CBSE Class 10 Science

Sample Paper - 12

Maximum Marks: 80

Time Allowed: 3 hours

General Instructions:

i. The question paper comprises three sections – A, B and C. Attempt all the sections.
ii. All questions are compulsory.
iii. Internal choice is given in each section.
iv. All questions in Section A are one-mark questions comprising MCQ, VSA type and assertion-reason type questions. They are to be answered in one word or in one sentence.
v. All questions in Section B are three-mark, short-answer type questions. These are to be answered in about 50 - 60 words each.
vi. All questions in Section C are five-mark, long-answer type questions. These are to be answered in about 80 – 90 words each.
vii. This question paper consists of a total of 30 questions.

Section A

1. Why is combustion of Liquefied Petroleum Gas (LPG) a chemical change?

2. Name the group to which the element with electronic configuration 2, 8, 3 belongs.

3. **Answer the questions that follow on the basis of your understanding of the following paragraph and the related studied concepts:**

   Biogas is an excellent fuel as it contains up to 75% methane. It burns without smoke, leaves no residue like ash in wood, charcoal and coal burning. It is heating capacity is high. Biogas is also used for lighting. The slurry left behind is removed periodically and used as excellent manure, rich in nitrogen and phosphorous. The large-scale utilisation of bio-waste and sewage material provides a safe and efficient method of

waste-disposal besides supplying energy and manure.

i. What type of source of energy is mentioned in the above picture?
ii. Does this source of energy can cause pollution? Justify your answer with a brief explanation.
iii. Write the two advantages of biogas as fuel.
iv. Write the different components of Biogas?

4. You must have noticed many dramatic changes in your appearance as well as that of your friends as you approached 10–12 years of age. These changes associated with puberty are because of the secretion of testosterone in males and oestrogen in females. Do you know anyone in your family or friends who has been advised by the doctor to take less sugar in their diet because they are suffering from diabetes? As a treatment, they might be taking injections of insulin. This is a hormone which is produced by the pancreas and helps in regulating blood sugar levels. If it is not secreted in proper amounts, the sugar level in the blood rises causing many harmful effects.

   Answer the following questions:

   a. Write the name of the hormone which is secreted by the pancreas.
   b. Name the hormone which is secreted by male and female during the adolescent.
   c. What happens if Insulin is not secreted in the proper amount?
   d. From which cells of pancreatic islets insulin and glucagon hormone are secreted?

5. An object is kept at a distance more than twice the focal length (F) from a concave mirror. The image will be formed at a distance**:**

a. Between F and 2F

b. Equal to F

c. More than 2F

d. Less then F

OR

The image of a bright object is brought on a screen with the help of a concave mirror. If the upper half of the concave mirror is covered, the effect on the image will be**:**

a. Its size becomes half

b. The image changes position

c. The image disappears

d. Brightness will be reduced

6. ‘Chipko Andolan’ originated in a remote village called Reni in Garhwal in the Himalayas during the

   a. 1970

   b. 1972

   c. 1974

   d. 1971

7. The resistance of the conductor is R. If the length is doubled by stretching the wire, then its new resistance will be**:**

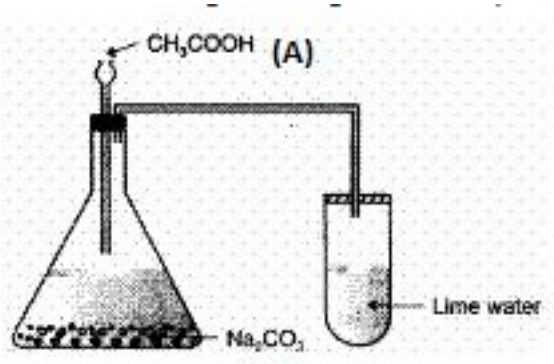
   a. R

   b. 4R

   c. 8R

d. 2R

8. What is wrong in this given set up if lime water does not turn milky?



a. in A red litmus turns blue, in B it remains red

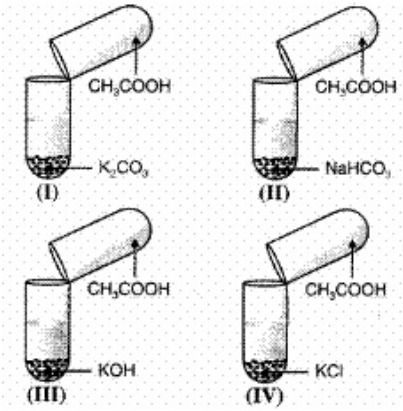
b. in A red litmus remains red, in B it becomes blue

c. in both A, B it changes to blue

d. in both A, B it remains red

OR

If burning candle is brought near each of the following test tube, in which of the following candle will get extinguished?



a. I and III

b. II and III

c. III and IV

d. I and II

9. Which of the following is/are terrestrial ecosystem(s)?
   A. Forest
   B. Aquarium
   C. Grassland
   D. Desert

   a. A, B and D

   b. A and D

   c. A and B

   d. All of these

10. The ecosystem of the earth is known as**:**

    a. Community

    b. Biosphere

    c. Association

    d. Biome

11. Substance ‘X’ is formed by the oxidation of an aldehyde. What will be the action of the substance formed on the litmus solution?

    a. No action on litmus solution

    b. Turns blue litmus red

    c. Turns red litmus blue

    d. None of these

12. As the pH value of solution increases from 7 to 14, it represents

    a. a decrease on the concentration of OH^- ions

b. an increase in the concentration in OH^- ion

c. no change in the concentration of OH^- ions

d. an increase in the concentration of H_3O^+ ions.

13. **Assertion:** Propene reacts with HBr to give isopropyl bromide.
Reason: Addition of Br_2 to alkene takes place at the faster rate in the presence of ionizing substance.

a. Both assertion and reason are CORRECT but, reason is NOT THE CORRECT explanation of the assertion.
b. Assertion is INCORRECT but, reason is CORRECT.
c. Both assertion and reason are CORRECT and reason is the CORRECT explanation of the assertion.
d. Assertion is CORRECT but, reason is INCORRECT.

14. **Assertion:** Positive charge inside the cell always goes from positive terminal to the negative terminal.
Reason: Positive charge inside the cell may go from negative terminal to the positive terminal.

a. Assertion is INCORRECT but, reason is CORRECT.
b. Assertion is CORRECT but, reason is INCORRECT.
c. Both assertion and reason are CORRECT but, reason is NOT THE CORRECT explanation of the assertion.
d. Both assertion and reason are CORRECT and reason is the CORRECT explanation of the assertion.

Section B

15. State the property utilised in the following:

i. Graphite in making electrodes.
ii. Electrical wires are coated with Polyvinyl Chloride (PVC) or a rubber-like material.
iii. Metal alloys are used for making bells and strings of musical instruments.

16. Identify the component oxidizing in the following reaction :

    (i) $Zn + 2HCl \rightarrow ZnCl_2 + H_2$

    (ii) $2Na + Cl_2 \rightarrow 2NaCl$

OR

On heating blue coloured powder of copper (II) nitrate in a boiling tube, copper oxide (black), oxygen gas and a brown gas X is formed.

i. Write a balanced chemical equation of the reaction.
ii. Identify the brown gas X evolved.
iii. Identify the type of reaction.
iv. What could be the pH range of the aqueous solution of the gas X?

17. Complete the following reactions and name the main product formed in each case:

    i. $CH_3COOH + NaOH \rightarrow ..... + ...$

    ii. $C_2H_5OH + O_2 \rightarrow ..... + ...$

18. Write a short note on different types of heterotrophic nutrition.

OR

Why are glomeruli considered as dialysis bags?

19. Explain the term lateral inversion.

20. A stock contains 58 chromosomes and scion contains 30 chromosomes, then how many chromosomes are present in root and egg cell of resultant plant, respectively?

21. Draw a diagram showing structure of neuromuscular junction.

22. Though the same current flows through line wires and the filament of a bulb, yet only the latter glows. Why?

23. Suppose your parents have constructed a two-room house and you want that in the living room there should be a provision of one electric bulb, one electric fan, a refrigerator and a plug point for appliances of power up to 2 kilowatts. Draw a circuit

diagram showing electric fuse and earthing as safety devices.

24. How many electrons are there in 1C of charge?

OR

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.

Section C

25. i. Why does an aqueous solution of acid conduct electricity?
    ii. How does the concentration of hydrogen ions $[H_3O]^+$ changes when the solution of an acid is diluted with water?
    iii. Which has higher pH? A concentrated or dilute solution of HCL?
    iv. What would you observe on adding dil HCL acid to
        a. Sodium bicarbonate placed in a test tube.
        b. Zinc metal in a test tube.

26. The element of a period of the periodic table are given below in order, from left to right with one of its element missing.
    Li Be B C O F Ne

    i. To which period to these elements belong?
    ii. One element of this period is missing. Which is the missing element and where should it be placed?
    iii. Which one of these elements in the period shows the property of catenation?
    iv. Which one of the above elements belongs to the halogen series?
    v. Identify the noble gas.

27. What is the functional difference between four-chambers of the heart?

28. State principle of dominance.

OR

How is the sex of child determined in human beings?

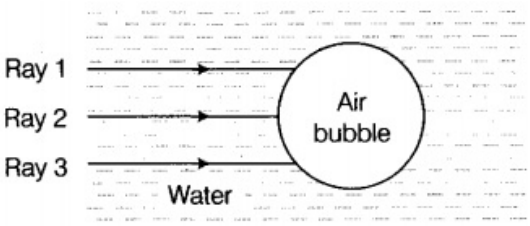
29. Give the principle, construction and working of an electric motor. Where is it used? Write the function of a split ring in electric motor.

30. A 14-year old student is not able to see clearly the questions written on the blackboard placed at a distance of 5 m from him.

    a. Name the defect of vision he is suffering from.
    b. With the help of labelled ray, diagrams show how this defect can be corrected.
    c. Name the type of lens used to correct this defect.

OR

An air bubble in water is shown in the figure. Three rays of light are incident on the air bubble.



The angle of incidence of ray 1 on the air bubble is greater than the critical angle. The angle of incidence of ray 2 on the air bubble is less than the critical angle. Ray 3 is perpendicular to the surface of the bubble.

i. In figure at the point where ray 1 meets the air bubble, mark
    a. the normal to the surface
    b. the angle of incidence
ii. Complete the ray diagram to show how all three rays continue after they meet the air bubble.
iii. Define refractive index of water. If the speed of light in air is 3×10^8 ms^{-1} and the speed of light in water is 2.2×10^8 ms^{-1}. Calculate the refractive index of water.

Answer

Section A

1. Combustion of Liquefied Petroleum Gas (LPG) is a chemical change because after its combustion, the new substance formed changes chemically and cannot be turned back into LPG.

2. The electron configuration of an element shows how many electrons are present. Add them to get the atomic number. 2 + 8 + 3 = 13.
   Alternatively, there are 3 shells of electrons so the element is in period 3, and the last shell has 3 electrons so it is in Group (13 or IIIA).

3. i. It is a renewable source of energy.
   ii. No, Biogas is a renewable, as well as a clean, source of energy. The gas generated through bio-digestion is non-polluting; it actually reduces greenhouse emissions.
   iii. The two advantage of biogas as a fuel are:
      a. It burns without smoke, leaves no residue like ash in wood, charcoal and coal burning.
      b. Eco-friendly, cheaper, easy to use.
   iv. Biogas is a mixture of methane, hydrogen, carbon dioxide, and hydrogen sulphide.
4. a. Insulin hormone is secreted by the pancreas.
   b. Testosterone in male and oestrogen in the female are the hormone that is secreted during the adolescent.
   c. If Insulin is not secreted in the proper amount then it causes diabetes.
   d. Glucagon and Insulin are secreted from alpha and beta cells of islets of pancreas respectively.
5. (a) Between F and 2F
   Explanation: When an object is placed at a distance more than twice the focal length (F) from a concave mirror, the image will be formed at a distance between F and 2F.

OR

(d) Brightness will be reduced, **Explanation:** If the upper half of the concave mirror is covered, the amount of light that gets reflected from the mirror will be reduced. Consequently, the brightness of the image that is formed on the screen will be reduced.

6. (a) 1970, **Explanation:** Chipko movement was started in 1970's in the Himalayas of Uttar Pradesh in order to prevent the illegal deforestation and destruction of forest and trees. Indian villagers, mainly the women have participated in this movement. They adopted Gandhian method of Satyagraha by hugging the trees and saving them from being cut down.
7. (b) 4R, **Explanation:** The resistance of a uniform metallic conductor is directly proportional to its length (l) and inversely proportional to the area of its cross-section (A). $R = \rho\frac{l}{A}$ where ρ is a constant of proportionality and is called the electrical resistivity of the material of the conductor.

   $R_1 = p\frac{l_1}{A_1}$ and $R_2 = p\frac{l_2}{A_2}$ and $l_2 = 2l_1$

   The volume of the wire remains unchanged. $\therefore \pi {r_1}^2 l_1 = \pi {r_2}^2 l_2$
   $\implies (\pi {r_1}^2)(l_1) = (\pi {r_2}^2)(l_2) \implies (A_1)(l_1) = (A_2)(2 \times l_1) \implies A_2 = \frac{A_1}{2}$

   Thus, when the wire is stretched to double its length, the area of cross-section becomes half.

   $\therefore R_2 = \rho\frac{l_2}{A_2} \implies R_2 = \rho\frac{2\times 2\times l_1}{A_1} \implies R_2 = 4 \times R_1$

   Thus, the new resistance becomes four times of the original resistance.

8. (b) in A red litmus remains red, in B it becomes blue
   Explanation: Red paper that does not change color indicates the sample is an acid. Red paper turn in blue indicate the sample is basic. So, in acetic acid, red litmus remaining as it is whereas in Na_2CO_3 solution red litmus changes to blue.

OR

(d) I and II, **Explanation:** In I and II gas evolved will be CO_2 which is non-supporter of combustion, therefore candle will get extinguished.

$2CH_3COOH + K_2CO_3 \rightarrow CO_2\uparrow + H_2O + 2KCH_3COO$

Sodium bicarbonate reacts with acetic acid to form water, carbon dioxide and sodium acetate.

$CH_3COOH + NaHCO_3 \rightarrow CH_3COONa + H_2O + CO_2\uparrow$

9. (d) All of these, **Explanation:** All given ecosystems are terrestrial ecosystems. Forest, grassland and desert are natural ecosystems. An aquarium is an example of a human-made (artificial) ecosystem.
10. (b) Biosphere, **Explanation:** The ecosystem of the earth is known as **biosphere**. Biosphere is the worldwide sum of all ecosystems.
11. (b) Turns blue litmus red, **Explanation:** Oxidation of an aldehyde (-CHO group) leads to the formation a carboxylic acid (-COOH group). A carboxylic acid turns blue litmus red.
12. (b) an increase in the concentration in OH^- ion

    Explanation: The pH scale measures how acidic or basic a substance is. The pH scale ranges from 0 to 14. A pH of 7 is neutral. A pH less than 7 is acidic. A pH greater than 7 is basic. The higher the concentration of H^+ ions, the lower is the pH value. The increase of pH from 7 to 14 indicates the increase in the concentration of OH^- ions.
13. (a) Both assertion and reason are CORRECT but, reason is NOT THE CORRECT explanation of the assertion. Explanation: Both assertion and reason are CORRECT but, reason is NOT THE CORRECT explanation of the assertion.
14. (a) Assertion is INCORRECT but, reason is CORRECT. Explanation: Assertion is INCORRECT but, reason is CORRECT.

Section B

15. i. Graphite in an allotrope of carbon which is a good conductor of electricity because of presence of free electron and it is cheap, insoluble in water, do not react with acids and bases (non-corrosive). Due to these properties, it is used in making electrodes.
    ii. Polyvinyl Chloride (PVC) or a rubber-like material are insulators means they are bad conductors of electricity and hence do not allow electrons to flow. Hence, these are used in coating the electrical wires.
    iii. Metal alloys are used for making bells and strings of musical instruments because

they are sonorous.

16. Elements or compounds in which oxygen or non-metallic element is added or hydrogen or metallic element is removed are called to be oxidized.
The component which gets oxidized can be determined by writing the equation in the ionic form.

(i) $Zn + 2H^+ + 2Cl^- \rightarrow Zn^{2+} + 2Cl^- + H_2$

As Zn loses electrons and forms Zn^{2+} ions, therefore, Zn is oxidized to Zn^{2+} ions.

(ii) $2Na + Cl_2 \rightarrow 2Na^+ Cl^-$

As Na loses electron and forms Na^+ ions, therefore, Na is oxidized to Na^+ ions.

OR

i. $\underset{\text{Copper (II) nitrate}}{2Cu(NO_3)_2(s)} \xrightarrow{\text{Heat}} \underset{(Black)}{2Cu\ O(s)} + \underset{(Brown)(X)}{4NO_2(g)} + \underset{Oxygen}{O_2(g)}$

ii. Nitrogen dioxide is the brown gas(X).

iii. Thermal decomposition reaction

iv. pH < 7 because NO_2 dissolves in water to form acidic solution (pH lies below 7).

17. i. This is a double displacement reaction. Here main product Sodium ethanoate is formed.
$CH_3COOH + NaOH \rightarrow CH_3COONa + H_2O$

ii. This is a combustion reaction. Here main product Carbon dioxide is formed.
$2C_2H_5OH + 6O_2 \rightarrow 4CO_2 + 6H_2O$ + Heat + Light

18. Heterotrophic nutrition is the mode of nutrition in which organisms depend upon other organisms to survive. All heterotrophs have to convert solid food into soluble compounds capable of being absorbed (digestion). Then the soluble products of digestion for the organism are being broken down for the release of energy (respiration). Heterotrophic plants have only four types:

1. **Saprotrophic nutrition:** In this mode of nutrition, organisms obtain nutrients from dead and decaying organic matter, Saprotrophic nutrition is a process of chemo heterotrophic extracellular digestion involved in the processing of decayed organic matter. It occurs in saprotrophs and heterotrophs and is most often

associated with fungi and soil bacteria.

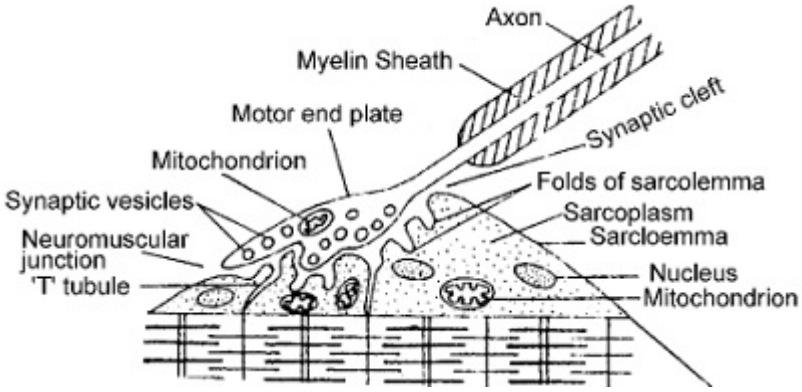
2. **Parasitic nutrition** In this nutrition, organisms obtain food from other living organisms (the host), with the host receiving no benefit from the parasite. When a parasite is present inside the body of the host, it is known as an endoparasite. These parasites suck and feed on the blood of the host. E.g.: tapeworms, Cuscuta (amarbel), Plasmodium, ticks etc.
3. **Holozoic nutrition** is a method of nutrition that involves the ingestion of liquid or solid organic material, digestion, absorption and assimilation of it to utilize it. It includes taking in the complex substances and converting them into simpler form. organisms obtain complex organic matter in the form of solid food which is digested and then absorbed into the cells for its utilization. It includes 5 steps- ingestion, digestion, absorption, assimilation, and egestion E.g.: human, Amoeba, frog and human beings.
4. **Symbiotic nutrition** In this mode of nutrition two organisms live in close association to benefit each other in which both suffers neither loss nor does it gain. E.g.: fungi and algae, rhizobium and leguminous plants roots.

OR

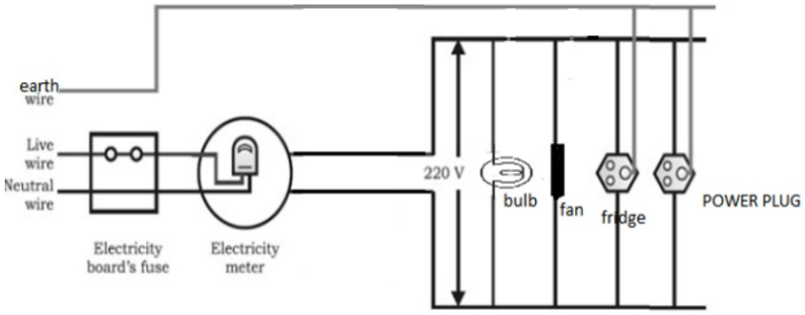
The main function performed by the glomeruli is ultra filtration. They filter small molecules containing glucose, salts, urea etc. The large molecules such as proteins remain in blood. Thus, glomeruli of the kidneys function as dialysis bags.

19. If an object is placed in front of a plane mirror, then the right side of the object appears to be the left side of the image, and the left side of the object appears to be the right side of its image. This change of sides of an object and its mirror image is called lateral inversion.

20. The plant part containing a strong root system is called stock while the plant part containing better flower, fruit yield is called Scion. The chromosome number remains the same in root cells but is reduced to half in egg cell borne in flower. If scion has 30 chromosomes, then the egg cell will be haploid of it i.e. contains 15 chromosomes while if stock contains 58 chromosomes, then root cells will have 58 chromosomes.
21. Neuromuscular junction



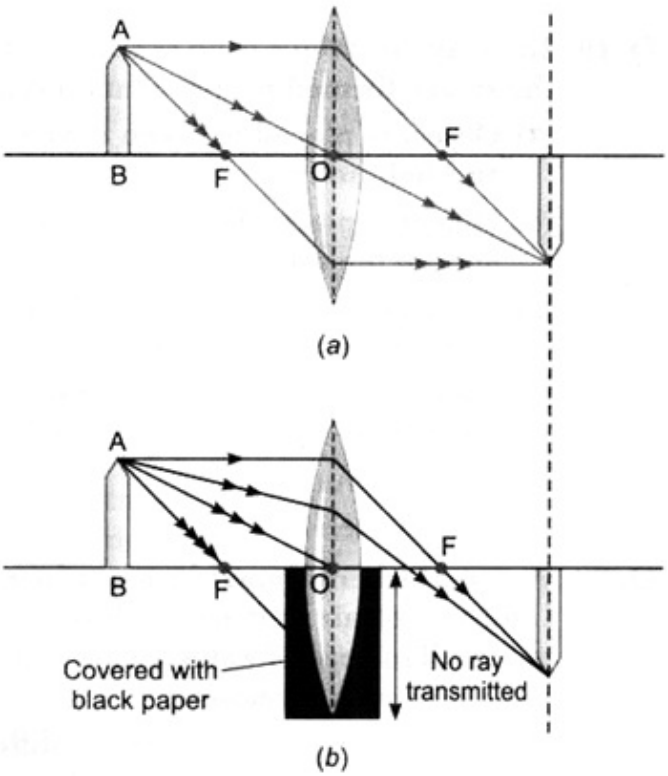
22. The filament of electric bulb is made up of material like tungsten which has high resistance, whereas the line wires are of negligible resistance. Since the amount of heat generated is proportional to the resistance $(H \propto R)$, the filament generates much more heat and it starts glowing.
23. The circuit diagram showing the electric fuse and earthing as safety devices is as follows:



24. Each electrons has a charge of 1.6 $\times 10^{-19}$C. If there are n electrons in 1C of charge, then n $\times$ 1.6 $\times 10^{-19}$ = 1

n = $\frac{1}{1.6 \times 10^{-19}} = \frac{10^{19}}{1.6}$ n = 6.25 $\times 10^{18}$ electrons.

OR



Yes, even when one-half of a convex lens is covered with a black paper, the lens will produce a complete image.

Take a live candle, keep it in front of a convex lens mounted on an optical bench. Move the candle along the axis of bench and take its full image on a screen. Now cover the lower half of lens with a black paper without changing the positions of candle, lens and screen.

You will observe that full image of candle is still seen on the screen, but the intensity of image is reduced. The reason is that a large number of rays incident on the lens are blocked. In the case of covered lower half of lens with black paper, the rays that are emerging from candle and incident on lens are refracted from upper part only and form the full image.

Section C

25. i. An aqueous solution of an acid conducts electricity because in water an acid (HCl) dissociates to give ions. Since the current is carried out by the movement of ions, an aqueous solution of acid conducts electricity.

    ii. During dilution, more of acid dissociates into ions. Thus concentration of $[H_3O]^+$ ions will increase on dilution.

    iii. Even on increasing $[H_3O]^+$ ions, the number of ions per unit volume decreases.

Therefore ph will increases on dilution.

iv. (a) CO_2 gas will evolves accompanied by brick effervescence.

$$NaHCO_3(s) + HCl(aq) \rightarrow NaCl(aq) + CO_2(g) + H_2O(aq)$$

(b) H_2 gas will evolves accompanied by brick effervescence.

$$Zn(s) + 2HCl(aq) \rightarrow ZnCl(aq) + H_2O(g)$$

26. i. All of these elements belongs to the 2nd period. Second period consists of 8 elements in total.
    ii. Nitrogen (N) is missing from these elements. It should be placed between carbon and oxygen in the V A group.
    iii. Carbon (C) shows the property of catenation.
    iv. Fluorine (F) belongs to the halogen series
    v. Neon (Ne) is the noble gas.
27. The functional differences between the four chambers of the heart are discussed below: **Right Atrium -** It receives deoxygenated blood from the body via superior and inferior vena cava and pumps it into the right ventricle. **Left Atrium -** It receives oxygenated blood from lungs via pulmonary vein and pumps it into the left ventricle. **Right Ventricle -** It collects blood from the right atrium and pumps it to the lungs for oxygenation via the pulmonary artery. **Left ventricle -** It collects blood from the left atrium and pumps it the entire body via aorta (main artery).
28. Law of dominance is known as the first law of inheritance. Each character is controlled by distinct units called factors, which occur in pairs. If the pairs are heterozygous, one will always dominate the other.

    Law of dominance explains that in a monohybrid cross between a pair of contrasting traits, only one parental character will be expressed in F1 generation and both are expressed in F2 generation in the ratio 3:1. The one which expressed in F1 generation is called dominant trait and the one which is suppressed is called recessive trait. In simple words, the law of dominance states that recessive traits are always dominated or masked by dominant trait.

    The law can be well explained by the monohybrid cross by studying the following crosses:

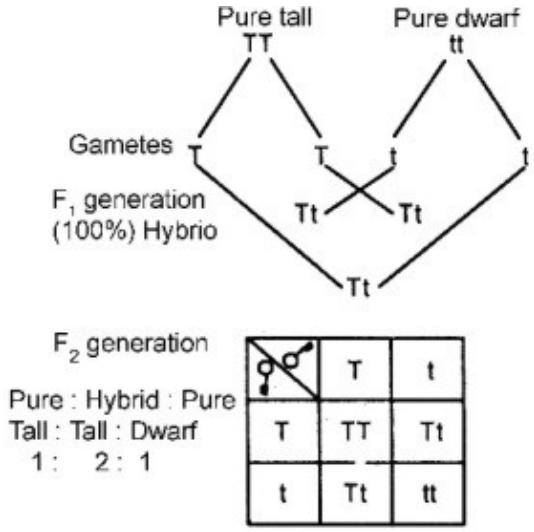
    i. Pure tall = TT, Hybrid tall = Tt

    Gametes of TT parent = $\frac{1}{2}$ T + $\frac{1}{2}$ T

    Gametes of Tt parent = $\frac{1}{2}$ T + $\frac{1}{2}$ t

The 50% are pure tall and 50% hybrid tall. Then pure tall plants will produce 100% tall in F_2 generation and hybrid plants will produce in the ratio of 1 : 2 : 1 in the F_2 generation.

ii. When the cross is made between pure tall and pure dwarf, we get results as follows

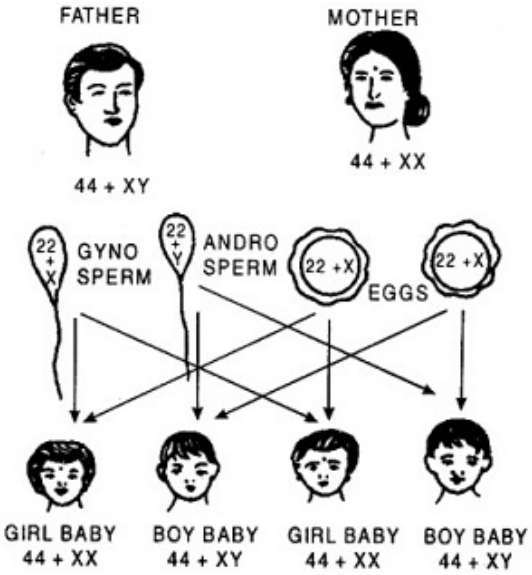


OR

Determination of the sex of child. Sex chromosomes determine sex in human beings. In males, there are 44 + XY chromosomes, whereas, in female there are 44 + XX chromosomes. Here X and Y chromosomes determine sex in human beings.

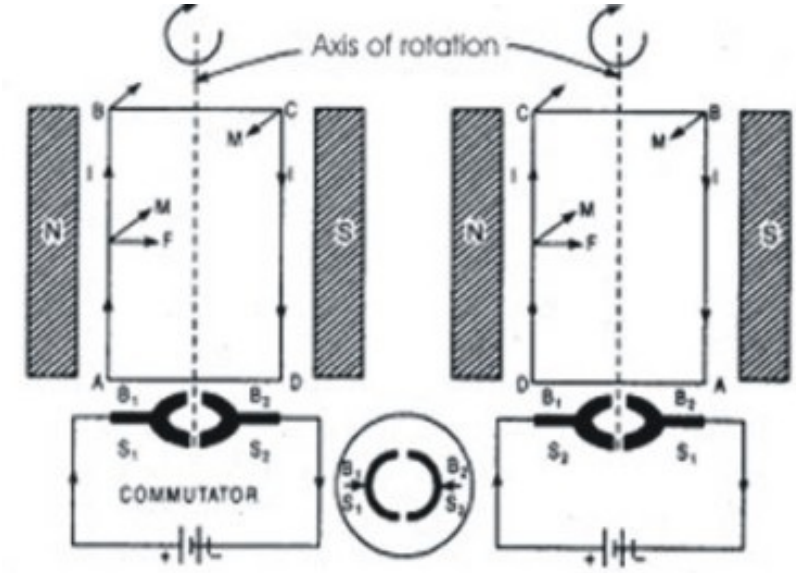
Two types of gametes are formed in male, one type is having 50%, X-chromosome, whereas, other type is having Y-chromosome. In female, gametes are of one type and contain X-chromosome.

The females are homogametic. If male gamete having Y-chromosome (endosperm) undergoes fusion with female gamete having X-chromosome the zygote will have X Y chromosomes and this gives rise to male child.



If male gamete having X-chromosome undergoes fusion with female gamete having X-chromosome, the zygote will be having XX-chromosome and this gives rise to female child.

29. Principle: Electric motor is based upon Fleming's left-hand rule. When a current-carrying conductor capable of free movement is placed in a magnetic field, it experiences a mechanical force and begins to move in a direction given by Fleming's left-hand rule. Construction: A DC motor consists of a single coil ABCD called armature between the pole pieces of magnet as shown in fig. Armature consists of a coil of a large number of turns of insulated wire wrapped on a soft iron core. The two ends of the armature are connected to segments S_1 and S_2 of a commutator. The brushes B_1 and B_2 keep their contact with the commutator as it rotates.



Working: A direct current from a battery is passed through armature. The current

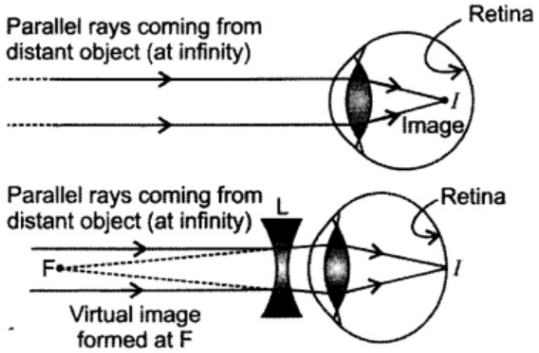
flows in the coil along ABCD as shown in fig. The limb AB of the coil experience downwards and CD of the coil experience upward force in accordance with Fleming's left-hand rule. These two equal and opposite forces constitute a couple tending to rotate the coil in clockwise direction. After half the rotation, brush B_1 has contact with S_2 and brush B_2 with S_1. The direction of the current gets reversed. The current now flows along DCBA instead of along ABCD. Limb DC experiences downward and BA experiences an upward force in accordance with Fleming's left-hand rule.

The process repeats itself and motion of armature becomes continuous after some time.

Split rings help in reversing the current in the coil after every half rotation.

30. a. SInce, 14-year old student is not able to see clearly the questions written on the blackboard placed at a distance of 5 m from him. Therefore, he is suffering from myopia (short-sightedness) defect. It is caused due to
    1. excessive curvature in cornea.
    2. elongation of eyeball.

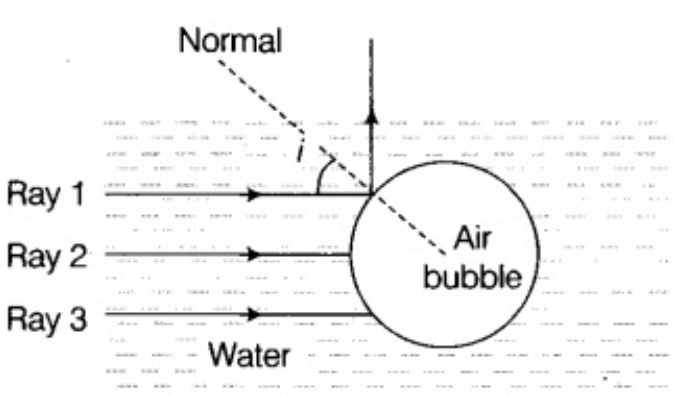
    b. A myopic eye has its far point nearer than infinity. It forms the image of a distant object in front of its retina as shown in the figure. It can be corrected by using the concave lens of suitable focal length.



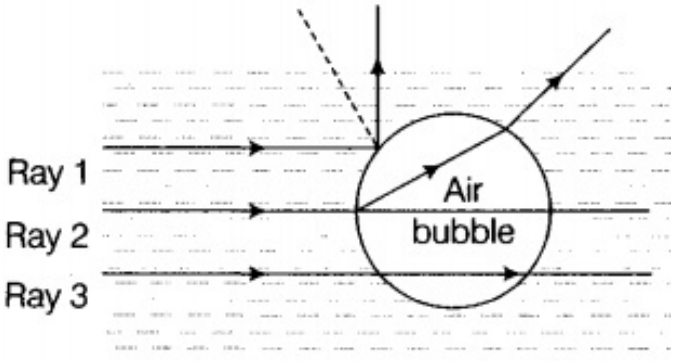
    c. The concave lens should be used to correct this defect.

OR

i. Diagram for first part is shown as:



ii. The three rays continue after they meet the air bubble are shown as:



iii. Refractive index of water is defined as the ratio of the speed of light in a vacuum to the speed of light in water.

Speed of light in air, $v_a = 3 \times 10^8$ ms^{-1}

Speed of light in water, $v_w = 2.2 \times 10^8$ ms^{-1}

Therefore, Refractive index,

$n = \frac{v_a}{v_w}$

$= \frac{3 \times 10^8}{2.2 \times 10^8}$

= 1.4