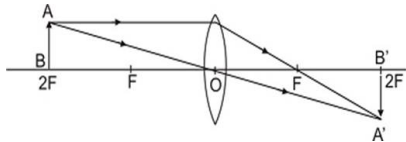
Object at 2F, image at 2F on the other side of the lens. Image is of size same as that of the object. When the object is between F and 2F, its real, inverted, magnified image is formed on the other side of the convex lens as shown in fig.
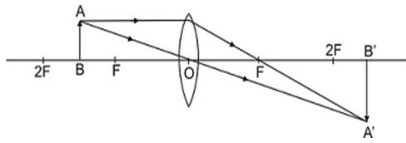

Object between F and 2F real, inverted, magnified image is formed beyond 2F on the other side of lens.

Object at F. When object is placed principal focus, a real, inverted, very highly magnified image is formed at infinity.
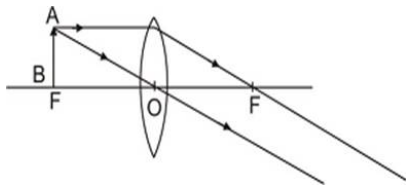
Object at F, a very highly magnified, real, inverted image is formed at infinity.

Object between F and C. When an object is placed between principal focus and optical centre of the lens, virtual, erect, magnified image is formed on the same side of the lens.
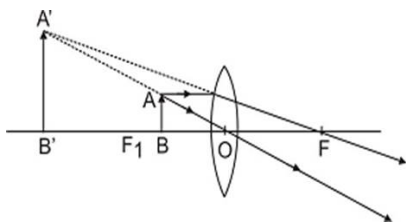
Object between F and C; a virtual, erect, magnified image is formed on the same side.