PART - I

Grade 10 Karnataaka Science 2023

There are three parts to the question paper.

Part A: Physics, Part B: Chemistry, Part C: Biology.

2. This question paper consists of objective and subjective types of 38 questions.

3. This question paper has been sealed by reverse jacket. You have to cut on the right side

to open the paper at the time of commencement of the examination. Check whether all the pages of the question paper are intact.

4. Follow the instructions given against both the objective and subjective types of questions.

5. Figures in the right-hand margin indicate maximum marks for the questions.

6. The maximum time to answer the paper is given at the top of the question paper. It includes 15 minutes for reading the question paper.

PART A

Q1. The device used to measure the rate of current in a circuit is

a. Ammeter

b. Voltmeter

c. Galvanometer

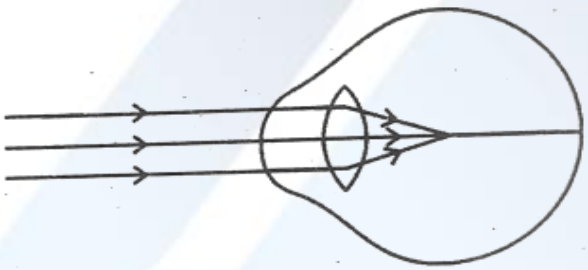
d. Battery

Solution:

The correct option is (a)

An ammeter is an instrument that is used to measure the current in a circuit.

Q2. Observe the given figure. Identify the eye defect indicated in this figure.



a. Presbyopia

b. Hypermetropia

c. Myopia

d. Cataract

Solution:

The correct option is (c)

Myopia, or nearsightedness, mostly affects young people. It happens when the eyeball becomes too long or the cornea curves more than normal. This causes light to focus in front of the retina instead of directly on it. Since the image of distant

objects does not form in the correct spot, they appear blurry.

Q3. A light ray enters to rarer medium from a denser medium. Then the speed of that light ray

a. Decreases and bends towards the normal
b. Increases and bends away from the normal
c. Decreases and bends away from the normal
d. Increases and bends towards the normal

Solution:

The correct option is (b)

When light moves from a denser to a rarer medium, it speeds up and bends away from the normal line.

Q4. The inner wall of the solar cooker is painted black. Because black colour

a. reflects light
b. converges solar rays
c. prevents from rusting
d. absorbs more heat

Solution:

The correct option is (d).

Black color absorbs heat well and traps it. This helps capture sunlight and prevents heat from escaping. Solar cookers are painted black to absorb maximum heat from the sun, allowing food to cook efficiently.

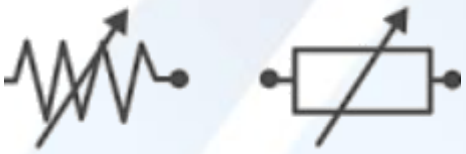
Q5. Write the symbols of the following components used in an electric circuit.

I. Rheostat

II. Wires crossing without joining

Solution:

I) Rheostat



II) Wires crossing without joining

Q6. What does the thumb indicate in the right-hand thumb rule?

Solution:

In the right-hand thumb rule, the thumb indicates the direction of the current in a straight wire, and the curled fingers show the direction of the magnetic field around it.

Q7. Light enters from air to benzene having refractive index 1.50 Calculate the speed of light in benzene.

(Speed of light in air: 3×10^8 m/s)

Solution:

Given that,

The refractive index of the benzene $(\mu) = 1.50$

Speed of light in air (c) $= 3 \times 10^8$ m/s

After traveling in air, the light enters benzene.

Let the speed of the light in benzene $= v$

Refractive index of the benzene,

$$\mu = \frac{c}{v} = \frac{\text{Speed of light in air}}{\text{speed of the light in benzene}}$$

$$\text{Speed of the light in benzene} = \frac{\text{Speed of light in air } (c)}{\mu}$$

$$\text{Speed of the light in benzene} = \frac{3 \times 10^8 \text{ m/s}}{1.50}$$

$$\text{Speed of the light in benzene} = 2 \times 10^8 \text{ m/s}$$

(OR)

A concave lens has focal length of 12 cm. At what distance should the object from the lens be placed so that it forms an image at 9 cm from the lens?

Solution:

Focal length, f = -12 cm Image distance, v=-9 cm

Object distance = u =?

As the lens is concave, the image formed is always virtual, therefore 'v' is negative.

Also, focal length of concave lens is negative.

From the lens formula: We know,

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

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

$$\frac{1}{u} = \frac{1}{-9} - \frac{1}{-12}$$

$$\frac{1}{u} = \frac{1}{12} - \frac{1}{9}$$

$$\frac{1}{u} = \frac{-1}{36}$$

$$u = -36 \text{ cm}$$

The object should be placed 36 cm in front of the lens (negative sign indicates it is on the same side as the incoming light).

Q8. Name the major constituent on biogas and write the properties of biogas

Solution:

- Biogas contains methane, carbon dioxide, and small amounts of gases like hydrogen sulphide, ammonia, and water vapour.
- It is made by mixing water with agricultural waste and is considered a good fuel.
- Biogas is a clean energy source that does not produce harmful waste.
- It gives more heat compared to wood, coal, and dung cakes.
- Biogas is a renewable energy source and is available in large amounts.
- It is an affordable source of energy.

(OR)

List the hazards of nuclear power generation.

Solution:

The major hazards of nuclear power generation are:

- Difficulty in storing and disposing of used fuel safely.
- Improper storage and disposal of nuclear waste can cause environmental pollution.
- Risk of accidental leakage of nuclear radiation.

Q9. State Ohm's law. On which factors do the resistance of a conductor depend? Mention the SI unit of electric power.

Solution:

Ohm's law: Ohm's law states that "the voltage across a conductor is directly proportional to the current flowing through it", as long as the physical conditions and temperature stay constant.

The resistance of a conductor depends upon

(1) Resistivity,

(2) length of the conductor

(3) Cross-sectional area of the conductor

The resistance (R) is given by the relation

$$\left(R = \rho \frac{l}{A}\right)$$

It does also depend on other physical factors like temperature etc.

Electric power: Electric power is the rate at which electric energy is transferred by an electric circuit.

The SI unit of power is the watt (W).

1 W = $\frac{J}{s}$ (Joule/sec)

(OR)

State Joule's law of heating, how is fuse connected in the circuits? Name the metal used in the filament and the gas filled in the electric blub.

Solution:

Joule's law of heating: Joule's law of heating states that the amount of heat (H) generated by an electrical conductor is proportional to

(1) Resistance (R)

(2) The square of the electric current (I^2)

(3) Time (t) for which the current flows.

$$H = I^2Rt$$

Where:

H is the heat produced,

I is the current,

R is the resistance,

t is the time.

- The fuse wire is always connected in the live wire of the circuit because if the fuse is put in the neutral wire, then due to excessive flow of current when the fuse burns, current stops flowing in the circuit, but the appliance remains connected to the high potential point of the supply through the live wire.
- The metal used for making filaments of an electric bulb is tungsten.
- The bulbs are filled with Nitrogen or Argon gas to prevent oxidation of the tungsten filament used in the bulb.

Q10. The resistors R_1, R_2 and R_3 have the values 10Ω, 20Ω and 60Ω respectively, which have been parallelly connected to a battery of 24 V in an electric circuit. Then calculate the following:

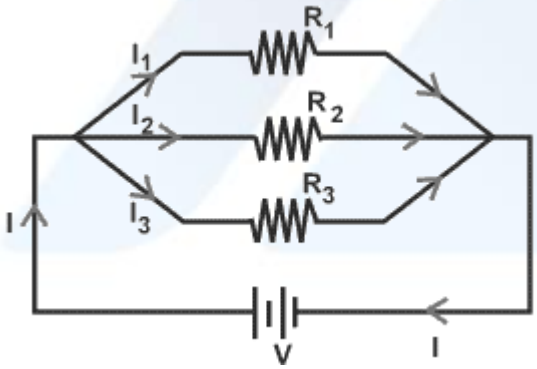
i) The current flowing through each resistor.

ii) The total current in the circuit.

iii) The total resistance of the circuit.

Solution:

i) In parallel connection of resistors, the voltage across each of them will be same = 24 V & the current is different across each resistor.



$$I_1 = \frac{V}{R_1} = \frac{24}{10} = 2.4\ A$$

$$I_2 = \frac{V}{R_2} = \frac{24}{20} = 1.2\ A$$

$$I = \frac{V}{R_3} = \frac{24}{60} = 0.4\ A$$

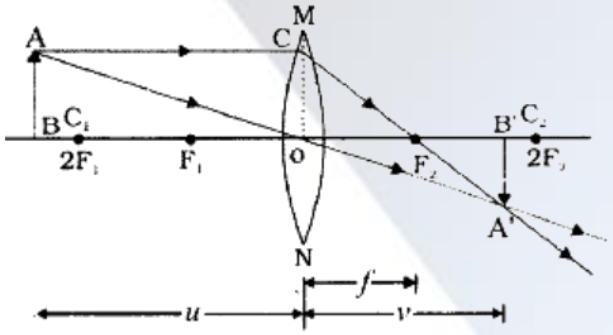
ii) Total current $= I_1 + I_2 + I_3 = 2.4 + 1.2 + 0.4 = 4\ A$

iii) Total circuit resistance (I) $= \frac{V}{\text{Totalcurrent}} = \frac{24}{4} = 6\Omega,$

Q11. Draw the ray diagram for the image formation in a convex lens when the object is placed beyond $2F_1$. Mention the position and nature of the image formed.
(F_1: Principal focus of the lens)

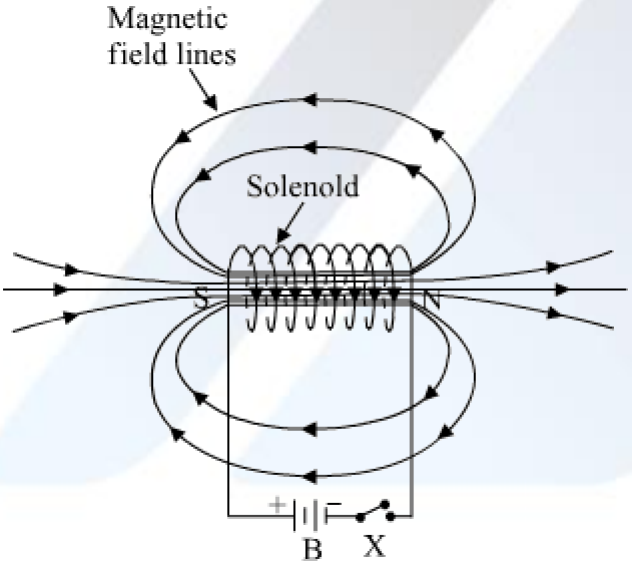
Solution:

When an object is placed beyond $2F_1$ and Infront of a convex lens, the image formed is formed between F_2 and $2F_2$ (on the other side of the lens), it is real image, inverted image and smaller than the object (diminished image) .



Q12. (a) What is solenoid? Write the properties of the magnetic field lines formed around a current carrying solenoid.

Solution:



- A solenoid is a coil of insulated or enamelled wire wrapped around a rod made of solid iron, steel, or powdered iron. Such devices can function as electromagnets.
- One end of the solenoid acts as the north magnetic pole, and the other end acts as the south magnetic pole.
- The magnetic field lines inside the solenoid are straight and parallel, showing that the field is uniform throughout the solenoid.
- Increasing the current in the solenoid makes the magnetic field lines become denser.

- The magnetic field strength increases when the number of turns in the solenoid is increased, given the same length.

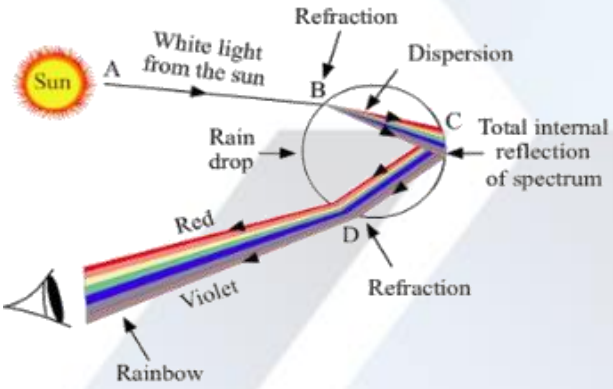
Q12. (b) What is alternating current? Electric appliances having metallic body are connected to earth wire, why?

Solution:

- An alternating current can be defined as a current that changes its magnitude and polarity at regular intervals of time.
- The metallic body of electrical appliances is linked to the ground through an earth wire, ensuring that any leakage of electric current is directed to the ground. This helps prevent electric shocks to users. Grounding wires provide an alternate path for the current to flow back to the source, instead of passing through a person in contact with a faulty appliance or electrical box.

Q13. (a) How does rainbow form in the nature? Explain. Mention the colour of the light that bends the most and that bends the least.

Solution:



- A rainbow is a band of colors that appears in the sky after rain. It is formed when sunlight is dispersed by tiny water droplets, which act like small prisms.
- When light hits the outer surface of these droplets, it enters and strikes the inner surface, reflecting inside rather than refracting out.
- The internally reflected light then strikes the opposite inner surface of the droplet, refracts, and exits.
- This refracted light spreads into the various colors of a rainbow. Multiple refractions and internal reflections create the rainbow.
- A rainbow becomes visible when sunlight is dispersed by water droplets in the atmosphere, splitting white light into seven distinct colors with different wavelengths.
- Red light, with a longer wavelength, bends the least, while violet light, with a shorter wavelength, bends the most.

Q13. (b) How does the eye lens accommodate to see the distant objects and nearby objects? Explain.

Solution:

The human eye can see both near and distant objects clearly by changing the focal length of the eye lens through a process called accommodation.

- When the ciliary muscles are relaxed, the lens becomes thinner, increasing its focal length, which helps us see distant objects clearly.
- When focusing on nearby objects, the ciliary muscles contract, making the lens thicker and increasing its curvature. This reduces the focal length, allowing us to see close objects clearly.

PART B
(CHEMISTRY)

Q14. The reactants that exchange ions by reacting with each other and form a precipitate among the following are

A. $BaCl_2$ and Na_2SO_4

B. Al_2O_3 and HCl

C. NaOH and H_2SO_4

D. Na_2O and CO_2

Solution: (A)

Barium chloride and sodium sulphate react together to form a precipitate of Barium sulphate (white precipitate).

$BaCl_2 + Na_2SO_4 \rightarrow BaSO_4 \downarrow + 2NaCl$

Q15. Among $_2X^4$, $_8Y^{16}$, $_{10}Z^{20}$ the elements having zero valency are [2,8,10 are atomic number of elements]

A. $_2X^4$ and $_8Y^{16}$

B. $_8Y^{16}$ and $_{10}Z^{20}$

C. $_2X^4$ and $_{10}Z^{20}$

D. $_2X^4$, $_8Y^{16}$ and $_{10}Z^{20}$

Solution: (C)

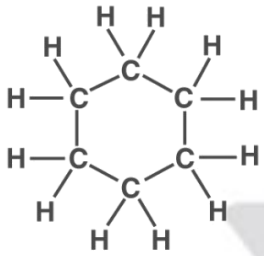
The valence or valency of an element indicates its ability to combine with other atoms when forming chemical compounds or molecules.

Noble gas family has zero valency. The elements $_2X^4$ and $_{10}Z^{20}$ are Helium and Neo. They have zero valency because they have their outer shells are filled completely. and are chemically inert gases.

Q16. The general formula of cycloalkanes is C_nH_{2n} and its first member is cyclopropane ($\mathbf{C_3H_6}$). Write the molecular formula and structural arrangements of the fourth member of this homologous series.

Solution:

Molecular Formula: $\mathbf{C_6H_{12}}$
Structural arrangement:



Q17. Packets of chips are flushed with nitrogen gas. Why?

Solution:

When fats and oils oxidize, they become rancid, altering their smell and taste. To prevent this, they are flushed with nitrogen gas, which is inert and helps stop the oxidation process.

Q18. An iron nail is dropped into a test tube having copper sulphate solution. The iron nail gradually turns to brownish colour. Why?

Solution:

An iron nail (Fe) is placed in blue copper sulphate ($CuSO_4$). Since iron is more reactive than copper, it displaces copper in the copper sulphate, forming ferrous sulphate, which is greenish blue. The displaced copper then forms reddish-brown deposits around the nail.

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

Q19. What is hydrogenation?

Solution:

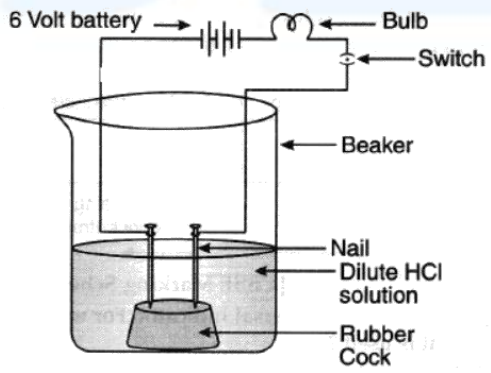
The addition of hydrogen to unsaturated hydrocarbons in presence of a catalyst such as nickel or palladium to form saturated hydrocarbons is called hydrogenation.

$$CH_2 = CH_2 \quad + \quad H_2 \quad \xrightarrow[\text{Heat}]{\text{Ni}} \quad CH_3 - CH_3$$

Ethene Hydrogen Ethane

Q20. Draw the diagram of arrangement of apparatus to show that acid solution in water conducts electricity and label dilute HCl solution.

Solution:



Q21. "Calcium oxide and carbon dioxide are produced on heating calcium carbonate". Write the balanced chemical equation for this reaction. Mention the type of this chemical reaction.

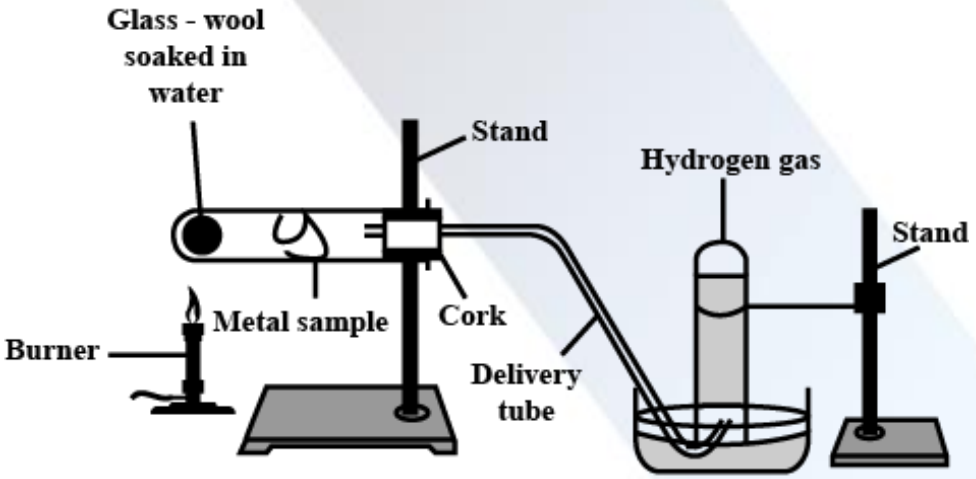
Solution:

Balanced chemical reaction: $CaCO_3 \rightarrow CaO + CO_2$

Type of chemical reaction: The given reaction is type of decomposition reaction.

Q22. Draw the diagram of arrangements of apparatus to show the action of steam on a metal.

Solution:



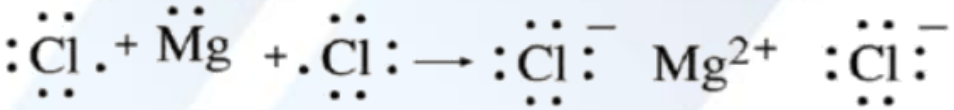
Action of steam on a metal

Q23. a) Depict the formation of magnesium chloride with the help of electron dot structure.

Solution:

The atomic number of Mg =12. The electronic configuration of Mg is 2,8,2. Mg atom has 2 valence electrons. It loses these 2 valence electrons to form Mg^{2+} ion.

The atomic number of Cl=17. The electronic configuration of Mg is 2,8,7. Cl atom has 7 valence electrons. It gains one valence electron to form Cl^- ion.



Q23. b) Hydrogen gas is not liberated when a metal like zinc reacts with nitric acid. Why?

Solution:

Hydrogen gas is not produced when zinc reacts with nitric acid because nitric acid, being a strong oxidizing agent, oxidizes the hydrogen to water during the reaction

(OR)

How are metals in the middle of the reactivity series extracted from their ores? Explain.

Solution:

The metals in the middle of the reactivity series, such as iron, zinc, lead, copper etc. are moderately reactive. These are usually present as sulphides or carbonates ores.

Before reduction, metal sulphides and carbonates must first be converted into oxides through roasting and calcination. Simply heating the metal oxides is not enough for reduction. To obtain the free metal, these oxides are reduced using chemical agents such as carbon, aluminium, sodium, or calcium

Following methods are used to extract the metals in the middle of the reactivity series extracted from their ores

- Reduction with carbon
- Electrolysis

Q24. a) Observe the given part of the modern periodic table and answer the following questions:

Groups → Periods ↓	1	2	13	17
2		Be		
3	Na	Mg	Al	Cl
4		Ca		

i) Which element is more electropositive? Why?

ii) Atoms of which element have minimum atomic radius? Why?

Solution:

(i) From the given table, Na is the most electropositive element because as we move left to right in a period electro positivity decrease.

(ii) When we move from left to right across a period, the atomic radius decreases, while in groups, the atomic radius increases as we move down. Since chlorine has 17 protons, it has a stronger effective nuclear charge, which pulls its valence electrons closer to the nucleus. As a result, chlorine is expected to have a smaller atomic radius compared to other elements in the table.

Q24. b) Mention the period and group number of the element that has atomic number 19.

Solution:

Atomic number: 19

Electron configuration: $1s^2 2s^2 2p^6 3s^2 3p^6 4s^1$

To determine an element's group and period number from its electronic configuration, look at the outermost electron shell and count the number of valence electrons.

4s means it comes under the fourth period and s^1 means it is the first group. It is a metal (Potassium).

Q25. Name the salts used in the following situations and write their molecular formula:

a) To remove permanent hardness of water.

b) To make drinking water free from germs.

c) To support fractured bones in their right position.

Solution:

a) Washing soda ($Na_2CO_3.10H_2O$) is used for removing the permanent hardness of the water.

b) Bleaching powder ($CaOCl_2$) is used to make drinking water free from germs.

c) Plaster of Paris ($CaSO_4 \cdot \frac{1}{2}H_2O$) is used as cast for setting broken bones.

(OR)

a) The pH values of four solutions are given in the below tables. Classify these into acidic and basic solutions:

Solutions	pH values
e	5
f	13
g	9
h	2

Solution:

Among the given,

Acidic solutions: e, h

Basic solutions: g, f

b) Name the antacid used to neutralise excess of acid in the stomach.

Solution:

The common antacid used to neutralize excess acid in the stomach are Magnesium hydroxide & Baking soda.

Q26. a) How will ethanol be oxidised?

Solution:

Oxidation of Ethanol:

- Ethanol in presence of acidified Potassium dichromate ($K_2Cr_2O_7$), undergoes oxidation forming Ethanal or Acetaldehyde (CH_3CHO) and water as products.
- Then, Acetaldehyde undergoes further oxidation to form Acetic acid or Ethanoic acid (CH_3COOH).
- The reaction is given below:

$$CH_3CH_2OH(l) + [O] \xrightarrow[\text{Acidifiod}]{K_2Cr_2O_7} CH_3CHO(l) + H_2O(l)$$

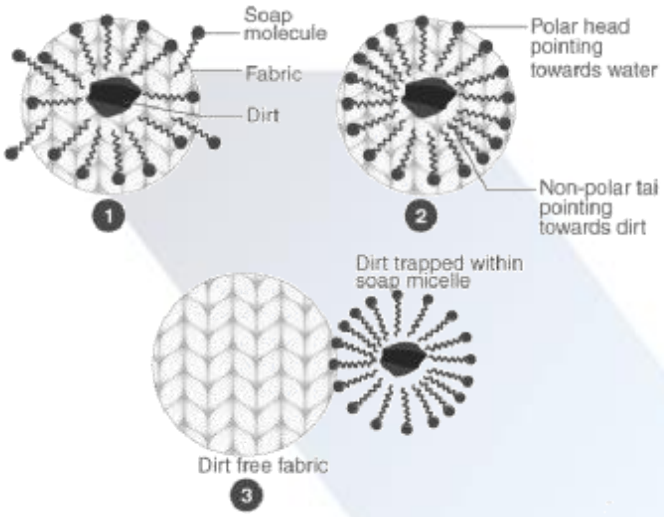
$$CH_3CHO(l) + [O] \xrightarrow[\text{Acdifled}]{K_2Cr_2O_7} CH_3COOH(l)$$

b) Explain the cleaning action of soaps.

Solution:

The dirt which is present on clothes is organic in nature and insoluble in water. Therefore, it cannot be removed by only washing with water.

When soap is dissolved in water, its hydrophobic ends attach themselves to the dirt and remove it from the cloth. Then the molecules of soap arrange themselves in micelle formation and trap the dirt at the centre of the cluster. These micelles stay suspended in water like particles in a colloidal solution, and the trapped dirt is easily washed away with water.



PART - C
(BIOLOGY)

]

Q27. "A person immediately starts running soon after observing a snake." The correct transmission path of reflex impulse in this situation is

A. Receptor → Sensory neuron → Brain Relay neuron → Motor neuron → Effector
B. Receptor → Sensory neuron → Spinal cord → Relay neuron → Motor neuron → Effector
C. Effector → Spinal cord cord → Sensory neuron → Relay neuron → Motor neuron → Receptor
D. Effector → Motor neuron → Relay neuron → Brain → Sensory neuron → Receptor

Solution:

B. Receptor → Sensory neuron → Spinal cord → Relay neuron → Motor neuron → Effector

When a person sees a snake, the sensory neuron detects the stimulus and sends the impulse to the spinal cord. In the spinal cord, a relay neuron processes the signal and passes it to the motor neuron, which then activates the muscles (effector) to initiate movement, such as running. The brain doesn't play a role in this immediate reflex response, as it is primarily managed by the spinal cord for a quicker reaction.

Q28. In humans, the testes are located outside the lower abdomen in the scrotum because

A. to protect testes from mechanical shocks
B. to increase the production of sperms
C. to maintain the secretion of testosterone hormone
D. to maintain the temperature required for sperm production.

Solution:

D. to maintain the temperature required for sperm production.

The testes are located outside the abdominal cavity in a pouch called the scrotum. The temperature inside the scrotum, which is essential for sperm production, needs to be 2°C lower than the body's normal temperature.

Q29. What is the role of abscisic acid in plants?

Solution:

- Abscisic acid is a plant hormone that inhibits growth. It acts opposite to gibberellic acid.
- Often called the "stress hormone," as it helps plants tolerate stress conditions such as drought or extreme temperatures.

Q30. Write two examples for the organisms that reproduce by binary fission.

Solution:

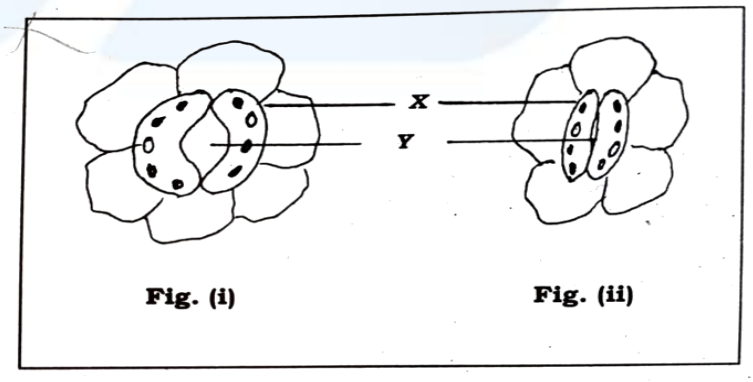
Two examples of organisms that reproduce by binary fission are:
1) Amoeba 2) Leishmania

Q31. Mention the tools used for tracing the evolutionary relationships between the organisms.

Solution:

The various tools of tracing evolutionary relationships that have been used for studying human evolution are
Excavation – Digging and uncovering ancient fossils and artifacts.
Carbon Dating – Determining the age of fossils by measuring the decay of carbon isotopes.
Study of Fossils – Analysing preserved remains of ancient human ancestors.
DNA Sequencing – Comparing genetic material to trace evolutionary links and common ancestors.

Q32. Observe the given below figures:



a) Which figure indicates the massive amount of exchange of gases? Why?

b) Name the parts X and Y. What is the function of part X ?

Solution:

a) In Figure (i), a large amount of gas exchange occurs because the stomatal pore is open.

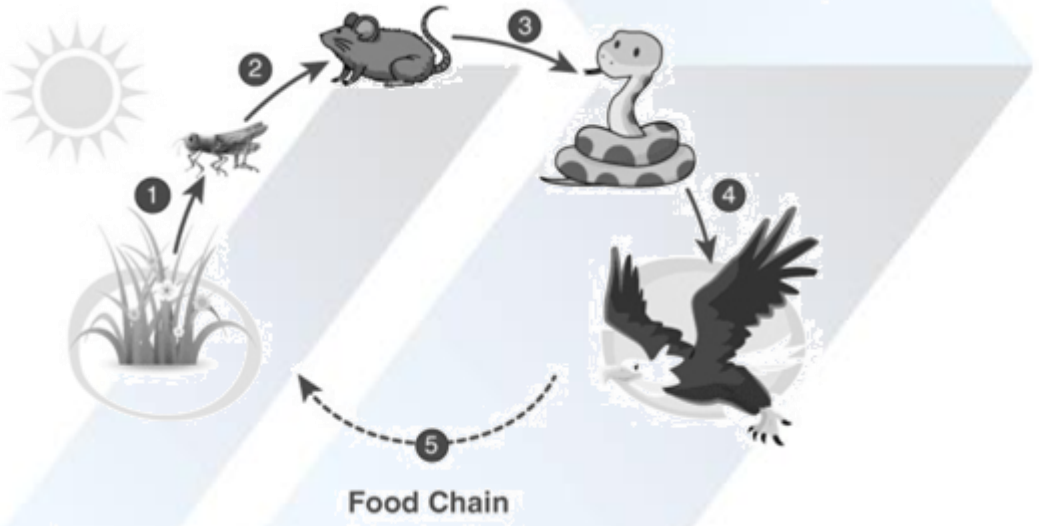
b) **X** represents the Guard Cell, and **Y** represents the Stomatal Pore. Guard cells are specialized epidermal cells that regulate gas exchange by controlling the opening and closing of stomatal pores.

Q33. Give an example for a food chain of grassland ecosystems. If there is an increase in the number of organisms in the second trophic level, how does this affect the food chain?

Solution:

An example of grassland food chain is explained below:

Grasses (producers, 1st trophic level) are consumed by grasshoppers (2nd trophic level), which are then eaten by frogs (3rd trophic level). The frogs are preyed upon by snakes (4th trophic level), and finally, vultures or eagles (5th trophic level) feed on these snakes.



Food Chain

The second trophic level includes primary consumers. If their population increases significantly, producers may disappear due to high consumption and limited availability.

Q34. What is pollination? What are the changes that occur in the flower after pollination?

Solution:

Pollination is the transfer of pollen grains from the stamen to the stigma of the pistil. Pollination occurs when pollen grains are carried from the anther to the stigma by insects, birds, wind or water.

Changes after pollination:

- The pollen grain forms a tube to reach the ovule.
- Fertilization takes place, forming a zygote.
- Petals and other flower parts may wither and fall.

- The ovary grows into a fruit.
- The ovules develop into seeds.

Q35. Coal and petroleum products should be used judiciously. Why?

Solution:

Coal and petroleum were formed millions of years ago from the breakdown of biomass. They are limited and non-renewable resources. Current petroleum reserves may last around forty years, while coal could last for about two hundred years, making it essential to use them wisely. Burning fossil fuels releases carbon dioxide, nitrogen oxides, sulfur oxides, and water. If there is not enough oxygen during combustion, carbon monoxide forms instead of carbon dioxide. At high concentrations, these gases can be harmful. These are all poisonous at high concentration.

Q36. Tall pea plant producing red flowers (TT RR) is crossed with a short pea plant producing white flowers (tt rr).

i) Mention the type of plants produced from these plants in the F_1 generation.
ii) Write the ratio of plants obtained in the F_2 generation by 2 crossing the plants of F_1, generation and name the varieties of plants obtained.

Solution:

(i) All tall red Flowers

	TR	TR
tr	TtRr	TtRr
tr	TtRr	TtRr

(ii)

	TR	**Tr**	**tR**	**tr**
TR	TTRR	TTRr	TtRR	TtRr
Tr	TTRr	TTrr	TtRr	Ttrr
tR	TtRR	TtRr	ttRR	ttRr
tr	TtRr	Ttrr	ttRr	ttrr

Tall pea plant bearing red flowers - TTRR
Short pea plant bearing white flowers - ttrr
F1 generation – TtRr
Self-pollination of F1 – TtRr X TtRr
Gametes - TR,Tr, tR, tr TR, Tr, tR, tr
F2 generation:
Phenotypic ratio: 9:3:3:1

9 (Tall red): 3 (Tall white): 3 (Dwarf red): 1 (Dwarf white)

(OR)

Analyse the situations given below. Answer the questions given:

Situation 1: The number of green grasshoppers in a green zone has been increasing from one generation to another generation.

Situation 2: The number of brown grasshoppers in the same green zone has been reducing.

Here,

a) Where could genetic drift happen more? Why?

b) How can natural selection be considered as an important factor in organic evolution?

Solution:

a) Genetic drift can occur in brown grasshoppers because their population is small, making them more vulnerable to being captured by predators.

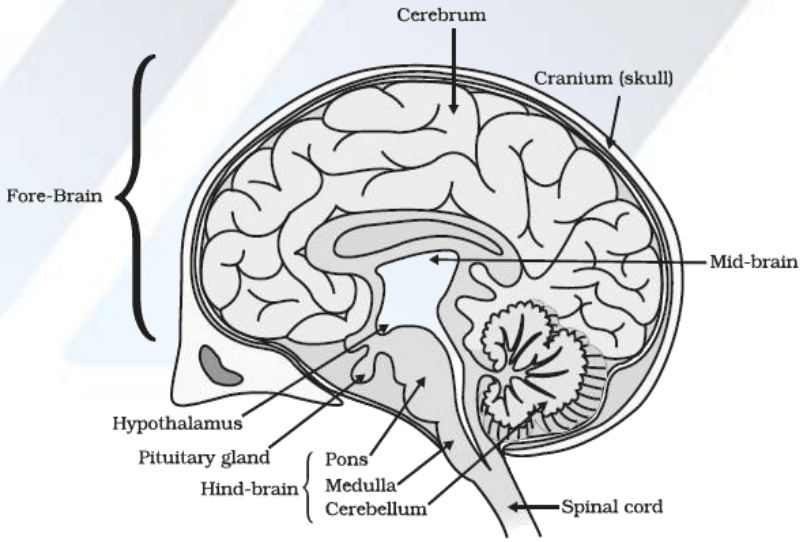
b) Natural selection is one of the most important processes that drives evolution and helps to explain the diversity of life on Earth. Because of natural selection, favourable traits are passed down through generations. This process can lead to speciation, where a new and distinct species emerges from an existing one.

Q37. Draw the diagram showing the structure of the human brain. Label the following parts:

i) Hypothalamus

ii) Pons.

Solution:



Q38. Explain the digestion of food materials in the stomach and small intestine.

Solution:

Digestion in the stomach:

- Stomach stores and mixes the food received from the oesophagus with the help of gastric juices.

- The main components of gastric juice are hydrochloric acid, mucus, and pepsinogen.
- Hydrochloric acid dissolves bits of food and creates an acidic medium. It also helps in killing bacteria.
- In this acidic medium, pepsinogen is converted to pepsin, which is a protein-digesting enzyme.
- Mucus protects the inner lining of the stomach from the action of HCl.

Digestion in the small intestine:

- Chyme is a semi-liquid substance formed in the stomach after food is mixed with gastric juices.
- Small intestine is the site for the complete digestion of carbohydrates, proteins, and fats.
- It produces intestinal juice from the glands present in its wall.
- The intestinal juice helps in the further digestion of food.
- Small intestine also obtains digestive juices from the liver and pancreas that helps in the mixing of food.
- The liver produces bile juice that causes the emulsification of fats, and the pancreas produces pancreatic juice for digesting proteins and emulsified fats.
- This digested food is finally absorbed through the intestinal walls with the help of tiny hair-like structures called villi.

(OR)

Explain the role of xylem and phloem tissues in the transportation of materials in plants.

Solution:

The vascular tissue system is a network of cells responsible for transporting essential materials throughout the plant. It consists of different types of cells, with the key components being the xylem and phloem. Both tissues play a vital role in moving substances within the plant. They help transport fluids and nutrients through the plant's internal system.

The xylem is a conducting tissue that transports water and nutrients from the roots to the stems and leaves. It forms a system that moves fluids and minerals from the plant's underground parts to its aerial parts. The xylem also helps replace water lost during transpiration and photosynthesis through capillary action. In woody plants, it provides structural support through the development of vascular cambium. Mature xylem cells are dead and lignified.

The phloem, primarily composed of living conducting tissues, is responsible for transporting nutrients and soluble organic compounds from the leaves to other parts of the plant for use or storage. It moves the products of photosynthesis, such as simple sugars, from the leaves to other plant parts. Excess sugars are transported to storage structures, like tubers and bulbs, for later use.