

JK Board Class 10 Science(Life Science) Question Paper with Solutions(Memory Based)

Time Allowed :3 Hour	Maximum Marks :60	Total Questions :24
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General Instructions

Read the following instructions very carefully and strictly follow them:

- Answers to this Paper must be written on the paper provided separately.
- You will not be allowed to write during the first 15 minutes
- This time is to be spent in reading the question paper.
- The time given at the head of this Paper is the time allowed for writing the answers,
- The paper has four Sections.
- Section A is compulsory - All questions in Section A must be answered.
- You must attempt one question from each of the Sections B, C and D and one other question from any Section of your choice.

1. Explain the process of Photosynthesis and write its balanced chemical equation.

Correct Answer: Photosynthesis is the process by which green plants prepare their food using carbon dioxide and water in the presence of sunlight and chlorophyll.

Solution:

Concept: Photosynthesis is a vital biological process through which green plants, algae, and some bacteria produce their own food. This process occurs in the **chloroplasts** of plant cells with the help of the pigment **chlorophyll**.

Step 1: Definition of Photosynthesis

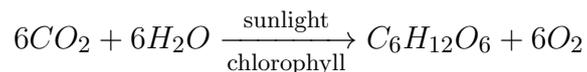
Photosynthesis is the process by which green plants synthesize **glucose (food)** from **carbon dioxide and water** in the presence of **sunlight and chlorophyll**, releasing **oxygen** as a by-product.

Step 2: Process of Photosynthesis

The process occurs in the following stages:

- Chlorophyll in the leaves absorbs **sunlight**.
- Roots absorb **water** from the soil.
- Leaves take in **carbon dioxide** from the atmosphere through stomata.
- Using solar energy, plants convert carbon dioxide and water into **glucose** and release **oxygen**.

Step 3: Balanced Chemical Equation



where CO_2 = Carbon dioxide

H_2O = Water

$C_6H_{12}O_6$ = Glucose

O_2 = Oxygen

Quick Tip

Photosynthesis converts **solar energy into chemical energy** stored in glucose, making it the primary source of energy for almost all living organisms.

2. Describe the mechanism of Respiration in humans, including the role of alveoli.

Correct Answer: Respiration in humans is the process by which oxygen is taken into the body and carbon dioxide is removed. Alveoli play a key role in the exchange of gases between air and blood.

Solution:

Concept: Respiration is a biological process through which the body obtains **oxygen** and releases **carbon dioxide**. It involves breathing and cellular respiration that produce energy for body activities.

Step 1: Inhalation (Breathing In)

During inhalation:

- The **diaphragm contracts** and moves downward.
- The **rib cage expands**.
- The lungs expand and **oxygen-rich air enters** through the nose, trachea, and bronchi into the lungs.

Step 2: Gas Exchange in Alveoli

Inside the lungs are millions of tiny air sacs called **alveoli**. These structures have:

- Very **thin walls**
- A **large surface area**
- A rich supply of **blood capillaries**

Oxygen from the inhaled air diffuses through the thin walls of the alveoli into the blood, while carbon dioxide from the blood diffuses into the alveoli.

Step 3: Transport of Gases

- Oxygen combines with **hemoglobin** in red blood cells and is transported to body tissues.
- Carbon dioxide produced by cells is carried back by the blood to the lungs.

Step 4: Exhalation (Breathing Out)

During exhalation:

- The diaphragm relaxes and moves upward.
- The rib cage contracts.
- Carbon dioxide-rich air is expelled from the lungs.

Quick Tip

Alveoli are specialized structures in the lungs that provide a **large surface area for efficient gas exchange** between air and blood.

3. Explain how gaseous exchange occurs in plants through stomata and lenticels.

Correct Answer: In plants, gaseous exchange occurs mainly through stomata present in leaves and lenticels present in woody stems.

Solution:

Concept: Plants require gases such as **carbon dioxide** for photosynthesis and **oxygen** for respiration. The exchange of these gases occurs mainly through specialized structures called **stomata** and **lenticels**.

Step 1: Gaseous Exchange through Stomata

Stomata are tiny pores present on the surface of leaves, mostly on the lower epidermis. Each stoma is surrounded by a pair of **guard cells** that control its opening and closing.

- During **photosynthesis**, carbon dioxide from the atmosphere enters the leaf through stomata.
- Oxygen produced during photosynthesis diffuses out through the stomata.
- Water vapor is also lost through stomata in a process called **transpiration**.

Step 2: Gaseous Exchange through Lenticels

Lenticels are small pores found in the bark of **woody stems**. They allow the exchange of gases between the internal tissues of the plant and the atmosphere.

- Oxygen enters the stem through lenticels for respiration.
- Carbon dioxide produced during respiration diffuses out through lenticels.

Step 3: Diffusion Process

The movement of gases in plants occurs mainly by the process of **diffusion**, where gases move from a region of higher concentration to a region of lower concentration.

Quick Tip

Stomata help in gaseous exchange and transpiration in leaves, while **lenticels** allow gaseous exchange in woody stems.

4. What is Transpiration, and how does it help in the upward movement of water in plants?

Correct Answer: Transpiration is the loss of water in the form of water vapour from the aerial parts of plants, mainly through stomata. It helps in the upward movement of water by creating a transpiration pull.

Solution:

Concept: Plants absorb water from the soil through their roots and transport it to different parts of the plant. The loss of water vapour from leaves plays an important role in pulling water upward through the plant.

Step 1: Definition of Transpiration

Transpiration is the process by which plants lose water in the form of **water vapour** from the aerial parts such as leaves, stems, and flowers, mainly through small openings called **stomata**.

Step 2: Transpiration Pull

When water evaporates from the surface of leaves during transpiration, it creates a **negative pressure (pull)** inside the xylem vessels. This force is known as the **transpiration pull**.

Step 3: Upward Movement of Water

Due to transpiration pull:

- Water absorbed by roots moves upward through the **xylem tissues**.
- The continuous column of water is maintained from roots to leaves.
- Minerals dissolved in water are also transported to different parts of the plant.

Thus, transpiration plays an important role in the **transport of water and minerals** within the plant.

Quick Tip

Transpiration not only helps in the upward movement of water but also **cools the plant and maintains water balance**.

5. Define Reflex Action and explain the pathway of a Reflex Arc with an example.

Correct Answer: Reflex action is an automatic and rapid response to a stimulus that occurs without conscious control. The pathway followed by the nerve impulse during this action is called the reflex arc.

Solution:

Concept: Reflex actions are quick, automatic responses that help protect the body from harm. These actions occur through a special neural pathway called a **reflex arc**, which mainly involves the **spinal cord** rather than the brain.

Step 1: Definition of Reflex Action

Reflex action is a sudden, automatic, and involuntary response to a stimulus without the involvement of conscious thinking.

Example: Quickly withdrawing the hand when it touches a hot object.

Step 2: Pathway of Reflex Arc

A **reflex arc** is the pathway through which nerve impulses travel during a reflex action. It consists of the following components:

- **Receptor:** Detects the stimulus (e.g., heat receptors in the skin).
- **Sensory neuron:** Carries the impulse from the receptor to the spinal cord.
- **Interneuron:** Located in the spinal cord, processes the signal.
- **Motor neuron:** Carries the impulse from the spinal cord to the effector.
- **Effector:** The muscle or gland that produces the response.

Step 3: Example of Reflex Action

When a person touches a hot object:

- Receptors in the skin detect heat.
- Sensory neurons carry the impulse to the spinal cord.
- The spinal cord sends a signal through motor neurons.
- The muscles of the hand contract, pulling the hand away quickly.

Quick Tip

Reflex actions are controlled mainly by the **spinal cord**, allowing the body to respond quickly to harmful stimuli.

6. Explain the role of Thyroxin and Insulin hormones in the human body.

Correct Answer: Thyroxin regulates metabolism and growth in the body, while insulin regulates the level of glucose in the blood.

Solution:

Concept: Hormones are chemical substances produced by endocrine glands that regulate various functions in the body. Two important hormones are **thyroxin** and **insulin**, which help control metabolism and blood sugar levels.

Step 1: Role of Thyroxin

Thyroxin is a hormone secreted by the **thyroid gland**. It plays an important role in regulating the **metabolism** of carbohydrates, proteins, and fats in the body.

Functions of thyroxin:

- Regulates the **metabolic rate** of the body.
- Helps in **growth and development**.
- Controls the **use of energy** in cells.

A deficiency of thyroxin can cause diseases such as **goitre**.

Step 2: Role of Insulin

Insulin is a hormone produced by the **pancreas**. It helps regulate the amount of **glucose (sugar)** in the blood.

Functions of insulin:

- Controls the **blood glucose level**.
- Helps cells **absorb glucose** from the blood.
- Converts excess glucose into **glycogen** for storage in the liver and muscles.

A deficiency of insulin can lead to **diabetes mellitus**.

Quick Tip

Thyroxin → Controls metabolism and growth.

Insulin → Regulates blood sugar level.

7. Distinguish between Sexual and Asexual reproduction with examples.

Correct Answer: Sexual reproduction involves two parents and the fusion of gametes, while asexual reproduction involves only one parent and no gamete formation.

Solution:

Concept: Reproduction is the biological process by which living organisms produce new individuals of the same species. It can occur in two main ways: **sexual reproduction** and **asexual reproduction**.

Step 1: Differences between Sexual and Asexual Reproduction

Feature	Sexual Reproduction	Asexual Reproduction
Number of parents	Two parents (male and female)	Only one parent
Gamete formation	Involves formation and fusion of gametes	No formation of gametes
Genetic variation	Offspring show genetic variation	Offspring are genetically identical
Speed of reproduction	Usually slower	Usually faster
Examples	Humans, animals, flowering plants	Amoeba, yeast, bacteria

Step 2: Examples

- **Sexual reproduction:** Occurs in humans where male and female gametes fuse to form a zygote.
- **Asexual reproduction:** Amoeba reproduces by **binary fission**, and yeast reproduces by **budding**.

Quick Tip

Sexual reproduction → Two parents, genetic variation.

Asexual reproduction → One parent, identical offspring.

8. Describe the process of Double Fertilization in flowering plants.

Correct Answer: Double fertilization is a process in flowering plants where one male gamete fuses with the egg cell to form a zygote and the other male gamete fuses with two polar nuclei to form endosperm.

Solution:

Concept: Double fertilization is a unique feature of **angiosperms (flowering plants)**. In this process, two fertilization events occur within the embryo sac of the ovule.

Step 1: Pollination and Pollen Tube Formation

After **pollination**, the pollen grain lands on the stigma and germinates to form a **pollen tube**. This tube grows through the style and reaches the ovule in the ovary, carrying two male gametes.

Step 2: First Fertilization (Syngamy)

One male gamete fuses with the **egg cell** present in the embryo sac to form a **zygote**.



The zygote later develops into the **embryo**.

Step 3: Second Fertilization (Triple Fusion)

The second male gamete fuses with the **two polar nuclei** present in the central cell of the embryo sac.



This forms the **endosperm**, which provides nourishment to the developing embryo.

Step 4: Meaning of Double Fertilization

Since two fertilization events occur in the same embryo sac—**syngamy** and **triple fusion**—the process is called **double fertilization**.

Quick Tip

In flowering plants:

First fusion → **Zygote (embryo)**

Second fusion → **Endosperm (nutrition for embryo)**

9. What is the importance of DNA copying in reproduction?

Correct Answer: DNA copying ensures that genetic information is passed from parents to offspring and also helps create variations necessary for evolution.

Solution:

Concept: DNA (Deoxyribonucleic Acid) carries the genetic information of an organism. During reproduction, this genetic material must be copied so that the new individual receives the characteristics of its parents.

Step 1: Transmission of Genetic Information

DNA copying ensures that the **genetic information** present in the parent is transferred to the offspring. This helps maintain the **continuity of species** from one generation to the next.

Step 2: Formation of New Cells

During cell division, DNA replicates so that each new cell receives an **identical set of genetic instructions**. This is essential for growth, repair, and reproduction.

Step 3: Creation of Variations

DNA copying is not always perfectly accurate. Small changes or errors during copying can introduce **variations** in offspring. These variations are important because they help organisms adapt to changing environments and contribute to **evolution**.

Quick Tip

DNA copying helps in **passing hereditary traits** from parents to offspring and also produces **variations that support evolution**.

10. How is the sex of a child determined in human beings?

Correct Answer: The sex of a child is determined by the combination of sex chromosomes received from the parents during fertilization.

Solution:

Concept: In human beings, the sex of an individual is determined by a pair of chromosomes called **sex chromosomes**. Humans have two types of sex chromosomes: **X** and **Y**.

Step 1: Sex Chromosomes in Parents

- Females have two X chromosomes (XX).
- Males have one X and one Y chromosome (XY).

Step 2: Formation of Gametes

During reproduction:

- The female produces eggs that always carry the **X chromosome**.
- The male produces two types of sperms: one carrying the **X chromosome** and the other carrying the **Y chromosome**.

Step 3: Fertilization and Sex Determination

- If an **X-bearing sperm** fertilizes the egg, the combination becomes (XX) and the child will be a **female**.
- If a **Y-bearing sperm** fertilizes the egg, the combination becomes (XY) and the child will be a **male**.

Thus, the **father's sperm determines the sex of the child**.

Quick Tip

XX → Female

XY → Male

The sex of the child is determined by the **chromosome carried by the father's sperm.**

11. What is Biological Magnification, and how does it affect different trophic levels?

Correct Answer: Biological magnification is the increase in concentration of harmful substances in organisms at successive trophic levels of a food chain.

Solution:

Concept: In an ecosystem, some harmful chemicals such as pesticides and heavy metals cannot be broken down easily. These substances enter the food chain and gradually increase in concentration at each trophic level. This process is known as **biological magnification** or **biomagnification**.

Step 1: Definition of Biological Magnification

Biological magnification is the phenomenon in which the concentration of toxic substances increases progressively at each higher level of the **food chain**.

Step 2: Entry of Harmful Substances

Toxic chemicals such as **pesticides (e.g., DDT)** enter the ecosystem through water or soil and are absorbed by producers such as plants or algae.

Step 3: Effect on Trophic Levels

- **Producers:** Absorb small amounts of harmful chemicals.
- **Primary consumers (herbivores):** Consume producers and accumulate higher amounts of toxins.
- **Secondary consumers:** Receive even greater concentrations of these chemicals.
- **Top consumers:** Accumulate the highest concentration of toxic substances, which can cause serious health problems.

Quick Tip

Biological magnification causes the **highest concentration of toxins in top-level consumers** of the food chain.