Class X Session 2025-26
Subject - Science
Sample Question Paper - 09

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. An organism which breaks down the food material outside the body and then absorbs it is **[1]**

    a) a bacteria, Rhizobium   b) a plant parasite, Cuscuta

    c) an animal parasite, Tapeworm   d) a fungi, Rhizopus

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

    a) Tt and Tt   b) TT and Tt

    c) Tt and tt   d) TT and tt

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

Column A	Column B
(i) Junction between neuron	(a) Thermoreceptors
(ii) The largest cell in the human body	(b) Neuron
(iii) Sense organs for smell	(c) Synapse
(iv) Sense organs for touch	(d) Olfactory receptors

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

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

4. Sensory nerve of a reflex arc carries information from the receptor cells to the: **[1]**

    a) brain   b) bones of the receptor organ

    c) spinal cord   d) muscles of the effector organ

5. Which one of the following is **not** an advantage of building large dams? **[1]**

    a) Generation of electricity   b) Use in growth of water intensive crops

   c) Adequate storage of water   d) Decrease in biological diversity

6. During vigorous exercise, the occurrence of cramps in the outer muscles of an athlete is due to the conversion of **[1]**
    pyruvate to:

    a) Lactose   b) Glucose

    c) Lactic acid   d) Ethanol

7. The part of seed which is a source of food during germination of seed is: **[1]**

    a) Radicle   b) Plumule

    c) Cotyledon   d) Embryo

8. Slides A and B show stages of asexual reproduction in two different organisms.   **[1]**
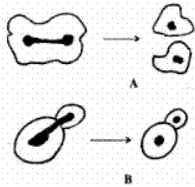
    The slides A and B are depicting

    a) Binary fission in Yeast and budding in   b) Budding in both Amoeba and Yeast
       Amoeba

    c) Binary fission in Amoeba and budding in   d) Binary fission in both Amoeba and Yeast
       Yeast

9. **Assertion (A):** Each human trait is influenced by both paternal and maternal DNA.   **[1]**

    Reason (R): As compared to the father, the mother contributes more amount of genetic material to the child.

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

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

10.   i. What is meant by pollination?   **[2]**

     ii. Name and differentiate between the two modes of pollination in flowering plants.

11.   i. From the following group of organisms create a food chain which is the most advantageous for Human   **[2]**
         beings in terms of energy.
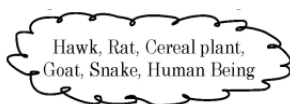
     ii. State the possible disadvantage if the cereal plant is growing in soil rich in pesticides.

     iii. Construct a food web using the organisms mentioned above.

                                        OR

     List two reasons to show that the existence of decomposers is essential in an ecosystem.

12. Trace the sequence of events which occur when a bright light is focused on your eyes.   **[2]**

13. A red-eyed individual is crossed with a white-eyed individual to produce F_1 progeny with red eyes. When F_1 **[3]**
     individuals are intercrossed, F_2 progeny is formed with both red as well as white-eyed individuals.

     a. How is the dominant trait identified?

     b. What are recessive traits?

c. If 12 individuals are produced in F_2 generation, then how many white-eyed individuals would be obtained? Calculate the ratio of red-eyed individuals to white-eyed individuals.

14. a. Explain the surgical method of contraception used by (i) males, and (ii) females to prevent fertilisation. **[3]**

b. Write the role of oral pills taken by women as a contraceptive.

15. If a plant is releasing carbon dioxide and taking in oxygen during the day, does it mean that there is no photosynthesis occurring? Justify your Answer. **[4]**

16. a. List three different categories of contraception methods. **[5]**

b. Why has Government of India prohibited prenatal sex determination by law? State its benefits in the long run.

c. Unsafe sexual act can lead to various infections. Name two bacterial and two viral infections caused due to unsafe sex.

OR

What constitutes the central and peripheral nervous systems? How are the components of central nervous system protected? Which signals will get disrupted in case of a spinal cord injury?

Section B

17. Find the incorrect statement: **[1]**

A. The pH of the stomach is approximately 4.5

B. Plants grow well in natural soil

C. The pH of acid rain is nearly 5.6

D. The pH of rainwater is nearly 7

a) Statement (B) b) Statement (D)

c) Statement (C) d) Statement (A)

18. Which of the given statement is true or false: **[1]**

Statement A: Valeric acid is the common name of hexane.

Statement B: Glycerol is added in the manufacturing of soap.

a) Statement B is true and statement A is false b) Neither statement A nor statement B is false

c) Both the statements A and B are false d) Statement A is true and statement B is false

19. A metal **X** is used in thermit process. When **X** is heated with oxygen, it gives an oxide **Y**, which is amphoteric in nature. **X** and **Y** respectively are: **[1]**

a) Fe, Fe_2O_3 b) Mg, MgO

c) Mn, MnO_2 d) Al, Al_2O_3

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

Column A	Column B
(i) Welding	(a) Ethyl alcohol
(ii) Fuel in a spirit lamp	(b) Ester
(iii) Lime water turns milky	(c) Carbon dioxide
(iv) Fruity smell	(d) Ethyne and oxygen

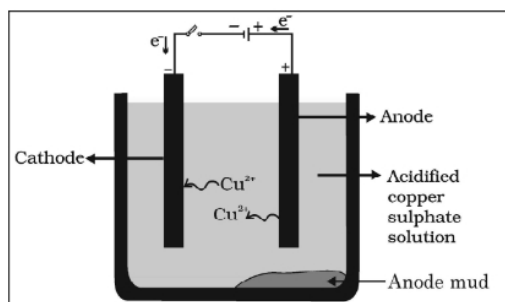a) (i) - (c), (ii) - (b), (iii) - (d), (iv) - (a)   b) (i) - (a), (ii) - (c), (iii) - (b), (iv) - (d)

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

21.   The following diagram shows the electrolytic refining of copper: **[1]**

Which of the following statements is **<u>incorrect</u>** description of the process?

a) The impure metal from the anode dissolves into the electrolyte.

b) Insoluble impurities settle down at the bottom of the anode.

c) On passing the current through the electrolyte, the pure metal from the anode dissolves into the electrolyte.

d) The pure metal from the electrolyte is deposited on the cathode.

22.   Consider the structures of the three cyclic carbon compounds A, B and C given below and select the correct option from the following: **[1]**
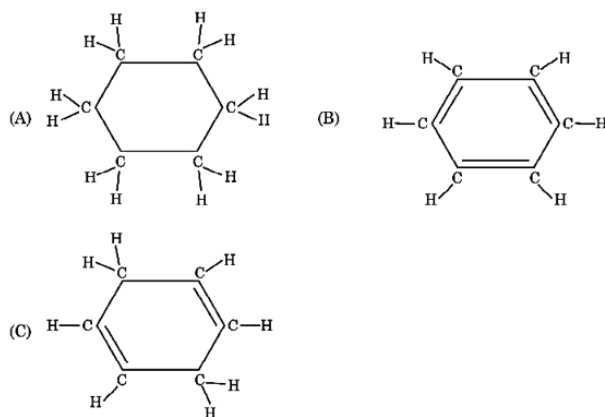
a) A and C are isomers of hexane and B is benzene.

b) A is a saturated cyclic hydrocarbon and B and C are unsaturated cyclic hydrocarbons.

c) A is an isomer of hexane, B is benzene and C is an isomer of hexene.

d) A is cyclohexane and B and C are the isomers of benzene.

23.   Which of the following gives the correct increasing order of acidic strength?   **[1]**

  a. Sodium chloride < Acetic acid < Hydrochloric acid

  b. Sodium chloride < Hydrochloric acid < Acetic acid

  c. Acetic acid < Sodium chloride < Hydrochloric acid

  d. Hydrochloric acid < Sodium chloride < Acetic acid

a) Sodium chloride < Acetic acid < Hydrochloric acid

b) Acetic acid < Sodium chloride < Hydrochloric acid

c) Hydrochloric acid < Sodium chloride < Acetic acid

d) Sodium chloride < Hydrochloric acid < Acetic acid

24.   Which of the following substances produce hydrogen on reacting with metals?   **[1]**

a) Water (H_2O)   b) C_2H_5OH

c) H_2SO_4 d) All of these

25.   What will be the action of the following substances on litmus paper?   **[2]**

   i. Dry HCl gas

  ii. Moistened NH_3 gas

 iii. Curd

 iv. Soap solution.

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.

<div align="center">OR</div>

Explain the following in terms of gain or loss of oxygen with two examples each:

a. Oxidation

b. Reduction

27.   Pratyush took sulphur powder on a spatula and heated it. He collected the gas evolved by inverting a test tube   **[3]**
over it.

What will be the action of gas on

  i. Dry litmus paper?

 ii. Moist litmus paper?

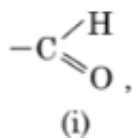Write a balanced chemical equation for the reaction taking place.

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

More than three million carbon compounds have been discovered in the field of chemistry. The diversity of these
compounds is due to the capacity of carbon atoms for bonding with one another as well as with other atoms.
Most of the carbon compounds are poor conductors of electricity and have low melting and boiling points.

  a. Write the molecular formula of first two members of homologous series having functional group -Br. **(1)**

 b. Given below are the formulae of some functional groups: **(1)**

Write the name of these functional groups.

  c. What would be observed on adding a 5% alkaline potassium permanganate drop by drop to some warm
ethanol taken in a test tube? State the role of $KMnO_4$ in the reaction and write the chemical equation for the
reaction involved. **(2)**

   OR

Write the name of the compound formed when ethanol is heated at 443 K temperature with excess of conc.
H_2SO_4. What is the role of conc. H_2SO_4 in the reaction? Write the chemical equation for the reaction
involved. **(2)**

<div align="center">OR</div>

Read the following text carefully and answer the questions that follow:

Two allotropic forms of carbon which are crystalline in nature, are diamond and graphite. They differ physically but

chemically they are similar. Diamond is the hardest crystalline form of carbon. In diamond, each carbon atom is linked to four other carbon atoms by covalent bonds. In graphite, each carbon atom is linked to three other carbon atoms by covalent bond. Graphite is relatively soft and greasy. It is also a good conductor of electricity. The C-C bond length in graphite is 141.5 pm while in diamond it is 154 pm.

   i. Which is a good conductor of heat and electricity- graphite or diamond? Explain. (1)

  ii. Which binding force is present in the structure of diamond? (1)

 iii. Why Diamond is not a good conductor of electricity and heat? (2)

    OR

    Draw the structure of diamond showing bond between carbons. (2)

29. In an industrial process used for the manufacture of sodium hydroxide, a gas **A** is formed as a by-product. The gas **A** reacts with lime water to give a compound **B** which is used as a bleaching agent in the chemical industry. Identify **A** and **B**. Also give the chemical equations of the reactions involved. **[5]**

<div align="center">OR</div>

Explain chlor-alkali process and write balanced chemical equations for the reactions that occur. Name the gases obtained at the anode and cathode respectively. Mention two uses each of the two gases obtained in the above process.

<div align="center">**Section C**</div>

30. An old person is unable to see clearly nearby objects as well as distant object. To correct the vision, what kind of lens will he require? **[1]**
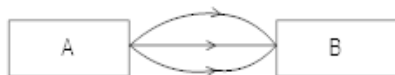
  a) Concave lens   b) Convex lens

  c) Bifocal lens whose upper portion is convex   d) Bifocal lens whose upper portion is concave
     lens and lower portion is concave lens   lens and lower portion is convex lens

31. **Assertion (A):** As the temperature of a medium increases the refractive index decreases. **[1]**

   Reason (R): When a ray travels from a vacuum to a medium, then μ is known as the absolute refractive index of the medium. (μ_{vacuum} = 1).

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

  c) A is true but R is false.   d) A is false but R is true.

32. Figure shows the magnetic field lines between the two faces A and B of two magnets. **[1]**

  a) Both faces A and B of two bar magnets are   b) Face A is south pole while face B is north
     North pole.   pole.

  c) Both faces A and B of two bar magnets are   d) One direction at any point in space
     South pole.

33. A teacher gives a convex lens and a concave mirror of focal length of 20 cm each to his student and asks him to find their focal lengths by obtaining the image of a distant object. The student uses a distant tree as the object and obtains its sharp image, one by one, on a screen. The distances d_1 and d_2 between the lens/mirror and the screen in the two cases and the nature of their respective sharp images are likely to be **[2]**

  a. (20 cm, 40 cm) and (erect and erect)

b. (20 cm, 40 cm) and (inverted and inverted)

c. (20 cm, 20 cm) and (inverted and inverted)

d. (20 cm, 40 cm) and (erect and inverted)

Give reason for your answer.

34. An electric lamp, whose resistance is 20 Ω, and a conductor of 4 Ω resistance are connected to a 6 V battery. **[2]**
Draw the circuit diagram. Calculate (a) the total resistance of the circuit, and (b) the current through the circuit.

OR

The rest position of the needles in a milliammeter and voltmeter, not in use, are as shown in Figure A. When a student uses these instruments in his experiment, the readings of the needles are in the positions shown in Figure B. Determine the correct values of current and voltage the student should use in his calculations.

Figure A   Figure B
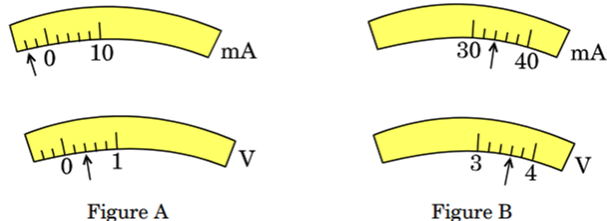
35.   1. Write the function of each of the following parts of human eye : cornea, iris, crystalline lens, ciliary muscles.   **[3]**

2. Millions of people of the developing countries of world are suffering from corneal blindness. These people can be cured by replacing the defective cornea with the cornea of a donated eye.

A charitable society of your city has organised a campaign in your neighbourhood in order to create awareness about this fact.

If you are asked to participate in this mission how would you contribute in this noble cause?

1. State the objective of organising such campaigns.

2. List two arguments which you would give to motivate the people to donate their eyes after death.

3. List two values which are developed in the persons who actively participate and contribute in such programme.

36. Find out the following in the electric circuit given in Figure   **[3]**
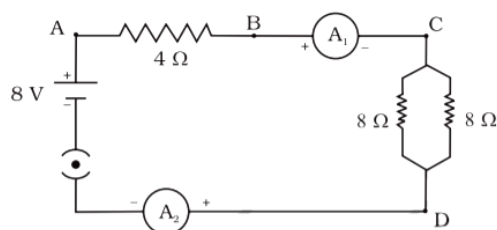
i. The effective resistance of two 8 Ω resistors in the combination

ii. Current flowing through 4 Ω resistor

37.   a. Draw the pattern of magnetic field lines produced by a current carrying circular loop showing the direction   **[3]**
of current in the loop and the direction of the magnetic field lines.

b. State the rule which can be applied to know the direction of magnetic field lines in the above case.

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

How do we express electric current? Electric current is defined by the amount of charge flowing through a particular area in unit time. In other words, it is the rate of flow of electric charges. In circuits using metallic wires, electrons constitute the flow of charges. However, electrons were not known at the time when the phenomenon of electricity was first observed. So, electric current was considered to be the flow of positive charges and the direction of flow of positive charges was taken to be the direction of electric current.

Conventionally, in an electric circuit, the direction of electric current is taken as opposite to the direction of the flow of electrons, which are negative charges.
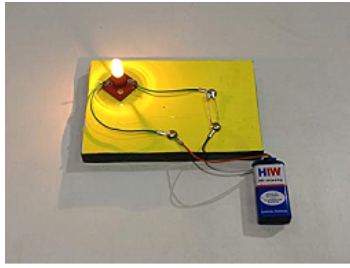
   i. If a net charge Q, flows across any cross-section of a conductor in time **t**, then the current **I**, through the cross-section is given by which formula? (1)

  ii. What is the SI unit of electric charge? It is equivalent to how many numbers of electrons? (1)

 iii. The electric current is expressed in which unit? Define the unit used to measure electric current. (2)

   OR

   If the amount of charge passing through the cell in 4 seconds is 12 C then find the current supplied by a cell. (2)

39.   a. List four characteristics of the image formed by a concave lens of focal length 20 cm when the object is placed at a distance of 40 cm from its optical centre.   **[5]**

   b. The size of image of an object by a convex lens of focal length 20 cm is observed to be reduced to $\frac{1}{3}$rd of its size. Find the distance of the object from the optical centre of the lens.

<div align="center">OR</div>

   i. A concave mirror of focal length 10 cm can produce a magnified real as well as virtual image of an object placed in front of it. Draw ray diagrams to justify this statement.

  ii. An object is placed perpendicular to the principal axis of a convex mirror of focal length 10 cm. The distance of the object from the pole of the mirror is 10 cm. Find the position of the image formed.

Solution

1.

   (d) a fungi, Rhizopus

   Explanation:

   a fungi, Rhizopus breakdown food outside body.

2.

   (c) Tt and tt

   Explanation:

   Tt Tall plant and tt short plant.

3.

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

   Explanation:

   - In the nervous system, a synapse is a structure which serves as Junction between neuron that permits a neuron to pass an electrical or chemical signal to another neuron.
   - A neuron is an electrically excitable cell that processes and transmits information through electrical and chemical signals that is why it is the largest cell in the human body.
   - Olfactory receptors are responsible for the detection of odorants which give rise to the sense of smell.
   - Thermoreceptors are able to detect heat and cold and are found throughout the skin in order to allow sensory reception throughout the body.

4.

   (c) spinal cord

   Explanation:

   A reflex action, or reflex, is an automatic reaction to a stimulus that is not under conscious control. A reflex arc is a neural pathway that mediates a reflex action. The Central Nervous System (CNS), which is composed of the brain and spinal cord, receives data from the receptor cell via the sensory nerve of a reflex arc. The sensory nerve fibres in the body terminate in the spinal cord, where motor neurons that control the effector organ share synapses with interneurons to transmit information.

5.

   (d) Decrease in biological diversity

   Explanation:

   Decrease in biological diversity

6.

   (c) Lactic acid

   Explanation:

   During vigorous exercise, the occurrence of cramps in the outer muscles of an athlete is due to the conversion of pyruvate to Lactic acid

7.

   (c) Cotyledon

   Explanation:

   Cotyledon

8.

(c) Binary fission in Amoeba and budding in Yeast

Explanation:

Amoeba is a very good example of the organism which reproduces by binary fission.

Yeast is an example of unicellular organism which reproduces by budding.

These are the correct stages of asexual reproduction in the organisms.

9.

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

Explanation:

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

10. Pollination is the process of the transfer of pollen grains from the anther to the stigma of the flower. Which is achieved by the help of either biotic or abiotic factors. Such as insects (entomophily), wind (anemophily), water (hydrophily) etc. Agent are known as pollinators.

There are two modes of pollination in flowering plants:

  i. Self-pollination

 ii. Cross-pollination

Difference between self-pollination and cross-pollination are:

Self-pollination	Cross-pollination
In this, the pollen grain from the stamen of a flower is transferred to the stigma of the same flower which is Autogamy. Also, pollen grains from the stamen of one flower is transferred to the stigma of another flower of the same plant which is known as Geitonogamy.	In this, the pollen grain from the stamen of a flower is transferred to the stigma of a different flower. Which is known as Xenogamy. Which leads to development of new variety.

11.   i. Short food chains are more efficient in terms of energy. The shorter the food chain is, more is the available amount of energy.
Cereal Plant → Human being

  ii. Harmful for human consumption as the traces of pesticide will be carried by food.
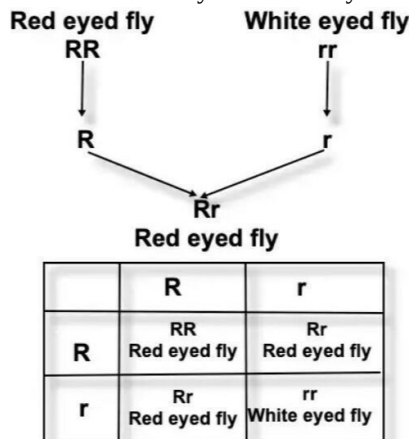
 iii.
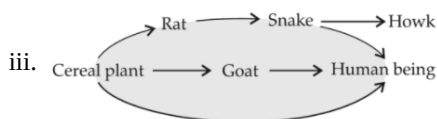
OR

Microorganisms like bacteria and fungi which helps in the breakdown of organic matter or biomass of dead plants and animals into simple inorganic raw materials and replenish the environment are termed as decomposers. Their existence is thus, essential in an ecosystem because

  i. They help in the natural replenishment of soil.

  ii. They help in keeping the environment clean as they reduce environmental pollution.

12. Receptor Cells of eyes/retina → Sensory Neuron → Brain / CNS → Motor Neuron → Eye Muscles → Pupil contracts / Eye lids close/blink

13.   a. The **dominant trait** is identified by observing its expression in the F1 generation.

  b. The **recessive trait** is the one that is masked in the presence of the dominant trait and only expressed in the homozygous recessive state.

c. The **ratio** of red-eyed to white-eyed individuals is 3:1

Red eyed fly
RR   **White eyed fly**
                          rr

R   r

Rr
Red eyed fly

	R	r
R	RR Red eyed fly	Rr Red eyed fly
r	Rr Red eyed fly	rr White eyed fly

14. a. i. The surgical method of birth control for men is called vasectomy in which a small portion of the vas deferens is cut and their ends are sealed to prevent sperms from coming out.

    ii. **Tubectomy:** A small portion of the female fallopian tube is removed, and ends are tied with a nylon thread, preventing egg transport into the uterus.

   b. **Oral contraceptive pills:**

    i. The oral contraceptive pill, also recognized as the birth control pill or merely "the pill," is a form of birth control that is taken into the body by women.

    ii. Contraceptive pills (birth control pills) are estrogen medications that are taken orally.

    iii. They prevent pregnancy by delaying ovulation and sperm from passing through the cervix.

15. If plant is releasing carbon dioxide and taking in oxygen during the day, it means that respiration is happening in plant. But it does not mean that photosynthesis is not happening. Carbon dioxide released after respiration comes out of stomata. For photosynthesis, the plant takes in carbon dioxide from atmosphere. In other words, plant does not depend on respiration for carbon dioxide for photosynthesis.

16. a. a. **Barrier method:** Where physical barriers like condoms (worn over penis), diaphragm (used by females), cervical cap and copper-T (an IUCD) are used.

    b. **Chemical method:** Spermicidal applications by women, vaginal pills or oral contraceptive pills (OCPs) are used. OCPs are hormonal preparations which alter the hormonal level in female body. Use of OCPs is not meant for males.

    c. **Surgical method:** Portion of vas deferens in male (vasectomy) or portion of fallopian tube in females (tubectomy) is cut or ligated. This stops release of gametes, preventing fertilisation.

   b. Selective Medical Termination of Pregnancy (MTP) of female foetus using amniocentesis is the main reason behind decline female-male sex ratio in our country. This is because many sections of our society considered girl child as a burden. That is why Government of India prohibited prenatal sex determination by law.

   Its benefits in the long run:
   - Generating awareness about girls being equal helping hands in the family income.
   - Banning prenatal sex determination tests.
   - Banning certain ill practices in our society like dowry system.

   c. Bacterial diseases transmitted through sexual contact:
   (i) Gonorrhoea (ii) Syphilis
   Viral diseases : (i) Warts (ii) HIV-AIDS

OR

Central - Brain and Spinal cord: The central nervous system consists of the brain and spinal cord. The brain is the control center of the nervous system and is responsible for processing sensory information, initiating voluntary movements, regulating involuntary functions (such as heartbeat and respiration), and higher cognitive functions (such as thinking, memory, and emotions).

Peripheral - cranial nerves and spinal nerves: The peripheral nervous system consists of all the nerves and ganglia (clusters of nerve cell bodies) outside of the brain and spinal cord. The PNS connects the central nervous system to the rest of the body, including muscles, glands, and sensory organs.

- **Protection of the Components of the Central Nervous System:**
- The brain is protected by the skull, a hard and bony structure that surrounds and encases the brain tissue, providing physical protection against external trauma.

- The spinal cord is surrounded by a series of protective membranes called meninges, which provide additional cushioning and support. The three layers of meninges are the dura mater (outer layer), arachnoid mater (middle layer), and pia mater (inner layer).
- **Signals Disrupted in Case of Spinal Cord Injury:**
- A spinal cord injury disrupts the transmission of nerve signals between the brain and the rest of the body, leading to various impairments depending on the location and severity of the injury.
- Motor signals: Damage to the spinal cord can result in paralysis or weakness of muscles below the level of injury, leading to loss of voluntary movement and control.
- Sensory signals: Spinal cord injury can also cause loss of sensation, including touch, temperature, and proprioception (awareness of body position and movement).

Section B

17.

(d) Statement (A)

Explanation:

The human stomach produces gastric juices which contain hydrochloric acid in them resulting in a pH of 1.4.

18.

(c) Both the statements A and B are false

Explanation:

Valeric acid is another name for pentanoic acid. **Soaps** are sodium or potassium salts of long-chain fatty acids. When triglycerides in fat/oil react with aqueous NaOH or KOH, they are converted into **soap** and glycerol.

19.

(d) Al, Al_2O_3

Explanation:

Al, Al_2O_3

20.

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

Explanation:

- The oxyacetylene welding process uses a combination of ethyne (C_2H_2) and oxygen gas to provide a high-temperature flame. It is commonly used to permanently join mild steel.
- Alcohol meant for industrial purposes (fuel for spirit lamps) is made unfit for human consumption by adding small amounts (about 5%) of methanol to alcohol. The mixture is known as denatured spirit or denatured alcohol.
- Carbon dioxide turns lime water turns milky due to the formation of insoluble calcium carbonate.
- Esters have a fruity smell and are used in perfumes and cosmetics due to their characteristic odour.

21.

(c) On passing the current through the electrolyte, the pure metal from the anode dissolves into the electrolyte.

Explanation:

When current is passed through the electrolyte, the impure metal from the anode is dissolved in the electrolyte and an equal amount of pure metal from the electrolyte is deposited on the cathode.

22. **(a)** A and C are isomers of hexane and B is benzene.
Explanation:
A and C are isomers of hexane and B is benzene.

23. **(a)** Sodium chloride < Acetic acid < Hydrochloric acid
Explanation:
Since NaCl is neutral, acetic acid is weak, and HCl is strong, the correct order is: Sodium chloride < Acetic acid < Hydrochloric acid

24.

    (d) All of these

    Explanation:

   All of these produce hydrogen on reacting with metals.

- Metal + Water → Metal hydroxide + Hydrogen
- Metal + Steam → Metal oxide + Hydrogen (only those metals displace hydrogen from water (or steam) which are above hydrogen in the reactivity series.
- Metal + Acid → Metal salt + Hydrogen
- $2C_2H_5OH + Na \rightarrow 2C_2H_5ONa + H_2$ (This reaction is used as a test for ethanol).

25.   i. No change in colour will be seen as dry HCl will not liberate H^+ ions.

   ii. It will turn red litmus paper to blue because moistened NH_3 gas will form Ammonium Hydroxide (NH_4OH).

  iii. Curd will turn blue litmus paper into the red as it contains lactic acid.

  iv. Soap solution will turn red litmus paper to blue as it is basic in nature.

26.   a. White colour

   b. The chemical reaction is as:

     $2AgCl(s) \longrightarrow 2Ag(s) + Cl_2(g)$
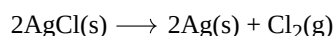
   This is a **decomposition chemical reaction.**

   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).

<div align="center">OR</div>

Oxidation- Addition of oxygen or removal of hydrogen in a chemical reaction is called oxidation reaction. For example:

$2Cu + O_2 \rightarrow 2CuO$

$4Al + 3O_2 \rightarrow 2Al_2O_3$
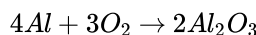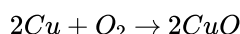
Reduction- Addition of hydrogen or removal of oxygen in a chemical reaction is called reduction reaction. For example:

$CuO + H_2 \rightarrow Cu + H_2O$

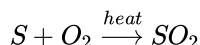$H_2S + Cl_2 \rightarrow 2HCl + S$
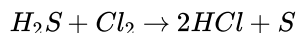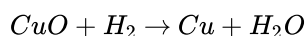
27. The gas is sulphur-dioxide (SO_2)

   i. It will not react with dry litmus paper.

  ii. The gas will bleach moist litmus paper.
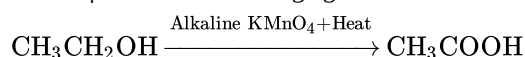
The balanced chemical equation is

$S + O_2 \xrightarrow{heat} SO_2$

28.   a. CH_3Br

     C_2H_5Br

   b. Aldehyde

    Ketone

   c. The colour of $KMnO_4$ disappears;

    $KMnO_4$ acts as an oxidizing agent.

    $CH_3CH_2OH \xrightarrow{\text{Alkaline } KMnO_4 + Heat} CH_3COOH$

    OR

    Ethene

    Conc. H_2SO_4 acts as a dehydrating agent.

    $C_2H_5OH \xrightarrow[\text{443 K}]{\text{Conc. } H_2SO_4 + Heat} CH_2 = CH_2 + H_2O$
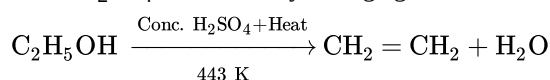
<div align="center">OR</div>

   i. Graphite is the good conductor of heat and electricity because In graphite one carbon atom is attached to three other carbon atoms. One electron of carbon remains free. Due to this free valence electron graphite is an thermal and electrical conductor.

  ii. Covalent bonding is present between carbon atoms in diamond i.e. they share their electrons with each other.
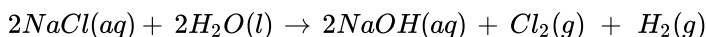
iii. In diamond, one carbon is attached to four other carbon atoms hence it has no free electron. So it do not show heating and electrical conductivity.

OR
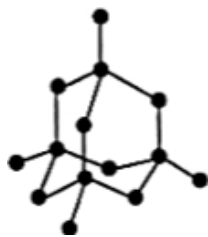
29. In the manufacture of sodium hydroxide (Chlor-alkali process), hydrogen gas and chlorine gas are formed as by-products. The chemical equation for the reaction is as follows**:-**

$2NaCl(aq) + 2H_2O(l) \rightarrow 2NaOH(aq) + Cl_2(g) + H_2(g)$

Gas 'A', which is formed as by-product and which also reacts with lime water (calcium hydroxide) to form calcium oxy-chloride is thus, chlorine. Gas A is not hydrogen. Calcium oxy-chloride is used as a bleaching agent in the chemical industry. The chemical equation for the formation of calcium oxy-chloride is as follows**:-**

$Ca(OH)_2(s) + Cl_2(g) \rightarrow CaOCl_2(s) + H_2O(l)$
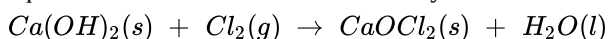
Therefore, gas '**A'** is **chlorine gas** (Cl_2) and '**B'** is **calcium oxy-chloride** (bleaching powder).

OR

- Chlor-akali process - When electricity is passed through aqueous solution of sodium chloride (brine), it decomposes to form sodium hydroxide, chlorine and hydrogen.
- 2NaCl (aq) + 2H$_2$O(l) → 2NaOH + Cl$_2$ + H$_2$
- Anode - Chlorine gas/Cl$_2$
- Cathode - Hydrogen gas/H$_2$
- Cl$_2$

    1. Used in the preparation of bleaching powder.
    2. To make drinking water free from germs or any other.

- H$_2$

    1. Used in the manufacture of ammonia fertilisers.
    2. Used in fuels and margarine.

Section C

30.

(d) Bifocal lens whose upper portion is concave lens and lower portion is convex lens

Explanation:

The upper portion (concave lens) facilitates distant vision and the lower portion (convex lens) facilitates near vision.

31.

(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.

32.

**(d)** One direction at any point in space

Explanation:

Because magnetic field lines are directed from north to south .Which implies face of A is north and that of B is south and If field lines ever intersect at any point, there will be two tangents to the field line curve at that point, which is contradictory, as there can only be one net magnetic field vector having only one direction at any point in space.

33. (c) (20 cm, 20 cm) and (inverted and inverted)

Reason: Only real and inverted image can be obtained on the screen.

34. Figure: An electric lamp connected in series with a resistor of 4 Ω to a 6 V battery.
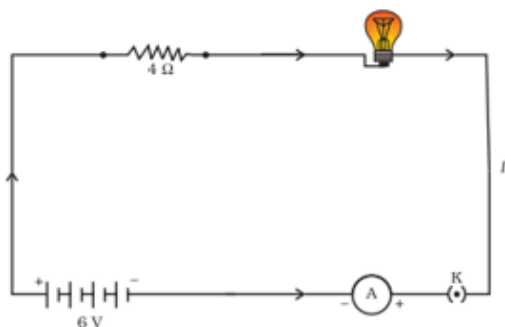
   a. The resistance of electric lamp, R1 = 20 Ω,

     The resistance of the conductor connected in series, R2 = 4 Ω.

     Then the total resistance in the circuit R =R1 + R2 Rs = 20 Ω + 4 Ω = 24 Ω.

     The total potential difference across the two terminals of the battery V = 6 V.

   b. Now by Ohm's law, the current through the circuit is given by I = V/Rs = 6 V/24 Ω = 0.25 A.

<p align="center">OR</p>

   The correct values of current and voltage the student should use in his calculations are 38 mA, 3.2 V

35.   1. Functions of following parts of human eye are given below :

       1. Cornea - It is a thin membrane which provides 67% of the eye's focussing power.

       2. Iris - It controls amount of light entering the eye by controlling the size of pupil similar to the aperture of a camera which has capacity to decrease or increase the amount of light entering eye.

       3. Crystalline lens - It helps to focus light on retina for image formation.

       4. Ciliary muscles - It contracts and relax in order to change the lens shape for focussing image at retina. when it contracts the lens become thicker and when it relaxes the lens become flat.

   2.   1. The objective of organising such compaigns is to guide, educate and help those people who are suffering from corneal blindness that they can be cured by corneal replacement surgery.

       2. 1. Come to participate in this campaign because, if someone get his vision through your eyes, it is an incredible help.

       2. As eye is one of the most valuable sense organs through which an individual can achieve so many things in his/her life, so try to realise the situation that these people are sufferinng from.

       3. The persons who actively participate and contribute in such programme are strong hearted and very much helpful for the people living in such situations.
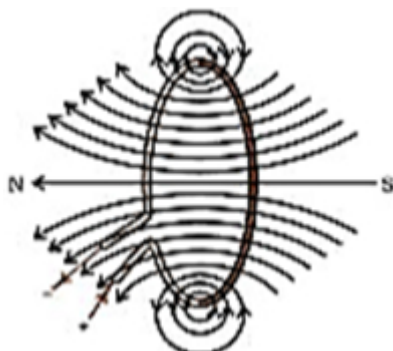
36. Given :-

   Resistor, R_1 = 4 Ω

   Resistor, R_2 = 8 Ω

   Resistor, R_3 = 8 Ω

   Potential Difference, V = 8 volts.

   i. Since two 8Ω resistances are in parallel, their effective resistance (Rp) is given by $\frac{1}{R'} = \frac{1}{8} + \frac{1}{8} + \frac{1}{4}$ or R' = 4Ω

   ii. The total resistance in the circuit, $R = 4\Omega + R_p = 4\Omega + 4\Omega = 8\Omega$

     Current through the electric circuit, $I = \frac{V}{R} = \frac{8}{4} = 2A$

     Since 4Ω resistor and Rp are in series, the current through 4Ω resistors = 1A.

37.   a.

   b. Right Hand Thumb Rule:- When a current carrying straight conductor is held in the right hand in such a way that the thumb points towards the direction of the current, then the fingers will wrap around the conductor in the direction of the field lines of

38. i. If a net charge Q, flows across any cross-section of a conductor in time 't', then the current 'I', through the cross-section is given by $I = \frac{Q}{T}$

    ii. The SI unit of electric charge is the coulomb (C), which is equivalent to the charge contained in nearly 6×10^{18} electrons.

    iii. The electric current is expressed by a unit called ampere (A). One ampere is constituted by the flow of one coulomb of charge per second.

    OR

    $I = \frac{Q}{t} = \frac{12}{4} = 3A$

39. i.
    - Virtual
    - Erect
    - Diminished
    - On the same side of the object

    ii. Focal Length = 20cm.

    u = -x cm

    $v = \frac{x}{3}$
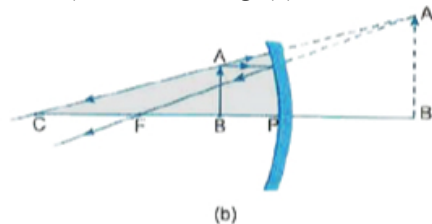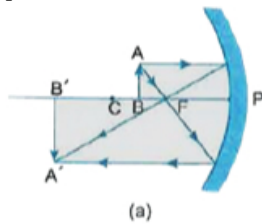
    $\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$

    x = 80 cm

    Hence, the distance of the object from the optical centre of the lens is 80 cm.

    <div align="center">OR</div>

    a. A concave mirror of focal length f = 10 cm can produce a magnified real image if an object is placed between F and C (i.e., when 20 cm > u > 10 cm) as shown in Fig. (a). However, the same mirror may form a magnified virtual image when object is placed between P and F (i.e., u < 10 cm) as shown in Fig. (b).

(a)   (b)

    b. Here focal length of convex mirror f= + 10 cm, distance of the object from the pole u = -10 cm

    As per formula,

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

    $\frac{1}{v} = \frac{1}{f} - \frac{1}{u} = \frac{1}{+10} - \frac{1}{-10}$

    $= \frac{1}{10} + \frac{1}{10} = \frac{1}{5}$

    $\Rightarrow$ v = +5 cm

    Thus, image is formed behind the mirror at 5 cm from the pole of mirror.