
FOCUS
ACADEMY
Std.: K.G. to 12 Com. Eng. & Guj. Medium

17. Solution A $\rightarrow$ 4 pH, B $\rightarrow$ 1 pH, C $\rightarrow$ 11 pH, D $\rightarrow$ 7 pH, E $\rightarrow$ 9 pH.

Ascending order of pH : $1 < 4 < 7 < 9 < 11$

(i) pH of neutral solution is 7.

$\therefore$ Solution D is neutral solution.

(ii) pH of strong basic solution is more than 7 and less than 14.

$\therefore$ Solution C is strong basic solution.

(iii) pH of strong acidic solution is much less than 7.

$\therefore$ Solution B is strongly acidic.

(iv) pH of weak basic solution is more than 7 but less than 11.

$\therefore$ Solution E is weak basic solution.

18.

Metals	Non-metals
1. They are electro-positive elements.	1. They are electro-negative elements.
2. Atoms of metal possess one, two or three electrons in their outermost shell.	2. Atoms of non-metals possesses more than four electrons in their outermost shell.
3. Hydrogen gas is evolved when metals reacts with dilute acid.	3. When non-metal react with dilute acid hydrogen gas is not evolved.
4. Oxides of metals are basic or amphoteric in nature. For example, Na_2O, Al_2O_3.	4. Oxides of non-metals are acidic in nature. For example, SO_2, CO.

19. (1) Electronic configuration is $\begin{matrix} K & L & M \\ 2 & 8 & 4 \end{matrix}$.

There are 4 electrons in the outermost orbit and 3 electron orbits.

∴ This element is in 14th group and 3rd period of the periodic table.

(2) Electronic configuration is $\begin{matrix} K & L & M & N \\ 2 & 8 & 8 & 1 \end{matrix}$.

There is 1 electron in the outermost orbit and 4 electron orbits.

∴ This element is in first group and 4th period of the periodic table.

20. Small intestine receives bile juice from liver and pancreatic juice from pancreas. Bile salts break large fat globules present in food down into smaller globules. This process is called emulsification. The enzyme lypaso present in it finally convert fats into fatty acids and glycerol. Thus, fat (lipid) is digested in our body.

OR

20.

Aerobic respiration	Anaerobic respiration
1. O_2 is used in this process.	1. O_2 is not used in this process.
2. At the end of this process CO_2 and H_2O are produced.	2. At the end of this process in medium of plant origin Ethanol and CO_2 are produced and in medium of animal origin only lactic acid is produced and no CO_2.
3. In aerobic respiration complete oxidation of glucose molecules occurs, in which one mole of glucose on oxidation releases much greater energy.	3. In anaerobic respiration glucose molecules are incompletely oxidized, so one mole of glucose releases less energy along with the organic by-products.
4. There are two phases in aerobic respiration, the first phase occurs in the cytoplasm and does not utilize O_2. The second phase occurs in the mitochondria and utilizes O_2.	4. There is only one phase in anaerobic respiration. It occurs in the cytoplasm. It occurs entirely in the absence of O_2.

21. In many plants root, stem and leaves develop into new plant under appropriate condition. Such a mode of reproduction is called vegetative propagation.

Advantages of vegetative propagation are as follows :

(1) Vegetative propagation is used in layering or grafting methods to grow many plants like sugarcane, roses or grapes for agricultural purposes.

(2) Plants raised by vegetative propagation can bear flowers and fruits earlier than those produced from seeds.

(3) The plants that have lost the capacity to produce seeds can also be produced by vegetative propagation. e.g., banana, orange, rose, jasmine

(4) All plants produced by vegetative propagation are genetically similar to the parent plant.

22. (1) Headlight of a car → Concave mirror is used.

Reason : In a headlight and torch the light source is placed at the principal focus of a concave mirror. As a result, an intense parallel beam of light comes out from headlight and torch. This parallel beam of light spreads till far distance. So the road till far distance appears lighted.

(2) A convex mirror is used as a rear-view mirror.

Reason : This is because a convex mirror (always) forms an erect, virtual and diminished image of an object, wherever the object may be located. Also, a convex mirror has a wider field of view. Thus, a convex mirror fitted on the side of a vehicle enables the driver to see traffic behind him / her to facilitate safe driving.

23. The electric potential difference (p.d.) between any two points A and B in an electric field is the work done to move a unit positive charge (+ 1 C) from one point A to the another point B against the electric force due to the electric field.

Potential difference (V) between two points

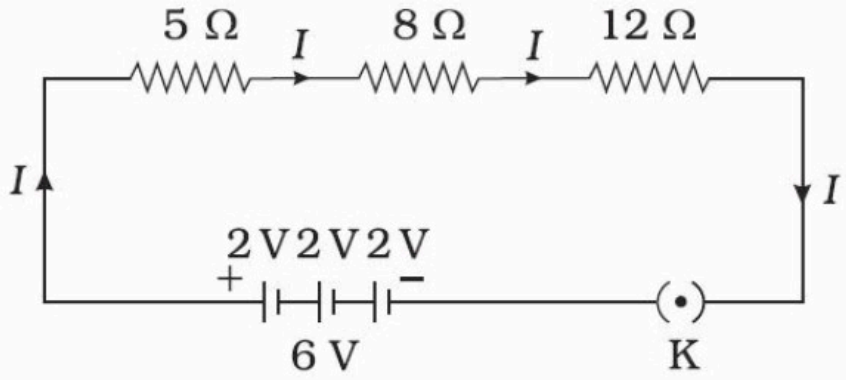
$= \frac{\text{Work done } (W)}{\text{Charge } (Q)}$; Thus, $V = \frac{W}{Q}$

→ The SI unit of p.d. is volt or joule / coulomb (J / C).

The instrument used to measure electric potential difference is voltmeter.

OR

23. The electric circuit in which the given components are connected in series is as follows :



The equivalent restistance of series combination

$R_S = R_1 + R_2 + R_3$

$= 5\,\Omega + 8\,\Omega + 12\,\Omega$

$= 25\,\Omega$

24. Advantages of using Alternating Current in daily life :

(1) Relative to the production of DC, it is easier and economical to produce AC.

(2) AC power can be transmitted over longer distances without much loss of energy.

(3) The AC voltage can be increased or decreased without much loss of electricity (electric energy).

[A device, called a transformer, is used to increase or decrease AC voltage.]

25. The problems caused by the generated non-biodegradable wastes are as follows :

(1) It causes biological magnification.

(2) They keep on accumulating in nature causing pollution.

(3) They prevent growth of vegetation when dumped underground.

(4) They may be inert and simply persist in the environment for a long time and may harm various members of the ecosystem.

(5) There is imbalance of the food chains causing problems in ecosystem.

OR

26. Steps for controlling carbon dioxide level in the atmosphere are as follows :

(1) Reduce the consumption of fossil fuels such as petrol, diesel automobiles. Using public transport helps in reduction of petrol usage.

(2) Use alternative fuels such as CNG instead of fossil fuels.

(3) Instead of burning litter, prepare manure out of it.

(4) Planting of large number of trees.

(5) The smoke coming out of thermal power stations and other industries should be well treated to remove harmful gases, before discharging it into atmosphere.

26. Criticisms about large dams project address three problems :

(**1**) **Social problems :** Construction displaces large number of tribals and local peasants without proper compensation and rehabilitation.

(**2**) **Economic problems :** Projects need lot of money without the generation of proportionate benefits.

(**3**) **Environmental problems :** Construction of a dam causes deforestation and loss of biodiversity.

27. Combination reaction : Chemical reaction in which two or more substances (reactants) undergo reaction to form a single product is called combination reaction.

Example 1 :

$$\underset{\substack{\text{Calcium oxide}\\\text{(Limestone, quicklime)}}}{CaO(s)} + \underset{\text{Water}}{H_2O(l)} \longrightarrow \underset{\substack{\text{Calcium hydroxide}\\\text{(Slaked lime, lime water)}}}{Ca(OH)_2(aq)}$$

In above reaction, two compounds CaO(s) and $H_2O(l)$ undergo chemical reaction and form single product $Ca(OH)_2(aq)$; along with evolution of heat. Thus, this reaction is a combination reaction.

Example 2 : $\underset{\text{Hydrogen}}{2H_2(g)} + \underset{\text{Oxygen}}{O_2(g)} \longrightarrow \underset{\text{Water}}{2H_2O(l)}$

29. Hormones are secreted in appropriate quantities. Imbalance in the concentration of hormone causes disorders. Such hormonal disorders are as follows :

(1) **Giants :** Due to excess secretion of growth hormone, individual becomes extremely tall.

(2) **Dwarfism :** Deficiency of growth hormone in childhood leads to dwarfism (very short).

(3) **Goitre :** Iodine deficiency in our diet affect the synthesis of thyroxin and cause goitre. Due to enlarged thyroid gland, swelling in neck region seen.

(4) **Diabetes :** If insulin is not secreted in appropriate amounts, the sugar level rises in the blood. It causes diabetes.

(2) In human beings the sex of the individual is determined by sex chromosomes and is thus genetically determined. The genes inherited from parents decide the sex of the offspring.

Exception : The animal such as certain snail can change its sex. The sex therein, is not genetically determined.

OR

31. (1) **Darwin :** His theory of evolution tells us how life evolved from simple to more complex forms. Darwin's theory is called "Theory of Natural Selection".

But he could not explain about how life began on earth.

(2) **J. B. S. Haldane :** He was a British scientist who suggested in 1929 that life must have developed from the simple inorganic molecules which were present on primitive earth.

He speculated that the conditions on the earth at that time could have given rise to more complex organic molecules that were necessary for life. The first primitive organisms arose further by chemical synthesis.

(3) **Stanley L. Miller and Harold C. Urey :** In 1953, they assembled an experiment in which primitive atmosphere was simulated.

It had compounds like ammonia, methane, hydrogen and water vapour but no oxygen. This was maintained at a temperature just below 100 °C and electric sparks were passed through the mixture of gases to simulate lightning. At the end of a week, 15% of the carbon had been converted to simple compounds of carbon including amino acids which are monomers of protein molecules.

32. Focal length of concave mirror $f = -18\,\text{cm}$

Object-distance $u = -27\,\text{cm}$, height of object $h = 7\,\text{cm}$

Image-distance $v = ?$, height of image $h' = ?$

According to mirror formula,

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

$$\therefore \frac{1}{v} + \frac{1}{-27} = \frac{1}{-18}$$

$$\therefore \frac{1}{v} = \frac{1}{27} - \frac{1}{18}$$

$$= \frac{2-3}{54}$$

$$= -\frac{1}{54}$$

$$\therefore v = -54\,\text{cm}$$

→ Let I_1, I_2 and I_3 be the currents flowing through the resistors with resistances R_1, R_2 and R_3 respectively.

$$\therefore I = I_1 + I_2 + I_3 \quad \ldots\ldots (1)$$

→ In a parallel combination of resistors, the potential difference across every resistor is equal to the potential difference V of the battery.

According to Ohm's law,

$$I_1 = \frac{V}{R_1},\ I_2 = \frac{V}{R_2} \text{ and } I_3 = \frac{V}{R_3}$$

$$\therefore I_1 = \frac{V}{R_1} + \frac{V}{R_2} + \frac{V}{R_3} \quad \ldots\ldots (2)$$

→ Now, if a resistor with resistance R_p, instead of three resistors with resistances R_1, R_2 and R_3, is connected in the circuit such that the current flowing through the circuit remains the same as I then R_p is called the equivalent resistance of the circuit [see figure (b)].

$$I = \frac{V}{R_p} \quad \ldots\ldots (3)$$

From equation (2) and (3),

$$\frac{V}{R_p} = \frac{V}{R_1} + \frac{V}{R_2} + \frac{V}{R_3}$$

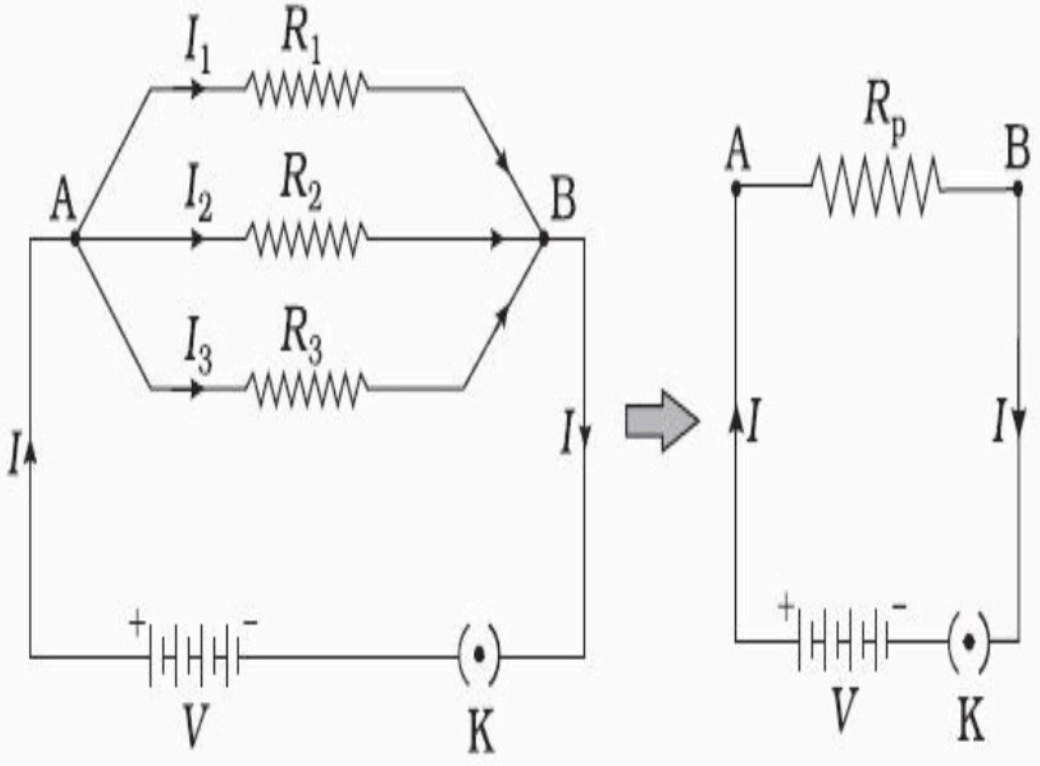
$$\therefore \boxed{\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}}$$

→ Thus, in a parallel combination of resistors, the sum of the reciprocals of the individual resistances is equal to the reciprocal of the equivalent resistance.

33. In parallel combination of resistors more than one paths are available for the current to flow and potential difference across each resistor is the same and is equal to the applied potential difference between the two common points.

Three resistors with resistances, R_1, R_2 and R_3 are connected in parallel between points A and B as shown in the figure (a).

Here, the current I gets divided at point A amongst three resistors as shown in the figure. The value of the current flowing through each resistor depends on the value of its resistance.



(a) Electric circuit

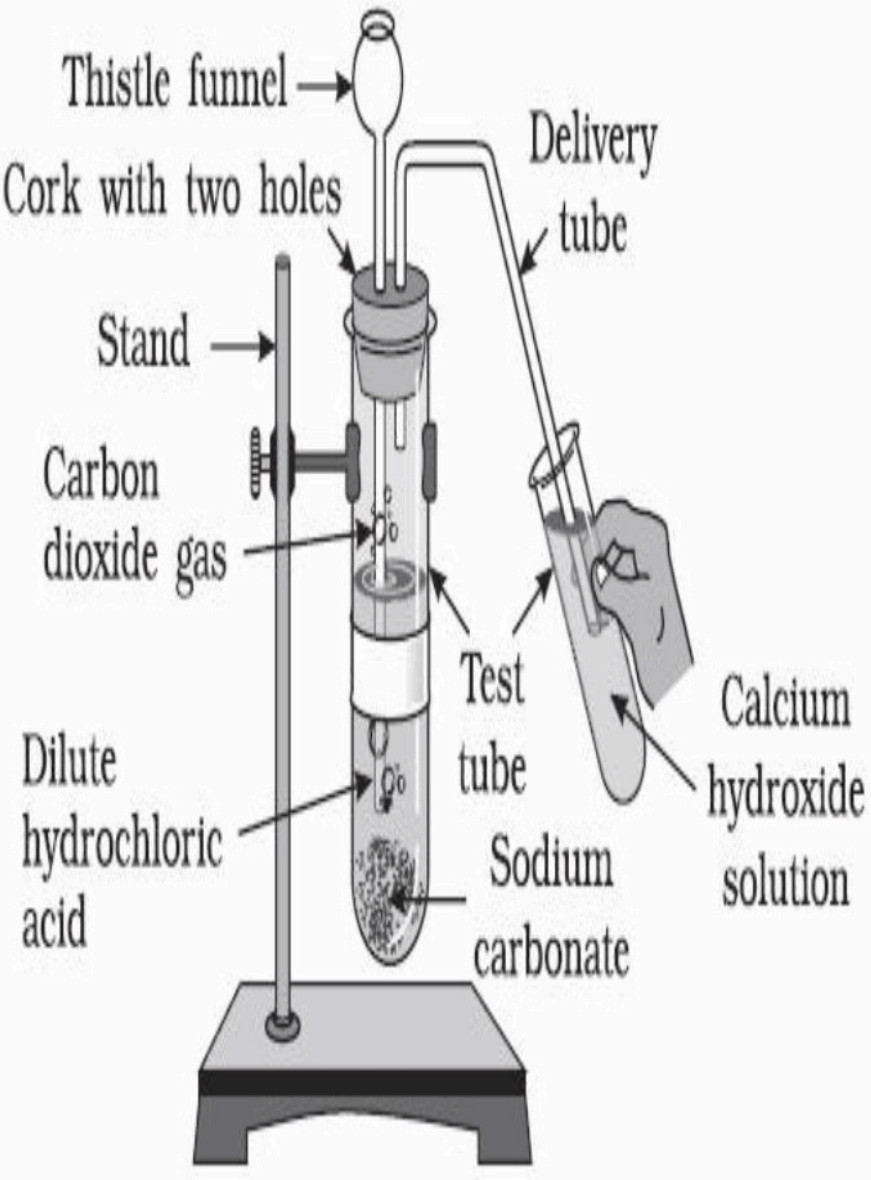
(b) Equivalent circuit

35. Aim : To study the reaction of sodium carbonate with dilute hydrochloric acid.

Apparatus : Two test tubes – large and small, cork with two holes, thistle funnel, delivery tube, stand.

Materials : Sodium carbonate, dilute hydrochloric acid (HCl), decanted lime water (calcium hydroxide solution).

Diagram :



Description of the experiment :

→ Take a large test tube. Take about 1 gram sodium carbonate in it and arrange the apparatus as shown in the figure.

→ Now, add about 5 mL of dilute hydrochloric acid through the thistle funnel.

→ Hold the test tube filled with decanted lime water (calcium hydroxide solution) at the other end of the delivery tube. Note your observation.

Observation : Carbon dioxide gas is evolved when sodium carbonate and dilute hydrochloric acid react. When carbon dioxide gas is passed into the solution of decanted lime water through the delivery tube, it turns milky. So it is confirmed that the gas evolved is carbon dioxide.

Equation of reaction occurring between sodium carbonate and dilute hydrochloric acid :

$$Na_2CO_3(s) + 2HCl(aq) \longrightarrow 2NaCl(aq) + H_2O(l) + CO_2(g) \uparrow$$

Equation of reaction occurring between CO_2 gas with decanted lime water ($Ca(OH)_2$) :

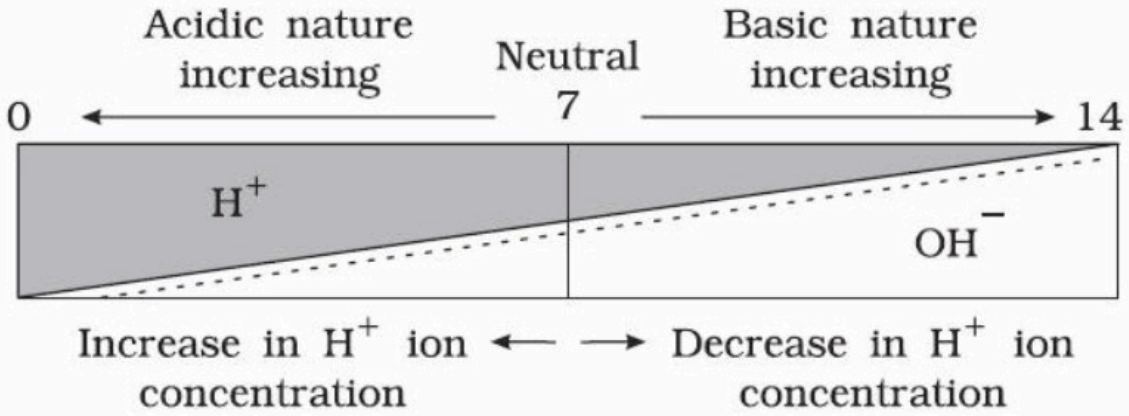
$$Ca(OH)_2(aq) + CO_2(g) \longrightarrow CaCO_3(s) \downarrow + H_2O(l)$$

35. A scale for measuring hydrogen ion concentration in a solution is called pH scale.

→ p in pH stands for 'potenz' in German which indicates the meaning power.

→ On the pH scale, we can measure pH generally from 0 (very acidic) to 14 (very alkaline).

→ On the pH scale, value less than 7 represents acidic solution; value greater than 7 represents basic solution while the value 7 shows neutral solution. It is shown in the figure below :

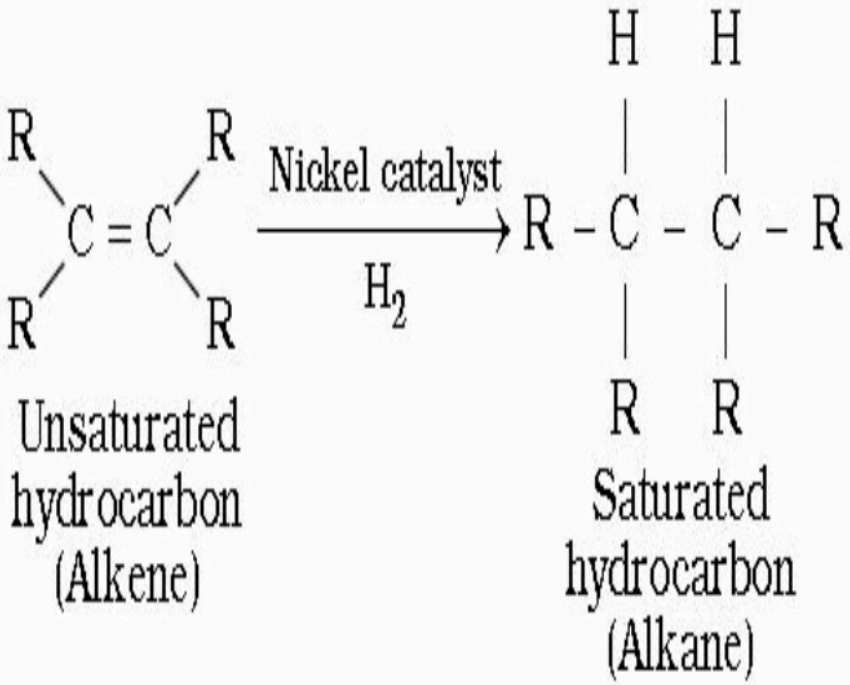


→ The pH value increases from 7 to 14, which indicates an increase in concentration of OH^- ions, that is, increase in strength of alkali and the solution becomes more basic.

→ In general, higher the concentration of hydronium ion ($H_3^+(aq)$), higher is the acidity and lower is the pH value; and lower the concentration of hydronium ion ($H_3^+(aq)$), lower is the acidity and higher is the pH value.

36. (1) A reaction involving addition of an atom or molecule to an unsaturated compound so as to yield a saturated product is called addition reaction.

→ Unsaturated hydrocarbons add hydrogen in the presence of catalysts such as palladium or nickel to form saturated hydrocarbons.



→ This reaction is commonly used in the hydrogenation of vegetable oils using a nickel catalyst.

→ Vegetable oils possesses long unsaturated carbon chains while animal fats possesses saturated carbon chains; hence, vegetable oils are good for health.

(2) Reaction in which substitution of an atom or a group of atoms in an organic compound takes place by another atom or group of atoms is called substitution reaction.

→ Chlorination of hydrocarbon compounds takes place in the presence of sunlight. Chlorine can replace the hydrogen atoms one by one. This type of reaction is called substitution reaction.

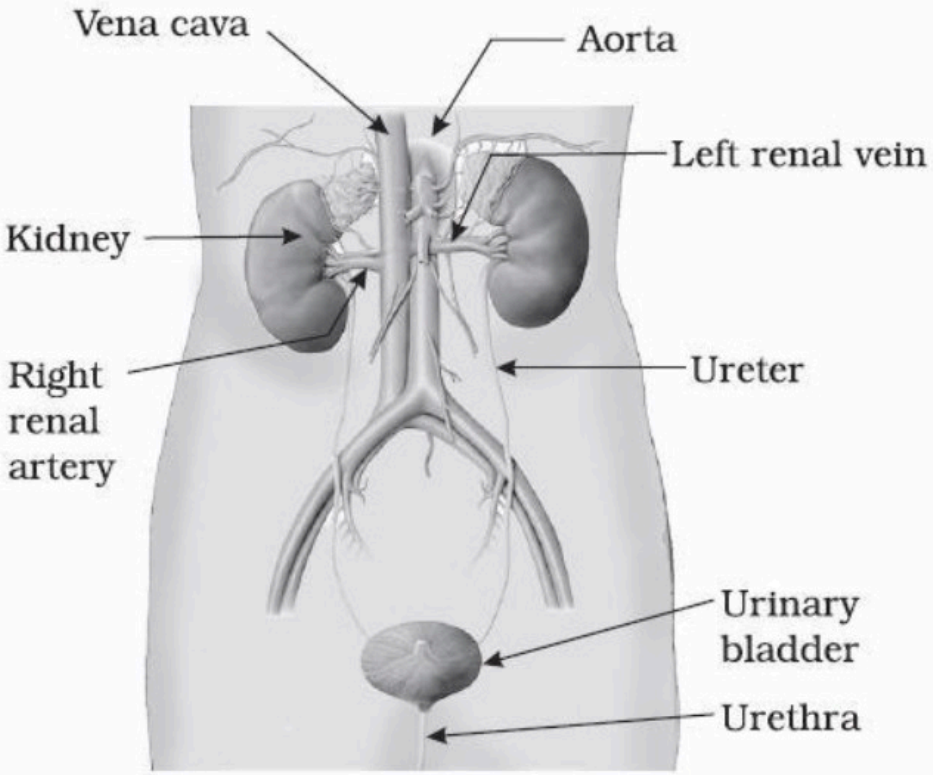
$$\underset{\text{Methane}}{CH_4} + Cl_2 \xrightarrow{\text{Sunlight}} \underset{\text{Chloromethane}}{CH_3Cl} + HCl$$

and

$$CH_3Cl + Cl_2 \xrightarrow{\text{Sunlight}} CH_2Cl_2 + HCl$$

→ A number of products in this reaction are formed with the higher homologous of alkanes.

37. The excretory system of human being includes a pair of kidneys, a pair of ureters, a urinary bladder and a urethra.



(1) Kidney : In human being a pair of kidneys are located in the abdomen, one on either side of the backbone.

→ Urine is produced by filtering out nitrogenous waste products from the blood in the kidneys.

(2) Ureter : A pair of long tubes, which connect the kidneys with the urinary bladder.

→ Urine produced in the kidneys pass to urinary bladder through ureter.

(3) Urinary bladder : It is a muscular bag, for storing urine. Urine is temporarily stored in it.

(4) Urethra : A passage extending from urinary bladder and opening to outside of body.

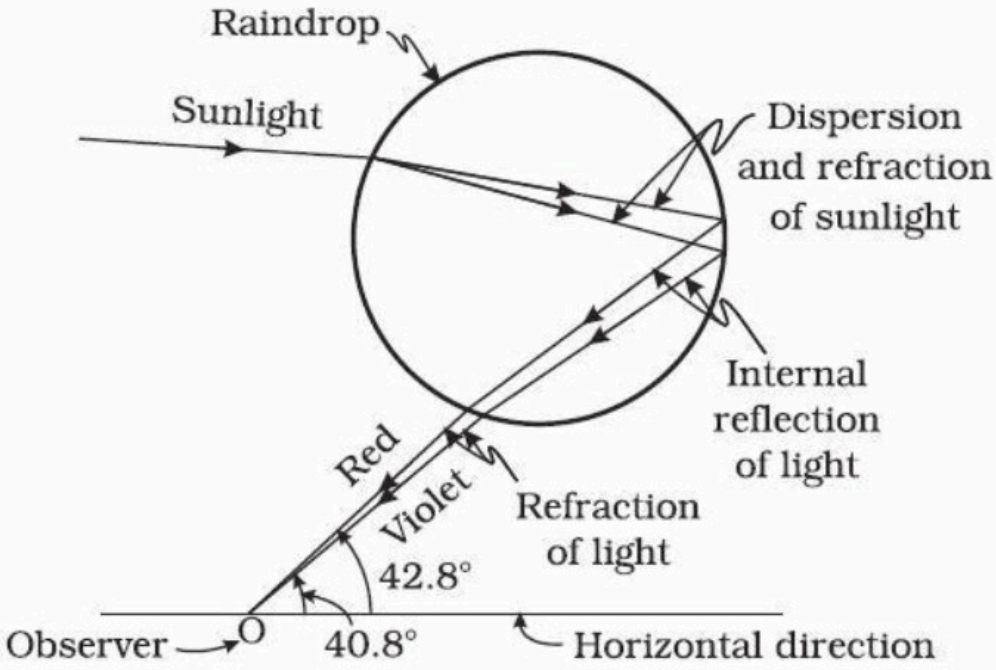
→ Urine is excreted through it.

38. A rainbow is a natural spectrum appearing in the sky after a rain shower.

→ Rainbow is caused by dispersion of sunlight on refraction by tiny water droplets, present in the atmosphere.

→ It is always formed in the direction opposite to that of the Sun. So the rainbow is seen when the Sun is behind the observer.

→ Here, water droplets act like small prisms. They first refract and disperse the incident sunlight, then reflect it internally (not necessarily total internal reflection) and finally refract it again while it comes out of the raindrop.



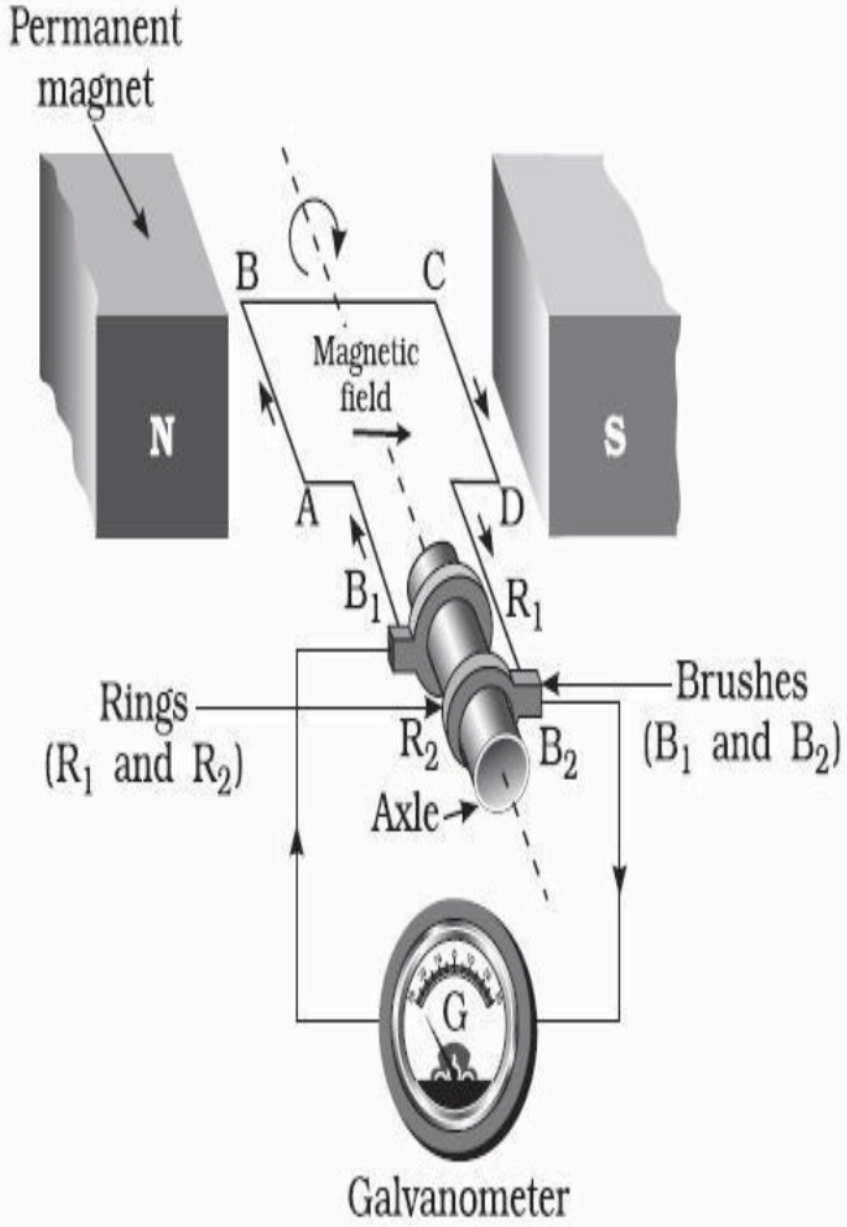
→ This phenomenon is shown using schematic diagram in the figure, using only one water drop out of many water drops.

→ From the figure one can say that, the water drop causes internal reflection once and refraction twice of the incident ray of sunlight.

→ Due to dispersion of light and internal reflection, different colours reach the observer's eye.

39. Principle of electric generator : Conversion of mechanical energy into electrical energy or electromagnetic induction.

Diagram :



Working :

→ Suppose, the axle attached to the two rings is rotated such that the arm AB moves up and the arm CD moves down in the magnetic field produced by the permanent magnet. Then the coil ABCD rotates clockwise in the arrangement shown in the figure.

→ By applying Fleming's right-hand rule, we find that the induced currents are set up in these arms along the directions AB and CD. This means that the current in external circuit flows from brush B_2 to B_1.

→ After half a rotation, arm CD starts moving up and AB moving down. As a result, the directions of the induced currents in both the arms change, giving rise to the net (resultant) induced current in the direction DCBA. This means that the current in the external circuit now flows from brush B_1 to B_2.

→ Thus, after every half rotation the direction of the current in the respective arms changes (reversed).

→ Such a current, which changes direction after equal intervals of time, is called an Alternating Current (abbreviated as AC).

[**Note** : Using two half rings (split rings) instead of two ring, DC (Direct Current) can be obtained.]

Uses : When electric supply is stopped, electric generator is used in shops, banks, hospitals, etc. It is used to produce electric current.