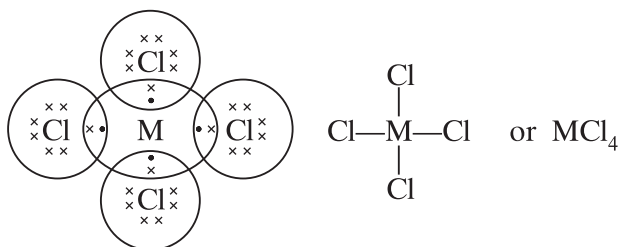


Answers to RST-DS1/Set-3

1. (b)
2. (d)
3. (a)
4. (b) Non-essential parts of a flower are sepals and petals (F and E).
5. (a)
6. (b)
7. (d)
8. (a)
9. (d)
10. (c)
11. (a)
12. (b) 'X' is a salt of strong base and weak acid and its pH value is greater than 7 which turns phenolphthalein to pink. 'Y' should be either a neutral salt or an acidic salt.
13. (b) Element 'M'
Atomic number 6
Electronic configuration 2, 4
It can neither lose nor gain four electrons. It will share 4 electrons and form covalent compound.



14. (d) Resistance of wire = $R \Omega$
Resistance of each part = $\frac{R}{5} \Omega$ as resistance is directly proportional to the length of the wire.
 $R_1 = R_2 = R_3 = R_4 = R_5 = \frac{R}{5} \Omega$

When connected in parallel

$$\begin{aligned}\frac{1}{R_p} &= \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \frac{1}{R_4} + \frac{1}{R_5} \\ &= \frac{5}{R} + \frac{5}{R} + \frac{5}{R} + \frac{5}{R} + \frac{5}{R} = \frac{25}{R}\end{aligned}$$

$$\therefore R_p = \frac{R}{25}$$

15. (b)
16. (c)
17. (b) Both A and R are true and R is not the correct explanation of A.
18. (c) A is true but R is false.
19. (d) A is False but R is true.

A magnetic field line is a path along which a hypothetical free North pole tend to move towards South pole.

20. (b) Both A and R are true and R is not the correct explanation of A.

21. $I = 80 \text{ mA}$, $\rho = \frac{RA}{l} \Rightarrow R = \frac{\rho l}{A}$

(a) ρ (rho) is a constant of proportionality and is called electrical resistivity. Resistivity will not change as it depends on the material of the wire. Since the material of the metallic wire remains same, hence resistivity of the wire does not change.

(b) Current in the circuit is reduced to half as resistance is inversely proportional to current as given by Ohm's law:

$$\begin{aligned}V &= IR \\ R &= \frac{V}{I} \quad \text{or} \quad R \propto \frac{1}{I}\end{aligned}$$

i.e. $I = 40 \text{ mA}$

(c) Resistance of a wire is doubled if length of the metallic wire is doubled as resistance is directly proportional to the length of the wire.

$$R \propto l$$

22. (a) Variations are useful for the survival of the organisms over time as variations make species more adapted to survive, grow and develop in the changing environmental conditions. The variations help the species to overcome the adverse and extreme conditions in the surrounding environment. That is why, they can survive and reproduce to pass the traits to their offsprings over time.

(b) During sexual reproduction, two type of gametes fuse to form a zygote. Even though the gametes contain the same number of chromosomes, their DNA is not identical. As a result the offspring produced is not a true copy of his/her parents.

23. (a) The concentrated sulphuric acid must be added slowly to water with constant stirring because the process of mixing acid with water is highly exothermic and heat evolved will be absorbed by the large amount of water. If water is added to acid, the heat generated may cause the mixture to splash out and cause burns. The glass container may also break due to excessive local heating.

(b) When dil. sulphuric acid (H_2SO_4) is added to an aqueous solution of sodium hydroxide (NaOH), the salt formed is sodium sulphate (Na_2SO_4). The pH of the salt will be 7 as it is neutral salt (made up of strong acid and strong base).



OR

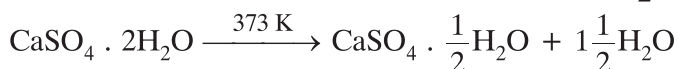
(a) The substance 'X' is Plaster of Paris.

Chemical name – Calcium sulphate hemihydrate

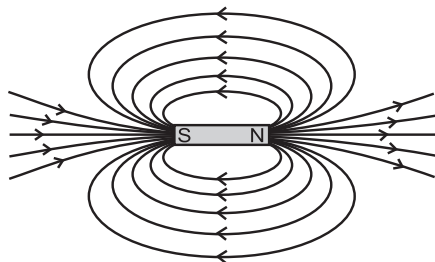
Chemical formula – $\text{CaSO}_4 \cdot \frac{1}{2}\text{H}_2\text{O}$

(b) Preparation of substance 'X'

On heating gypsum ($\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$) at 373 K it loses water molecules and becomes calcium sulphate hemihydrate ($\text{CaSO}_4 \cdot \frac{1}{2}\text{H}_2\text{O}$).



24. (a)



(b) It is used

(i) in navigation to find the direction.

(ii) to detect the magnetic field.

(iii) to test the nature of substance whether it is magnetic or not. (any two)

25. (i) Pulmonary artery
(ii) Left ventricle
(iii) Aorta
(iv) Vena cava

Function of pulmonary artery

Deoxygenated blood from the heart is carried to lungs by pulmonary artery from right ventricle for purification.

OR

- (a) The given figure is of alveoli present in the lungs of human beings.
Alveoli provide a large surface area where exchange of gases takes place.
Alveoli are present in lungs.
- (b) The sphincter muscles present at the junction of stomach and small intestine are called pyloric sphincter. If they do not function properly, food from the stomach will get into the small intestine too faster causing poor digestion and absorption.

If anal sphincter present at the anus does not work properly, there will be involuntary release of faeces from the body.

26. Magnification, $m = -3$

Object distance, $u = -20$ cm

Image distance, $v = ?$

$$m = \frac{-v}{u} \Rightarrow -3 = \frac{-v}{-20}$$

$$\therefore v = -60 \text{ cm}$$

By applying mirror formula

$$\begin{aligned} \frac{1}{f} &= \frac{1}{v} + \frac{1}{u} \\ &= \frac{1}{-60} + \frac{1}{-20} = \frac{-1-3}{60} = \frac{-4}{60} = \frac{-1}{15} \text{ cm} \end{aligned}$$

$$\therefore f = -15 \text{ cm}$$

Magnification is reduced to $-\frac{1}{3}$

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

$$\Rightarrow -\frac{1}{3} = -\frac{v}{u}$$

$$u = 3v$$

Applying mirror formula,

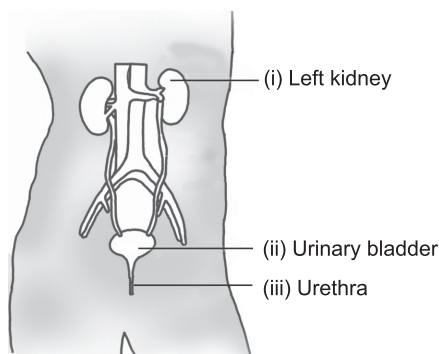
$$\begin{aligned}\frac{1}{f} &= \frac{1}{v} + \frac{1}{u} \\ \frac{1}{-15} &= \frac{1}{v} + \frac{1}{3v} = \frac{3+1}{3v} = \frac{4}{3v} \\ \frac{1}{-15} &= \frac{4}{3v} \\ 3v &= -60 \\ v &= -20 \text{ cm}\end{aligned}$$

Substituting the value of v in

$$u = 3v = 3 \times (-20) = -60 \text{ cm}$$

The object should be placed at 60 cm in front of the concave mirror, i.e. beyond C.

27. (a)

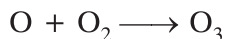
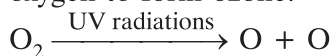


(b) The biological process involved in the removal of the harmful metabolic wastes from the body is called excretion.

Majority of the unicellular organisms remove their wastes by simple diffusion from the body surface into the surroundings.

28. (a) Ozone layer prevents harmful ultraviolet (UV) radiations reaching the earth's surface.

(b) At higher levels, ozone is a product of UV radiations acting on oxygen (O_2) molecule. The higher energy UV radiations split apart some molecular oxygen (O_2) into free oxygen [O] atoms. These atoms then combine with the molecular oxygen to form ozone.



(c) The amount of ozone in the atmosphere began to drop in 1980s due to the release of chlorofluorocarbons (CFCs) in the environment. The CFCs are synthetic chemicals which are used as refrigerant and in the fire extinguishers.

Ozone layer depletion exposes human beings to harmful UV radiations which can cause skin cancer, cataract in eyes etc. (any one)

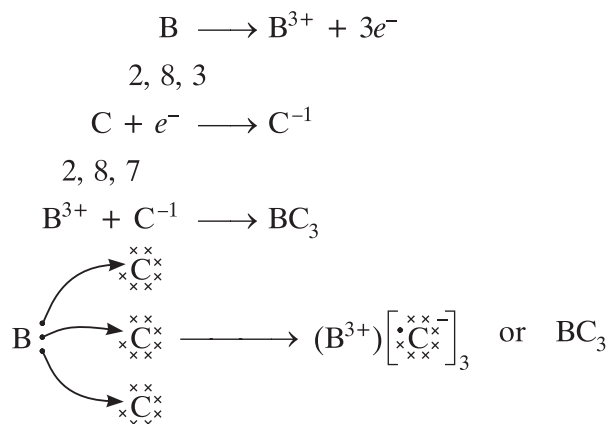
29.

Element	Atomic number	Electronic configuration			
		K	L	M	N
A	2	2			
B	13	2	8	3	
C	17	2	8	7	
D	19	2	8	8	1

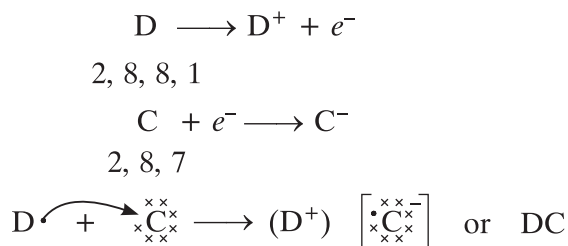
Element A cannot lose, gain or share electrons. It is an inert gas. Elements B and D are metals. Element B can lose three electrons from its M shell, then its L shell becomes the outer most shell and that has a stable octet. D can lose one electron to acquire stable octet. Element C requires one more electron to complete its octet.

- (a) Elements B and D are metals and form ionic or electrovalent compounds with element C.
- (b) Element C is a non-metal and forms covalent compounds with another atom of C.

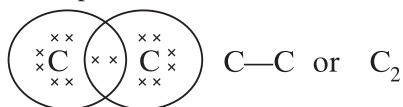
Formation of ionic compound between B and C



Formation of ionic compound between C and D

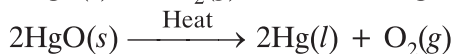


Formation of covalent compound between C and C

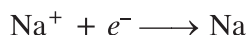


OR

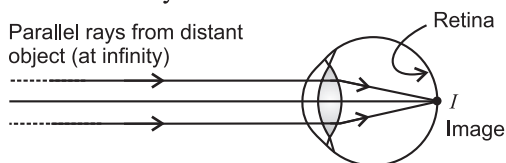
- (a) The ore of mercury is cinnabar (HgS). When cinnabar is heated in air, it is converted into mercuric oxide (HgO). Mercuric oxide is then reduced to mercury on further heating.



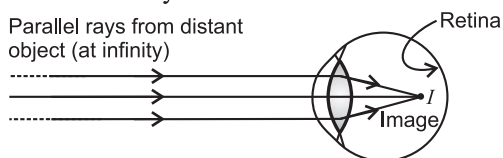
- (b) Carbon cannot reduce the oxides of sodium to sodium as it has more affinity for oxygen than carbon.
- (c) Sodium is obtained by the electrolysis of its molten chloride i.e., by electrolytic reduction. Sodium metal is deposited at the cathode.



30. (a) (i) When Advitya is seated at front seat.



- (ii) When Advitya is seated at the back seat.

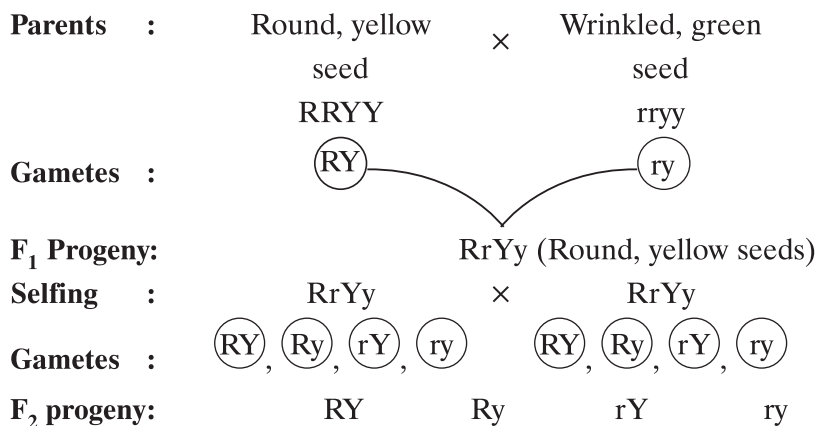


- (b) Advitya is suffering from myopia.

Causes of myopia

- Excessive curvature of the eye lens.
- Elongation of the eyeball.

31. In a dihybrid cross, when two contrasting pairs of traits were considered simultaneously, only one parental combination appeared in F₁ generation. In F₂ generation after self pollination, four combinations of traits appeared. Out of these four combinations, two were parental type traits and two were new combinations.



	RY	Ry	rY	ry
RY	RRYY Round, yellow	RRYy Round, yellow	RrYY Round, yellow	RrYy Round, yellow
Ry	RRYy Round, yellow	RRyy Round, green	RrYy Round, yellow	Rryy Round, green
rY	RrYY Round, yellow	RrYy Round, yellow	rrYY Wrinkled, yellow	rrYy Wrinkled, yellow
ry	RrYy Round, yellow	Rryy Round, green	rrYy Wrinkled, yellow	rryy Wrinkled, green

- The phenotypic ratio of the F₂ generation is
- | | | | |
|---------------------------------------|--------------------------------------|--|---|
| Round,
yellow-
seeded
plants | Round,
green-
seeded
plants | Wrinkled,
yellow-
seeded
plants | Wrinkled,
green-
seeded
plants |
| 9 | 3 | 3 | 1 |

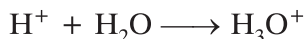
If 1120 plants were obtained in F₂ progeny, the number of plants having new combinations were

$$\text{Round and green seeds} = \frac{3}{16} \times 1120 = 210$$

$$\text{Wrinkled and yellow seeds} = \frac{3}{16} \times 1120 = 210$$

We can conclude that round and yellow colour seeds are dominant. Occurrence of new combinations show that genes for round and yellow colour seeds are inherited independently of each other. This law is known as ‘Law of Independent Assortment.’

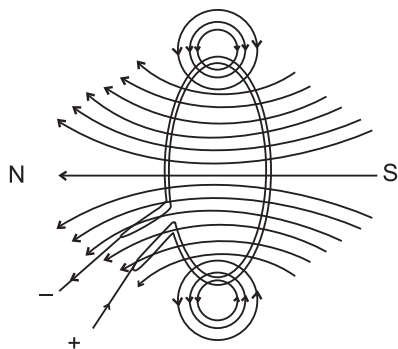
32. (a) $[H^+]$ ions/Hydrogen ions exist in water as hydronium $[H_3O^+]$ ions.



Higher the hydronium ion concentration, lower is the pH and vice-versa or we can say pH of a solution is inversely proportional to $[H^+]$ ions concentration.

- (b) Phenolphthalein remains colourless in acidic solution and turns pink in basic solution. Since solution ‘A’ turns pink, it is basic in nature and has pH more than 7. When Meera added solution ‘B’ to the pink coloured solution ‘A’ the pink colour disappears. The solution ‘B’ being acidic neutralises solution ‘A’. Hence solution ‘B’ is acidic.
- (c) When a few drops of universal indicator are added to distilled water, the colour of water changes to green indicating its pH 7 and it is neutral.

33. (a)

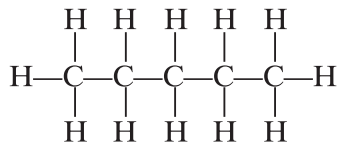


- (b) The pattern of magnetic field due to current carrying circular loop depends inversely on the distance from it. At every point of current carrying circular loop, the concentric circles representing the magnetic field around it would become larger and longer as we move away from the wire. At the centre of the circular loop, the arcs of these big circles would appear as straight lines.
- (c) If there is a circular coil having ‘n’ turns, the magnetic field produced by this current carrying circular coil will be ‘n’ times as that produced by a circular loop of a single turn, because the current in each circular turn of coil flows in the same direction and magnetic field produced by each turn of circular coil then just adds up.

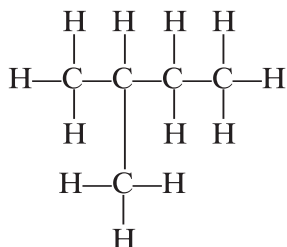
34. (a) (i) The compounds which possess the same molecular formula but different structural formulae are called isomers and the phenomenon is known as isomerism.

In the first three members of alkane series, branching is not possible. Only one type of arrangement of carbon atoms is possible. This is the reason that for the first three members of alkane series, isomerism is not possible.

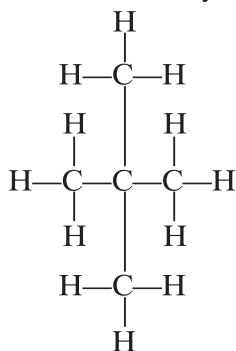
(ii) Fifth member of alkane series is pentane C_5H_{12}



n-Pentane or Pentane



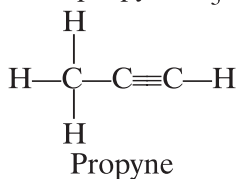
Isopentane or 2-Methyl butane



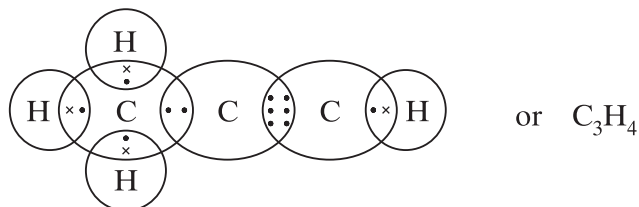
Neopentane or 2,2-Dimethyl propane

(b) General formula for alkynes is C_nH_{2n-2}

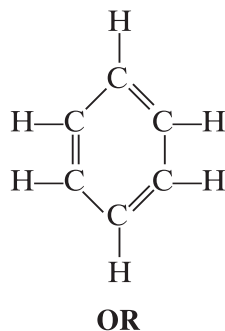
Second member of alkyne is propyne C_3H_4



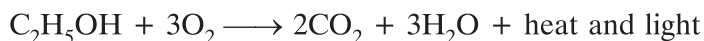
Electron dot structure



Structural formula for cyclohexene



- (a) (i) When ethanol is heated in air, it burns in oxygen and releases carbon dioxide, water and a large amount of heat and light



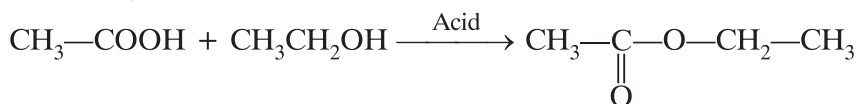
- (ii) When ethanol is heated at 443 K with excess of concentrated sulphuric acid, dehydration of ethanol gives rise to ethene. Here H_2SO_4 acts as a dehydrating agent which removes water molecule from ethanol.



- (iii) When a small piece of sodium is dropped in ethanol, ethanol reacts with sodium to form sodium ethoxide and hydrogen gas.



- (iv) When ethanol reacts with acetic acid (ethanoic acid) in the presence of acid catalyst, an ester is formed. This reaction is called esterification.



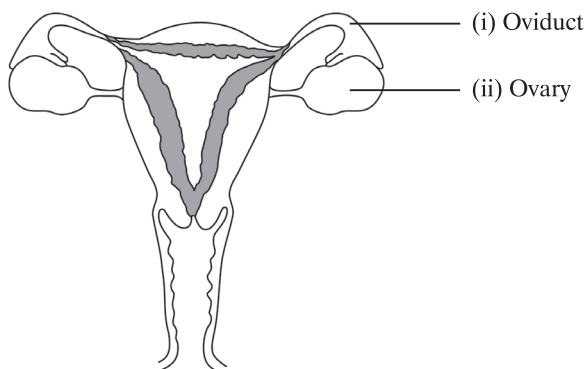
(b) Action of sodium carbonate or sodium hydrogen carbonate

Ethanol	Ethanoic acid
<ul style="list-style-type: none">It does not react.	<p>It reacts with Na_2CO_3 or NaHCO_3 and produces brisk effervescence due to evolution of CO_2.</p> $2\text{CH}_3\text{COOH} + \text{Na}_2\text{CO}_3 \longrightarrow 2\text{CH}_3\text{COONa} + \text{CO}_2 + \text{H}_2\text{O}$ $\text{CH}_3\text{COOH} + \text{NaHCO}_3 \longrightarrow \text{CH}_3\text{COONa} + \text{CO}_2 + \text{H}_2\text{O}$

Action of alkaline potassium permanganate

Ethanol	Ethanoic acid
<ul style="list-style-type: none">It discharges the pink colour of KMnO_4 and forms ethanoic acid. $\text{CH}_3\text{CH}_2\text{OH} \xrightarrow{\text{alk. KMnO}_4} \text{CH}_3\text{COOH}$	<ul style="list-style-type: none">It does not react.

35. (a)



(i) Oviduct – The egg/ovum produced in the ovary is carried to the uterus through oviduct/fallopian tube. The fertilisation between sperm and ovum takes place in the fallopian tube/oviduct.

(ii) Ovary – The female germ cell/egg/ovum is produced in the ovary. Ovary is also responsible for the production of hormone, estrogen.

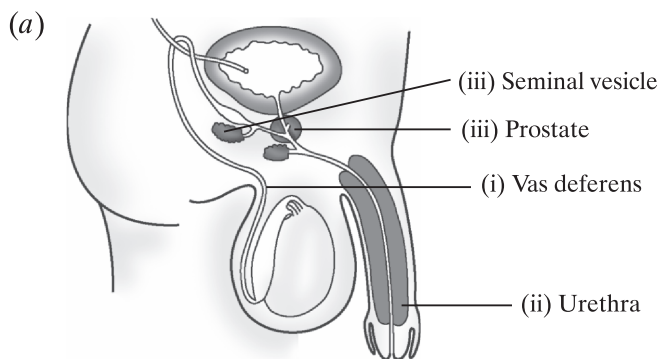
(b) Consequences of reckless female foeticide

- Decline in sex ratio.
- Increased sexual violence and abuse against women.

(c) Differences between human male gamete and female gamete:

Male gamete/Sperm	Female gamete/Ovum
– Smaller in size	– Larger in size
– Motile	– Non-motile
– With scanty amount or no food reserve.	– Has a good amount of food reserve.

OR



(i) Vas deferens

(ii) Urethra

(iii) Prostate glands and seminal vesicle add their secretions in the vas deferens so that the sperms are in a fluid.

This fluid also known as semen makes the transport of sperms easier and also provides nutrition.

(b) Advantages of using condoms:

- avoids unwanted/undesirable pregnancies.
- prevents the transmission of sexually transmitted diseases (STDs).

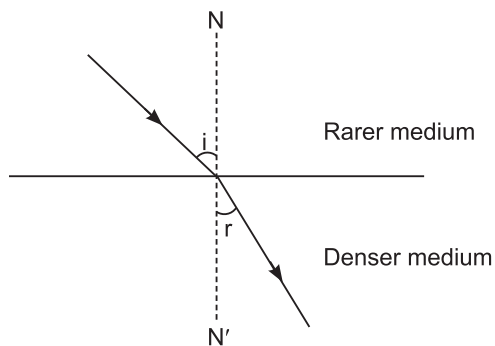
(c) (i) Bacteria— Gonorrhoea, Syphilis

(any one)

(ii) Virus— Warts, HIV-AIDS

(any one)

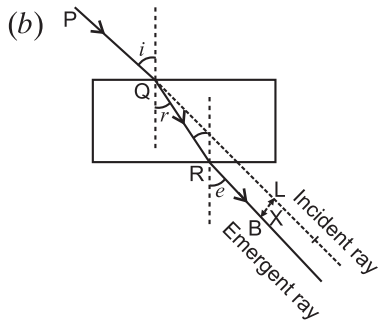
36. (a) (i)



(ii) The light would travel faster in the rarer medium because it has more refractive index than the denser medium.

(iii) **Refraction of light:** When a ray of light enters obliquely from one medium to another, the direction of propagation of light in the second medium changes.

Snell's law of refraction: The ratio of sine of angle of incidence to the sine of angle of refraction is a constant, for the light of a given colour and for given pair of media.



(c) Speed of light in air, $c = 3 \times 10^8$ m/s.

Let speed of light in crown glass and diamond be v_C and v_D respectively

$$n = \frac{c}{v}$$

$$v = \frac{c}{n_C}$$

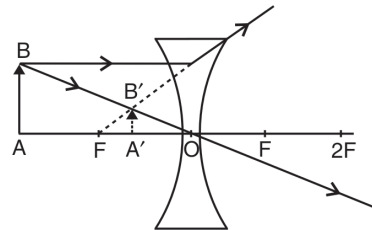
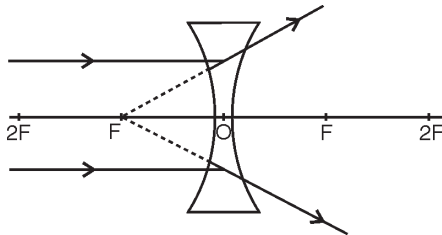
$$v_C = \frac{3 \times 10^8}{1.52} = 1.97 \times 10^8$$

$$v_D = \frac{c}{n_D} = \frac{3 \times 10^8}{2.42} = 1.23 \times 10^8$$

$$\therefore v_C : v_D = 1.97 : 1.23$$

OR

(a) Rahul has concave lens.



$$P = 4.5 \text{ D}, f = ?$$

$$\text{Now, } P = \frac{1}{f} \Rightarrow f = \frac{1}{P} = -\frac{1}{4.5} = -0.22 \text{ m} = -22 \text{ cm}$$

(b) $h_o = 5 \text{ cm}$, $f = -20 \text{ cm}$, $u = -30 \text{ cm}$, $v = ?$, $h_i = ?$

By applying mirror formula,

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

$$\frac{1}{v} = \frac{1}{f} - \frac{1}{u} = \frac{1}{-20} - \frac{1}{-30}$$

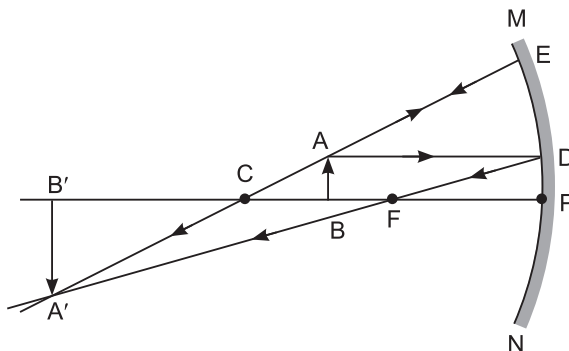
$$\Rightarrow \frac{1}{v} = \frac{1}{-20} + \frac{1}{30} = \frac{-3+2}{60} = \frac{-1}{60}$$

$$\therefore v = -60 \text{ cm}$$

$$\frac{h_i}{h_o} = \frac{-v}{u}$$

$$h_i = \frac{-v}{u} \times h_o = \frac{-(-60)}{(-30 \text{ cm})} \times 5$$

$$h_i = \frac{60 \times 5}{-30} = -10 \text{ cm}$$

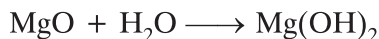


Nature of image – Real and inverted

Size of image – Enlarged

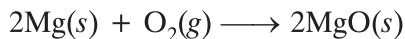
37. (a) Magnesium ribbon is to be cleaned before burning to remove a white layer of magnesium oxide.

(b) The nature of the solution is basic.



When magnesium oxide (MgO) is dissolved in water, it forms magnesium hydroxide Mg(OH)_2 . When a litmus paper is dipped in the solution, the red litmus paper turns blue.

- (c) (i) The reaction between magnesium and oxygen is also called oxidation reaction because addition of oxygen takes place and magnesium oxide is formed.



- (ii) An exothermic reaction is the one in which heat is given out. The reaction between magnesium and oxygen is also an exothermic reaction as heat is given out.

OR

- (c) Quick lime is calcium oxide. A vigorous reaction is found to occur between quick lime and water.



Since CaO combines with H₂O to form a single compound Ca(OH)₂ so, it is a combination reaction.

Take a small amount of quick lime in a beaker. Slowly add water to it and touch the beaker. It is found to be hot. This proves that heat is given out during the reaction and the reaction is exothermic.

38. (a) Resistance of resistor = $R \Omega$

$$\text{New resistance of resistor} = \frac{R}{2} \Omega$$

By applying Joule's law of heating

$$H = I^2 R t \quad \dots(i)$$

$$\text{As per Ohm's law, } V = IR \text{ or } I = \frac{V}{R} \quad \dots(ii)$$

By putting the value of I , from (ii) to (i)

$$H = \frac{V^2}{R^2} \times R \times t$$

$$\Rightarrow H = \frac{V^2}{R} \times t$$

$$\text{In circuit (i), } H = \frac{V^2}{R} \times t$$

$$\text{In circuit (ii), } H' = \frac{V^2}{R/2} \times t = \frac{V^2 \times 2 \times t}{R} = 2H$$

Hence in circuit (ii) heating effect is double than in circuit (i).

- (b) (i) The heating elements of electric toasters and electric irons are made of alloy as the resistivity of an alloy is higher than that of its constituent metals. Alloys do not oxidise readily at high temperatures.

- (ii) The cord of an electric heater is made of thick copper wire and has much lower resistance, than its element. For the same current (I) flowing through the cord and the element, heat produced (I^2Rt) in the element is much more than that produced in the cord. As a result, the element becomes very hot and glows whereas the cord does not become hot and not glow.

OR

(b) $I = 10 \text{ A}$, $V = 220 \text{ V}$, $t = 3 \text{ h}$

Power, $P = VI$
 $= 220 \times 10 = 2200 \text{ W} = 2.2 \text{ kW}$

Energy consumed, $E = P \times t$
 $= 2.2 \times 3 = 6.6 \text{ kW}$

We know $1 \text{ kWh} = 3.6 \times 10^6 \text{ J}$

\therefore Energy consumed $= 6.6 \times 3.6 \times 10^6 \text{ J} = 2.4 \times 10^7 \text{ J}$

39. (a) The endocrine gland which secretes TSH is thyroid gland. The thyroid gland is situated in the neck region.
- (b) Thyroxine regulates carbohydrates, fats and protein metabolism in the body so as to provide the best balance for growth.
- (c) (i) The mineral responsible for the synthesis of thyroxine hormone is iodine.
(ii) Goitre
(iii) The most common symptom of this disease is swollen neck.
(iv) It is important to include iodised salt in our diet because iodine is necessary for the thyroid gland to make thyroxine hormone.

OR

- (c) At the time of puberty, the hormone released in the boys is testosterone and the hormone released in the girls is estrogen.

Changes that happen during puberty

- Change in voice.
- Sudden increase in height.
- Thick hair growth in new parts of the body such as armpits and the genital area
- Skin becomes oily.
- Thinner hair appears on the legs and arms. (any two)