CBSE Class 10 Science

Sample Paper - 05

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. Write a balanced chemical equation with state and symbols for the following reactions:

    i. Solutions of barium chloride and sodium sulphate in water react to give insoluble barium sulphate and the solution of sodium chloride.
    ii. Sodium hydroxide solution reacts with a hydrochloric acid solution to produce sodium chloride solution and water.

2. Out of two elements, potassium and sodium, which one can lose electron easily? Give reason for your answer.

3. **Answer the questions that follow on the basis of your understanding of the**

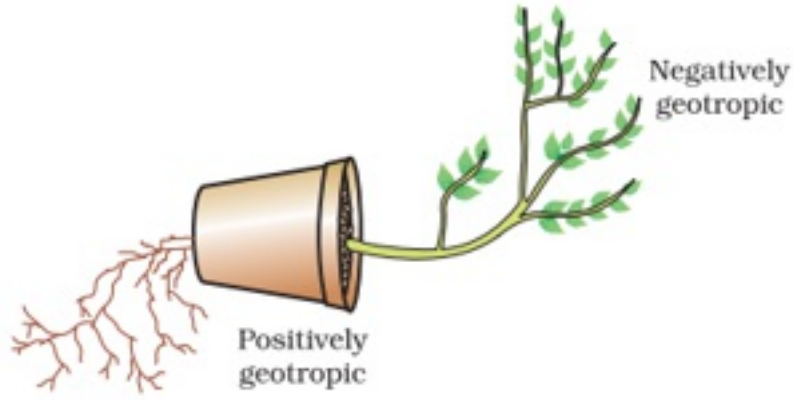
following paragraph and the related studied concepts:

In ancient times, wood was the most common source of heat energy. The energy of flowing water and wind was also used for limited activities. The exploitation of coal as a source of energy made the industrial revolution possible. Increasing industrialisation has led to a better quality of life all over the world. It has also caused the global demand for energy to grow at a tremendous rate. The growing demand for energy was largely met by fossil fuels – coal and petroleum. Our technologies were also developed for using these energy sources. But these fuels were formed over millions of years ago and there are only limited reserves. Fossil fuels are non-renewable sources of energy, so we need to conserve them. If we were to continue consuming these sources at such alarming rates, we would soon run out of energy. In order to avoid this, alternate sources of energy were explored.

i. What do you mean by non- renewable sources of energy?
ii. Write five examples of non-renewable energy sources.
iii. Which is the main element in fossil fuels?
iv. Which type of environmental hazard is not contributed by the combustion of fossil fuels?

4. Environmental triggers such as light, or gravity will change the directions that plant parts grow in. These directional, or tropic, movements can be either towards the stimulus, or away from it. So, in two different kinds of phototropic movement, shoots respond by bending towards light while roots respond by bending away from it. How does this help the plant? Plants show tropism in response to other stimuli as well. The roots of a plant always grow downwards while the shoots usually grow upwards and

away from the earth. This upward and downward growth of shoots and roots, respectively, in response to the pull of earth or gravity is, obviously, geotropism. If 'hydro' means water and 'chemo' refers to chemicals, what would 'hydrotropism' and 'chemotropism' mean? Can we think of examples of these kinds of directional growth movements? One example of chemotropism is the growth of pollen tubes towards ovules, about which we will learn more when we examine the reproductive processes of living organisms.



Answer the following questions:

a. Where does negative phototropism occurs in plants?
b. Phototropism in shoots is attributed due to which plant hormone?
c. Tendrils exhibit/ twining of tendrils show which type of tropic movement?
d. If the stem grows towards sunlight and root grows just opposite to it, then what type of movement of stem is it?

5. If a pencil beam is allowed to fall along the principal axis of a concave mirror, the ray will

a. emerge out along the principal axis

b. deviate by 60°

c. retrace its path along principal axis

d. deviate by 30°

OR

The lateral displacement of an incident ray passing out of a rectangular glass slab is:

a. None of the above

b. Directly proportional to the thickness of the glass slab

c. Independent of the thickness of the glass slab

d. Inversely proportional to the thickness of the glass slab

6. Which one of the following is an inexhaustible natural resource?

a. minerals

b. forests

c. coal

d. water

7. The following apparatus is available in the laboratory
Battery : adjustable from 0 to 6 V
Resistors : 4Ω and 12Ω
Ammeters : A_1 and Range 0 to 5 A; Least Count 0.25 A : A_2 and Range 0 to 3 A; Least Count 0.1 A
Voltmeters : V_1 of Range 0 to 10 V; Least Count 0.5 V : V_1 of Range 0 to 5 V; Least Count 0.1 V
For the experiments to find the equivalent resistance of the parallel combination of the two given resistors, the best choice would be :

a. ammeter A_2 and voltmeter V_1

b. ammeter A_2 and voltmeter V_2

c. ammeter A_1 and voltmeter V_2

d. ammeter A_1 and voltmeter V_1

8. KOH is a strong base since in solution it forms

a. more number of K^+ ions

b. more number of OH^- ions

c. less number of OH^- ions

d. less number of K^+ ions

OR

A gas produced in the lab is highly soluble in water. Its colourless solution turns pink when a few drops of phenolphthalein is added to it. What is the nature of the gas?

a. Basic

b. Amphoteric

c. Acidic

d. Neutral

9. Match the following with the correct response:

(1) Saprotrophs	(A) Organisms obtaining food from green plants
(2) Parasites	(B) Organisms obtaining food from host
(3) Autotrophs	(C) Organisms obtaining food from dead plants and animals
(4) Herbivores	(D) Organisms which prepare their own food

a. 1-B, 2-D, 3-A, 4-C

b. 1-C, 2-B, 3-D, 4-A

c. 1-D, 2-A, 3-C, 4-B

d. 1-A, 2-C, 3-B, 4-D

10. In a food chain, the third trophic level is always occupied by

a. Producers

b. Decomposers

c. Herbivores

d. Carnivores

11. The functional group of butanone is:

a. Alcoholic

b. Ketonic

c. Carboxyl acid

d. Aldehydic

12. All metal carbonates and hydrogen carbonates react with acids to form the corresponding

a. acid
b. salt
c. base
d. precipitate

13. **Assertion:** C_8H_8 and C_4H_{10} are the successive members of the homologous series of methane.
Reason: Any two successive members in a homologous series differ in their molecular formula by a $-CH_3$ unit.

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

14. **Assertion:** Electric appliances with metallic body have three connections, whereas an electric bulb has a two pin connection.
    Reason : Three pin connections reduce heating of connecting wires.

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

Section B

15. Explain the process of electrolytic refining for copper with the help of a labelled diagram.

16. What happens when zinc plate is dipped in a solution of copper sulphate ($CuSO_4$) ?

OR

    a. Define Rusting
    b. Why do you apply paint on iron articles?

17. Explain the nature of the covalent bond using the bond formation in CH_3Cl.

18. Differentiate between ureter and urethra.

OR

    Give two points of difference between respiration in plants and respiration in animals.

19. Name a mirror which can give an erect and enlarged image of an object.

20. How does binary fission differ from multiple fission?

21. Answer the following:

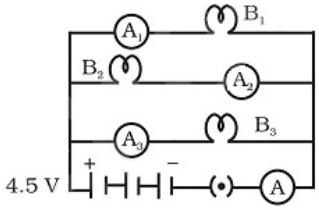
    i. Name the endocrine gland associated with brain.

ii. Which gland secretes digestive enzymes as well as hormones?
iii. Name the endocrine gland associated with kidneys.
iv. Which endocrine gland is present in males, but not in females?

22. Draw a schematic diagram of a circuit consisting of 3V battery, 5 Ω, 3 Ω and 1 Ω resistor, an ammeter and a plug key, all connected in series.

23. Two cells of 3V each are connected in parallel. An external resistance of 0.5 Ω is connected in series to the junction of two parallel resistors of 4 Ω and 2 Ω and then to the common terminal of the battery through each resistor. Draw the circuit diagram. What is the current flowing through 4 Ω resistors?

24. B_1, B_2 and B_3 are three identical bulbs connected as shown in figure. When all the three bulbs glow, a current of 3A is recorded by the ammeter A.



How much power is dissipated in the circuit when all the three bulbs glow together?

OR

Name the type of mirror used in a solar furnace. How can high temperature be achieved by this device?

Section C

25. Give experiment to show that blue vitriol crystals contain water of crystallisation.

26. The electrons in the atoms of four elements A, B, C and D are distributed in three shells having 1, 3, 5 and 7 electrons respectively in their outermost shells. Write the group numbers in which these elements are placed in the Modern Periodic Table. Write the electronic configuration of the atoms of B and D and the molecular formula of the compound formed when B and D combine.

27. Write the summary of oxygen transport in the body.

28. How has the method of 'artificial selection' by humans helped in the evolution of different vegetables?

OR

'A trait may be inherited, but may not be expressed'. Justify this statement with the help of a suitable example.

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. A student is unable to see clearly the words written on the black board placed at a distance of approximately 3 m from him. Name the defect of vision the boy is suffering from. State the possible causes of this defect and explain the method of correcting it.
    b. Why do stars twinkle? Explain.

OR

We wish to obtain an erect image of an object, using a concave mirror of focal length 15 cm. What should be the range of distance of the object from the mirror? What is the nature of the image? Is the image larger or smaller than object? Draw a ray diagram to show the image formation in this case.

Answer

Section A

1. i. $BaCl_2(aq) + Na_2SO_4(aq) \longrightarrow BaSO_4(s)\downarrow + 2NaCl(aq)$ **[balanced chemical equation]**
   ii. $NaOH\ (aq) + HCI\ (aq) \longrightarrow NaCl\ (aq) + H_2O(l)$ **[balanced chemical equation]**

2. Potassium because the tendency to lose electron increases as we move down a group, number of shells increases so size of the atom also increases and IMF of attraction decreases.

3. i. **Non-renewable resources** are those found inside the earth, and they took millions of years to form.
   ii. The five examples of non-renewable energy sources are fossil fuels, oil, natural gas, and coal and nuclear energy.
   iii. Carbon is the main element in fossil fuels.
   iv. Combustion of fossil fuel doesn't lead to the destruction of wildlife habitat.
4. a. Root
   b. Auxin
   c. Thigmotropism
   d. Positive phototropic movement.
5. (c) retrace its path along principal axis
   Explanation: Angle of incidence for a ray along principal axis is zero and so will be the reflection angle. So the ray will retrace its path.

OR

(b) Directly proportional to the thickness of the glass slab
Explanation: The emergent light ray passing out of a rectangular glass slab is shifted slightly sideways. This shift of an incident ray, also known as lateral displacement, is directly proportional to the thickness of the glass slab.

6. (d) water
   Explanation: Yes, water is an inexhaustible resource because it is replaced from the

oceans through the water cycle

7. (b) ammeter A_2 and voltmeter V_2

   Explanation:

   $$I = \frac{V}{R} = \frac{6}{\frac{4 \times 12}{16}} = \frac{6 \times 16}{4 \times 12} = 2\ A$$

   So V_2 of range 0 to 5V and A_2 of range 0 to 3 A range is suited for measuring upto 2A.

8. (b) more number of OH^- ions

   Explanation: A strong base that is completely ionized in aqueous solution. This means when the strong base is placed in a solution such as water, all of the strong base will dissociate into its ions. The general equation of the dissociation of a strong base is: $XOH(aq) \rightarrow X^+(aq) + OH^-(aq)$

   In aqueous medium KOH dissociates completely to form a large number of OH^- ions.

   OR

   (a) Basic, **Explanation:** Phenolphthalein gives a pink colour with a base and remains colourless with an acid.

9. (b) 1-C, 2-B, 3-D, 4-A

   Explanation: Organisms can be grouped as producers, consumers and decomposers according to the manner in which they obtain their sustenance from the environment. Producers or autotrophs prepare their own food. Consumers can be classed as herbivores, carnivores, omnivores and parasites. Herbivores obtain food directly from green plants. Parasites obtain food from a host.

(1) Saprotrophs	(C) Organisms obtaining food from dead plants and animals
(2) Parasites	(B) Organisms obtaining food from host
(3) Autotrophs	(D) Organisms which prepare their own food
(4) Herbivores	(A) Organisms obtaining food from green plants

10. (d) Carnivores, **Explanation:** Carnivores
11. (b) Ketonic, **Explanation:** The functional group of **butanone** is ketonic group. Butanone ($CH_3COCH_2CH_3$) is a four carbon compound with a **ketone** (- CO -) functional group**.** A ketone

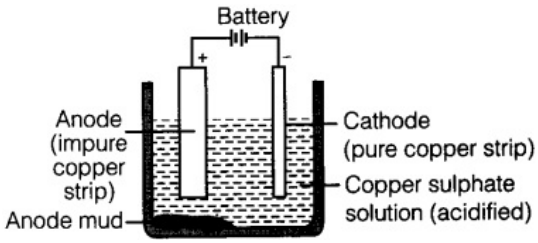
functional group has two free valencies. In butanone, these valencies are satisfied by one methyl (- CH_3) group and one ethyl (- C_2H_5) group.

12. (b) salt Explanation: Carbonates and hydrogen carbonates are types of base. They make a salt and water when we neutralise them with acid we get carbon dioxide gas.

    The reaction fizzes as bubbles of carbon dioxide are given off. This is easy to remember because we see the word 'carbonate' in the chemical names.
    acid + metal hydrogen carbonate → a salt + water + carbon dioxide

13. (c) Assertion is CORRECT but, reason is INCORRECT. Explanation: Assertion is CORRECT but, reason is INCORRECT.
14. (a) Assertion is CORRECT but, reason is INCORRECT. Explanation: Assertion is CORRECT but, reason is INCORRECT.

Section B

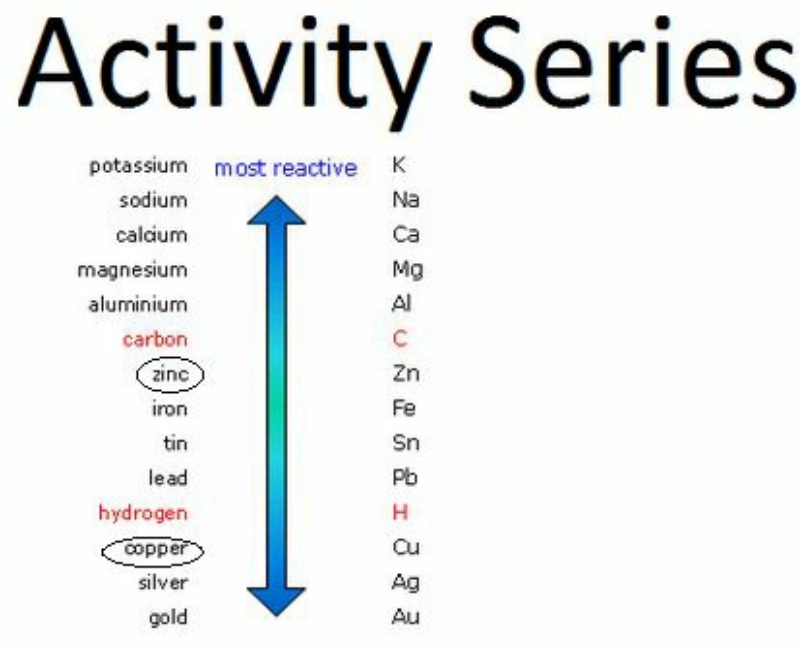
15. 

    In electrolytic process, the impure metal is made the anode (negatively charged electrode) and a thin strip of pure metal is made the cathode (positively charged electrode). A solution of the metal salt is used as an electrolyte. On passing the current through the electrolyte, the pure metal from the anode goes into the electrolyte solution and takes up electron and gets reduced to metal and deposited at cathode.

    At cathode Cu^{2+} +2e^- $\rightarrow$ Cu (deposited)
    At anode $\underset{(Impure\ metal)}{Cu\ (s)} \rightarrow \underset{(Dissolved)}{Cu^{2+}\ (aq)} + 2e-$

16. Zinc lies above copper in the activity series. Therefore, zinc plate will slowly dissolve and copper will be precipitated at the bottom of the container.
    $Zn+CuSO_4 \longrightarrow ZnSO_4 + CuSO_4$

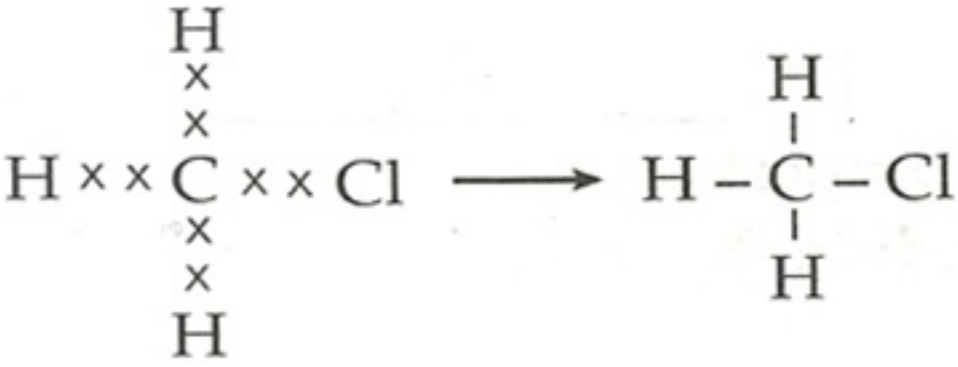
    Hence it is automatically proved that Zn is more reactive than Cu.



OR

a. The corrosion of iron in the presence of air and water is called **rusting.**
b. We apply paint on iron articles to protect them from rusting.

17. **Covalent bonding in CH_3Cl:** Covalent bonds between carbon and hydrogen are formed by sharing of electrons between the two atoms. Carbon has a valency of 4 and requires 4 electrons to complete its octet. In CH_3Cl, a carbon atom shares an electron each with three hydrogen atoms and one electron with a chorine atom. A chorine atom requires one electron to complete its octet and a hydrogen atom requires one electron to complete its duplet, and thus become stable.



18. Differences between Ureter and Urethra

Ureter	Urethra

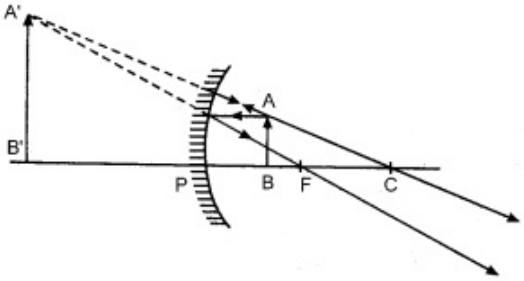
1) Ureter is a muscular tube arising from the kidney.	1) Urethra is a muscular tube arising from the urinary bladder.
2) It serves to conduct urine from the kidney to the urinary bladder.	2) It serves to conduct urine from the urinary bladder to the exterior.

OR

Respiration in Animals: i. It occurs through lungs.
ii. Animals release CO_2 as waste by product into the atmosphere.
iii. As animals are hetrotrophs they get glucose and oxygen from outside to carry out repiration.

Respiration in plants : i. It occurs through stomata, lenticels, roots etc.
ii. It gives out O_2.
iii. Plants produce glucose and oxygen on their own to carry out respiration.

19. Concave mirror produces an erect and enlarged image when the object is placed between pole and focus as shown in the figure.



20.

Binary fission	Multiple fission
1) Parent divides into two daughters.	1) Parent divides into many daughters.
2) It takes place during favourable conditions.	2) It takes place during unfavourable conditions.
3) Nothing is left with parent.	3) Residual cytoplasm is left.
4) It occurs during normal conditions.	4) It takes place during unfavourable

	conditions (Encysted stage),
5) Cytoplasm divides after each nuclear division.	5) Cytoplasm does not divide after every nuciear division.

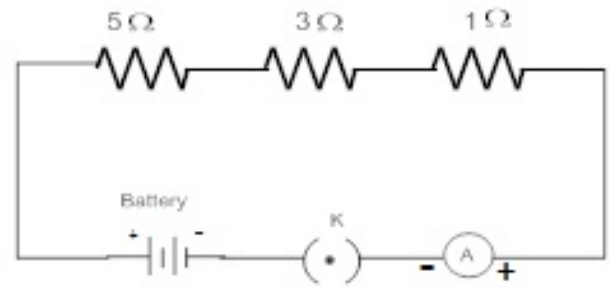
21. i. **Pituitary gland**: Hypothalamus present in brain releases hormones that regulate the secretion of pituitary glands. The pituitary gland is a part of the **endocrine system which is also known as Master gland** it produces many hormones that travel throughout the body, directing certain processes or stimulating other **glands** to produce other hormones. Its main function is to secrete **hormones** into our bloodstream. These **hormones** can affect other organs and glands, especially **thyroid. It also** stimulates the adrenal **glands** to **secrete** steroid hormones, principally cortisol. growth hormone, which regulates growth, metabolism and body composition.

ii. **Pancreas:** It is part of the digestive system and produces insulin and other important enzymes and hormones that help break down foods. The pancreas has an **endocrine** function because it releases juices directly into the bloodstream, and it has an exocrine function because it releases juices into ducts.

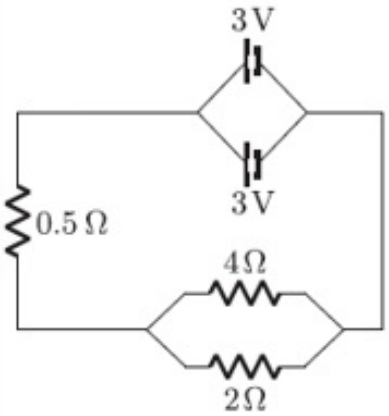
iii. **Adrenal gland:** -The **adrenal glands** (also known as **suprarenal glands**) are endocrine **glands** that produce a variety of hormones They are found above the kidneys. Each **gland** has an outer cortex which produces steroid hormones and an inner medulla. Located at the top of each **kidney**, the adrenal glands produce **hormones** that help the **body** control blood sugar, burn protein and **fat**, react to stressors like a major illness or injury, and regulate blood pressure. Two of the most important adrenal **hormones** are cortisol and aldosterone.

iv. **Testis** The testis are housed in the **scrotum** just behind the penis. The testis is the male gonads — the primary male reproductive organs. They have two, very important functions that are very important to the male reproductive system, they produce gametes, or sperm, and they secrete **hormones**, primarily testosterone.

22.



23. The circuit diagram is as follows:



To calculate the current

Resistor 4Ω and 2Ω are connected in parallel. So, their equivalent resistance is given by

$R_p = \frac{4\times2}{4+2} = \frac{8}{6} = \frac{4}{3}\Omega = 1.33\Omega$

Total resistance of circuit,

R = R_p + $0.5\ \Omega$ = (1.33 + 0.5) Ω = 1.83 Ω

Current in the circuit,

$I = \frac{3V}{1.83\Omega} = 1.64\text{A}$

Potential difference across 0.5Ω resistor is

$V' = 1.64 \times 0.5$ = 0.82 V

The potential difference across 4Ω resistor is

V" = V - V' = 3 - 0.82 = 2.18 V

Thus, current flowing through 4Ω resistor is

$I_1 = \frac{2.18\text{V}}{4\Omega} = 0.55\text{A}$

24. For finding power, we need to first calculate the resistance in the circuit.

$R = \frac{V}{1} = \frac{4.5V}{3A} = 1.5\Omega$

Now, $P = I^2R = (3A)^2 \times 1.5\Omega = 13.5W$

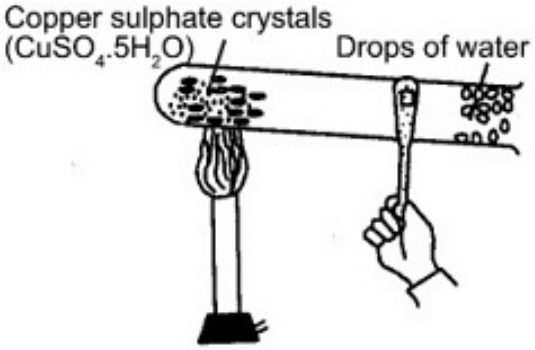
OR

Concave mirror is used in a solar furnace. The solar furnace is placed at the focus of the large concave reflector the concave reflector focuses the Sun's heat rays on the furnace and a high temperature is achieved.

Section C

25. Experiment to show that blue vitriol crystals contain water of crystallization: Take some powdered copper sulphate crystals in a clean and dry test tube and heat the crystals with slightly tilting it downwards. Drops of colourless liquid will condense on the cooler parts and collect it in a dish.
Anhydrous white copper sulphate is left behind in the test tube. This liquid turns anhydrous copper sulphate blue indicating that this liquid is water

$$\underset{\text{Hydrated Copper sultphate}}{CuSO_4 5H_2O} \xrightarrow{Heat} \underset{\text{Anhydrous Copper sultphate}}{CuSO_4} + 5H_2O$$



26.

Elements	Outermost electrons	Group No.
A	1	1^{st}
B	3	13^{th}
C	5	15^{th}
D	7	17^{th}

The electronic configuration of B = 2, 8, 3 and D = 2, 8, 7
The valency of B is 3 and valency of D is 1. Therefore when B and D combine, the molecular formula is BD_3.

27. Summary of oxygen (O_2) transport

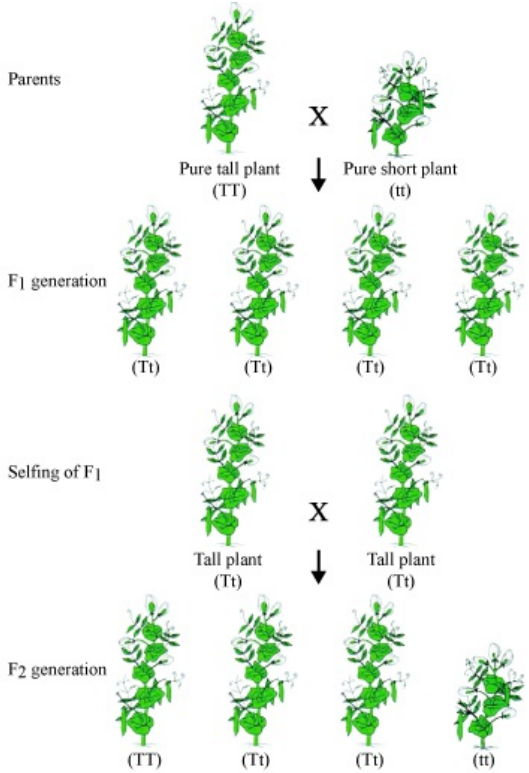
Inspired air (in lungs)	→	O_2 (in alveoli of lungs)		
Oxyhaemoglobin	←	Oxyhaemoglobin	←	Dissolved O_2
(in RBC of tissue capillaries)		(in RBC of lung capillaries)		(in plasma of lung capillaries)

Dissolved O_2	→	Dissolved O_2	→	O_2 consumption
(in plasma of tissue capillaries)		(in cells)		(in cells)

28. A wild variety of a plant species may exhibit different variations. In due course of time, humans had selected some of these variants and had grown them for generations and that they had become totally different species. For example, variants in wild cabbage were selected on the basis of certain features-
(i) Short distances between leaves, led to the formation of green leaf buds-the common cabbage.
(ii) Arrested flower development has bred broccoli.
(iii) The variant with sterile flowers has made the cauliflower.
(iv) Variant with swollen leaf parts-kohlrabi.
(v) Variant with larger leaves-kale.

OR

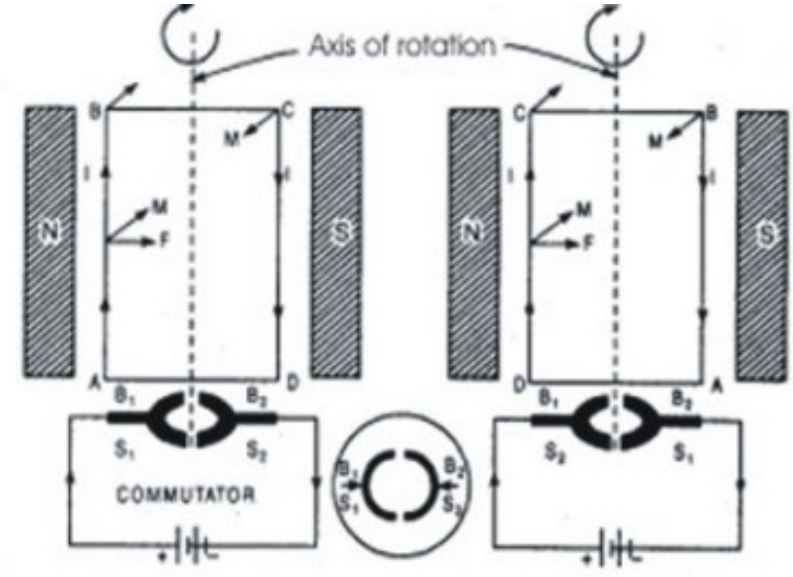
Let us take following example to justify the above statement. Mendel crossed tall pea plants with dwarf pea plants.



In Mendel's observation when the parent generation was crossed the F_1-generation showed all tall plants that is the dwarf character did not appear but when F_1-generation underwent self cross the trait that was unexpressed in F_1 (dwarf) was observed in some F_2-progeny. Thus, both traits were inherited but only single trait was expressed in F_1 generation and dwarf, was expressed in F_2-generation. Thus the trait is definitely inherited but might or might not be expressed.

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. Defect of vision - Myopia or short-sightedness or near-sightedness.
Causes of myopia:
i. Excessive curvature of eye lens.
ii. Elongation of eyeball
Methods of correction: By using a concave lens of suitable power.

b. Due to atmospheric refraction:- Due to atmospheric refraction the starlight reaching our eyes increases and decreases continuously. And the star appears to Twinkle at night.

OR

When the object is placed between pole and principal focus of the concave mirror, an erect, enlarged, virtual image is formed behind the mirror. Therefore range of distance is greater than zero and less than focal length i.e. between more than zero to less than 15 cm.