Class X Session 2025-26
Subject - Science
Sample Question Paper - 04

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

General Instructions:

1. This question paper consists of 39 questions in 3 sections. Section A is Biology, Section B is Chemistry and Section C is Physics.
2. All questions are compulsory. However, an internal choice is provided in some questions. A student is expected to attempt only one of these questions.

Section A

1. Most of the digestion and absorption of the food takes place in the **[1]**

   a) small intestine
   b) stomach
   c) large intestine
   d) liver

2. The statement that correctly describes the characteristic(s) of a gene is: **[1]**

   a) Each chromosome has only one gene located all along its length.
   b) In individuals of a given species, a specific gene is located on a particular chromosome.
   c) All the inherited traits in human beings are not controlled by genes.
   d) A gene is not the information source for making proteins in the cell.

3. Some wastes are given below: **[1]**

   i. Garden waste
   ii. Ball point pen refills
   iii. Empty medicine bottles made of glass
   iv. Peels of fruits and vegetables
   v. Old cotton shirt

   The non-biodegradable wastes among these are:

   a) (i), (iii) and (iv)
   b) (i), (iv) and (v)
   c) (ii) and (iii)
   d) (i) and (ii)

4. Match the following with correct response. **[1]**

Column A	Column B
(i) Thyroid gland	(a) Testosterone
(ii) Pancreas	(b) Thyroxin
(iii) Testis	(c) Estrogen
(iv) Ovaries	(d) Insulin and glucagon

a) (i) - (d), (ii) - (a), (iii) - (c), (iv) - (b)

b) (i) - (a), (ii) - (d), (iii) - (b), (iv) - (c)

c) (i) - (c), (ii) - (b), (iii) - (d), (iv) - (a)

d) (i) - (b), (ii) - (d), (iii) - (a), (iv) - (c)

5. Which of the following are water intensive crops? **[1]**

a) Wheat and sugarcane

b) Wheat and rice

c) Sugarcane and rice

d) Wheat and gram

6. Which one of the following statements is correct about the human circulatory system? **[1]**

a) Blood transports only oxygen and not carbon dioxide.

b) Human heart has five chambers.

c) Valves ensure that the blood does not flow backwards.

d) Both oxygen-rich and oxygen-deficient blood gets mixed in the heart.

7. Identify an involuntary action from the following: **[1]**

a) Regular beating of heart

b) Riding a bicycle

c) Picking up a pencil

d) Walking in a straight line

8. **Assertion (A):** Offsprings produced by asexual reproduction are genetically similar to the parents. **[1]**
Reason (R): Asexual reproduction involves a single parent.

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.

9. **Assertion (A):** The waste we generate daily may be biodegradable or non-biodegradable. **[1]**
Reason (R): The waste generated, if not disposed off properly may cause serious environmental problems.

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.

10. a. Name the reproductive and non-reproductive parts of bread mould (Rhizopus). **[2]**
b. List any two advantages of vegetative propagation.

11. How can you help in reducing the problem of waste disposal? Give any two methods. **[2]**

OR

The improvement in our lifestyle has led to the generation of large amount of waste material. List two reasons to justify this statement.

12. Draw a diagram of neuron and name and label the part **[2]**
a. where information is acquired,
b. through which information travels as an electric impulse, and
c. where the electric impulse must be converted into a chemical signal for onward transmission.

13. A green stemmed tomato plant denoted by (GG) is crossed with a tomato plant with purple stem denoted by (gg). **[3]**
a. What colour of the stem would you expect in their F_1 progeny?
b. In what ratio would you find the green and purple coloured stem in plants of F_2 progeny?

c. What conclusion can be drawn for the above observations?

14. a. Draw a diagram of human alimentary canal and label - gall bladder, pancreas, liver and small intestine on it. **[3]**

b. Give two reasons to explain why absorption of digested food occurs mainly in the small intestine.

15. **Read the following text carefully and answer the questions that follow:** **[4]**

Refer to the given table regarding results of F_2 generation of Mendelian cross.

Plants with round and yellow coloured seeds (P)	315
Plants with round and green coloured seeds (Q)	108
Plants with wrinkled and yellow coloured seeds (R)	101
Plants with wrinkled and green coloured seeds (S)	32

i. What would be the phenotype of F_1 generation regarding given data of F_2 generation? (1)

ii. What would be the genotype of parental generation regarding the given result of F_2 generation? (1)

iii. If a plant with wrinkled and green coloured seeds (S) is crossed with the plant having wrinkled and yellow coloured seeds (R), what will be the probable phenotype of offspring? (2)

OR

What will result when plant YyRr is self-pollinated? (2)

16. a. Name any two bacterial infections that are sexually transmitted. How can they be prevented? **[5]**

b. List three different ways, other than the one stated in (a) above, that help an individual to avoid unwanted pregnancies.

c. List three advantages for adopting contraceptive measures.

OR

a. Name the hormone secreted by (i) Pituitary, and (ii) Thyroid stating one main function of each. Name the disorder a person is likely to suffer from due to the deficiency of the above mentioned hormones.

b. How is the timing and amount of hormone released regulated? Explain with an example.

Section B

17. Which of the following is(are) true when HCl (g) is passed through water? **[1]**

i. It does not ionise in the solution as it is a covalent compound.

ii. It ionises in the solution

iii. It gives both hydrogen and hydroxyl ion in the solution

iv. It forms hydronium ion in the solution due to the combination of hydrogen ion with water molecule

a) (iii) only
b) (iii) and (iv)
c) (i) only
d) (ii) and (iv)

18. Which of the given statement is correct or wrong: **[1]**

Statement A: Detergent with less branching in the molecule is degraded more easily than branched-chain detergents.

Statement B: Soaps are 100% biodegradable.

a) Both the statements A and B are true.
b) Neither statement A nor statement B is true.
c) Statement B is true; Statement A is false.
d) Statement A is true; Statement B is false.

19. Copper utensils slowly lose their shiny brown surface and gain a green coat on prolonged exposure to **[1]**

atmospheric air. This is due to the formation of a coating of

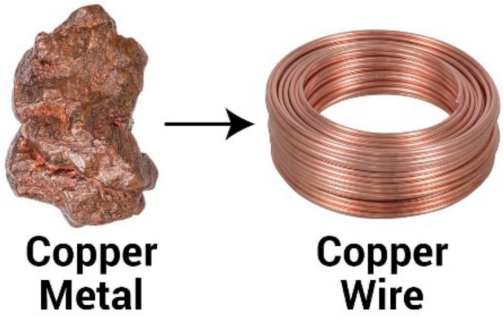
a) Copper sulphate
b) Cupric oxide
c) Cuprous oxide
d) Copper carbonate

20. Match the following with the correct response: **[1]**

Column A	Column B
(i) Copper is used in electrical appliances	(a) Hydrogen sulphide
(ii) Sodium is very reactive	(b) Good conductor
(iii) Silver is tarnished	(c) Graphite
(iv) A non-metal and a good conductor	(d) Stored in kerosene

a) (i) - (b), (ii) - (d), (iii) - (a), (iv) - (c)
b) (i) - (d), (ii) - (a), (iii) - (c), (iv) - (b)
c) (i) - (c), (ii) - (b), (iii) - (d), (iv) - (a)
d) (i) - (a), (ii) - (c), (iii) - (b), (iv) - (d)

21. The property of metal by which it can be drawn into wires is called: **[1]**



a) Ductility
b) Sonorous
c) Conductivity
d) Malleability

22. Which one of the following properties of Carbon is **not** responsible for its formation of large number of compounds? **[1]**

a) Isomerism
b) Catenation
c) Tetravalency
d) Allotropy

23. A solution turns the colour of turmeric to reddish brown. If the same solution is poured on universal indictor, its colour would change to- **[1]**

a) blue
b) red
c) violet
d) green

24. **Assertion (A):** Strength of the acid or base decreases with dilution. **[1]**
Reason (R): Ionization of an acid or a base increases with dilution.

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.

25. a. If you have phenolphthalein as an indicator, how will you test for acid and base? **[2]**
b. What will be the colour of a blue litmus paper on bringing it in contact with a drop of dil. NaOH?

26. Silver chloride kept in a china dish turns grey in sunlight. **[3]**

a. Write the colour of silver chloride when it was kept in the china dish.

b. Name the type of chemical reaction taking place and write the chemical equation for the reaction.

c. State one use of the reaction. Name one more chemical which can be used for the same purpose.

OR

On heating blue coloured powder of copper (II) nitrate in a boiling tube, copper oxide (black), oxygen gas and a brown gas X is formed.

i. Write a balanced chemical equation of the reaction.

ii. Identify the brown gas X evolved.

iii. Identify the type of reaction.

iv. What could be the pH range of the aqueous solution of the gas X?

27. A cleaned aluminium foil was placed in an aqueous solution of zinc sulphate. When the aluminium foil was taken out of the zinc sulphate solution after 15 minutes, its surface was found to be coated with a silvery grey deposit. From the given observation, what can be concluded? **[3]**

28. **Read the following text carefully and answer the questions that follow:** **[4]**

In a balanced chemical reaction, equal number of atoms are present on both sides of reaction. A balanced chemical reaction is based on law of conservation of mass which means that total mass of reactants and products participating in a reaction must be equal. For example, a balanced chemical equation of burning of magnesium in oxygen to form magnesium oxide is written as:

$2Mg + O_2 \longrightarrow 2MgO$

The mass of reactants ($2 \times 24 + 32 = 80$) is equal to the mass of products [$2 \times (24 + 16) = 80$].

i. In a reaction, 35 g of reactant, PQ breaks down into 20 g of product, P and an unknown amount of product, Q. Find the amount of product Q. (1)

ii. The solid mercury (II) oxide is heated, and liquid mercury and oxygen gas are produced. Mention balanced chemical reaction. (1)

iii. Which laws are satisfied by a balanced chemical equation? (2)

OR

In the given chemical reaction, (2)

$2C_6H_{6(l)} + 15O_{2(g)} \longrightarrow mCO_{2(g)} + nH_2O_{(l)}$

Find the values of m and n respectively.

29. a. State any two reasons for carbon forming a large number of compounds. Why does carbon form compounds **[5]**

i. mainly by covalent bonding?

ii. having low melting and boiling points?

b. With the help of balanced chemical equations, explain what happens when

i. a piece of sodium is added to ethanol?

ii. ethanol burns in the presence of oxygen?

OR

i. It is observed that covalent compounds are bad conductors of electricity. Give reason.

ii. Carbon can neither form C^{4+} cation nor C^{4-} anion. Why?

iii. Draw electron dot structure of Ethanol.

iv. Identify hetero atom(s) in the following compounds:

a. $CH_3CH_2 - \underset{\underset{O}{\|}}{C} - CH_3$

b. CH_3CH_2Cl

Section C

30. Which of the following statement is/are true? **[1]**

A. The speed of all colours is the same in air or vacuum.

B. The speed of all colours is different in denser media.

C. Speed of light in air is 3×10^8 ms^{-1}.

D. Refractive index has no unit.

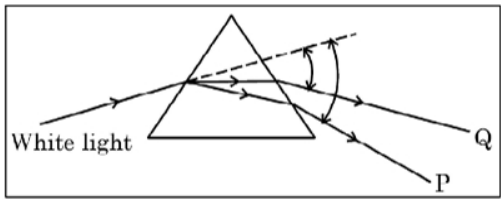
a) A and B

b) B and D

c) All of these

d) A, B and C

31. In the following diagram showing dispersion of white light by a glass prism, the colours **P** and **Q** respectively are- **[1]**



a) Violet and Red

b) Orange and Green

c) Red and Blue

d) Red and Violet

32. **Assertion (A):** A neutral body may experience a net nonzero magnetic force. **[1]**

Reason (R): The net charge on a current-carrying wire is zero, but it can experience a force in a magnetic field.

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.

33. Write the conditions for observing a rainbow. Show, by drawing a suitable diagram, how one understands the formation of a rainbow? **[2]**

34. a. Write the mathematical expression for Joule's law of heating. **[2]**

b. Compute the heat generated while transferring 96000 coulomb of charge in two hours through a potential difference of 40 V.

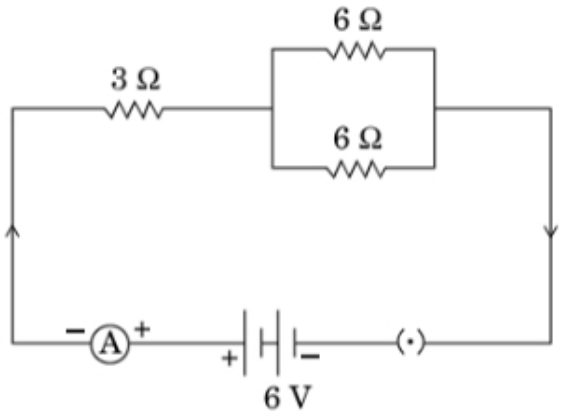
OR

In the given circuit, find:

a. Total resistance of the network of resistors

b. Current through ammeter A, and

c. Potential difference across 3 Ω and 6 Ω resistors



35. Find the direction of magnetic field due to a current carrying circular coil held: **[3]**

i. Vertically in North-South plane and an observer looking it from East sees the current to flow in anti-clockwise direction.

ii. Vertically in East-West plane and an observer looking it from South sees the current to flow in anti-clockwise direction.

iii. Horizontally and an observer looking at it from below and see the current flowing in clockwise direction.

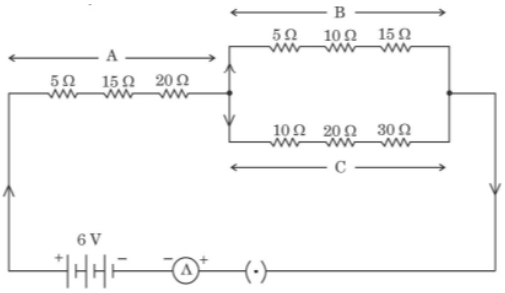
36. A camera in many ways is similar to the human eye, still, there are some basic differences in image formation between the two. Explain. **[3]**

37. a. Draw the pattern of magnetic field lines around a bar magnet. Mark the position of North Pole, South Pole and the places where the magnetic field is strongest. **[3]**

b. Why do the magnetic field lines not intersect each other?

38. **Read the following text carefully and answer the questions that follow:** **[4]**

Study the following electric circuit in which the resistors are arranged in three arms A, B and C:



i. Find the equivalent resistance of arm B. (1)

ii. Calculate the equivalent resistance of the parallel combination of the arms B and C. (1)

iii. Determine the current that flows through the ammeter. (2)

OR

Determine the current that flows in the ammeter when the arm B is withdrawn from the circuit. (2)

39. i. Draw a ray diagram to show the path of the refracted ray in each of the following cases: **[5]**

A ray of light incident on a concave lens

1. parallel to its principal axis, and
2. is directed towards its principal focus.

ii. A 4 cm tall object is placed perpendicular to the principal axis of convex lens of focal length 24 cm. The distance of object from the lens is 16 cm. Find the position and size of image formed.

OR

a. Define power of a lens and write its SI unit. Name the type of lens whose power is negative.

b. A convex lens forms a real and inverted image of finite size at a distance of 50 cm from it. Where is the object placed in front of the lens? Give all possible positions of the object stating reason in each case.

c. Draw labelled ray diagram for any one position of the object mentioned in (b) above.

Solution

Section A

1. **(a)** small intestine
   Explanation:
   The small intestine is the part of the gastrointestinal tract between the stomach and the large intestine where much of the digestion of food takes place. The primary function of the small intestine is the absorption of nutrients and minerals found in food.
2. **(b)** In individuals of a given species, a specific gene is located on a particular chromosome.
   Explanation:
   In individuals of a given species, a specific gene is located on a particular chromosome.
3. **(c)** (ii) and (iii)
   Explanation:
   (ii) and (iii)
4. **(d)** (i) - (b), (ii) - (d), (iii) - (a), (iv) - (c)
   Explanation:
   - Thyroxin is secreted by the thyroid gland to regulate the metabolic rate and help control body temperature.
   - Insulin and glucagon are hormones that help regulate the levels of blood glucose in the body secreted by the pancreas.
   - The testes are the most essential organs of the male reproductive system. They are the glands where sperm and testosterone are produced.
   - Estrogen is a female steroid hormone that is produced by the ovaries.
5. **(c)** Sugarcane and rice
   Explanation:
   Sugarcane and rice
6. **(c)** Valves ensure that the blood does not flow backwards.
   Explanation:
   i. The human circulatory system consists of many systems that are associated with each other.
   ii. These systems are arteries, veins, heart, and vessels. There are further two types of vessels which are known as coronary vessel and portal vessel.
   iii. The human circulatory system regulates the flow of blood in the body.
   iv. Blood flows from the heart to lungs and then back to heat in a cycle.
7. **(a)** Regular beating of heart
   Explanation:
   Regular beating of heart
8. **(a)** Both A and R are true and R is the correct explanation of A.
   Explanation:
   Both A and R are true and R is the correct explanation of A.

9.

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

Explanation:

Both A and R are true but R is not the correct explanation of A.

10. a. Reproductive parts of bread mould (Rhizopus) - Sporangium
    Non-reproductive parts of bread mould (Rhizopus) - Hyphae
    b. Two advantages of vegetative propagation:
        i. Helps in growing seedless plants.
        ii. Helps in preservation of the characters of the parent plant.

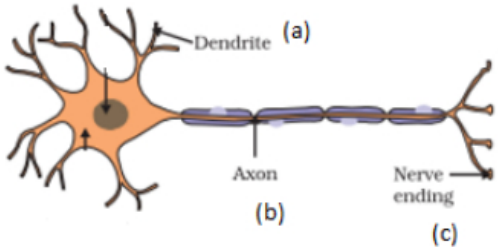
11. i. Recycling of wastes.
    ii. Reduction at source.
    iii. Better management.
    iv. Vermicomposting.
    v. Use of eco-friendly products such as disposable paper cups in place of plastic cups.

OR

The above statement can be supported by two facts -

- Recently, its been a trend to use disposable materials like cups, plates, spoons etc. in marriages and parties. These are usually made up of non biodegradable substances like plastic and styrofoam which eventually result in polluting our environment.
- Another example is the use of disposable plastic cups in trains. These leads to generation of a lot of plastic waste. However, they are being slowly replaced by paper cups to reduce the burden on the environment.

12. Diagram: Structure of a neuron



a. End of the dendritic tip
b. Axon
c. Nerve ending

13. a. All the plants in F_1 progeny will be of green coloured stem.

	♂		♀
Parents	GG (Green)	×	gg (Purple)
Gametes	G		g
F_1 generation	Gg (All green stem)		

b. Cross for F_2 progeny is:

	♂		♀
Parents (selfing F_1)	Gg (Green)	×	Gg (Purple)
Gametes	G g		G g

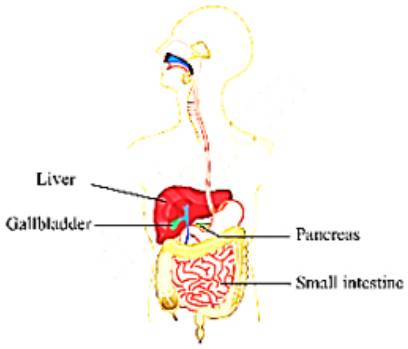
F_2progeny-

♂	G	g
♀		
G	Gf (Green)	Gf (Green)
g	Gf (Green)	gg (Purple)

Phenotypic ratio = Green : Purple = 3 : 1

c. According to the finding above, purple stems are subordinate to green stems. Thus, according to the rule of dominance, only the dominant characteristic was present in F_1. Purple stem in F_2 indicates that the alleles for purple stem were inherited but were not expressed in F_1, nevertheless. Only in F_2 under homozygous circumstances did they get expressed.

14. a.



b. The absorption of digested food primarily occurs in the small intestine because of the following reasons:

- The finger-like projection of mucosa into the lumen of the small intestine is called villi which in turn serves to increase the surface area to facilitate maximum absorption of digested food.
- The Wall of the small intestine is richly supplied with blood vessels that take the absorbed food to the different body parts.
- **Large Surface Area:** The small intestine has a highly folded surface covered with finger-like projections called villi and microvilli. These structures greatly increase the surface area available for absorption. As a result, the small intestine can efficiently absorb nutrients, such as carbohydrates, proteins, fats, vitamins, and minerals, into the bloodstream.

15. i. Plants with round and yellow coloured seeds.

ii. YYRR and yyrr

iii. Plant with wrinkled and green coloured seeds (S) (genotype rryy) is crossed with plant with wrinkled and yellow coloured seeds (R) (genotype rrYY or rrYr). If plant with wrinkled and green coloured seeds (rryy) is crossed with plant having wrinkled and yellow coloured seeds of genotype rrYY then all plants produced with wrinkled and yellow coloured seeds whereas if plant with wrinkled and green coloured seeds (rryy) is crossed with plant having wrinkled and yellow coloured seeds that has genotype rrYy then 50% plants with wrinkled and yellow coloured seeds and 50% plants with wrinkled and green coloured seeds are produced.

OR

9 : 3 : 3 : 1 ratio of phenotypes only

The transfer of pollen grains from the anther to the stigma of the same flower or another flower on the same plant is known as self-pollination.

16. a. Two bacterial infections:

i. Gonorrhoea

ii. Syphilis

Prevention: Using a covering called condom, for the penis, during sex helps in prevention of such infections.

b. i. By changing hormonal balance using contraceptive pills/oral pills.

ii. Contraceptive devices like loop or Copper - T.

iii. Surgical methods like blocking fallopian tubes or vas deferens.

c. i. The health of women will not be affected adversely if she adopts contraceptive measures.

ii. Maintain gap between two pregnancies/children.

iii. To prevent sexually transmitted diseases (STDs)

OR

a.

Name of hormone	Function	Disease
Growth Hormone	stimulates growth of organs	Gigantism
Thyroxine	regulates carbohydrates, proteins and fat metabolism	Goitre

b. It is regulated by feed back mechanism. Hormones has to be released in appropriate amount

Example:

- Rise in sugar level leads to more secretion of insulin from the pancreas

- Fall in sugar level leads to less secretion of insulin
- **Return to Homeostasis:** With decreased TRH and TSH stimulation, the thyroid gland reduces its production of T3 and T4, helping to maintain hormonal balance and return to homeostasis.

Section B

17. **(d)** (ii) and (iv)
Explanation:
Any acid produces hydrogen ion (H^+) which is present as hydronium ion (H_3O^+) because of combination with a water molecule.

18. **(a)** Both the statements A and B are true.
Explanation:
All soaps are biodegradable i.e. they can be decomposed by micro-organisms like the bacteria. Branched-chain synthetic detergents are far less degradable than unbranched detergents.

19. **(d)** Copper carbonate
Explanation:
Copper carbonate

20. **(a)** (i) - (b), (ii) - (d), (iii) - (a), (iv) - (c)
Explanation:
- Copper is a good conductor of electricity and is used in electrical appliances.
- Sodium is very reactive and is stored under kerosene.
- Silver is tarnished by hydrogen sulphide. Tarnish is a thin layer of corrosion that forms over it.
- Graphite is an allotrope of carbon and a good conductor of electricity. It is used for making carbon electrodes and graphite electrodes in dry cells and electric arcs.

21. **(a)** Ductility
Explanation:
Ductility

22. **(a)** Isomerism
Explanation:
Isomerism

23. **(a)** blue
Explanation:
Turmeric is a natural indication that can help us determine if a given solution is acidic, basic, or neutral. If the pH is between 7.5 and 9.5, the turmeric paper turns reddish brown. As a result, the solution is straightforward. As a result, the Universal pH indicator will display the colour Blue or a little darker blue. Violet will not be present because violet is only seen in strongly alkaline bases.

24. **(b)** Both A and R are true but R is not the correct explanation of A.
Explanation:
Ionization of an acid or a basic increases on dilution but concentration of H^+ or OH^- ions decreases per unit volume, thus strength of the acid or the base decreases with dilution.

25. a. The Phenolphthalein in neutral solution is colourless. When it is added to a basic solution the colour changes to pink and it remains colourless in acidic solution.
b. The colour of blue litmus paper will remain blue as a drop of dil. NaOH is a base and base will not change the color of blue litmus paper.

26. a. White colour

b. The chemical reaction is as:

$2AgCl(s) \longrightarrow 2Ag(s) + Cl_2(g)$

This is a **decomposition chemical reaction.**

c. One major application of decomposition reactions is in the extraction of metals from their ores. For example, zinc can be obtained from calamine by subjecting it to a decomposition reaction. In a similar manner, sodium can be obtained from sodium chloride (NaCl).

OR

i. $\underset{\text{Copper (II) nitrate}}{2Cu(NO_3)_2(s)} \xrightarrow{\text{Heat}} \underset{(Black)}{2Cu\ O(s)} + \underset{(Brown)(X)}{4NO_2(g)} + \underset{Oxygen}{O_2(g)}$

ii. Nitrogen dioxide is the brown gas(X).

iii. Thermal decomposition reaction

iv. pH < 7 because NO_2 dissolves in water to form acidic solution (pH lies below 7).

27. Aluminium is more reactive than zinc hence it displaces zinc from zinc sulphate solution and forms silvery white zinc metal. The reaction is as follows:

$\underset{Zinc\ sulphate}{3ZnSO_4(aq)} + \underset{Aluminium}{2Al(s)} \rightarrow \underset{Aluminium\ sulphate}{Al_2(SO_4)_3(aq)} + 3Zn(s)$

28. i. $\underset{35\ g}{PQ} \longrightarrow \underset{20g\ +\ ?}{P + Q}$

According to law of conservation of mass,

Mass of PQ = Mass of P + Mass of Q

∴ Mass of Q = (35 - 20)g = 15 g

ii. 2 moles of mercury (II) oxide produce 2 moles of mercury and one mole of oxygen gas.

$2HgO_{(s)} \longrightarrow 2Hg_{(l)} + O_{2(g)}$

iii. The law of conservation of mass is satisfied by a balanced chemical equation.

OR

12 and 6

29. a. property of carbon atom to combine with itself to form long chains is called catenation.

small size of carbon atom

i. It has 4 electrons in its outermost shell and needs to gain or lose 4 electrons to attain stable noble gas configuration. It would require a large amount of energy to gain or lose 4 electrons. So carbon atom shares 4 electrons with other atoms of carbon or with atoms of other elements to form covalent bonds.

ii. Due to weak intermolecular forces carbon compounds have low melting and boiling points.

b. $2Na + 2CH_3CH_2OH \longrightarrow 2CH_3CH_2ONa + H_2$

$CH_3CH_2OH + 3O_2 \longrightarrow 2CO_2 + 3H_2O$

OR

i. The bonds which are formed by the sharing of an electron pair between two atoms are known as covalent bonds. Since the electrons are shared between atoms and no charged particles are formed, such covalent compounds are generally poor conductors of electricity.

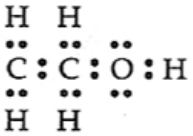
ii. In the case of carbon, it has four electrons in its outermost shell and needs to gain or lose four electrons to attain noble gas configuration. If it were to gain or lose electrons:

a. It could gain four electrons forming C^{4-} anion. But it would be difficult for the nucleus with six protons to hold on to ten electrons.

b. 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 on to just two electrons.

iii. Electron dot structure of ethanol is as follows:

iv.



v. Heteroatom in following compound is

a. Oxygen

b. Chlorine

Section C

30.

(c) All of these

Explanation:

All the given statements are correct.

- The speed of all colours is the same in air or vacuum i.e. 3×10^8 ms^{-1}. But the speed of all colours is different in a denser medium.
- The refractive index has no unit since it is a ratio. The absolute refractive index of a medium (n_m) is given by $n_m = \frac{c}{v}$ where c is the speed of light in air, and v is the speed of light in the medium.

31. **(a)** Violet and Red

Explanation:

The splitting of white light into its constituent colours is known as light dispersion. The spectrum is the band of seven colours produced by splitting white light. All of the constituent colours of white light have the same velocity in vacuum, but their velocity changes when they pass through a transparent 'medium' like a glass prism. Different colours are diverted by different angles on the prism's initial face. Violet's minimum speed is deviated by the maximum angle, whereas red's maximum speed is distorted by the minimum angle. As a result, the letters 'P' and 'Q' are violet and crimson, respectively.

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

Explanation:

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

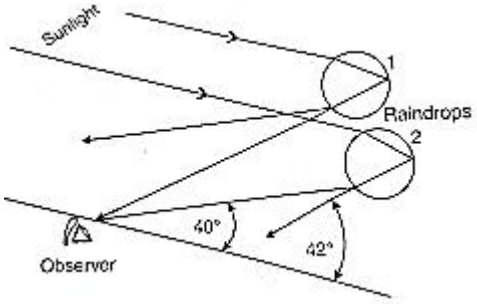
33. The conditions for observing a rainbow are:

i. The sun comes out after a rainfall.

ii. The observer stands with the sun towards His/her back.

Formation of a rainbow :

The rays of light reach the observer through a refraction, followed by a reflection and a refraction. Figure shows red light, from drop 1 and violet light from drop 2, reaching the observer's eye.



34. a. The mathematical expression of the Joules Law of heating is: $H = I^2 Rt$

Here, H is a heating effect, I is the current flowing through the device and t is the time taken.

b. Given:

Amount of charge transferred = 96000 C

Time taken = 2hrs = $2 \times 60 \times 60$ sec = 7200 sec

Potential difference = 40 V

Heat generated = $V \times I \times t$

and we know that; $I = \frac{Q}{t}$

So, H = VQ

$= 40 \times 96000$

$= 3.84 \times 10^6$ J

OR

a. $X_1 = 3\ \Omega$; $X_2 = 3\ \Omega$

$\frac{1}{x_2} = \frac{1}{6} + \frac{1}{6} = \frac{2}{6} = \frac{1}{3}$

Total resistance $R = X_1 + X_2 = 3\ \Omega + 3\ \Omega = 6\ \Omega$

b. Current through ammeter A, $I = \frac{V}{R} = \frac{6V}{6\Omega} = 1$ A

c. Potential difference across 3 Ω = 1A × 3 Ω = 3 V

Potential difference across $6\Omega = \frac{1}{2}$ A × 6Ω = 3 V

35. i. When the coil is kept vertically in North-South plane and the current is flowing in the anti-clockwise direction through the loop, then the magnetic field is in the East-West direction.

ii. When the coil is kept vertically in East-West plane and current through the coil is in the anti-clockwise direction, then the magnetic field is in the South-North direction.

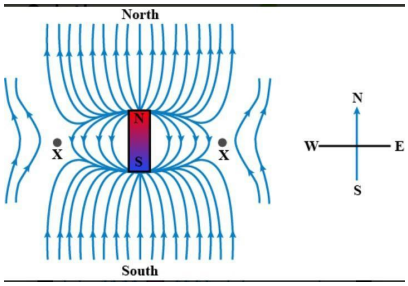
iii. In this case, the direction of the field for the observer positioned below the coil is in the downward direction.

36. A camera in many ways is similar to the human eye as both eye and camera has convex lens. But, there are some basic differences in image formation between the two as follows:

i. In camera, the distance between the lens and the screen can be adjusted but not the focal length of the lens. However, in eye, the ciliary muscles adjust the focal length keeping the distance between the lens and the retina constant.

ii. The image formed on the retina is temporary and its impression is recorded in the brain as memory. However, the image formed on the film of camera is a permanent record.

37. a.



the poles are mentioned in the given figure and the magnetic field will be stronger at the end of the pole.

b. If magnetic field lines intersect each other, then at the intersection point there will be two directions of the same field which is not possible. Hence the field lines do not cross or intersect each other.

38. i. Since the resistance in arm B are connected in series.

So, R_B = 5Ω + 10Ω + 15Ω

R_B = 30Ω

ii. Total resistance in arm C

R_C = 10Ω + 20Ω + 30Ω

R_C = 60Ω

Now as arm B and arm C are in parallel

Equivalent resistance $\frac{1}{R} = \frac{1}{R_B} + \frac{1}{R_C}$

$\frac{1}{R} = \frac{2+1}{60} = \frac{3}{60}$

R = 20Ω

iii. Total resistance in arm A

R_A = 5Ω + 15Ω + 20Ω

R_A = 40Ω

Now, Equivalent resistance of circuit

R_{eq} = R_{eq} + R

R_{eq} = 40 + 20 = 60Ω

By ohm's law

V = IR

$I = \frac{V}{R} = \frac{6}{60}$ = 0.1 A

OR

If arm B is removed

Equivalent resistance in circuit

R_{eq} = R_A + R_C

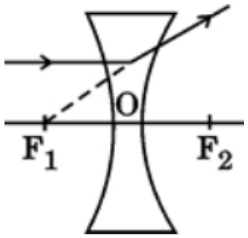
R_{eq} = 40 + 60 = 100Ω

From ohm's law

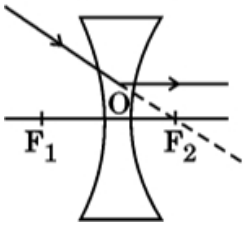
V = IR

$I = \frac{V}{R} = \frac{6}{100}$ = 0.06 A

39. i. 1.



2.



ii. Given u = -16 cm, f = +24 cm, h = 4 cm

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

$\therefore \frac{1}{v} - \frac{1}{(-16)} = \frac{1}{+24}$

$\frac{1}{v} = \frac{-1}{48}$

v = -48 cm

Image is formed on the same side as the object

$m = \frac{h'}{h} = \frac{v}{u}$

$\frac{h'}{4} = \frac{-48}{-16}$

h' = 12 cm

OR

a. Power of a lens is the Ability of a lens to diverge or converge light rays and SI unit of Power – diopter (D).

Type of lens whose power is negative is Concave lens.

b. Position of object:

i. Beyond $2F_1$

ii. At 2 F_1

iii. Between $2F_1$ and F_1

c. Labelled ray diagram -