CLASS X (2020-21)
SCIENCE (CODE 086)
SAMPLE PAPER-9

Time : 3 Hours   **Maximum Marks : 80**

General Instructions :
(i)   The question paper comprises four sections A, B, C and D. There are 36 questions in the question paper. All questions are compulsory.
(ii) Section–A – question no. 1 to 20 - all questions and parts thereof are of one mark each. These questions contain multiple choice questions (MCQs), very short answer questions and assertion - reason type questions. Answers to these should be given in one word or one sentence.
(iii) Section–B – question no. 21 to 26 are short answer type questions, carrying 2 marks each. Answers to these questions should in the range of 30 to 50 words.
(iv) Section–C – question no. 27 to 33 are short answer type questions, carrying 3 marks each. Answers to these questions should in the range of 50 to 80 words.
(v)   Section–D – question no. 34 to 36 are long answer type questions carrying 5 marks each. Answer to these questions should be in the range of 80 to 120 words.
(vi) There is no overall choice. However, internal choices have been provided in some questions. A student has to attempt only one of the alternatives in such questions.
(vii) Wherever necessary, neat and properly labelled diagrams should be drawn.

Section A

1. Give an example of a redox reaction. [1]

Ans :

$$ZnO + C \longrightarrow Zn + CO$$

In this reaction, C is oxidised to CO and ZnO is reduced to Zn.

or

What type of reaction is represented by the digestion of food in our body?

Ans :

Decomposition reaction.

2. Write the name given to bases that are highly soluble in water. Give an example. [1]

Ans :

Alkali, e.g., NaOH (Sodium hydroxide).

3. What is meant by homologous series of carbon compounds? [1]

Ans :

A series of compounds in which the same functional group substitutes for hydrogen in a carbon chain is called homologous series

4. In which form
(i)   oxygen is carried to the tissues?
(ii) CO_2 moves out of the blood? [1]

Ans :

(i)   Oxyhaemoglobin
(ii) Carboxyhaemoglobin and as carbonic acid (CO_2 dissolved in blood plasma).

5. Name two organisms in which food material is broken down outside the body and absorbed. [1]

Ans :

Yeast, mushroom.

or

Name the various cells through which water moves upward to reach the leaves.

Ans :

Water absorbed by root hairs moves through epidermis → root cortex → endodermis → root xylem (i.e., tracheids and vessels) → stem xylem → xylem in the leaf.

6. What prevents backflow of blood inside the heart during contraction? [1]

Ans :

Valves in heart prevent backflow of blood inside the heart during contraction.

7. Why is convex mirror used as a rear view mirror in vehicles? State any one reason. [1]
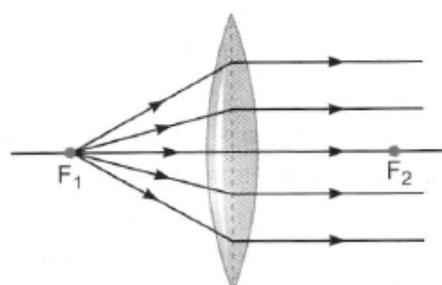
Ans :

As convex mirror gives a wider field view of the approaching traffic and is used as a rear view mirror in vehicles.

or

A small electric lamp is placed at the focus of a convex lens. What is the nature of beam of light produced by the lens?

Ans :

The beam of light coming out of lens is a parallel beam of light as shown below.

8. Which property of concave mirror is utilised for using them as shaving mirrors? [1]

   Ans :

   When an object is placed between the pole and focus of concave mirror; a magnified, erect and virtual image is obtained.

9. How will you use two identical prisms so that a narrow beam of white light incident on one prism emerges out of the second prism as white light? [1]

   Ans :

   By using two identical prisms, one placed inverted with respect to the other we get a narrow beam of white light incident on one prism emerges out of the second prism as white light.

10. Why is resistance less when resistors are joined in parallel? [1]

    Ans :

    We know that, $R \propto \dfrac{1}{A}$

    In parallel combination of resistors, the effective area of cross-section of the conductor increases, so the resistance decreases.

    or

    Define resistance. Give its SI unit.

    Ans :

    The hindrance offered by a conductor to the flow of current is called resistance. Its SI unit is ohm (Ω).

11. How is the strength of the magnetic field at a point near a wire related to the strength of the electric current flowing in the wire? [1]

    Ans :

    The magnitude of magnetic field is directly proportional to the strength of the electric current flowing in the wire.

12. Name the alloy which is mainly used for making permanent magnets. [1]

    Ans :

    The alloy 'Alnico' is used for making permanent magnets. It is an alloy of aluminium, nickel, cobalt and iron.

13. What is a biodegradable substance? [1]

    Ans :

    Biodegradable substances are the substances that are broken down by biological processes.

    or

    What is the function of ozone in the upper atmosphere?

    Ans :

    Ozone shields the surface of the Earth from ultraviolet rays of the Sun.

    For question numbers 14, 15 and 16, two statements are given-one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below :

    (a) Both A and R are true and R is correct explanation of the assertion.

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

    (c) A is true but R is false.

    (d) A is false but R is true.

14. **Assertion :** In a reaction of copper with oxygen, copper serves as a reducing agent.
    Reason : The substance which gains oxygen in a chemical reaction acts as a reducing agent. [1]
    Ans : (a) Both A and R are true and R is correct explanation of the assertion.

15. **Assertion :** Mendel selected the pea plant for his experiments.
    Reason : Pea plant is cross-pollinating and has unisexual flowers. [1]
    Ans : (c) A is true but R is false.

16. **Assertion :** Supersonic jets cause thinning of ozone layer.
    Reason : Depletion of ozone layer causes greenhouse effect. [1]
    Ans : (b) Both A and R are true but R is not the correct explanation of the assertion.

    or

    Assertion : Biotic components of ecosystem continuously require energy to carry on life processes.
    Reason : Abiotic components are the non-living factors of the ecosystem.
    Ans : (b) Both A and R are true but R is not the correct explanation of the assertion.

17. **Read the following and answer any four questions from 17.1 to 17.5.** 1×4
    In 1817, Dobereiner showed that when the three elements in a triad were written in the order of increasing atomic masses; the atomic mass of the middle element was roughly the average of the atomic masses of the other two elements. But this classification into triads was not found to be useful.
    In 1866, Newlands arranged the then known elements in the order of increasing atomic masses and proposed a law known as `Newlands' Law of Octaves'. It states that "when elements are arranged in order of increasing atomic masses, then every eighth element has properties similar to that of the first". In order to fit elements into his table, he adjusted two elements in the same slot, but also put some unlike elements under the same note. Then Mendeleev, a Russian chemist was the most important contributor to the early development of a Periodic Table of elements in which the elements were arranged on the basis of atomic mass and also on the similarity of chemical properties.
    17.1 The three triads identified by Dobereiner are
    (a) N, P, As; He, Ne, Ar; Ca, Sr, Ba

    (b) Li, Na, K; N, P, As; Cl, Br, I

    (c) N, P, As; Ca, Sr, Ba; Cl, Br, I

    (d) Be, Mg, Ca; N, P, As; Cl, Br, I

    Ans : (c) N, P, As; Ca, Sr, Ba; Cl, Br, I

    17.2 Which of the following statements is incorrect about the table proposed by Newlands?

(a) It was applicable only upto calcium.

(b) It worked well with heavier elements only.

(c) It became irrelevant for noble gases.

(d) It was not applicable for only 56 elements existed at that time .

Ans : (b) It worked well with heavier elements only.

It worked well with lighter elements.

17.3 The two pairs of elements placed in one slot by Newlands are

(a) Co, Ni and Ce, La (b) Be, Mg and Co, Ni

(c) F, Cl and Ce, La (d) Zn, Sr and Be, Mg

Ans : (a) Co, Ni and Ce, La

17.4 The drawbacks of Mendeleev's Periodic Table were removed when the elements are arranged in the order of

(a) decreasing atomic masses

(b) increasing atomic masses

(c) decreasing atomic number

(d) increasing atomic number

Ans : (d) increasing atomic number

In the Modern Periodic Table, elements are arranged in the increasing order of atomic number.

17.5 Who introduced the terms 'Groups' and 'Periods' in the Periodic Table first?

(a) Dobereiner (b) Newlands

(c) Mendeleev (d) Henry

Ans : (c) Mendeleev

18. Read the following and answer any four questions from 18.1 to 18.5. 1 × 4

Nitrogenous materials formed due to metabolic activities are need to be removed. The biological process involved in the removal of these harmful metabolic wastes from the body is called excretion. Different organisms use varied strategies to do this. Many unicellular organisms remove these wastes by simple diffusion from the body surface into the surrounding water while complex multi-cellular organisms use specialised organs to perform the same function.

18.1 The excretory system of human beings include

(a) a pair of kidneys, a pair of ureters, a urinary bladder and a urethra

(b) a pair of kidneys, a pair of urinary bladders, a ureter, and a urethra

(c) a pair of kidneys, a pair of ureters, a pair of urinary bladders and a urethra

(d) a kidney, a ureter, a urinary bladder and a urethra

Ans : (a) a pair of kidneys, a pair of ureters, a urinary bladder and a urethra

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

**18.2** The given figure represents the structure of a nephron.
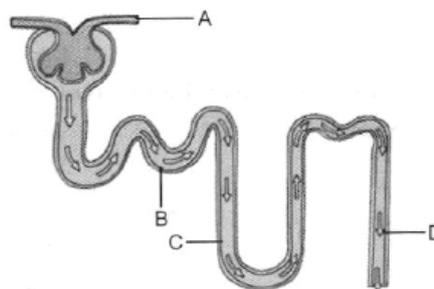
Which section of the nephron is responsible for concentrating the solute in the filtrate?

(a) A (b) B

(c) C (d) D

Ans : (c) C

In the given diagram, A is renal artery; B is proximal convoluted tubule; C is loop of Henle and D is collecting tubule. The proximal convoluted tubule does not alter solute concentration and the distal convoluted tubule decreases solute concentration in the filtrate. It is the loop of Henle (descending and ascending limbs), which is responsible for concentrating or diluting the tubular fluid using a process called counter current mechanism.

18.3
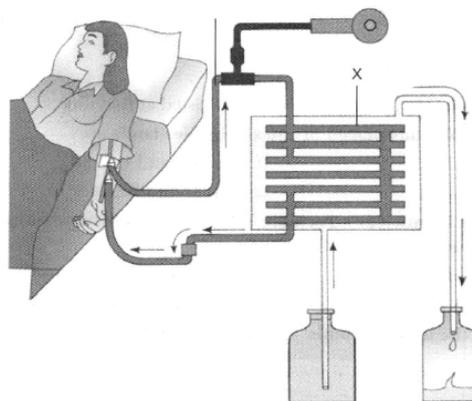
Study the picture given above and choose the correct combination of plots provided in the following table.

	X	Process used	Function
(a)	Dialyser	Diffusion	To remove the excess wastes and fluid from the blood
(b)	Blood thinner	Clotting	To remove the clots from the blood
(c)	Dialysate	Osmosis	To add fluid to the blood
(d)	Dialysing pump	Filtration	To draw blood from the body and send it to dialyser

Ans : (a)

The given picture represents the process of haemodialysis where "X" is denoting the dialyser. A

dialyser is often referred to as an "artificial kidney." Its function is to remove the excess wastes and fluid from the blood, when the patient's kidneys can no longer perform that task. During this passage, the waste products from the blood pass into dialysing fluid by diffusion.

18.4 Which of the following statement(s) is (are) true about excretion in human beings?

I. Kidneys are the primary excretory organs.
II. The bladder is muscular, so it is under nervous control.
III. Each kidney has large numbers of filtration units called nephrons.
IV. Urine is stored in the urethra until the urge of passing it out.

(a) I and II only   (b) I and III only
(c) I, II and III only   (d) I and IV only

Ans : (c) I, II and III only

Urine is stored in the urinary bladder until the pressure of the expanded bladder leads to the urge to pass it out through the urethra.

18.5 Study the table below and select the row that has the incorrect information.

|	Excretory organ	Substances excreted
(a)	Kidneys	Nitrogenous wastes
(b)	Lungs	Urea
(c)	Skin	Sweat
(d)	Oil glands	Sebum

Ans : (b)

Lungs excrete carbon dioxide from the blood.

19. Read the following and answer any four questions from 19.1 to 19.5. 1×4

The image formed by a convex lens depends on the position of the object in front of the lens. When the object is placed anywhere between focus and infinity, the image formed by convex lens is real and inverted. The image is not obtained on the screen when the object is placed between focus and the lens.

The distance between the optical centre O of the convex lens and the focus point F_1 or F_2 is its focal length.

When the object shifts from $-\infty$ to F_1, the image moves from F_2 to $+\infty$.
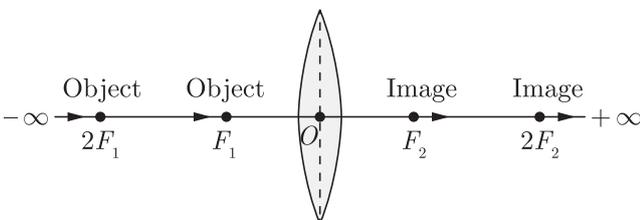
When the object shifts from F_1 to O, the image moves from $-\infty$ to O.
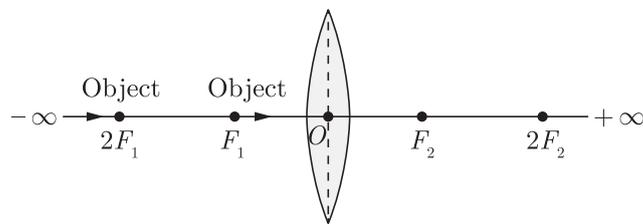
A student did an experiment with a convex lens. He put an object at different distances from the lens. In each case he measured the distance of the image from the lens. The results were recorded in the following table.

Object distance (in cm)	25	30	40	60	120
Image distance (in cm)	100	24	60	30	40

Unfortunately his results are written in the wrong order.

19.1 The focal length of this lens is
(a) 20 cm   (b) 25 cm
(c) 30 cm   (d) 35 cm

Ans : (a) 20 cm

When the object distance equals the image distance, they are at twice the focal length from the lens.

When, $2F = 60 \text{ cm}$

$F = 30 \text{ cm}$

When an object is placed at focus ($F = 30$ cm) of a convex lens, the image formed is at infinity. But infinity is not any observation in the given table.

Hence, $F = 30 \text{ cm}$ is not possible.

Now, when $2F = 40 \text{ cm}$

$F = 20 \text{ cm}$

19.2 The image distances in the correct order (in cm) is
(a) 24, 30, 40, 60, 100
(b) 100, 24, 60, 40, 30
(c) 100, 60, 30, 40, 24
(d) 100, 60, 40, 30, 24

Ans : (d) 100, 60, 40, 30, 24

When object come closer to the lens up to F then image will be formed away from the lens and vice-versa.

19.3 Which of this object distances gives the biggest image?
(a) 30 cm   (b) 25 cm
(c) 40 cm   (d) 60 cm

Ans : (b) 25 cm

At object at $2F$ gives large image which is same as object.

19.4 The minimum distance between an object and its real image formed by a convex lens is
(a) $2f$ (b) $3f$
(c) $4f$ (d) zero

Ans : (c) $4f$

When object at $2F_1$ then image is formed at $2F_2$ then minimum distance between object and real image is

$2F_1 + 2F_2 = 4F$, i.e., $(F_1 = F_2)$.

19.5 A virtual image is formed by convex lens when object is placed
(a) at infinity
(b) between C and F
(c) at F
(d) between F and O

Ans : (d) between F and O

When object is placed between F and O image formed is virtual, erect and magnified.

20. Read the following and answer any four questions from 20.1 to 20.5. 1×4

When magnet is brought into the field of another magnet, the field interacts with each pole of the magnet and each of these poles experience magnetic force.

The space surrounding a magnet where a magnetic force is experienced is called magnetic field.

A magnetic field line is a continuous curve in a magnetic field such that the tangent at any point on it gives the direction of magnetic field at that point.
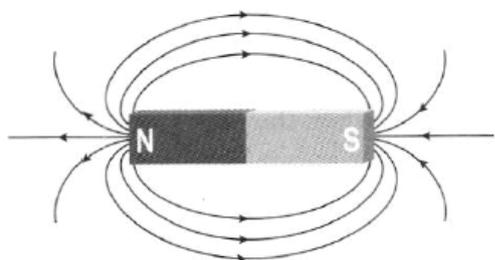
20.1 Magnetic field is produced by the flow of current in a straight wire. The phenomenon was discovered by
(a) Faraday
(b) Fleming
(c) Oersted
(d) Maxwell

Ans : (c) Oersted

20.2 At the centre of bar magnet, the magnetism is
(a) same as the pole
(b) zero
(c) maximum
(d) minimum

Ans : (d) minimum

In side the magnet, magnetic field strength decreasing. So, at the centre of bar magnet, the magnetism is minimum.

20.3 Magnetic field lines can be used to determine
(a) only the direction of magnetic field
(b) only the relative strength of the magnetic field
(c) both the direction and relative strength of the magnetic field
(d) the shape of the magnetic field

Ans : (c) both the direction and relative strength of the magnetic field

The relative strength of the magnetic field is shown by degree of closeness of the field lines and the direction of the magnetic field is obtained by tangent to the field lines at the point of intersect.

20.4 A bar magnet has strongest magnetism
(a) inside of the magnet
(b) at the centre of the magnet
(c) near the poles of the magnet
(d) at one quarter distance from the poles of the magnet

Ans : (c) near the poles of the magnet

At the pole magnetic field strength is maximum.

20.5 SI unit of magnetic field is
(a) webre
(b) tesla
(c) newton
(d) henry

Ans : (b) tesla

SECTION-B

21. Why are food cans tin-plated instead of zinc plated though zinc is cheaper than tin? [2]

Ans :

Tin is less reactive than zinc. It is less likely to dissolve in the liquid stored in the food cans. Tin reacts only with powerful acids whereas zinc can easily react even with tomatoes, so it is not safe to store food in zinc-plated cans.

22. What is a covalent bond? What type of bond exists in
(i) CCl_4
(ii) $CaCl_2$? [2]

Ans :

The chemical bonds formed between two atoms by the sharing of electrons between them is known as a covalent bond. The sharing of electrons between the two atoms takes place in such a way that both the atoms acquire stable electronic configuration of their nearest noble gas.
(i) CCl_4 - Covalent bond
(ii) $CaCl_2$ - Ionic bond.

or

Carbon, Group (14) element in the Periodic Table, is known to form compounds with many elements.
Write an example of a compound formed with
(i) Chlorine (Group 17 of Periodic Table)
(ii) Oxygen (Group 16 of Periodic Table)

Ans :

(i) Carbon tetrachloride (CCl_4)
(ii) Carbon dioxide (CO_2)

23. What is the role of saliva in the digestion of food? [2]

Ans :

Saliva contains an enzyme called salivary amylase which digests the starch (complex molecule) present in food into sugar (maltose).

24. "All plants give out oxygen during day and carbon dioxide during night". Do you agree with this statement? Give reason. [2]

Ans :

During day time, as the rate of photosynthesis is more than the rate of respiration, the net result is evolution of oxygen. At night there is no photosynthesis, so they give out carbon dioxide due to respiration.

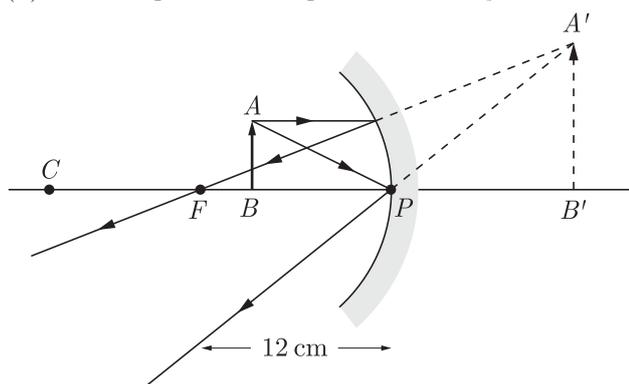**or**

What is translocation? Why is it essential for plants?

Ans :

The transport of food from the leaves to other parts of the plant is called translocation. Leaves of the plants perform photosynthesis and produce carbohydrates

(sugar) in the form of food which are translocated to the other parts of the plant through phloem. This allow plants to have access to raw materials needed during photosynthesis by leaves.

25. Is the position of a star as seen by us is its true position? Justify your answer. [2]

Ans :

No, light from stars undergoes atmospheric refraction which occurs in medium of gradually changing refractive index. So, we see the apparent position of the star after refraction by atmosphere.

26. Two lamps, one rated 100 W; 220 V, and the other 60 W; 220 V, are connected in parallel to electric mains supply. Find the current drawn by two bulbs from the line, if the supply voltage is 220 V. [2]

Ans :

Current in first bulb,

$$I_1 = \frac{P_1}{V} = \frac{100 \text{ W}}{220 \text{ V}} = \frac{5}{11} \text{ A} = 0.45 \text{ A}$$

Current in first bulb,

$$I_2 = \frac{P_2}{V} = \frac{60 \text{ W}}{220 \text{ V}} = \frac{3}{11} \text{ A} = 0.27 \text{ A}$$

SECTION-C

27. 2 g of ferrous sulphate crystals are heated in a dry boiling tube.
(i) List any two observations.
(ii) Name the type of chemical reaction taking place.
(iii) Write balanced chemical equation for the reaction and name the products formed. [3]

Ans :

(i)
  (a) The colour of ferrous sulphate crystals changes from green to white then turn into brown due to formation of Fe_2O_3.
  (b) The smell of burning sulphur due to the evolution of SO_2 gas is observed.
(ii) Thermal decomposition reaction.
(iii)
$$2FeSO_4(s) \xrightarrow{\text{Heat}} \underset{\text{(Ferric oxide)}}{Fe_2O_3(s)} + \underset{\text{(Sulphur dioxide)}}{SO_2(g)} + \underset{\text{(Sulphur trioxide)}}{SO_3(g)}$$

28. (i) Write the electron dot structures of sodium, oxygen and magnesium.
(ii) Show the formation of Na_2O and MgO by the transfer of electrons.
(iii) What are the ions present in these compounds?[3]

Ans :

(i)

Sodium	Na 2, 8, 1	Na •
Oxygen	O 2, 8, 6	:Ö:
Magnesium	Mg 2, 8, 2	Mg :

(ii) Na_2O

MgO

(iii) Ions in Na_2O are Na^+ and O^{2-}
Ions in MgO are Mg^{2+} and O^{2-}

29. Two elements X and Y have atomic numbers 12 and 16 respectively. To which period of the Modern Periodic Table do these two elements belong? What type of bond will be formed between them and why? Also give the chemical formula of the compound formed. [3]

Ans :

Electronic configuration of X is 2, 8, 2 and Y is 2, 8, 6. Both X and Y belong to 3rd period.
Ionic bond will be formed between them because X will lose 2 electrons and Y will gain 2 electrons to complete their octet and become stable.
The chemical formula of the compound is XY.

30. Write three types of blood vessels. Give one important feature of each. [3]

Ans :

The three types of blood vessels are:
(i) **Arteries :** Carry blood from heart to different body parts.
(ii) **Veins :** Transport blood towards heart from various body parts.
(iii) **Capillaries :** Site of exchange of materials between blood and living cells through tissue fluid.

31. Give the pair of contrasting traits of the following characters in pea plant and mention which is dominant and recessive.
(i) yellow seed
(ii) round seed [3]

Ans :

(i) Yellow - dominant.
    Green - recessive.
(ii) Round - dominant.
     Wrinkled - recessive.

or

What is DNA copying? State its importance.

Ans :

A process where a DNA molecule produces two similar copies of itself in a reproducing cell is called DNA copying.
Its importance are:
(i) It makes the transmission of characters from parents to the next generation possible.
(ii) It causes variation in the population.

32. It is desired to obtain an erect image of an object, using concave mirror of focal length of 12 cm.
(i) What should be the range of the object distance in the above case?
(ii) Will the image be smaller or larger than the object? Draw a ray diagram to show the formation of image in this case.
(iii) Where will the image of this object be, if it is placed 24 cm in front of the mirror? [3]

Ans :

(i) Range of distance should be 0 cm to $< 12\,cm$ for the concave mirror to form erect image.

(ii) The image will be larger than the object.

(iii) When an object is placed at the centre of curvature of a concave mirror, the image formed is also at the centre of curvature. Here, focal length $= 12\,cm$. It means focus is at 12 cm and centre of curvature will be at $2 \times 12 = 24\,cm$.

Thus, the image is formed at a distance of 24 cm in front of the mirror.

33. Calculate the amount of energy available to tiger in the following food chain if plants have 30,000 J of energy available from the Sun:

Plant $\longrightarrow$ Deer $\longrightarrow$ Tiger [3]

Ans :

Plants can trap only 1% of the Sun's energy falling on them. Now, 1% of 30,000 J is 300 J which is the energy available to plants.

The plants are eaten up by deer. According to 10% law, 10% of 300 J, i.e., 30 J of energy will be available to deer as food.

The deer will transfer 10% of its 30 J energy to the tiger. Thus, the food energy available to the tiger will be 10% of 30 J which is 3 J.

$$\underset{(30{,}000\,J)}{Sun} \xrightarrow{1\%\ absorbed} \underset{(300\,J)}{Plants} \xrightarrow{10\%} \underset{(30\,J)}{Deer} \xrightarrow{10\%} \underset{(3\,J)}{Tiger}$$
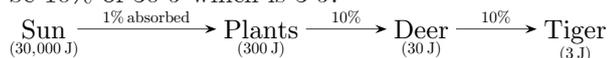
SECTION-D

34. (i) Why does an aqueous solution of an acid conduct electricity?

(ii) How does the concentration of hydronium ions (H_3O^+) change when a solution of an acid is diluted?

(iii) Which has higher pH value, a concentrated or dilute solution of hydrochloric acid?

(iv) What do you observe on adding dilute hydrochloric acid to
(a) sodium carbonate placed in test tube,
(b) zinc metal in a test tube? [5]

Ans :

(i) Aqueous solution of acid releases ions so that it can conduct electricity. Aqueous solution of acid produces H^+ ions which conduct electricity.

(ii) When solution of an acid is diluted, concentration of hydronium ions (H_3O^+) decreases.

(iii) Dilute solution of HCl will have higher pH than concentrated solution.

(iv) (a) $Na_2CO_3 + 2HCl \longrightarrow 2NaCl + CO_2 + H_2O$
Effervescence of CO_2 gas is seen.

(b) $Zn + 2HCl \longrightarrow ZnCl_2 + H_2$
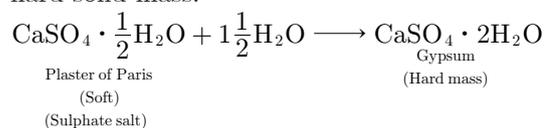Odourless and colourless gas hydrogen is evolved with bubbles on surface of zinc.
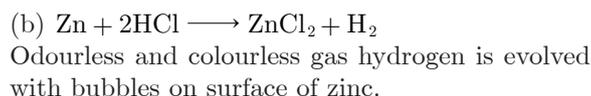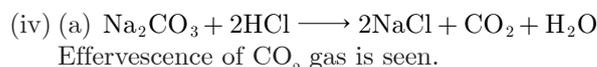
or

A sulphate salt of Group 2 element of the Periodic Table is a white, soft substance, which can be moulded into different shapes by making its dough. When this compound is left in open for some time, it becomes a solid mass and cannot be used for moulding purposes. Identify the sulphate salt and state why does it show such a behaviour. Give the reaction involved.

Ans :

The substance which is used for making different shapes is Plaster of Paris. Its chemical name is calcium sulphate hemihydrate $(CaSO_4 \cdot \frac{1}{2}H_2O)$. The two formula unit of $CaSO_4$ share one molecule of water. As a result, it is soft.

When it is left open for some time, it absorbs moisture from the atmosphere and forms gypsum, which is a hard solid mass.

$$\underset{\substack{\text{Plaster of Paris}\\\text{(Soft)}\\\text{(Sulphate salt)}}}{CaSO_4 \cdot \frac{1}{2}H_2O} + 1\frac{1}{2}H_2O \longrightarrow \underset{\substack{\text{Gypsum}\\\text{(Hard mass)}}}{CaSO_4 \cdot 2H_2O}$$

35. (i) Draw the diagram of female reproductive system and mark the part(s):
(a) where block is created surgically to prevent fertilization
(b) where CuT is inserted
(c) inside which condom can be placed

(ii) Why do more and more people prefer to use condoms? What is the principle behind the use of condoms? [5]

Ans :

(i)
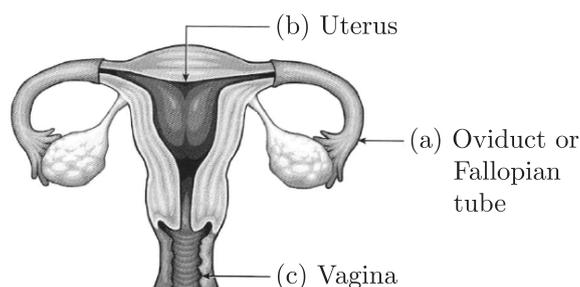
(a) Fallopian Tube/Oviduct,
(b) Uterus,
(c) Vagina

(ii) More people prefer to use condoms because
(a) it prevents sexually transmitted diseases (STDs),
(b) it can act as a birth control measure.

Principle : Condoms create a physical barrier and prevent the meeting of sperms and egg.

36. (i) Consider a conductor of resistance 'R',length 'L', thickness 'd' and resistivity 'ρ'.
Now this conductor is cut into four equal parts. What will be the new resistivity of each of these parts? Why?

(ii) Find the resistance if all of these parts are connected in
   (a) parallel
   (b) series
(iii) Out of the combinations of resistors mentioned above in the previous part, for a given voltage which combination will consume more power and why? [5]

Ans :

(i) Resistivity will not change as it depends on the nature of the material of the conductor.
(ii) The length of each part becomes $L/4$, since ρ, A are constant.

$$R = \frac{\rho L}{A}$$

Resistance of each part $= R_{\text{part}} = \dfrac{\left(\dfrac{\rho L}{4}\right)}{A} = \dfrac{R}{4}$

(a) In parallel,

$$\frac{1}{R_{\text{eq}}} = \frac{1}{R_{\text{part}}} + \frac{1}{R_{\text{part}}} + \frac{1}{R_{\text{part}}} + \frac{1}{R_{\text{part}}}$$

$$= \frac{4}{R_{\text{part}}} = \frac{16}{R}$$

$$R_{\text{eq}} = \frac{R}{16}\,\Omega$$

(b) In series,

$$R_{\text{eq}} = \frac{R}{4} + \frac{R}{4} + \frac{R}{4} + \frac{R}{4} = R\,\Omega$$

(iii) $$P = \frac{V^2}{R}$$

If R_{eq} is less, power consumed will be more.
In the given case, R_{eq}, is lesser in the parallel so it will consume more power.

or

(i) Explain an activity to show that a current-carrying conductor experiences a force when placed in a magnetic field. How do you think the displacement of rod AB will be affected if (a) current in rod AB is increased; (b) a stronger horse-shoe magnet is used; and (c) length of the rod AB is increased?
(ii) State the rule which gives the direction of force acting on the conductor.
(iii) An electron moves perpendicular to a magnetic field as shown in the figure.
   What would be the direction of force experienced by the electron? Electron
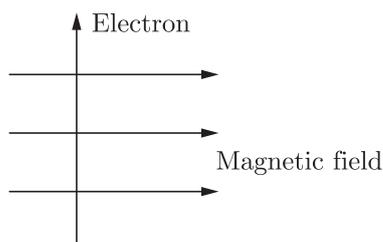
Ans :

(i) A small aluminium rod is suspended horizontally from a stand using two connecting wires. Place a strong horseshoe magnet in such a way that the rod lies between the two poles with the magnetic field directed upwards. For this, put the north pole of the magnet vertically below and south pole vertically above the aluminium rod. Connect the aluminium rod in series with a battery, a key and a rheostat. Pass a current through the aluminium rod from one end to other (B to A). The rod is displaced towards left. When the direction of current flowing through the rod is reversed, the displacement of rod across towards right.
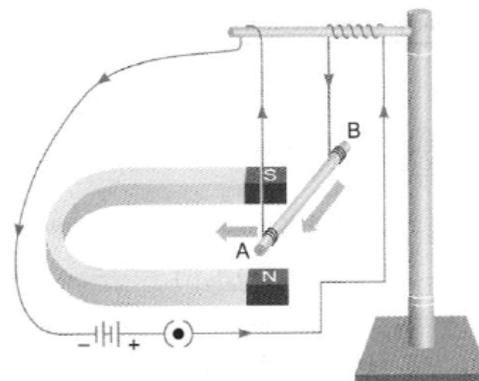
A current carrying conductor placed in a magnetic field experience a force. This force increases with the amount of current, strength of magnetic field and length of the conductor. The displacement of rod AB will
(a) increase (b) increase (c) increase.
(ii) **Fleming's left-hand rule.**
   Stretch the thumb, forefinger and middle finger of your left hand such that they are mutually perpendicular to one another. If the forefinger points in the direction of magnetic field and the middle finger in the direction of current, then the thumb will point in the direction of motion or the force acting on the conductor.
(iii) According to Fleming's left hand rule, the direction of force is perpendicular to the direction of magnetic field and current. We know that the direction of current is taken opposite to the direction of motion of electrons. Therefore, the force is directed upwards from the plane of the paper.