

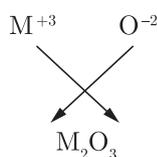
CLASS X (2020-21)
SCIENCE (CODE 086)
SAMPLE PAPER-5

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 be 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 be 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. An element M is in group 13 of the periodic table. What is the formula of its oxide? [1]

Ans :**or**

The atomic numbers of three elements X, Y and Z are given below:

Elements	Atomic Numbers
X	3
Y	9
Z	11

State giving reason which two elements will show similar chemical properties?

Ans :

Elements	Atomic Numbers	Electronic Configuration
X	3	2, 1
Y	9	2, 7
Z	11	2.8, 1

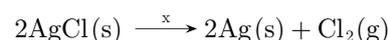
X and Z will show similar chemical properties because both of them have same number of valence electrons. Hence they belong to the same group (1).

2. Which element exhibits the property of catenation to maximum extent and why? [1]

Ans :

Carbon exhibits this property because it forms strong covalent bond.

3. Identify 'x' in the following reaction: [1]

**Ans :** x = sunlight

4. Define the term dispersion of white light. [1]

Ans :

The splitting up of white light into its component colours is called dispersion.

5. Which phenomenon is responsible for increasing the apparent length of the day by 4 minutes? [1]

Ans :

Due to atmospheric refraction of sunlight, the apparent length of the day is increased by 4 minutes.

6. A girl was playing with a thin beam of light from her laser torch by directing it from different directions on a convex lens held vertically. She was surprised to see that in a particular direction the beam of light continues to move along the same direction after passing through the lens. State the reason for the observation. [1]

Ans :

A ray of light passing through the optical centre of the convex lens will continue to move along the same direction after refracting through the lens.

or

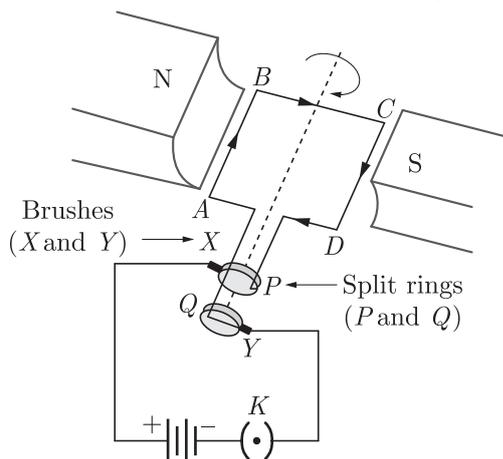
What is the nature and radius of curvature of the mirror having focal length -15 cm ?

Ans :

Focal length of mirror is negative. Hence mirror is concave in nature.

$$\begin{aligned}
 \text{Radius of curvature, } R &= 2f = 2(-15) \\
 &= -30\text{ cm}
 \end{aligned}$$

7. In the device shown in figure, there is a rectangular coil $ABCD$ of insulated copper wire. The ends of the coil are connected to the two halves of a split ring. [1]



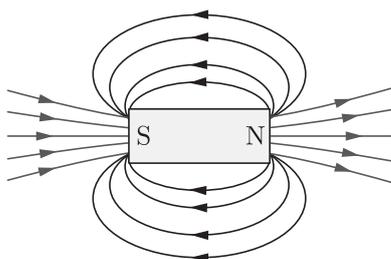
What is the role of split ring in the given device?

Ans :

The split ring acts as a commutator in the given device, i.e., it reverses the direction of current through the circuit after every half-cycle.

8. Draw the magnetic field lines around a bar magnet. [1]

Ans :



9. What happens to resistance of a conductor when its area of cross-section is increased? [1]

Ans :

We know that, $R \propto \frac{1}{A}$ i.e., on increasing the area of cross-section of a conductor, the resistance decreases.

or

Heating element of electrical heating devices is made up of an alloy rather than a pure metal. Give two reasons.

Ans :

Alloys are used for making elements of electrical heating devices because to the following reasons:

- (a) They have a higher resistivity as compared to pure metals.
- (b) They do not burn in oxygen, i.e., they do not oxidise readily at high temperatures.

10. Which enzyme present in saliva breaks down starch? [1]

Ans :

The saliva contains an enzyme called salivary amylase that breaks down starch.

11. Name the tissue which transports soluble products of photosynthesis in a plant. [1]

Ans :

Phloem transports soluble products of photosynthesis

in a plant.

or

What will happen to a plant if its xylem is removed?

Ans :

If xylem is removed from the plant, the water and mineral supply to the plant will stop and therefore, the plant will die.

12. Which class of chemicals is linked to the decrease in the amount of ozone in the upper atmosphere of the earth? [1]

Ans :

The chemical compound, chlorofluorocarbon is mainly responsible for decrease of ozone in the upper atmosphere.

or

The first trophic level in a food chain is always a green plant. Why?

Ans :

Only green plants can manufacture their own food from sunlight: Hence, green plants always acquire the first trophic level in a food chain.

13. Write the full form of DNA. [1]

Ans :

The full form of DNA is Deoxyribonucleic Acid.

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 :** Covalent compounds have generally low melting and boiling points. [1]

Reason : Covalent compounds are soluble in water.

Ans : (c) A is true but R is false.

15. **Assertion :** The enzymes released by micro-organisms help in breaking down biodegradable wastes.

Reason : Biodegradable wastes are generally inorganic wastes. [1]

Ans : (a) A is true but R is false.

16. **Assertion :** The embryo gets nutrition from the mother's blood with the help of a special tissue called placenta.

Reason : Placenta transfers glucose and oxygen from the mother to the embryo. [1]

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

or

Assertion : Fertilisation cannot take place in flowers if pollination does not occur.

Reason : Fertilisation requires both male and female gametes in a flower.

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

17. Read the following and answer any four question 17.1 to 17.5. 1 × 4

Sexually Transmitted Diseases (STDs) or Sexually Transmitted Infections (STIs) are caused by bacteria, viruses or parasites that are transmitted through unprotected sex and skin to skin genital contact. Bacterial infections include gonorrhoea, syphilis and Lymphogranuloma Venerum (LGV) whereas viral infections include warts, genital herpes and HIV-AIDS. STIs are an important public health problem in India. ICMR estimates the occurrence of about 30-35 million new infections in the country every year, almost half of them among adolescents and young people.

Birth control methods such as oral contraceptives or IUDs do not prevent STD transmission, however, correct and consistent use of male condom is highly effective in reducing STD transmission.

17.1 Which of the following is not a sexually transmitted disease?

- (a) gonorrhoea
- (b) hepatitis
- (c) syphilis
- (d) AIDS

Ans : (b) hepatitis

17.2 The sexually transmitted disease which is caused by bacteria is:

- (a) diarrhoea
- (b) AIDS
- (c) gonorrhoea
- (d) genital herpes

Ans : (c) gonorrhoea

17.3 Which of the following method of contraception protects a person from acquiring a STD?

- (a) oral pills
- (b) copper-T
- (c) surgery
- (d) condom

Ans : (d) condom

17.4 Study the table below and select the row that has the incorrect Information.

	Disease	Cause
(a)	LGV	Bacteria
(b)	Genital Herpes	Virus
(c)	Syphilis	Virus
(d)	Gonorrhoea	Bacteria

Ans : (c) Syphilis-Virus

17.5 STIs are most common in which age group?

- (a) people 60 and older
- (b) people aged 40 to 50
- (c) adolescents and young people upto age 25.
- (d) none of these

Ans : (c) adolescents and young people upto age 25.

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

In the year 1817, a German chemist, arranged certain elements with similar properties (both physical and chemical) in groups of three. The basis of the arrangement was the atomic masses of the elements.

In a particular group, the elements (e.g., *A, B, C*) with atomic masses 7, 23 and 39 respectively were arranged in order of increasing atomic masses and the atomic mass of the middle element (*B*) was almost the mean or the average of the atomic masses of the first and third elements i.e., *A* and *C*.

18.1 Which of the following scientist had proposed such a classification of elements?

- (a) Henry Mosely
- (b) Dmitri Mendeleev
- (c) John Newlands
- (d) Johann Dobereiner

Ans : (d) Johann Dobereiner

18.2 What could be the elements *A, B* and *C*?

- (a) Calcium, Strontium and Barium
- (b) Lithium, Sodium and Potassium
- (c) Lithium, Sodium and Calcium
- (d) Nitrogen, Calcium and Iodine

Ans : (b) Lithium, Sodium and Potassium

18.3 The three imaginary elements *X, Y* and *Z* represent elements according to the given law. If the atomic mass of element *X* is 14 and that of *Y* is 46, then the atomic mass of element *Z* will be:

- (a) 78
- (b) 32
- (c) 18
- (d) 60

Ans : (a) 78

18.4 What is the limitation of law discussed in the given paragraph?

- (a) This law could not explain the position of isotopes
- (b) This law proved to be true for elements only up to calcium.
- (c) This law could define a total of 9 elements only
- (d) This law could not define the position of hydrogen

Ans : (c) This law could define a total of 9 elements only

18.5 Out of *A, B* and *C* which element(s) catches fire in air?

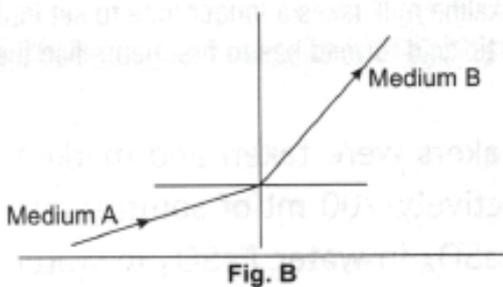
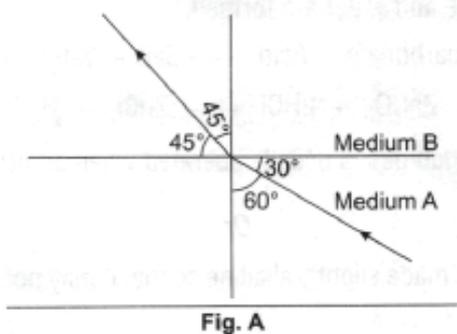
- (a) *A* and *B*
- (b) *B* Only
- (c) *C* only
- (d) *B* and *C*

Ans : (d) *B* and *C*

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

A student of class X wanted to understand the phenomenon of refraction of light through a glass slab. For this, he fix a sheet of white paper on a drawing board using drawing pins and place a rectangular glass slab over the sheet in the middle. Now, he draw the outline of slab with a pencil.

Using two pins, such that line joining the pins is inclined to edge of slab he look for images through the opposite edge such that images of pins also lie on a straight line and obtained the following ray diagrams as shown below:



19.1 What is the focal length of a glass slab?

- (a) Zero
- (b) One
- (c) Vary from zero to one
- (d) Infinite

Ans : (d) Infinite

19.2 In fig. B, the refractive index of medium B relative to A will be:

- (a) greater than unity
- (b) equal to unity
- (c) zero
- (d) less than unity

Ans : (a) greater than unity

19.3 Refer to fig. A, find the refractive index of medium B relative to medium A is:

- (a) $\frac{2}{\sqrt{6}}$
- (b) $\frac{\sqrt{2}}{\sqrt{3}}$
- (c) $\frac{\sqrt{3}}{\sqrt{2}}$
- (d) $\frac{\sqrt{6}}{2}$

Ans : (c) $\frac{\sqrt{3}}{\sqrt{2}}$

We know that,

$$n = \frac{\sin i}{\sin r} = \frac{\sin 60^\circ}{\sin 45^\circ} = \frac{\sqrt{3}/2}{1/\sqrt{2}} = \frac{\sqrt{3}}{\sqrt{2}}$$

19.4 In one case, the student observes that no refraction of light occurs when ray of light passes from medium A to medium B. In this case, the angle made by the ray of light at boundary of medium B is:

- (a) 0°
- (b) 90°
- (c) 45°
- (d) 60°

Ans : (b) 90°

19.5 You are given alcohol, mustard oil, glycerine and kerosene. In which of these media a ray of light incident obliquely at same angle would bend the most?

- (a) mustard oil
- (b) glycerine
- (c) kerosene
- (d) alcohol

Ans : (b) glycerine

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

1 × 4

The magnetic field lines around a straight conductor (straight wire) carrying current are concentric circles whose centres lie on the wire. It has been shown by experiments that the magnitude of magnetic field produced by a straight current carrying wire at a given point is: (i) directly proportional to the current passing in the wire, and (ii) inversely proportional to the distance of that point from the wire.

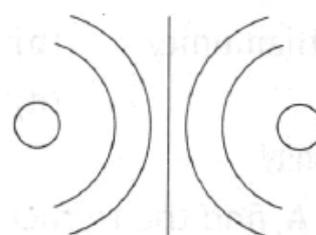
The magnetic field lines are circular near the current carrying circular loop. As we move away, the concentric circles representing magnetic field lines become bigger and bigger and at the centre the magnetic field lines are straight.

20.1 The direction of magnetic field developed around a current-carrying conductor can be easily found by the use of:

- (a) Fleming’s left-hand rule
- (b) Left-hand thumb rule
- (c) Right-hand thumb rule
- (d) Fleming’s right hand rule

Ans : (c) Right-hand thumb rule

20.2 The diagram given below represents magnetic field caused by a current-carrying conductor which is:



- (a) a solenoid
- (b) a long straight wire
- (c) a circular coil
- (d) a short straight wire

Ans : (c) a circular coil

20.3 The strength of magnetic field due to a straight conductor depends on the:

- (a) nature of conductor
- (b) current passing through the wire
- (c) direction of current
- (d) all of above

Ans : (b) current passing through the wire

20.4 Which of the following correctly describes the magnetic field near a long straight wire?

- (a) The field consists of straight Lines perpendicular to the wire
- (b) The field consists of straight lines parallel to the wire
- (c) The field consists of radial Lines originating from the wire
- (d) The field consists of concentric circles centred on the wire

Ans : (d) The field consists of concentric circles centred on the wire

20.5 The strength of magnetic field inside a long current carrying straight solenoid is:

- (a) same at all points

- (b) minimum in the middle
- (c) found to increase from one end to the other
- (d) more at the ends than at the centre.

Ans : (a) same at all points

Section B

21. (i) What is meant by heredity? [2]
 (ii) How many types of genes are there? Name them.

Ans :

- (i) The transmission of characters or traits from the parents to their offspring's is called heredity.
- (ii) There are two types of genes namely dominant genes and recessive genes.

or

Why did Mendel choose garden pea for his experiments?

Ans :

Mendel selected pea plant (*Pisum sativum*) because:

- (i) These plant are easily available.
- (ii) They have contrasting characters. The traits were seed's colour, pod's shape, flower's shape, position of flower, seed's shape and plant's height.
- (iii) They are self-pollinating.
- (iv) These plants are easier to maintain.

22. List two distinguishing features between sexual and asexual types of reproduction in tabular form. [2]

Ans :

Difference between sexual and asexual reproduction:

	Basis of Difference	Sexual Reproduction	Asexual Reproduction
1.	Number of parents	Sexual reproduction involves two individuals.	Asexual reproduction requires only one individual.
2.	Reproductive organs	Special organs for reproduction are not required.	Special organs for reproduction are required.

23. (i) What happens when an acid reacts with a metal carbonate? Give chemical equation involved.
 (ii) Which gas is usually liberated when an acid reacts with a metal. [2]

Ans :

- (i) When an acid reacts with a metal carbonate, a salt, carbon dioxide and water are formed.
 Metal carbonate + Acid \longrightarrow Salt + Water

+ Carbon dioxide



- (ii) Hydrogen gas is usually liberated when an acid reacts with a metal.

or

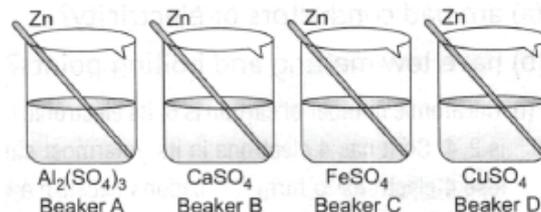
A milkman adds a very small amount of baking soda to fresh milk.

- (i) Why does he shift the pH of the fresh milk from 6 to slightly alkaline?
- (ii) Why does this milk take a long time to set as curd?

Ans :

- (i) Milk is made slightly alkaline so that it may not get sour easily.
- (ii) The alkaline milk takes a longer time to set into curd because the lactic acid formed has to first neutralise the alkali present in it.

24. Four beakers were taken and marked A, B, C and D respectively 200 ml of solution of $Al_2(SO_4)_3$ in water, $CaSO_4$ in water, $FeSO_4$ in water and $CuSO_4$ in water was filled in the beakers A, B, C and D respectively. Clean piece of metal zinc was placed in each solution and kept undisturbed for two hours. [2]

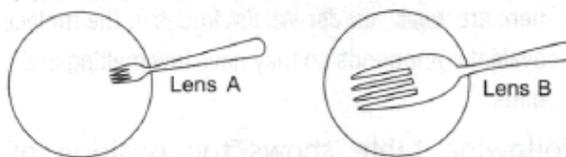


- (a) What colour change would you observe in beaker D?
- (b) Arrange the metals Zn, Al, Ca, Fe and Cu in the order of decreasing reactivity.

Ans :

- (a) In beaker D, zinc would displace copper from copper sulphate solution (blue) to form zinc sulphate which is colourless.
- (b) $Ca > Al > Zn > Fe > Cu$ is the order of reactivity.

25. A student performs an experiment in the lab to study image formation by different types of lenses. When a fork is seen through lenses A and B one by one, it appears as shown in the above figures.

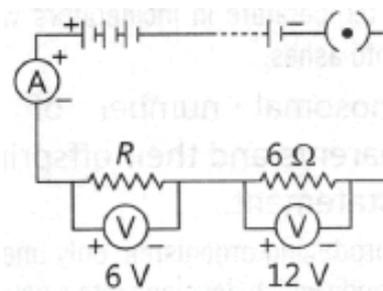


- (a) What is the nature of lens A? Give reason for your answer.
- (b) What is the nature of lens B? Give reason for your answer. [2]

Ans :

- (a) The nature of lens A is concave because such diminished image is observed when an object near a concave lens.
- (b) The nature of lens B is convex because such enlarged image is observed when an object is placed between the lens and focus of a convex lens.

26. A circuit is shown in the diagram given below.



- (i) Find the value of R.

- (ii) Find the potential difference across to terminals of the battery. [2]

Ans :

- (i) Potential difference,

PD across $6\ \Omega = 12\ V$
Hence, current through $6\ \Omega$,

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

Since, R and $6\ \Omega$ are connected in series, therefore, the current through R will be $2\ A$. According to Ohm's law,

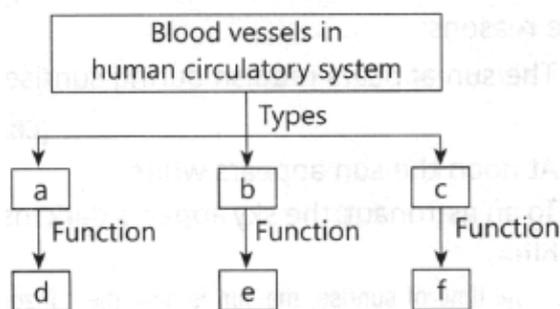
$$R = \frac{V}{I} = \frac{6}{2} = 3\ \Omega$$

- (ii) Potential difference across the terminals of the battery,

$$V = V_1 + V_2 = 6 + 12 = 18\ V$$

Section C

27. Complete the following flow chart as per the given [3]



Ans :

Types		Functions	
(a)	Arteries	(d)	Carry oxygenated blood from heart to various organs of the body.
(b)	Veins	(e)	Carry deoxygenated blood from various organs to heart.
(c)	Capillaries	(f)	Exchange of materials between blood and surrounding cells takes place in the capillaries.

or

What are the components of the transport system in human beings? What are the functions of these components?

Ans :

The main components of the transport system in the body of human are given as follows:

- (i) **Heart:** It acts as pump to transport oxygenated blood throughout the body. It receives deoxygenated blood from the various body parts and sends this impure blood to the lungs for oxygenation.
- (ii) **Blood:** It is a fluid connective tissue, which helps in transportation of oxygen, nutrients, CO_2 and

nitrogenous wastes.

- (iii) **Blood Vessels:** They (arteries, veins, and capillaries) carry blood either away from the heart to various organs or from various organs back to the heart.

28. State in brief two ways in which non-biodegradable substances would affect the environment. List two methods of safe disposal of the non-biodegradable waste. [3]

Ans :

The ways in which the environment gets affected by the non-biodegradable wastes are:

- (i) Accumulation of non-biodegradable waste may accumulate in the environment and concentrate in the food chain, thereby harming the organisms.
- (ii) Non-biodegradable substances may cause pollution in the soil and increase soil temperature. Two methods of safe disposal of non-biodegradable wastes are:
- (a) **Recycling :** The wastes should be treated to extract some valuable materials for reuse.
- (b) **Incineration :** Medical and toxic wastes should be burnt at high temperature in incinerators which transform the waste into ashes.

29. 'The chromosomal number of the asexually producing parents and their offspring is the same.' Justify this statement. [3]

Ans :

In asexually reproducing organisms, only one parent is involved. The part of the body which develops into a new organism contains cells having the same number of chromosomes as any other cell in the body of the organism. This separated part develops and forms a new organism.

For example, human being somatic cells contain 46 chromosomes. When gametes are formed, they contain half the number i.e., 23 chromosomes but when gametes fuse to form the zygote, they maintain the 46 chromosomes.

In sexually reproducing organisms, the parents are diploid (2N) as each of them is having 2 complete sets of chromosomes. They form haploid (N) male and female gametes by the process of meiosis. The haploid gamete has one set of chromosomes since, these gametes fuse during fertilisation and restore the original number of chromosomes in the offspring.

30. (i) Study the following reaction between lead sulphide and hydrogen peroxide:



- (a) Which substance is oxidised?
(b) Which substance is reduced?
- (ii) What happens when lead nitrate is heated? Write the equation involved. [3]

Ans :

- (i)
- (a) PbS is oxidised.
(b) H_2O_2 is reduced.
- (ii) When lead nitrate is heated, lead monoxide, nitrogen dioxide and oxygen are formed. This can be written as:



31. State the reason why carbon can neither form C^{4+} cation nor C^{4-} anions, but forms covalent bonds. Also state reasons to explain why covalent compounds:

- (a) are bad conductors of electricity?
 (b) have low melting and boiling points? [3]

Ans :

(i) The atomic number of carbon is 6. Its electronic configuration is 2,4. So it has 4 electrons in its outermost shell. It cannot lose 4 electrons to form C^{4+} cations because a lot of energy is required to remove $4e^-$. It also cannot gain $4e^-$ to form C^{4-} anions because it is difficult for 6 protons to hold onto $10e^-$. Hence, it cannot form C^{4+} cation or C^{4-} anion and thus forms a covalent bond.

(a) Since the electrons are shared by carbon so there are no charged particles and hence covalent compounds are bad conductors of electricity.

(b) There are weak van der Waals forces in the molecules of covalent compounds so they have low melting and boiling points.

32. The following table shows the position of five elements p, q, r, s and t in the modern periodic table: [3]

1							18
p	2	13	14	15	16	17	
		q					r
s						t	

Answer the following:

- (a) Select the letter which represents:
 (i) an alkali metal.
 (ii) a halogen.
 (b) What type of bond is formed between p and t ?
 (c) What type of bond is formed between s and t ?

Ans :

- (a) (i) s
 (ii) t
 (b) Covalent bond is formed between p and t .
 (c) Ionic bond is formed between s and t .

33. Give reasons:

- (i) The sun appears reddish during sunrise.
 (ii) At noon the sun appears white.
 (iii) To an astronaut, the sky appears dark instead of blue. [3]

Ans :

- (i) At the time of sunrise, the sun is near the horizon and the sunlight has to travel through a larger atmospheric distance. The blue component and the other shorter wavelengths of the sunlight get scattered away by the fine particles of atmosphere. Only red colour which is of longer wavelength is least scattered and reaches our eyes. So, the sun appears reddish during sunrise.
 (ii) At noon, when the sun is nearly overhead, the sunlight has to travel through a smaller atmospheric distance. So, the scattering is much less and the sun appears white.

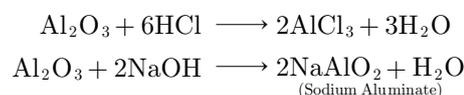
- (iii) The sky appears dark to the astronaut as scattering does not take place at very high altitude due to the absence of atmosphere.

Section D

34. (i) Define reactivity series of metals. Arrange the metals lead, calcium, gold and magnesium in order of their increasing reactivity.
 (ii) Why are ionic compounds usually hard?
 (iii) Write chemical equations that shows aluminium oxide reacts with acid as well as base. [5]

Ans :

- (i) Reactivity series is a list of metals arranged in decreasing order of their reactivity.
 Gold < lead < magnesium < calcium is increasing order of reactivity.
 (ii) It is due to the strong force of attraction between the positive and negative ions.
 (iii) Aluminium oxide reacts with acids and base in the following manner:

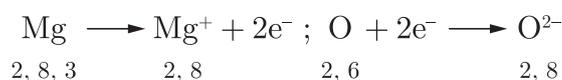
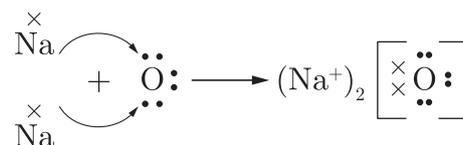
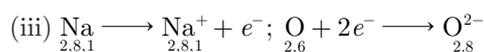
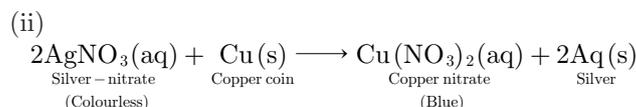


or

- (i) A copper coin is kept immersed in a solution of silver nitrate for sometime. What will happen to the coin and the colour of the solution?
 (ii) Write the equation involved.
 (iii) Show the formation of Na_2O and MgO by transfer of electrons. Name the ions present in these compounds.

Ans :

- (i) Copper is more reactive than silver. So copper displace silver from silver nitrate solution and forms copper nitrate and silver will deposit on copper coin. The colour of the solution will become blue due to the formation of copper nitrate. Copper coin will get a greyish white coating of silver metal.



Na_2O contains Na^+ and O^{2-} ions.

MgO contains Mg^{2+} and O^{2-} ions.

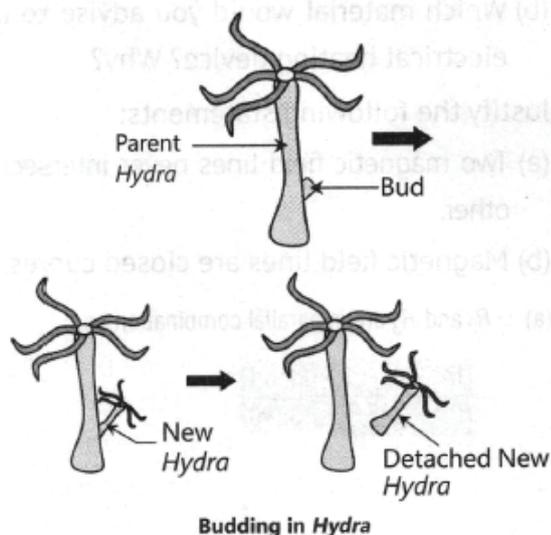
35. (i) Give two differences between the two modes of pollination in flowering plants.
 (ii) Explain with the help of labelled diagram the process by which Hydra reproduces asexually. [5]

Ans :

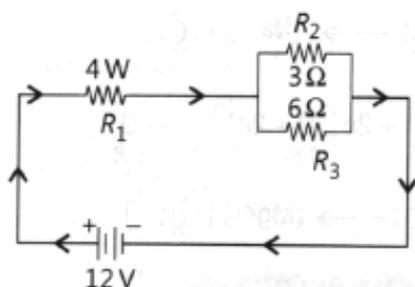
- (i) The two modes of pollination are self-pollination and cross-pollination.
 Difference between self-pollination and cross-pollination:

	Basis of Difference	Self-pollination	Cross-pollination
1.	Occurrence	Self-pollination occurs within a flower or between two flowers of the same plant.	Cross-pollination occurs between two flowers borne on different plants of the same species.
2.	Agents of pollination	Flowers do not depend on other agents for self-pollination	Agents such as insects, water and wind are required for cross-pollination.

- (ii) **Reproduction in Hydra:** Hydra reproduces by budding using the regenerative cells. A bud develops in the form of an outgrowth in Hydra due to repeated cell division at one specific site. On maturity, the bud detaches itself from the parent body and develops into a new independent individual.



36. (i) The circuit diagram given below shows the combination of three resistors R_1, R_2 and R_3 : [5]



Find:

- (a) Total resistance of the circuit.
 (b) Total current flowing in the circuit.
 (c) The potential difference across R_1 .
 (ii) What is meant by electric power? Write the formula for electric power in terms of potential difference and resistance.

Ans :

R_2 and R_3 are in parallel combination so,

$$\frac{1}{R'} = \frac{1}{R_2} + \frac{1}{R_3} = \frac{1}{3} + \frac{1}{6}$$

$$\frac{1}{R'} = \frac{2+1}{6} = \frac{3}{6}$$

$$R' = \frac{6}{3} = 2 \Omega$$

R_1 and R' are in series combination so,

Total resistance, $R = R_1 + R'$

$$R = 4 + 2$$

$$R = 6 \Omega$$

(b) $I = \frac{V}{R} = \frac{12}{6} = 2 \text{ A}$

(c) V across R_1 , $V = IR_1 = 2 \times 4 = 8 \text{ V}$

- (ii) Electric power is the electrical work done per unit time,

$$P = \frac{W}{t}$$

where, $P =$ Electric power; $W =$ Electric Work done; $t =$ time taken

The formula for electric power in terms of potential difference and resistance is,

$$P = \frac{V^2}{R}$$

or

- (i) Electrical resistivities of some substance at 20°C are given below :

Silver	$1.60 \times 10^{-8} \Omega\text{-m}$
Copper	$1.62 \times 10^{-8} \Omega\text{-m}$
Tungsten	$5.2 \times 10^{-8} \Omega\text{-m}$
Iron	$10.0 \times 10^{-8} \Omega\text{-m}$
Mercury	$94.0 \times 10^{-8} \Omega\text{-m}$
Nichrome	$100 \times 10^{-6} \Omega\text{-m}$

Answer the following questions in relation to them:

- (a) Among silver and copper which one is better conductor? Why?
 (b) Which material would you advise to use in electrical heating device? Why?
 (ii) Justify the following statements:
 (a) Two magnetic field lines never intersect each other.
 (b) Magnetic field lines are closed curves.

Ans :

- (i)
 (a) Silver is a better conductor because it has less resistivity.
 (b) Nichrome, because its resistivity is much higher in comparison to the others.
 (ii)

- (a) The magnetic lines of force never intersect (or cross) each other. If they do so, then at the point of intersection, two tangents can be drawn at that point which indicates that there will be two different directions of the same magnetic field, which is not possible.
- (b) Magnetic field lines are closed continuous curves. These lines emerge out from the north pole of a bar magnet and go into its south pole. Inside the magnet, they move from south pole to north pole.

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