Set No-1

Series A2DDC/2

Q.P.Code 31/2/1

Roll No. | | | | | | | | |

Candidates must write the Q.P. Code on the title page of the answer-book.

- Please check that this question paper contains **14** printed pages.
- Q.P. Code number given on the right hand side of the question paper should be written on the title page of the answer-book by the candidate.
- Please check that this question paper contains **39** questions.
- **Please write down the Serial Number of the questions in the answer-book beforeattempting it.**
- 15 minute time has been allotted to read this question paper. The question paper will be distributed at 10.15 a.m. From 10.15 a.m. to 10.30 a.m., the students will read the question paper only and will not write any answer on the answer-book during this period.

SCIENCE
HINTS & SOLUTIONS

Time allowed: 3 hours **Maximum Marks: 80**

General Instructions:

Read the following instructions carefully and strictly follow them :

(i) **The question paper consists of 39 questions. All questions are compulsory.**

(ii) **This question paper is divided into FIVE Sections viz. Section A, B, C, D and E**

(iii) **In Section A question number 1 to 20 are Multiple Choice Questions (MCQs) carrying 1 mark each.**

(iv) **In Section B question number 21 to 26 are Very Short Answer(VSA) type questions carrying 02 marks each. Answers to these questions should in the range of 30 to 50 words.**

(v) **In Section C question number 27 to 33 are Short Answer(SA) type questions carrying 03 marks each. Answers to these questions should in the range of 50 to 80 words.**

(vi) **In Section D question number 34 to 36 are Long Answer(LA) type questions carrying 05 marks each. Answers to these questions should in the range of 80 to 120 words.**

(vii) **In Section E question number 37 to 39 are of 3 source-based/case-based units of assessment of 04 marks each with sub-parts.**

(viii) **There is no overall choice. However, an internal choice has been provided in some Sections. Only one of the alternatives has to be attempted in such questions.**

SECTION-A (20 × 1 = 20)

Select and write one most appropriate option out of the four options given for each of the questions 1 to 20. Solid Calcium oxide 1 to 20

1. Solid calcium oxide reacts vigorously with layer to form Calcium hydroxide accompanied by the liberation of heat. From the information given above it may be concluded that this reaction
(A) is endothermic and pH of the solution formed is more than 7.
(B) is exothermic and pH of the solution formed is 7.
(C) is endothermic and pH of the solution formed is 7.
(D) is exothermic and pH of the solution formed is more than 7.

Ans. **(D) is exothermic and pH of the solution formed is more than 7.**

2. Juice of tamarind turns blue litmus to red. It is because of the presence of an acid called: 1
(A) methanoic acid (B) acetic acid (C) tartaric acid (D) oxalic acid

Ans. **(C) tartaric acid**

3. Select from the following a process in which a combination reaction is involved: 1
(A) Black and White photography (B) Burning of coal
(C) Burning of methane (D) Digestion of food

Ans. **(B) Burning of coal**

4. The oxide which can react with HCl as well as KOH to give corresponding salt and water is
(A) CuP (B) Al_2O_3 (C) Na_2O (D) K_2O 1

Ans. **(B) Al_2O_3**

5. Consider the following cases.
(a) $CaSO_4 + Al \rightarrow$ (b) $CuSO_4 + Ca \rightarrow$ (c) $FeSO_4 + Cu \rightarrow$ (d) $ZnSO_4 + Mg \rightarrow$
The cases in which new products will form are -
(A) (a) and (b) (B) (b) and (c) (C) (c) and (d) (D) (b) and (d)

Ans. **(D) (b) and (d)**

6. Identify the correct statement about the following reaction:
$2H_2S + SO_2 \rightarrow 2H_2O + S$
(A) H_2S is oxidising agent and SO_2 is reducing agent.
(B) H_2S is reduced to sulphur.
(C) SO_2 is oxidising agent and H_2S is reducing agent.
(D) SO_2 is oxidised to sulphur.

Ans. **(C) SO_2 is oxidising agent and H_2S is reducing agent.**

7. Consider the following statements about homologous series of carbon compounds: 1
(a) All succeeding members differ by - CH_2 unit.
(b) Melting point and boiling point increases with increasing molecular mass.
(c) The difference in molecular masses between two successive members is 16 u.
(d) C_2H_2 and C_3H_4 are NOT the successive members of alkyne series.
The correct statements are -
(A) (a) and (b) (B) (b) and (c) (C) (a) and (c) (D) (c) and (d)

Ans. **(A) (a) and (b)**

8. Which of the following statement(s) is (are) true about human heart?
(a) Right atrium receives oxygenated blood from lungs through pulmonary artery.
(b) Left atrium transfers oxygenated blood to left ventricle which sends it to various parts of the body.
(c) Right atrium receives deoxygenated blood through vena cava from upper and lower body.
(d) Left atrium transfers oxygenated blood to aorta which sends it to different parts of the body.
(A) (a) (B) (a) and (d) (C) (b) and (c) (D) (b) and (d)

Ans. **(C) (b) and (c)**

9. Select out of the following a gland which does NOT occur as a pair in the human body:
(A) Pituitary (B) Ovary (C) Testis (D) Adrenal

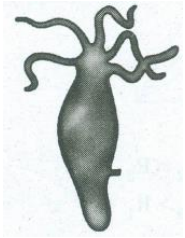
Ans. **(A) Pituitary**

10. In human respiratory system, when a person breathes in, the position of ribs and diaphragm will be : **1**

(A) lifted ribs and curve/dome shaped diaphragm.
(B) lifted ribs and flattened diaphragm.
(C) relaxed ribs and flattened diaphragm.
(D) relaxed ribs and curve/dome shaped diaphragm.

Ans. **(B) lifted ribs and flattened diaphragm**

11. Identify the mode of asexual reproduction in the following organism: **1**



(A) Fragmentation (B) Multiple fission (C) Budding (D) Binary fission

Ans. **(C) Budding**

12. A cross made between two pea plants produces 50% tall and 50% short pea plants. The gene combination of the parental pea plants must be **1**

(A) Tt and Tt (B) TT and Tt (C) Tt and tt (D) TT and tt

Ans. **(C) Tt and tt**

13. Consider the following statements in the context of human eye: **1**

(a) The diameter of the eye ball is about 2.3 cm.
(b) Iris is a dark muscular diaphragm that controls the size of the pupil.
(c) Most of the refraction for the light rays entering the eye occurs at the crystalline lens.
(d) While focusing on the objects at different distances the distance between the crystalline lens and the retina is adjusted by ciliary muscles.
The correct statements are

(A) (a) and (b) (B) (a), (b) and (c) (C) (b), (c) and (d) (D) (a), (c) and (d)

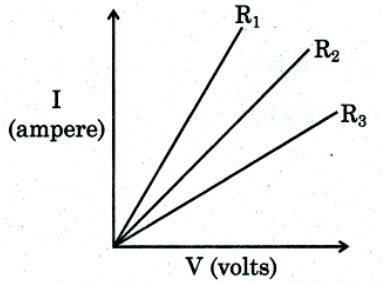
Ans. **(B) (a), (b) and (c)**

14. The maximum resistance of a network of five identical resistors of each can be $\frac{1}{5}\Omega$ each can be– **1**

(A) 1 Ω (C) 0.25 Ω (B) 0.5 Ω (D) 0.1 2

Ans. **(A) 1 Ω**

15. Study the I-V graph for three resistors of resistances R_1, R_2 and R_3 and select the correct statement from the following: **1**



(A) $R_1 = R_2 = R_3$ (B) $R_1 > R_2 > R_3$ (C) $R_3 > R_2 > R_1$ (D) $R_2 > R_3 > R_1$

Ans. **(C) $R_3 > R_2 > R_1$**

16. Strength of magnetic field produced by a current carrying solenoid DOES NOT depend upon: **1**

(A) number of turns in the solenoid (B) direction of the current flowing through it
(C) radius of solenoid (D) material of core of the solenoid

Ans. **(B) direction of the current flowing through it**

Q. Nos. 17 to 20 are Assertion- Reason based questions.

These consist of two statements - Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below:

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

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

(C) (A) is true, but (R) is false.

(D) (A) is false, but (R) is true.

17. **Assertion (A):** Different metals have different reactivities with water and dilute acids. **1**

Reason (R): Extraction of a metal from its ore depends on its position in the reactivity series.

Ans. **(B) Both (A) and (R) are true, but (R) is not the correct explanation of (A).**

18. **Assertion (A):** Human female has a perfect pair of sex chromosome. **1**

Reason (R): Sex chromosome contributed by the human male in the zygote decides the sex of a child.

Ans. **(B) Both (A) and (R) are true, but (R) is not the correct explanation of (A).**

19. **Assertion (A):** Myopic eye cannot see distant objects distinctly. **1**

Reason (R): For the correction of myopia converging lenses of appropriate power are prescribed by eye-surgeons.

Ans. **(C) (A) is true, but (R) is false.**

20. **Assertion (A):** The deflection of a compass needle placed near a current carrying wire decreases when the magnitude of an electric current in the wire is increased. **1**

Reason (R): Strength of the magnetic field at a point due to a current carrying conductor increases on increasing the current in the conductor.

Ans. (D) (A) is false, but (R) is true.

SECTION-B

Q. Nos. 21 to 26 are very short answer questions.

21. **(a)** "No precipitation reaction can occur without exchange of ions between the two reactants." Justify this statement giving a balanced chemical equation for the reaction. **2**

Sol. (a) A reaction in which an insoluble solid (called precipitate) is formed is called a precipitation reaction.

$$\underset{\text{Sodium sulphate}}{Na_2SO_4(aq)} + \underset{\text{Barium chloride}}{BaCl_2(aq)} \longrightarrow \underset{\text{Barium sulphate}}{BaSO_4(s)\downarrow} + \underset{\text{Sodium chloride}}{2NaCl(aq)}$$

In this reaction, barium sulphate is obtained as a precipitate

OR

(b) Giving one example of each, differentiate between a displacement reaction and a double displacement reaction. **2**

Sol. (b) Displacement Reactions :

It involves displacement of one of the constituents of a compound by another substance and may be regarded as a displacement reaction.

When an iron nail is dipped in a copper sulphate solution, it gets coated with copper.

$Fe(s) + CuSO_4(aq) \longrightarrow FeSO_4(aq) + Cu(s)$

Iron Copper sulphate Iron sulphate Copper

In this reaction, Fe has taken the place of Cu in the compound $CuSO_4$.

In other words, we say that Fe has displaced Cu from the compound $CuSO_4$.

Double Displacement :

It is mutual exchange of the radicals of two compounds taking part in the reaction and results in the formation of two new compounds.

• $NaCl(aq) + AgNO_3(aq) \longrightarrow AgCl\downarrow(s) + NaNO_3(aq)$

22. Photosynthesis takes place in the leaves and the food prepared by it reaches other parts of the plants. Name the process involved and explain it. **2**

Sol. Translocation is the process in which transport of soluble product (sucrose) occurs by conducting tissue phloem from leaves to various parts of plants with the help of ATP.

23. "Stability of DNA in a species is ensured during sexual reproduction." Justify the statement. **2**

Sol. To maintain the stability of DNA the chromosomes number get halved during the process of so that on fusion of two gametes they get same number of chromosomes as that of the parents.

24. **(a)** State two laws of refraction of light. **2**

Sol. **(a)** Laws of Refraction :

There are two laws of refraction :

(i) The incident ray, the refracted ray and the normal at the point of incidence lie in the same plane.

(ii) $\frac{\sin i}{\sin r}$ = constant called refractive index denoted by 'μ'.

The above law is called snell's law (willibrod snell). Eg. = $\frac{\sin i}{\sin r} = {}_1\mu_2$

Here ${}_1\mu_2$ is called refractive index of 2nd medium w.r.t. 1st medium.

{Laws of refraction are valid for both types of surfaces
i.e. for plane as well as spherical refracting surfaces.}

OR

(b) Define the term absolute refractive index of a medium. A ray of light enters from vacuum to glass of absolute refractive index 1.5. Find the speed of light in glass. The speed of light in vacuum is 3×10^8 m/s. **2**

Sol. **(b)** Refractive index of a medium with respect to vacuum is also called absolute refractive index.

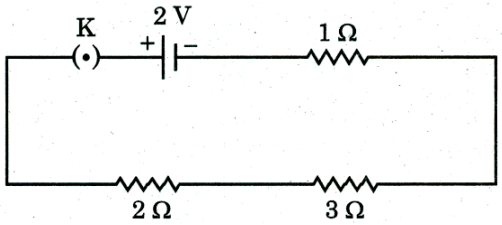
$\mu = \frac{c}{v}$

$1.5 = \frac{3\times10^8}{v}$

$v = \frac{3\times10^8}{1.5}$

$v = 2 \times 10^8$ m/sec

25. Use Ohm's law to determine the potential difference across the 3 Ω resistor in the circuit shown in the following diagram when key is closed : **2**



Sol. $I = \frac{V}{R} = \frac{2}{1+2+3} = \frac{2}{6} = \frac{1}{3}$ amp.

$V_{3\Omega} = IR$

$= \frac{1}{3} \times 3 = 1$ volt

26. Name the term used for the materials which cannot be broken down by biological processes. Give two ways by which they harm various components of an ecosystem. **2**

Sol. Non-Biodegradable

They can cause harm in following ways:-

(i) They cause soil, air and water pollution.

(ii) If they enter in food chain they get accumulated and causes diseases too.

SECTION-C

Q. No. 27 to 33 are short answer questions.

27. It is observed that Calcium on reaction with water floats on its surface. Explain why it happens. Also write a balanced chemical equation for the reaction that occurs. What happens when the aqueous solution of the product of this reaction reacts with Carbon dioxide gas? Write a balanced chemical equation for the reaction. **3**

Sol. Calcium reacts with cold water to form calcium hydroxide and hydrogen gas. The reaction is less violent.

$$Ca(s) + 2H_2O(\ell) \longrightarrow Ca(OH)_2(aq) + H_2(g)$$

Calcium Cold water Calcium hydroxide

The reaction between carbon dioxide and Aquoeous solutiuon of product (Calcium hydroxide) is as follows:

Carbon dioxide + Calcium hydroxide ⟶ Calcium carbonate + Water

$$CO_2 \quad Ca(OH)_2 \longrightarrow CaCO_3 \quad H_2O$$

When carbon dioxide is passed through lime water, calcium carbonate is formed, which makes lime water milky. The turning of lime water into milky is a standard test of carbon dioxide.

28. Draw a labelled diagram to show electrolytic refining of copper. State: what happens when electric current is passed through the electrolyte taken in this case. **3**

Ans. Electrolytic Refining of copper:

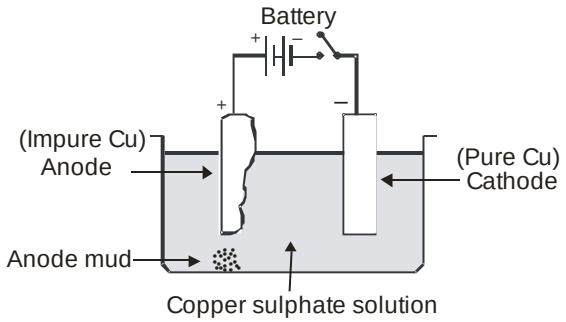
This is most general and widely used method for the refining of impure metals. Many metals such as copper, zinc, tin, nickel, silver, gold etc. are refined electrolytically. It is based upon the phenomenon of electrolysis. In this method, the crude metal is cast into thick rods and are made as anodes, while the thin sheets of pure metal are made as cathodes. An aqueous solution of salt of the same metal is used as an electrolyte. On passing current through the electrolyte, the pure metal from the anode dissolves into the electrolyte. An equivalent amount of pure metal from the electrolyte is deposited on the cathode. The soluble impurities go in the solution whereas the insoluble impurities settle down at the bottom of the anode and are known as anode mud. In this way, the pure metal from anode goes into electrolyte and from electrolyte it goes to the cathode.

$$\text{At anode : } Cu \xrightarrow{\text{Oxidation}} Cu^{+2} + 2e^-$$

Copper (from impure anode) Copper ion

$$\text{At cathode : } Cu^{2+} + 2e^- \xrightarrow{\text{Reduction}} Cu$$

Copper ion Copper (deposited at cathode)



Electrolytic refining for copper

29. **(a)** Give reasons for the following: **3**
(i) Alveoli in lungs are richly supplied with blood capillaries.
(ii) Respiratory pigment in the blood takes up oxygen and not carbon dioxide.
(iii) During anaerobic respiration, a 3-carbon molecule is formed as an end product instead of CO_2 in human beings.

Sol. (a) (i) Alveoli in lungs are richly supplied with blood capillaries for easy exchange of gases
(ii) Because respiratory pigment hemoglobin have more affinity for oxygen but not for CO_2.
(iii) Because of incomplete oxidation of glucose.

OR

(b) (i) Name the movements that occur all along the gut in human digestive system. How do they help in digestion? **3**
(ii) Where is bile juice stored in human body? List two roles of bile juice.

Sol. **(b)** (i) Peristaltic movement It helps in churning and mixing of food with digestive juices.
(ii) Bile juice store in liver.
its two roles :-
→ Emulsification of fat
→ Provide alkaline medium for intestinal and pancreatic enzymes.

30. Explain the events that take place once a sperm reaches the oviduct till it becomes a foetus. Write the role of placenta in pregnancy. **3**

Sol. When sperm reaches oviduct if fuses with egg to form zygote (fertilized egg) The zygote then gets implanted in the lining of the uterus and starts dividing and form embryo.
Function of placenta :-
→ Provide nourishment to developing embryo.
→ Remove wastes generated by embryo.

31. **(a)** Define the term power of accommodation of human eye. Write the name of the part of eye which plays a major role in the process of accommodation and explain what happens when human eye focuses (i) nearby objects and (ii) distant objects. **3**

Sol. Power of Accommodation : The images of the objects at different distances from the eye are brought to focus on the retina by changing the focal length of the eye-lens, which is composed of fibrous jelly-like material, can be modified to some extent by the ciliary muscles.

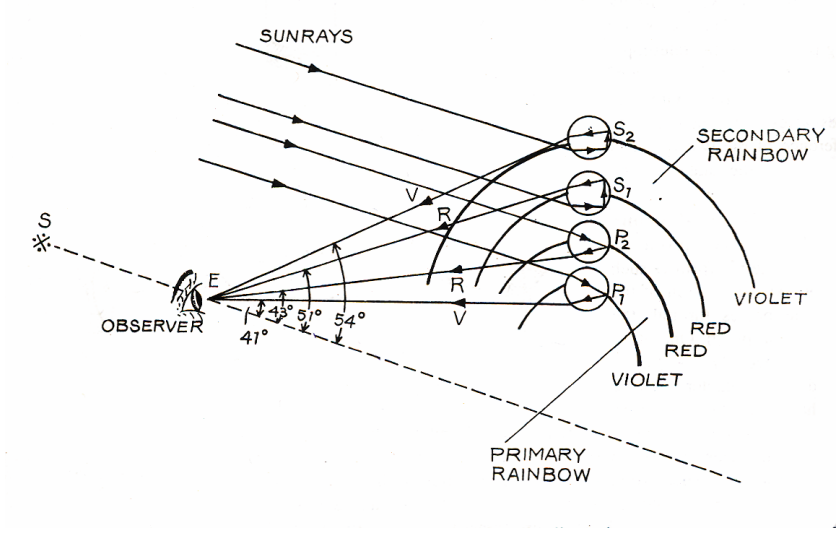
Ciliary muscles	
Relaxed	**Contract**
→ Eye-lens become thin	→ Eye - Lens become thick.
→ Increase the focal length	→ Decrease the focal length
→ Enable as to see distant object dearly	→ Enable as to see nearby object dearly.

Near Point of eye	Far point of eye
→ It is 25 cm for normal eye. The minimum distance at which object can seen most distinctly without stress.	→ It is infinite for normal eye. It is farthest point upto which the eye can see object dearly.

OR

(b) Draw a ray diagram to show the formation of a rainbow in the sky. On this diagram mark A where dispersion of light occurs, B where internal reflection of light occurs and C - where refraction of light occurs. List two necessary conditions to observe a rainbow. - **3**

Sol. When the sun shines upon falling raindrops and observer with his back towards the sun sees concentric arcs of spectral colours hanging in the sky.
These coloured arcs, which have their common centre on the line joining the sun and the observer, are called 'rainbow'. Usually, two rainbows are seen, one above the other. The lower one is called the 'primary' rainbow and the higher one is called the 'secondary' rainbow. The primary rainbow is brighter and narrower, having its inner edge violet and the outer edge red. The secondary rainbow, which is comparatively fainter, has reverse order of colours.



(i) Formation of primary Rainbow : Rainbows are formed by the dispersion of sunrays in raindrops. The primary rainbow is formed when sunrays, after suffering one internal reflection in the raindrops, emerge at minimum deviation and enters the observer's eye.

In Fig., P_1 and P_2 are two raindrops, E is the observer's eye and S is the sun. The sunrays fall on the drops parallel to SE. If the rays are deviated (and dispersed) by the drops so as to arrive at the

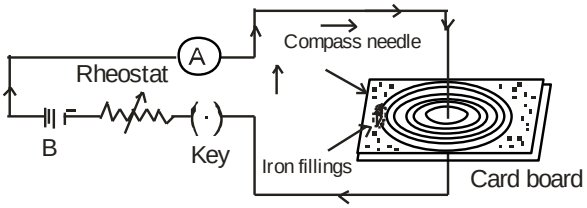
observer, the observer would receive intense light in those directions in which the rays suffer minimum deviation. It can be shown that he would receive red light in a direction making an angle of 42º, and intense violet light in a direction making an angle of 40º with the line SE produced. The drops sending the intense red and violet light to the observer lie on concentric circles which generate cones of semivertical angle 42º and 40º respectively with common vertex at E. Thus, the observer sees concentric coloured arcs of which the innermost is violet and the outermost is red. The intermediate colours lie in between. This is the primary rainbow.

(ii) Formation of secondary Rainbow: The secondary fainter rainbow is formed by the sunrays undergoing two internal reflections in the raindrops and emerging at minimum deviation, as occurring in drops S_2 and S_2 in the figure. The semivertical angles for this bow are 50º for the red rays to 53º for the violet rays. As such, the order of colours is reverse of that in the primary rainbow.

32. Draw a diagram to show the pattern of magnetic field lines on a horizontal sheet of paper due to a straight conductor passing through its centre and carrying current vertically upwards. Mark on it (i) the direction of current in the conductor and (ii) the corresponding magnetic field lines. State right hand thumb rule and check whether the directions marked by you are in accordance with this rule or not. **3**

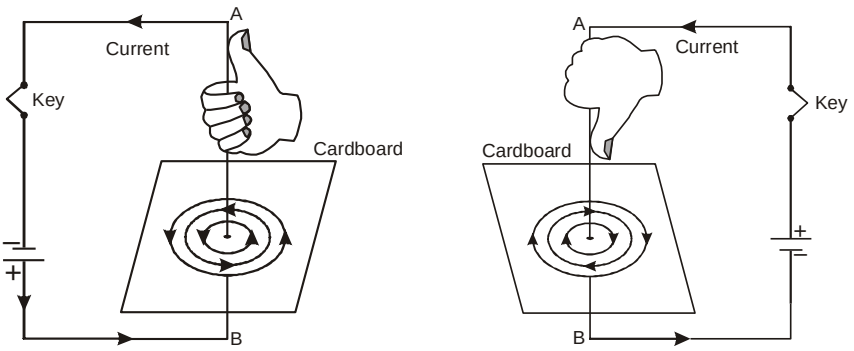
Sol. **Magnetic field due to a straight current carrying wire :** When a current is passed through a conducting wire, a magnetic field is produced around it. The direction of magnetic field due to a straight current carrying wire can be checked by means of a small compass needle or by iron fillings.

Experimental arrangement & working : We take a sheet of smooth cardboard with a hole at the centre. Place it horizontally and pass a wire vertically through the hole. Sprinkle some iron filings on the cardboard and pass an electric current through the wire. Gently tap the cardboard. We find that the iron filings arrange themselves in concentric circles around the wire as shown in figure.
If a small compass needle is kept anywhere on the board near the wire, the direction in which the north pole of the needle points gives the direction of the magnetic field (i.e., magnetic lines of force) at that point.



Pattern of magnetic lines of force: The magnetic lines of force form concentric circles near the wire, with their plane perpendicular to the straight conductor and with their centres lying on its axis. If the direction of current in the wire is reversed, the direction of lines of force is also reversed.
On increasing the strength of current in the wire, the lines of force becomes denser and iron fillings are arranged in circles upto a larger distance from the wire, showing that the magnetic field strength has increased.

Right hand thumb rule : If we hold the current carrying conductor in the right hand such that the thumb points in the direction of current, then the fingers encircle the wire in the direction of magnetic lines of force.



33. Use of pesticides to protect our crops affect organisms at various trophic levels especially human beings. Name the phenomenon involved and explain how does it happen. **3**

Sol. Pesticides used for crop protection when washed away/down into the soil/water bodies absorbed by plants/producers. On consumption they enter our food chain and being non-biodegradable, these chemicals get accumulated progressively and enter our body.
It is called as bio magnification.

SECTION-D

Q. No. 34 to 36 are long answer questions.

34. (a) (i) Give reason why carbon can neither form C^{4+} cations nor C^{4-} anions but form covalent compounds. **5**

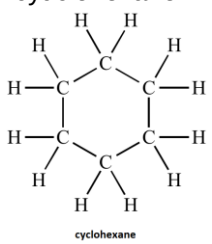
(ii) What is homologous series of carbon compound? Write the molecular formula of any two consecutive members of homologous series of aldehydes.
(iii) Draw the structure of the molecule of cyclohexane (C_6H_{12}).

Sol. (a) (i) Carbon can neither form C^{4+} cation nor C^{4-} anions because **it could gain four electrons forming** C^{4-} anion. But it would be difficult for the nucleus with six protons to hold onto ten electrons, that is, four extra electrons.

It could lose four electrons forming C^{4+} cation. But it would require a large amount of energy to remove four electrons leaving behind a carbon cation with six protons in its nucleus holding onto just two electrons.
Carbon overcomes this problem by sharing its valence electrons with other atoms of carbon or with atoms of other elements to form covalent compound.

(ii) Homologous series may be defined as a series of similarly constituted compounds in which the members possess similar chemical characteristics and the two consecutive members differ in their molecular formula by – CH_2.

Molecular formula of two consecutive members of homologues series of aldehyde-
(a) HCHO (formaldehyde) (b) C2H4O (acetaldehyde)
(iii)- Structure of cyuclohexane-



OR

(b) (i) Name a commercially important carbon compound having functional group -OH and write its molecular formula. **5**

(ii) Write chemical equation to show its reaction with

(1) Sodium metal

(2) Excess conc. sulphuric acid

(3) Ethanoic acid in the presence of an acid catalyst

(4) Acidified potassium dichromate

Also write the name of the product formed in each case.

Sol. (b)(i) Ethanol (C_2H_5OH)

(ii) Chemical equations to show reactions of ethanol with-

(1) Reaction with sodium : Ethanol reacts with sodium to produce hydrogen gas and sodium ethoxide.

$$\underset{\text{Ethanol}}{2C_2H_5OH} + 2Na \longrightarrow \underset{\text{Sodium ethoxide}}{2C_2H_5ONa} + H_2(\uparrow)$$

(2) Reaction with excess conc. Sulphuric acid-

$$CH_3CH_2OH \xrightarrow[443K]{\text{Conc. } H_2SO_4} CH_2 = CH_2 + H_2O$$

Ethanol Ethene

(3) When ethanol reacts with ethanoic acid in presence of concentrated sulphuric acid, ethyl ethanoate and water are formed.

$$\underset{\text{Ethanoic acid}}{CH_3COOH} + \underset{\text{Ethanol}}{C_2H_5OH} \xrightarrow{\text{Conc. } H_2SO_4} \underset{\text{Ethyl ethanoate}}{CH_3COOC_2H_5} + H_2O$$

(4) Reaction of ethanol with acidified potassium dichromate

$$\underset{\text{Ethanol}}{CH_3CH_2OH} \xrightarrow[\text{or } K_2Cr_2O_7+H_2SO_4]{\text{Alkaline } KMnO_4} \underset{\text{Ethanoic acid}}{CH_3COOH}$$

35. (a) (i) Distinguish between hormonal co-ordination in plants and animals. **5**

(ii) Which part of the brain is responsible for-

(1) intelligence

(2) riding a bicycle

(3) vomiting

(4) controlling hunger

(iii) How is brain and spinal-cord are protected against mechanical injuries?

Sol. (a) (i)

Plant Hormones	Animal Hormones
• These are also called phytohormones • In plant each cell can produce hormones • In plants hormones diffuses through xylem and phloem.	• These are also called chemical messenger. • In animal special glands are present which produces hormones • In animals hormones diffuses through blood.

(ii) (1) Cerebrum

(2) Cerebellum

(3) Medulla oblongata

(4) Hypothalamus

(iii) Brain is protected by skull and spinal cord is protected by vertebral column.

OR

35. (b) (i) What are tropic movements ? Give an example of hormone which (1) inhibits growth and (2) promotes cell division. **5**

(ii) Explain directional movement of a tendril in pea plant in response to touch. Name the hormone responsible for this movement.

Sol. (b) (i) Tropic movements are growth dependent movements in which direction of movement is determined by stimulus.

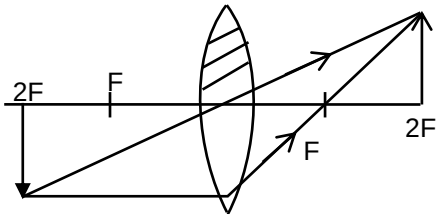
(1) Growth inhibitor $\rightarrow$ ABA (Abscisic acid)

(2) Cell division $\rightarrow$ Cytokinin

(ii) When a tendril comes in contact with a support auxin stimulate faster growth of the cells on the opposite side that why the tendril form a coil around the support. This Phenomenon is called as thigmotropism.

36. (a) Upper half of a convex lens is covered with a black paper. Draw a ray diagram to show the formation of image of an object placed at a distance of 2F from such a lens. Mention the position and nature of the image formed. State the observable difference in the image obtained if the lens is uncovered. Give reason to justify your answer. **5**

Sol.



- When an object lies at 2F, its real, inverted image having same size as that of the object is formed on the other side of the convex lens.
- The convex lens will form a complete image of an object, even if it's one-half is covered with black paper. It can be understood by the following.

In this case, a ray of light coming from the object will be refracted by the lower half of the lens. These rays meet at the other side of the lens to form the image of the given object, as shown in the above figure.

Full images are formed but the intensity of the image which is different.

(b) An object is placed at a distance of 30 cm from the optical centre of a concave lens of focal length 15 cm. Use lens formula to determine the distance of the image from the optical centre of the lens. **5**

Sol. (b)

u = –30 cm

f = – 15 cm

Using lens formula

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

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

$$\frac{-1}{15} + \frac{-1}{30} = \frac{1}{v}$$

$$\frac{-2-1}{30} = \frac{1}{v}$$

$$\frac{-3}{30} = \frac{1}{v}$$

v = –10 cm virtual & erect.

SECTION-E

Q. Nos. 37 to 39 are case based / data based questions with 2 to 3 short sub-parts. Internal choice is provided in one of these sub-parts.

37. Salts play a very important role in our daily life. Sodium chloride which is known as common salt is used almost in every kitchen. Baking soda is also a salt used in faster cooking as well as in baking industry. The family of salts is classified on the basis of cations and anions present in them. **4**

(a) Identify the acid and base from which Sodium chloride is formed. **1**

(b) Find the cation and the anion present in Calcium sulphate. **1**

(c) "Sodium chloride and washing soda both belong to the same family of salts." Justify this statement. **2**

Sol. (a) Acid- HCl Base- NaOH

(b) $CaSO_4$ ------ Ca^{+2} and SO_4^{-2}

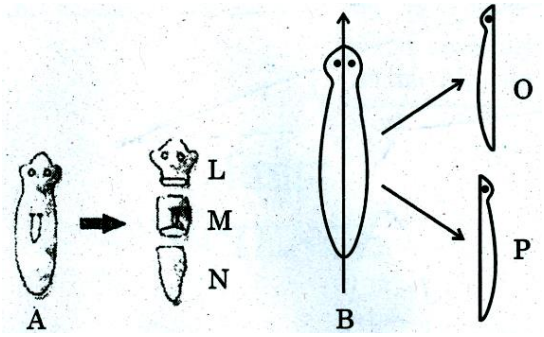
(c) "Sodium chloride and washing soda both belong to the same family of salts" but NaCl commonly known as table salt cannot be used as a substitute for washing soda in most applications while both substances contain sodium but they have different chemical composition and properties.
Sodium Chloride- NaCl Washing soda - $Na_2CO_3.10H_2O$

OR

(c) Define the term pH scale. Name the salt obtained by the reaction of Potassium hydroxide and Sulphuric acid and give the pH value of its aqueous solution. **2**

Sol. The pH scale is a commonly used scale to measure the acidity or the basicity of a substance. The possible values on the pH scale range from 0 to 14. Acidic substances have pH values ranging from 1 to 7 (1 being the most acidic point on the pH scale), and alkaline or basic substances have pH values ranging from 7 to 14.
Salt obtained by the reaction of potassium hydroxide and Sulphuric acid is potassium sulphate (K_2SO_4) and Ph value of its aqueous solution is 7.

38. Asexual reproduction involves a single parent to produce offsprings without the formation of gametes. It occurs by the following ways: Fission, Budding, Fragmentation, Spore formation and Regeneration. In one of the methods like regeneration, Planaria A is cut horizontally into three pieces - L, M and N and Planaria B is cut vertically into two equal halves - O and P.



(a) Which of the cut pieces of the two Planaria could regenerate to form a complete organism? **1**

(b) Give an example of another organism which follows the same mode of reproduction as Planaria. **1**

(c) What is the meaning of 'development' in regeneration? **2**

Sol. (a) LMN
(b) Hydra
(c) Development is related to regain its lost body part.

OR

(c) Differentiate between regeneration and fragmentation. **2**

Sol.

Regeneration	Fragmentation
It is an ability of an organism to regain its lost body part	It is the process in which body of an organism breaks into pieces and each piece develop into new individual.

39. When electric current flows in a purely resistive circuit electrical energy gets fully converted into heat energy. The amount of heat produced (H) in the circuit is found to be directly proportional to (i) the square of current (I^2) (ii) the resistance (R) of the conductor and (iii) the time (t) for which current flows. In other words $H = I^2Rt$. Electrical devices such an electric fuse, electric heater, electric iron etc. are all based on this effect called heating effect of electric current. **4**

(a) List two properties of heating elements. **1**
(b) List two properties of electric fuse. **1**
(c) Name the principle on which an electric fuse works. Explain how a fuse wire is capable of saving electrical appliances from getting damaged due to accidently produced high currents. **2**

Sol. $H = I^2Rt$
(a) List two properties of heating element
(i) High melting point
(ii) High resistivity

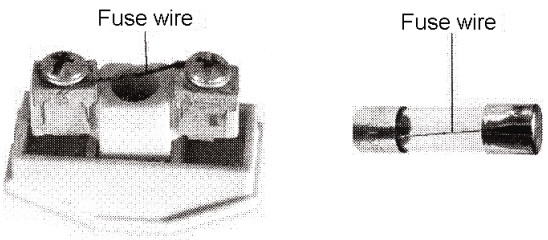
(b) List two properties of electric fuse
(i) It has low melting point
(ii) It has very high specific resistance

(c) **Joule's law of heating effect of electric current:** Joule found that when current is passed through a conductor the heat produced across it is:

(I) Directly proportional to the square of the current through the conductor i.e. $H \alpha I^2$
(II) Directly proportional to the resistance of the conductor i.e. $H \alpha R$
(III) Directly proportional to the time for which the current is passed i.e. $H \alpha t$
Combining the above three equations we have

$H = \frac{I^2Rt}{J}$ (in calorie) Where J is called Joule's mechanical equivalent of heat and has a value of $J = 4.18\ J\ cal^{-1}$. The above equation is called Joule's law of heating.

Electric fuse : An electric fuse is an easily fusible wire of short length put into an electrical circuit for protection purposes. It is arranged to melt ("blow") at a definite current.



It is an alloy of lead and tin (37% lead + 63% tin). It has a low resistivity and low melting point. As soon as the safe limit of current exceeds, the fuse "blows" and the electric circuit is cut off.

OR

(c) The power of an electric heater is 1100 W. If the potential difference between the two terminals of the heater is 220 V, find the current flowing in the circuit. What will happen to an electric fuse of rating 5 A connected in this circuit? **2**

Sol. Given that P = 1100 watt V = 220 volt

$P = VI$

$\Rightarrow I = \frac{P}{V} = \frac{1100}{220}$

I = 5 Amp.

For 5 amp it will continue without melting.