Date: 18/05/2026

SET~2

CODE 31/8/2

Aakash
Medical | IIT-JEE | Foundations

*Corporate Office :* AESL, 3rd Floor, Incuspaze Campus-2, Plot-13, Sector-18, Udyog Vihar, Gurugram, Haryana-122015

Time: 3 Hours

# Class-X

Max. Marks: 80

# SCIENCE

## CBSE Class-X (2026) Phase-2

## Answers & Solutions

### GENERAL INSTRUCTIONS

**Read the following instructions carefully and follow them :**

(i) This question paper comprises **39** questions. **All** questions are **compulsory**.

(ii) Question paper is divided into **THREE** sections – **A, B** and **C**.

**Section A : Biology (30 Marks)**

**Section B : Chemistry (25 Marks)**

**Section C : Physics (25 Marks)**

(iii) The question paper has MCQs, VSAs, SAs, LAs and C/S-BQs. Marks are given against each question.

(iv) There are **case based** questions (CBQs) with three sub-questions and are of **4 marks** each.

(v) **Divide your answer sheet into three sections as per question paper - Section A (Biology), Section B (Chemistry) and Section C (Physics). It is compulsory to answer each question in its respective section. Do not mix answers of one section into the other section.**

(vi) Instructions are given with each section and question, wherever necessary.

(vii) **Kindly note that a separate question paper has been provided for visually impaired candidates.**

(viii) There is no overall choice in the question paper. However, an internal choice has been provided in few questions. **Only one** the choices in such questions must be attempted.

## SECTION-A

1. Two pea plants one with round green seeds (RRyy) and another with wrinkled yellow seeds (rrYY) were crossed. All the seeds of $F_1$ progeny have round, yellow seeds (RrYy). When $F_1$ plants are self-pollinated, the $F_2$ progeny will have new combination of characters. **[1]**

   (i) Round, yellow

   (ii) Round, green

   (iii) Wrinkled, yellow

   (iv) Wrinkled, green

   Choose the option that shows new combination of characters in $F_2$ progeny.

   (A) (i) and (ii) (B) (i) and (iv)

   (C) (iii) and (iv) (D) (i) and (iii)

**Answer (B)**

**Sol.** Parental combinations were round green and wrinkled yellow.

So the new recombinations appearing in $F_2$ generation will be round yellow and wrinkled green. **[1]**

2. Examine the given food chains to establish the correct one in an ecosystem: **[1]**

   (A) Seed → mouse → snake → deer

   (B) Algae → small fish → large fish → hawk

   (C) Grasshopper → frog → snake → elephant

   (D) Plants → rabbit → deer → wolf

**Answer (B)**

**Sol.** The correct food chain in an ecosystem will be

Algae → small fish → large fish → hawk **[1]**

3. 'The lymph is colourless tissue fluid.' This indicates that it lacks __(i)__ cells and hence cannot carry __(ii)__ .

   From the following options, choose the one that correctly identifies (i) and (ii). **[1]**

   (A) (i) – Platelets; (ii) – excess fluid (B) (i) – Red blood; (ii) – oxygen

   (C) (i) – Red blood; (ii) – fats (D) (i) – White blood; (ii) – salts

**Answer (B)**

**Sol.** Here, (i) – Red blood; (ii) – oxygen **[1]**

4. Which of the following groups consists entirely of substances that are broken down by an enzyme, lipase? **[1]**

   (A) Carbohydrates, proteins and vitamins (B) Fats, oils and ghee

   (C) Minerals, starch and vitamins (D) Proteins, sugars and esters

**Answer (B)**

**Sol.** Oils, ghee and fats are digested by lipase. **[1]**

5. Select the incorrect statement from the following : **[1]**

   (A) Iodine is necessary for production of thyroxin hormone by pituitary gland.

   (B) Thyroxin regulates metabolism of carbohydrates, fats and protein.

   (C) Swelling of neck may indicate goitre due to iodine deficiency.

   (D) Thyroid is located in the neck region in our body.

**Answer (A)**

**Sol.** Thyroxin is produced by the thyroid gland, not the pituitary gland. Iodine is required for thyroxin production. **[1]**

6. Select the correct option that shows the path of flow of only the deoxygenated blood through the human circulatory system. **[1]**

(A) Body → left atrium → left ventricle → lungs → right atrium → right ventricle → body

(B) Right atrium → right ventricle → lungs → left atrium → left ventricle → body

(C) Body → left atrium → left ventricle → lungs

(D) Body → right atrium → right ventricle → lungs

**Answer (D)**

**Sol.** Deoxygenated blood from the body enters into the right atrium, then it moves to the right ventricle. From there, it is pumped to the lungs for oxygenation. **[1]**

7. A man underwent MRI of brain which shows some defects in the cerebellum of his brain. Which activity of that person will be affected? **[1]**

(A) Heart beat (B) Feeling of hunger and thirst

(C) Reflexes (D) Walking in straight line

**Answer (D)**

**Sol.** Cerebellum controls balance, posture, and coordination of muscular movements. **[1]**

Question No. **8 & 9** consists of **two** statements – Assertion (A) and Reason (R). Answer these questions selecting the appropriate option from (A), (B), (C) and (D) given below:

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

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

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

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

8. **Assertion (A) :** The energy transferred to a lion when it eats a deer is only a small fraction of the deer's total energy content.

**Reason (R) :** Energy transfer is efficient at all trophic levels with nearly 90% of energy passed on to the next level. **[1]**

**Answer (C)**

**Sol.** Energy transfer is highly inefficient. Nearly 90% of the energy is lost as heat during respiration and digestion at each trophic level. **[1]**

9. **Assertion (A) :** A reflex arc provides an immediate and automatic response to a stimulus.

**Reason (R) :** The nerve pathway in a reflex arc involves the brain for the fastest possible processing. **[1]**

**Answer (C)**

**Sol.** The nerve pathway in a reflex arc mainly involves the spinal cord, not the brain, to minimize processing time and ensure the fastest possible reaction.

10. (A) Transport of water and minerals in plants takes place through xylem tissue where vessels and tracheids of roots, stems and leaves are interconnected. This forms a continuous system of channels reaching all plant parts. Simple physical forces are involved in the process. If the soil has adequate water, name and explain which force will be acting effectively at : **[2]**

(i) Night

(ii) Day

**OR**

(B) Although plants do not have excretory system still they are able to get rid-off their waste products. How ?

**Sol.** (A) When soil has adequate water:

(i) **Night – Root Pressure**

At night, transpiration is very low because stomata remain mostly closed. Hence, the upward movement of water mainly occurs due to **root pressure**. Roots actively absorb mineral ions from the soil. This increases the concentration of solutes in the root cells. Water enters the roots by **osmosis**. The accumulated water creates pressure in the roots called **root pressure**. **[1]**

(ii) **Day – Transpiration Pull**

During the day, stomata are open and transpiration occurs actively. Hence, the main force is **transpiration pull**. Water evaporates from the leaves through stomata. This creates a negative pressure (suction) in the leaf xylem. Due to cohesion between water molecules and adhesion to xylem walls, a continuous water column is maintained. This pulls water upward from roots to leaves. **[1]**

**OR**

(B) Although plants do not have a specialized excretory system like animals, they are able to remove waste materials by different methods:

Gaseous wastes such as oxygen and carbon dioxide are removed through stomata in leaves and lenticels in stems.

Some waste substances are stored in leaves, bark, old xylem, or fruits, which are later shed off.

Wastes may be stored in the form of gums, resins, latex, and crystals.

Some waste materials are released into the surrounding soil through roots. **[2]**

11. The sensitive plant shows movement of leaves in response to touch. Explain such movement briefly. **[2]**

**Sol.** Leaves of plant *Mimosa pudica* or 'touch-me-not'. On touching leaves there is immediate folding and drooping of leaves. It is apparent that point of movement is different from point of touch. Plants use an electrical-chemical means to convey the information from cell to cell but they do not have specialised tissue for conduction of information. Once the information reaches the point of movement, plant cells change shape by changing the amount of water in them. Thus, the leaves fold and droop. **[2]**

12. (A) Name the reproductive and non-reproductive parts of bread mould (Rhizopus). **[2]**

(B) Give any two advantages of sexual reproduction in plants.

**Sol.** (A) In bread mould (*Rhizopus*), the sporangia and spores act as the reproductive parts, while the vegetative (non-reproductive) structures include the hyphae, mycelium, rhizoids and stolons. **[1]**

(B) • It mixes genetic material from two parents, creating unique offspring with diverse genetic combinations. **[0.5]**

• Because of the variations introduced, plants are better equipped to adapt to changing environmental conditions. **[0.5]**

13. "Each organism has two sets of all genes, one inherited from each parent i.e. both parents contribute equally to the DNA of the progeny during sexual reproduction".

If such is the case, then how is the stability of DNA of the species ensured ?

Discuss. **[3]**

**Sol.** During sexual reproduction, each body cell has two sets of chromosomes, one from the mother and one from the father. Germ cells (gametes) are formed by taking only one chromosome from each pair, so they contain a single set of genes. These chromosomes are separate independent units, not one long DNA thread. When male and female germ cells fuse during fertilisation, the normal number of chromosomes is restored in the offspring. In this way, the stability of DNA of the species is maintained, while different combinations of genes produce variations. **[3]**

14. Consider a simple aquatic ecosystem like a lake which consists of algae, small fish and large fishes. It was found that the lake water was contaminated with a low concentration of a non-biodegradable pesticide, DDT. Based on this ecosystem, answer the following questions : **[3]**

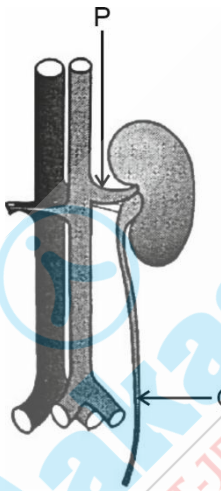
(a) In which organism will the concentration of the pesticide DDT be the highest ? Name and explain the phenomenon.

(b) Why is the flow of energy in a food chain always unidirectional ?

**Sol.** (a) The concentration of DDT will be highest in large fish. This phenomenon is called biomagnification or biological magnification. Since DDT is non-biodegradable, it keeps accumulating in organisms and its concentration increases at each trophic level of the food chain. **[2]**

(b) The flow of energy is unidirectional. The energy that is captured by the autotrophs does not revert back to the solar input and the energy which passes to the herbivores does not come back to autotrophs. As it moves progressively through the various trophic levels it is no longer, available to the previous level. **[1]**

15. The given diagram shows the human kidney and its associated structures.




Study the Table I and Table II that shows the concentration of certain substances found within the structure P and Q.

| **Table I** | - | **Structure P** |
|---|---|---|
| **components** | | **concentration %** |
| Urea | - | 0.05 |
| Amino acids | | 0.06 |
| Salts | | 1.72 |
| Glucose | | 0.10 |
| **Table II** | - | **Structure Q** |
| **Components** | - | **concentration %** |
| Urea | - | 1.00 |
| Amino acids | - | 0.00 |
| Salts | - | 1.60 |
| Glucose | - | 0.00 |

(A) Where are kidneys located in the human body ? Name the filtration unit of them. **[1]**

(B) List two factors on which reabsorption of water from the filtrate depends. **[1]**

(C) Why is there variation in the concentration of given substance in structure P and Q listed in table I and II respectively ? **[2]**

**OR**

(C) If a person is suffering from diabetes, concentration of which substance present in structure Q (listed in table II) will be modified and why ? **[2]**

**Sol.** (A) Kidneys are located in the abdomen, one on either side of the backbone. The filtration units of kidney are called nephrons. **[1]**

(B) The amount of water re-absorbed depends on the amount of excess water in the body and on the dissolved waste to be excreted. **[1]**

(C) Here, the structure 'P' is renal vein, while 'Q' is ureter.

Essential nutrients like glucose and amino acids are selectively reabsorbed by nephrons back into the blood. Waste products like urea are filtered and concentrated into urine instead of being reabsorbed. **[2]**

**OR**

(C) The substance whose concentration is modified is glucose as high blood sugar levels exceed the kidney's capacity to reabsorb glucose. Excess glucose remains unabsorbed in the filtrate and passes out into the urine. **[2]**

16. (A) (i) Name the special tissue inside the uterus that provides nutrition to the developing embryo. Describe its structure. State its two functions besides nutrition. **[3]**

(ii) Write any two sexually transmitted diseases in humans and their causative microbial agents. **[2]**

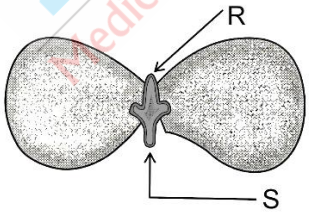
**OR**

(B) In flowering plants, the process of pollination leads to fertilization. **[5]**

(i) Explain with the help of a well-labelled diagram how the male germ cell from the pollen grain reaches the female germ cell located in the ovule.

(ii) Differentiate between self-pollination and cross-pollination.

(iii) Identify and name the parts 'R' and 'S' in the given diagram of seed.




**Sol.** (A) (i) Placenta **[1]**

**Structure of placenta:**

- It is a disc-like tissue embedded in the uterine wall.
- It contains villi on the embryo's side of the tissue.
- On the mother's side, it contains blood spaces that surround the villi. **(Any one) [1]**

**Functions of placenta are:**

- It provides oxygen to the developing embryo and removes carbon dioxide.
- It removes nitrogenous waste products generated by the embryo by transferring them into the mother's blood. **(Any two) [2×½]**

(ii) • Syphilis

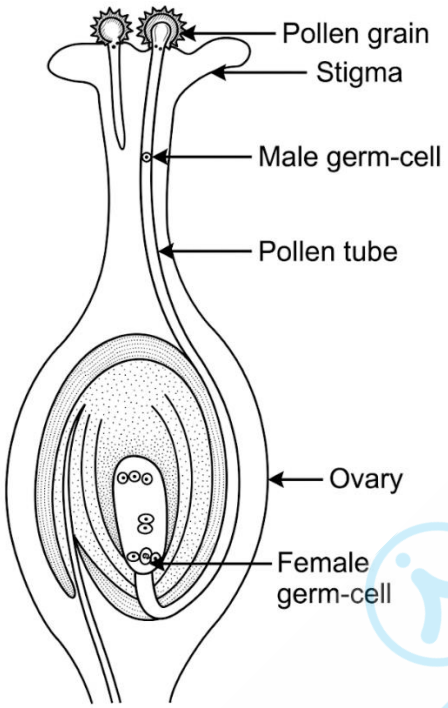
Causative agent: Bacterium

• AIDS (Acquired immunodeficiency syndrome)

Causative agent: Virus **[2×1]**

**OR**

(B) (i)




**[1]**

A pollen grain lands on the stigma of a compatible flower.

The pollen grain germinates and produces a pollen tube. This tube grows down through the style toward the ovary.

The pollen tube carries two male germ cells (gametes). It enters the ovule through a small opening called the micropyle.

Once inside, one male germ cell fuses with the female germ cell (egg) to form a zygote. **[2]**

(ii) **Differences between self-pollination and cross-pollination are:**

| **Features** | **Self-pollination** | **Cross-pollination** |
|---|---|---|
| Transfer | Pollen moves from anther to stigma of the same flower or another flower on the same plant. | Pollen moves from the anther of one flower to the stigma of a flower on a different plant of the same species. |
| Agents | Does not strictly require external pollinators (wind, insects). | Requires external agents like wind, water, insects or animals. |

**(Any one) [1]**

(iii) Here, the labelled part '**R**' is plumule (future shoot) and the labelled part '**S**' is radicle (future root).

**[2×½]**

## SECTION-B

17. The number of isomers of butane is **[1]**

(A) 1 (B) 2

(C) 3 (D) 4

**Answer (B)**

**Sol.** Butane ($C_4H_{10}$) has two structural isomers which are as follows :

- n-butane : $CH_3 – CH_2 – CH_2 – CH_3$
- Isobutane or 2–methylpropane : $CH_3 – CH(CH_3) – CH_3$ **[1]**

18. Which of the following compound is formed when $CO_2$ gas is passed through ammoniacal brine solution? **[1]**

(A) $Na_2CO_3$ (B) $NH_4Cl$

(C) NaOH (D) $NaHCO_3$

**Answer*(B&D)**

**Sol.** $NaCl + NH_3 + H_2O + CO_2 \longrightarrow NaHCO_3 + NH_4Cl$ **[1]**

19. Which of the following compounds will undergo addition reaction? **[1]**

(A) $C_3H_8$ (B) $C_4H_8$

(C) $C_2H_6$ (D) $C_4H_{10}$

**Answer (B)**

**Sol.** Butene ($C_4H_8$) is an unsaturated hydrocarbon so it will undergo addition reaction **[1]**

20. In the compound $CH_3 – \underset{\underset{O}{\|}}{C} – OH$, which of the following functional group is present? **[1]**

(A) Carboxylic acid (B) Alcohol

(C) Aldehyde (D) Ketone

**Answer (A)**

**Sol.** The given compound is ethanoic acid and it contains carboxylic acid (–COOH) group. **[1]**

21. Which of the following acid-base indicators will be used by a visually challenged student to detect the presence of acid in a given solution? **[1]**

(A) Blue litmus

(B) Clove oil

(C) Red cabbage extract

(D) Methyl orange

**Answer (B)**

**Sol.** Clove oil is an olfactory indicator. Olfactory indicator are the substances whose odour changes in acidic or basic media.

22. Which of the following aqueous solution reacts with crushed egg-shells to give a gas that turns lime water milky? **[1]**

(A) KCl (B) HCl

(C) NaCl (D) $NH_4Cl$

**Answer (B)**

**Sol.** Egg-shells contain calcium carbonate. Calcium carbonate reacts with dilute aqueous solution of hydrogen chloride and produces carbon dioxide gas which turns lime water milky.

$CaCO_3(s) + 2HCl(aq) \rightarrow CaCl_2(aq) + H_2O(l) + CO_2(g)$

$$\underset{\text{(Lime water)}}{Ca(OH)_2(aq)} + CO_2(g) \longrightarrow \underset{\text{(White precipitate)}}{CaCO_3(s)} + H_2O(l)$$

23. During the preparation of hydrogen chloride gas on a humid day, the gas is usually passed through a guard tube containing calcium chloride. The role of $CaCl_2$, taken in guard tube is to - **[1]**

(A) Absorb the evolved gas

(B) Moisten the gas

(C) Absorb moisture from the gas

(D) Absorb chloride ions from the evolved gas

**Answer (C)**

**Sol.** Anhydrous calcium chloride ($CaCl_2$) acts as a drying agent, so it absorbs moisture from the gas.

For question number **24**, **two** statements are given-one labelled as Assertion (A) and the other labelled as Reason (R). Answer this question selecting the appropriate option from (A), (B), (C) and (D) given below :

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

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

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

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

24. **Assertion (A) :** Sodium acetate is a basic salt. **[1]**

**Reason (R) :** It is because it is a salt of weak acid and strong base.

**Answer (A)**

**Sol.** Sodium acetate is a basic salt because it is formed from strong base (sodium hydroxide) and weak acid (acetic acid).

A salt formed from the neutralisation of strong base and weak acid is called basic salt.

25. Write chemical equations for the reactions taking place when : **[1+1]**

(A) $Fe_2O_3$ is heated with aluminium powder.

(B) Sodium metal reacts with water.

**Sol.** (A) $Fe_2O_3(s) + 2Al(s) \xrightarrow{\text{Heat}} 2Fe(l) + Al_2O_3(s) + \text{Heat}$ **[1]**

(B) $2Na(s) + 2H_2O(s) \longrightarrow 2NaOH(aq) + H_2(g) + \text{Heat}$ **[1]**

26. (A) Name the acid present in ant sting and give its chemical formula. Give the common method to get relief from the pain and irritation caused by ant sting.

(B) Two solutions 'X' and 'Y' have pH values 3.0 and 9.5 respectively. Which of these will turn blue litmus to red and which will turn phenolphthalein from colourless to pink? **[2+1]**

**Sol.** (A) The acid present in ant sting is formic (methanoic) acid. **[½]**

Its chemical formula is HCOOH. **[½]**

Use of a mild base like baking soda on the stung area gives relief from the pain and irritation. **[1]**

(B) Solution 'X' = Turns blue litmus red. **[½]**

Solution 'Y' = Turns phenolphthalein from colourless to pink. **[½]**

27. Attempt either option (A) or (B):

(A) (i) State any two reasons for carbon forming a large number of compounds. Why does carbon form compounds mainly by covalent bonds?

(ii) Identify the compound which contains aldehyde as its functional group:

$C_3H_7OH$, $C_3H_7Cl$, $C_2H_5CHO$, $CH_3COCH_3$ **[2+1]**

**OR**

(B) An organic compound 'X' is a constituent of wine. 'X' on reacting with acidified $K_2Cr_2O_7$ forms another compound 'Y' with molecular formula $C_2H_4O_2$. 'Y' produces brisk effervescence with sodium carbonate.

(i) Identify 'X' and 'Y'.

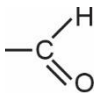
(ii) Name the gas evolved when 'Y' reacts with sodium carbonate.

(iii) Write the chemical equations involved for the chemical reactions taking place. **[3×1]**

**Sol.** (A) (i) The two primary reasons are:

1. **Catenation:** Carbon has the unique ability to form strong covalent bonds with other carbon atoms, giving rise to long straight chains, branched chains, or ring structures. This self-linking property is called catenation. **[1]**
2. **Tetravalency:** Carbon has an atomic number of 6, with an electronic configuration of (2, 4). Having four valence electrons, it is capable of bonding with four other atoms of carbon or atoms of other elements. **[1]**

(ii) Formula of aldehyde functional group is



The compound which contains aldehyde as its functional group is $C_2H_5CHO$ **[1]**

**OR**

(B) (i) 'X' is ethanol ($C_2H_5OH$) **[½]**

'Y' is ethanoic acid ($CH_3COOH$) **[½]**

(ii) The gas evolved when 'Y' reacts with sodium carbonate is carbon dioxide ($CO_2$) **[1]**

(iii) $\underset{\text{'X'}}{CH_3-CH_2OH} \xrightarrow[\text{Or acidified } K_2Cr_2O_7+\text{Heat}]{\text{Alkaline } KMnO_4+\text{Heat}} \underset{\text{'Y'}}{CH_3COOH}$ **[½]**

$Na_2CO_3(s) + 2\underset{\text{'Y'}}{CH_3COOH}(aq) \rightarrow 2CH_3COONa(aq) + H_2O(l) + CO_2(g)$ **[½]**

28. The Statue of Liberty is one of the seven wonders. It is present on Liberty island in New York harbour in U.S.A. It is made up of a metal. Over a period of time, the metal's colour has changed and statue gives greenish look.

Answer the following questions based on the above information:

(A) What is corrosion? **[1]**

(B) Why do silver articles turn black after some time? **[1]**

(C) Copper reacts with moist gas 'A' present in the air and slowly loses its shiny surface. It turns green. Identify 'A' and the substance of green coating formed on the surface of copper. **[2]**

**OR**

(C) What is an alloy? How is an alloy made? **[2]**

**Sol.** (A) Corrosion is a slow process of the degradation or eating away of metals due to their reaction with atmospheric air (oxygen), moisture (water), or other chemicals present in the environment on their surface. A common example is the rusting of iron. **[1]**

(B) Silver articles turn black after some time because silver reacts with sulphur compounds, specifically hydrogen sulphide ($H_2S$) gas, present in the air. This reaction forms a black coating of silver sulphide ($Ag_2S$) on the surface of the article. **[1]**

(C) The moist gas 'A' present in the air is carbon dioxide ($CO_2$). **[1]**

The green substance formed on the surface of copper is basic copper carbonate, which has the chemical formula $CuCO_3 \cdot Cu(OH)_2$. **[1]**

**OR**

(C) An alloy is a homogeneous mixture of two or more metals, or a metal and a non-metal. It is prepared by first melting the primary (base) metal and then dissolving the other constituent elements (metals or non-metals) into it in definite, fixed proportions. This molten mixture is then allowed to cool to room temperature. **[2]**

29. Attempt either option (A) or (B):

(A) Write chemical equations for the following when

(a) Silver bromide is exposed to sunlight.

(b) A piece of lead metal is dropped into copper (II) chloride solution.

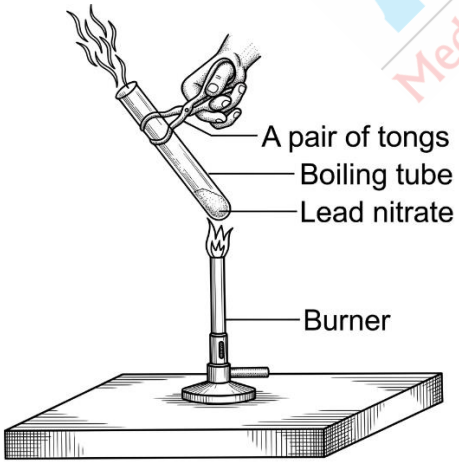
(c) Hydrogen gas is passed over heated copper oxide.

(d) Methane gas is burnt in air.

(e) Quick lime is mixed with water. **[5×1]**

**OR**

(B) (a)




Study the experimental setup shown in the diagram and write chemical equation for the same. Name and define the type of reaction. Mention the colour of the products formed. **[3]**

(b) What type of reaction takes place when aqueous solution of lead (II) nitrate and potassium iodide are mixed together? Write chemical equation also. **[2]**

**Sol.** (A) (a) $2AgBr(s) \xrightarrow{\text{Sunlight}} 2Ag(s) + Br_2(g)$ **[1]**

(b) $Pb(s) + CuCl_2(aq) \longrightarrow PbCl_2(aq) + Cu(s)$ **[1]**

(c) $CuO(s) + H_2(g) \xrightarrow{\Delta} Cu(s) + H_2O(g)$ **[1]**

(d) $CH_4(g) + 2O_2 \longrightarrow CO_2(g) + 2H_2O(l) + \text{Heat}$ **[1]**

(e) $CaO(s) + H_2O(l) \longrightarrow Ca(OH)_2(aq) + \text{Heat}$ **[1]**

**OR**

(B) (a) $2Pb(NO_3)_2(s) \xrightarrow{\Delta} 2PbO(s) + 4NO_2(g) + O_2(g)$ **[1]**

**Type of reaction:** Thermal decomposition reaction **[½]**

**Defination:** The reaction in which a single reactant breaks down into number of products, on applying heat, is called thermal decomposition reaction. **[½]**

Color of products formed:

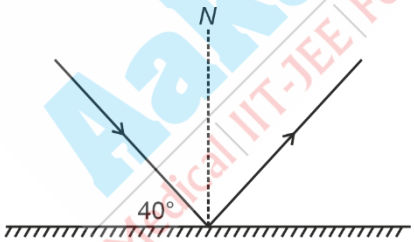
- Yellow solid of PbO
- Brown fumes of $NO_2$
- Colourless $O_2$ gas **[1]**

(b) Type of reaction- Double displacement reaction or precipitation reaction. **[1]**

$Pb(NO_3)_2(aq) + 2KI(aq) \longrightarrow PbI_2(s) + 2KNO_3(aq)$ **[1]**

## SECTION-C

30. In the given ray diagram the values of the angle of incidence and the angle of reflection are : **[1]**




(A) $i = 50°, r = 40°$ (B) $i = 40°, r = 50°$

(C) $i = 40°, r = 40°$ (D) $i = 50°, r = 50°$

**Answer (D)**

**Sol.** $\angle i = 90° - 40°$

$\angle i = 50°$

As, $\angle i = \angle r$

$\therefore \quad \angle r = 50°$ **[1]**

31. When a convergent beam of light is incident on a convex mirror, the reflected rays appear to be coming from a point 20 cm behind the mirror and retrace their path. The focal length of the mirror is **[1]**

(A) 20 cm (B) 10 cm

(C) 40 cm (D) 30 cm

**Answer (B)**

**Sol.** $R = 20$ cm

$$f = \frac{R}{2} = \frac{20}{2} = 10 \text{ cm}$$ **[1]**

**For question number 32, two statements are given – one labelled as Assertion (A) and the other is labelled as Reason (R). Answer this question selecting the appropriate option from (A), (B), (C) and (D) given below :**

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

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

(C) Assertion (A) is true, but Reason (R) is false

(D) Assertion (A) is false, but Reason (R) is true

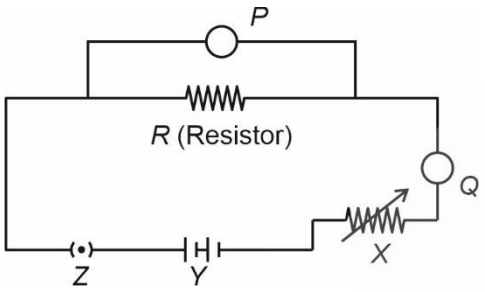
32. **Assertion (A) :** The bending of a straight wire in the form of current carrying circular coil will change the pattern of magnetic field around it.

**Reason (R) :** Strength of magnetic field depends upon number of turns of coil and current flowing through the coil. **[1]**

**Answer (B)**

**Sol.** Magnetic field lines due to a current carrying straight wire shows the pattern of concentric circles around the wire while due to current carrying coil, it appear as straight lines at the centre of the loop.

The magnetic field produced by a current carrying wire at a given point depends directly on the current passing through it. Therefore, if there is a circular coil having *n* turns, the field produced is *n* times as large as the produced by a single turn. **[1]**

33. 

**[2]**

(A) In the given electric circuit of Ohm's law experiment, identify *P* and *X*.

(B) Write the uses of *Q* and *X* in the given circuit.

**Sol.** (A) *P* — Voltmeter. **[½]**

*X* — Variable resistance or rheostat. **[½]**

(B) *Q i.e.*, ammeter is used to measure electric current in a circuit. **[½]**

*X i.e.*, rheostat is often used to change the resistance in the circuit. **[½]**

34. (A) What is meant by scattering of light? **[2]**

How do our observations differ when white light (sun light) is scattered from (i) very fine particles of the medium and (ii) very large particles of the medium?

**OR**

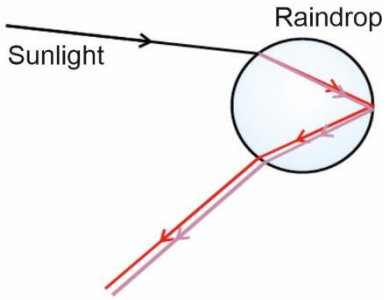
(B) With the help of a ray diagram, explain a phenomenon of formation of spectrum in nature.

**Sol.** (A) Particles include smoke, tiny water droplets, suspended particles of dust and molecules of air. When a beam of light strikes such fine particles, the path of the beam becomes visible. This phenomenon is called scattering of light. **[1]**

The colour of the scattered light depends on the size of the scattering particles. Very fine particles scatter mainly blue light while particles of larger size scatter light of longer wavelengths. If the size of the scattering particles is large enough, then, the scattered light may even appear white. **[1]**

**OR**

(B) A rainbow is a natural spectrum appearing in the sky after a rain shower. It is caused by dispersion of sunlight by tiny water droplets, present in the atmosphere. A rainbow is always formed in a direction opposite to that of the Sun. The water droplets act like small prisms. They refract and disperse the incident sunlight, then reflect it internally, and finally refract it again when it comes out of the raindrop. Due to the dispersion of light and internal reflection, different colours reach the observer's eye. **[1]**




**[1]**

35. (A) Write any two precautions to be taken to avoid electrical accidents. **[3]**

(B) State how these precautions prevent possible damage to the electric circuit.

**Sol.** (A) (i) To avoid the risk of electric shocks, metallic body of electric appliances should be earthed.

(ii) The fuse should always be connected in live wire. **[1.5]**

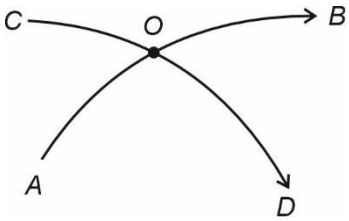
(B) (i) The earth wire provides a low-resistance conducting path for the current. Thus it diverts any leakage of the current to the metallic body of the appliance and keeps its potential to the earth, protecting the device's internal components.

(ii) A fuse in a circuit prevents damage to the appliances and the circuit due to overloading. **[1.5]**

36. (A) A vertical wire is carrying a current in the upward direction. It is placed in a magnetic field, pointing towards the East direction. Find out the direction of force on the wire. **[3]**

(B) Out of the two current carrying circular coils, coil 'A' has 10 turns while coil 'B' has 15 turns. Which of the two coils will produce a stronger magnetic field at its centre if same current is flowing through both the coils? Explain with reason.

(C)




In the given figure, *AB* and *CD* are two magnetic field lines intersecting each other at point *O*. If a compass is placed at point *O*, what will happen? State your conclusions.

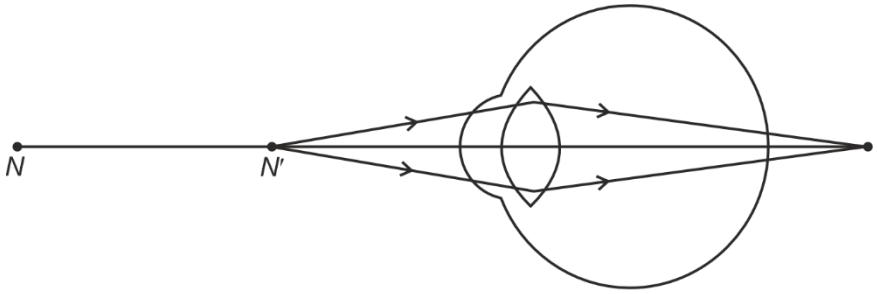
**Sol.** (A) Using Fleming's left hand rule the direction of force on the wire is in North-direction. **[1]**

(B) In a circular coil having *n* turns, the field produced is *n* times as large as that produce by a single turn. Hence, coil *B* having 15 turns will produce a stronger magnetic field at its centre if same current is flowing through both the wires. **[1]**

(C) The magnetic compass needle will not point in a particular direction because at the point of intersection there will be two tangents which give two directions of magnetic field at the same point which is not possible. **[1]**

37. A person cannot read newspaper placed nearer than 50 cm from his eyes. Name the defect of vision he is suffering from. Draw a ray diagram to illustrate the defect. List two possible causes of this defect also. **[3]**

**Sol.** The person is suffering from hypermetropia. **[1]**



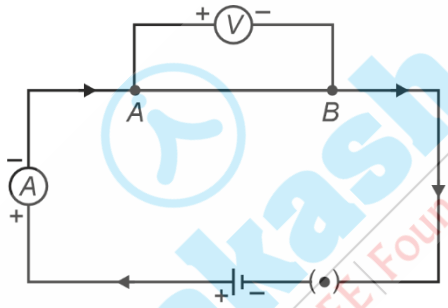

Hypermetropic eye **[1]**

This defect arises either because

(i) The focal length of the eye lens is too long. **[½]**

(ii) The eyeball has become too small. **[½]**

38. Four cells, a thin wire *AB*, a voltmeter, an ammeter, a plug key and some thick connecting wires are taken. The circuit is set up as shown below. **[4]**




The key is inserted into the plug and readings of ammeter (*I*) and voltmeter (*V*) are noted. Then the plug key is removed. Now two cells are connected in the circuit in series. Plugging in the key the new values of '*V*' and '*I*' are noted. The experiment is repeated by connecting three cells in series and then four cells. In each case '*V*' and '*I*' are noted.

(A) Why was the plug key removed after each measurement of '*V*' and '*I*' and inserted again for the next step?

(B) What change takes place in the reading of the voltmeter when a new cell is added in series in the circuit? Give reason.

(C) In which case will the readings of voltmeter and ammeter be maximum in the above experiment? What conclusion can be drawn from the straight line graph between '*V*' and '*I*'?

**OR**

(C) Suppose this experiment is carried out using only one cell but wires of same length & thickness but made of different material like nichrome wire, fuse wire, copper wire and iron wire which are replaced one by one. Out of *V* and *I* which will change and why?

**Sol.** (A) To protect the cell and to ensure accurate measurement. **[1]**

(B) Voltmeter reading will increase, because when more cells are added keeping resistance constant more current will flow through wire *AB*. By Ohm's law.

$V \propto I$ **[1]**

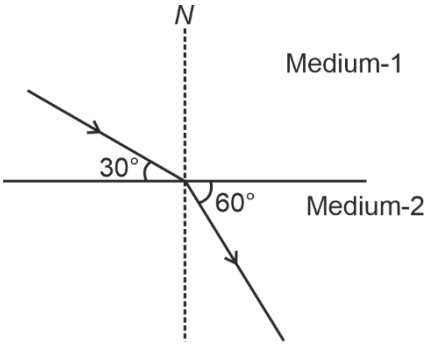
(C) When four cells are connected in series, then the reading of voltmeter and ammeter will be maximum in the above experiment. **[1]**

The straight line graph between *V* and *I* indicates that the current through ammeter is directely proportional to the voltage applied. **[1]**

**OR**

(C) When the wire is replaced by the wires made of different materials keeping length and thickness same, the resistance of the circuit changes. Due to which both *V* and *I* will change. **[2]**

39. (A) (i)




With the help of given ray diagram, calculate the refractive index of medium 2 with respect to medium 1. **[5]**

(ii) If speed of light in medium-1 is $3 \times 10^8$ m/s, then calculate the speed of light in medium-2.

(iii) Compare the optical density of medium-1 and medium-2 and justify your answer.

**OR**

(B) (i) Define the focus of a convex lens.

(ii) An object placed on a meter scale at 8 cm mark, was focused on a white screen placed at 92 cm mark, by using a converging lens placed on the scale at 50 cm mark.

(I) Find the focal length of converging lens.

(II) Find the position of object if the image forms at 71 cm mark on meter scale.

(III) State the nature of image formed if the object is kept on 36 cm mark of meter scale.

**Sol.** (A) (i) Given $i = 60°$

$r = 30°$

By Snell's law

$\mu_1 \sin i = \mu_2 \sin r$

$\mu_1 \sin 60° = \mu_2 \sin 30°$

$$\frac{\sin 60°}{\sin 30°} = \frac{\mu_2}{\mu_1}$$ **[1]**

$$\frac{\frac{\sqrt{3}}{2}}{\frac{1}{2}} = \frac{\mu_2}{\mu_1}$$

$$\frac{\mu_2}{\mu_1} = \sqrt{3}$$

Refractive index of medium 2 with respect to medium 1 is $\sqrt{3}$. **[1]**

(ii) Speed of light in medium 1

$$v_1 = \frac{c}{\mu_1} = 3 \times 10^8 \text{ m/s} \quad \ldots(1)$$

Speed of light in medium 2

$$v_2 = \frac{c}{\mu_2} \quad \ldots(2)$$

From equations (1) and (2)

$$\frac{v_1}{v_2} = \frac{\left(\frac{c}{\mu_1}\right)}{\left(\frac{c}{\mu_2}\right)} = \frac{\mu_2}{\mu_1}$$

$$\frac{3 \times 10^8}{v_2} = \frac{\mu_2}{\mu_1}$$ **[1]**

$$\frac{3 \times 10^8}{v_2} = \sqrt{3}$$

$$v_2 = \sqrt{3} \times 10^8 \text{ m/s}$$

$= 1.73 \times 10^8$ m/s **[1]**

(iii) Since $\mu_1 < \mu_2$, medium-2 is optically denser than medium-1. **[1]**

**OR**

(B) (i) (I) The principal focus of a convex lens is the point on the principal axis where rays of light parallel to the principal axis converge after refraction through the lens. **[1]**

(II) Object position = 8 cm mark

Lens position = 50 cm mark

Screen (image) position = 92 cm mark

Object distance,

$u = 50 - 8 = 42$ cm

Image distance,

$v = 92 - 50 = 42$ cm **[1]**

(ii) (I) Using lens formula

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

$$\frac{1}{f} = \frac{1}{42} - \left(\frac{1}{-42}\right)$$

$f = 21$ cm **[1]**

(II) Lens position = 50 cm

Image position = 71 cm

So,

$v = 71 - 50 = 21$ cm

Focal length,

$f = 21$ cm

Using lens formula

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

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

$$\frac{1}{u} = \frac{1}{21} - \frac{1}{21}$$

$u = \infty$

Therefore, the object should be placed at infinity. **[1]**

(III) $u = 50 - 36 = 14$ cm

$u < f$ (14 cm < 21 cm)

For a convex lens, when the object is placed between the optical centre and principal focus, the image formed is virtual, erect and magnified. **[1]**

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