BSEAP General Science 2024 Question Paper with Solutions

Time Allowed :2 Hours	**Maximum Marks :**50	**Total questions :**18

General Instructions

(i) Question paper consists of 4 Sections and 17 questions.

(ii) Internal choice is available only for Q.No. 12 in Section III and for all the questions in Section - IV.

(iii) In the duration of 2 hours, 15 minutes of time is allotted to read the question paper.

(iv) All answers shall be written in the answer booklet only.

(v) Answer shall be written neatly and legibly.

SECTION - I

Note:

1) Answer all the questions.

2) Each question carries 1 mark.

1. Which digestive juice is secreted in the mouth?

Solution: The digestive juice secreted in the mouth is **saliva**. It contains the enzyme **salivary amylase** (also known as ptyalin), which helps in the breakdown of starch into maltose.

Quick Tip

Saliva not only aids in digestion but also helps in lubricating food, making it easier to swallow.

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2. Identify the movement that occurs in this diagram.

Solution: The movement shown in the diagram is called **peristalsis**. It is the involuntary contraction and relaxation of muscles in the esophagus, pushing food downward towards the stomach. This wave-like motion ensures smooth movement of food along the digestive tract.

Quick Tip

Peristalsis occurs throughout the digestive system, including the esophagus, stomach, and intestines, helping in the movement of food and waste.

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3. Mendel had chosen 7 pairs of contrasting characters in pea plants for his experiments. Identify which one of the following is not one among those characters:

(i) Colour of the flower

(ii) Length of the pod

(iii) Shape of the seed

Solution: Among the given options, **Length of the pod** is not one of the seven pairs of contrasting traits studied by Mendel. The seven pairs of contrasting traits include:

1. Flower Colour (Purple/White)
2. Seed Shape (Round/Wrinkled)
3. Seed Colour (Yellow/Green)
4. Pod Shape (Inflated/Constricted)
5. Pod Colour (Green/Yellow)
6. Flower Position (Axial/Terminal)
7. Stem Length (Tall/Dwarf)

Quick Tip

Mendel's experiments on pea plants led to the foundation of modern genetics, where he identified dominant and recessive traits.

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4. Write a slogan to protect Kolleru lake.

Solution: "Save Kolleru, Save Life! Keep the waters clean and the ecosystem green!"

Quick Tip

Kolleru Lake is one of the largest freshwater lakes in India and plays a crucial role in biodiversity conservation. Protecting it helps in maintaining ecological balance.

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5. Natural resources decrease rapidly. Guess a consequence of this condition.

Solution: A major consequence of rapid depletion of natural resources is **environmental degradation and scarcity of essential resources**. This can lead to deforestation, loss of biodiversity, climate change, and economic crises due to resource shortages.

Quick Tip

Sustainable resource management and conservation efforts are essential to ensure future generations have access to natural resources.

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6. Read the following table and answer the question given below.

Sl. No.	Animal Phylum	Excretory Organ/Process
1	Protozoa	Simple diffusion from the body surface
2	Arthropoda	Green glands, Malpighian tubules

What is the process of excretion in the phylum Protozoa?

Solution: In the phylum **Protozoa**, the process of excretion occurs through **simple diffusion**. Waste materials such as ammonia diffuse directly across the body surface into the surrounding environment.

Quick Tip

Protozoa lack specialized excretory organs; instead, they rely on diffusion for the removal of metabolic wastes.

SECTION - II

Note:

1) Answer all the questions.

2) Each question carries 2 marks.

7. Write differences between bolus and chyme.

Solution: The differences between bolus and chyme are as follows:

Bolus	Chyme
Bolus is a soft, moist mass of chewed food mixed with saliva.	Chyme is a semi-liquid substance formed in the stomach after partial digestion.
It is formed in the mouth during mastication.	It is formed in the stomach due to the action of gastric juices.
Bolus moves from the mouth to the stomach through the esophagus.	Chyme moves from the stomach to the small intestine for further digestion.

Quick Tip

The transformation from bolus to chyme is essential for the efficient digestion and absorption of nutrients in the body.

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8. What questions will you ask a nephrologist to keep your kidneys healthy?

Solution: When consulting a nephrologist about kidney health, you may ask the following questions:

1. What are the early signs of kidney disease?
2. How can I prevent kidney stones and other kidney-related problems?
3. What foods and drinks should I avoid for better kidney health?
4. How much water should I drink daily to maintain kidney function?
5. What lifestyle habits contribute to kidney disease?
6. How does high blood pressure or diabetes affect my kidneys?
7. Are there any medical tests I should take regularly to monitor kidney health?

Quick Tip

Maintaining kidney health requires proper hydration, a balanced diet, and regular check-ups, especially for individuals with underlying health conditions.

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9. Read the following table.

Sl. No.	Reproductive Method	Organism
1	Fission	Paramecium, Bacterium
2	Budding	Yeast
3	Fragmentation	Algae, Fungi

Answer the following question:

1) Which organisms reproduce by fragmentation ?

Solution: Organisms that reproduce by **fragmentation** are **Algae** and **Fungi**. In this process, an organism breaks into fragments, and each fragment develops into a new individual.

Quick Tip

Fragmentation is a common mode of asexual reproduction in simple multicellular organisms like algae and fungi, allowing rapid population growth.

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2) Give an example for an organism which performs fission.

Solution: As per the table, organisms that perform **fission** include **Paramecium** and **Bacterium**. These unicellular organisms reproduce by splitting into two daughter cells, ensuring rapid population growth.

Quick Tip

Fission is a rapid form of asexual reproduction that occurs in unicellular organisms such as bacteria and protozoa.

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10. Guess what would happen if villi are absent in the small intestine?

Solution: If **villi** are absent in the small intestine, the absorption of nutrients would be significantly reduced. Villi increase the surface area for efficient absorption of digested food. Without them:

- The body would struggle to absorb essential nutrients.
- Malnutrition and deficiency diseases could occur.
- Digestion efficiency would decrease, leading to weakness and digestive disorders.

Quick Tip

Villi play a crucial role in nutrient absorption. Their finger-like projections maximize surface area, allowing efficient uptake of vitamins, minerals, and other nutrients.

SECTION - III

Note:

1) Answer all the questions.

2) Each question carries 4 marks.

11. Read the following table.

Sl. No.	Phase of Mitosis	Changes Occur
1	Prophase	Chromosomes become visible, chromatids are formed, nuclear membrane disappears.
2	Metaphase	Chromosomes move to spindle equator.
3	Anaphase	Spindle fibres pull chromatids towards poles.
4	Telophase	Nucleus divides into two, division of cytoplasm starts.

Answer the following questions:

1) In which phase of mitosis do chromosomes become distinctly visible?

Solution: Chromosomes become distinctly visible during the **Prophase** stage of mitosis.

Quick Tip

During Prophase, chromatin condenses into visible chromosomes, making them distinct under a microscope.

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2) Write a change that you observed during Metaphase.

Solution: During **Metaphase**, the chromosomes align at the **spindle equator**, preparing for separation.

Quick Tip

Metaphase ensures proper chromosome alignment, which is crucial for equal distribution during cell division.

3) In which phase does the nucleus divide?

Solution: The nucleus divides during the **Telophase** stage of mitosis.

Quick Tip

Telophase marks the end of mitosis, where two daughter nuclei form, followed by cytokinesis.

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4) Which structures pull the chromatids towards poles in Anaphase?

Solution: In **Anaphase**, the **spindle fibres** pull the chromatids towards opposite poles.

Quick Tip

Spindle fibres play a critical role in chromosome movement during cell division, ensuring equal genetic distribution.

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12. Draw any one of the following diagrams with labelling.

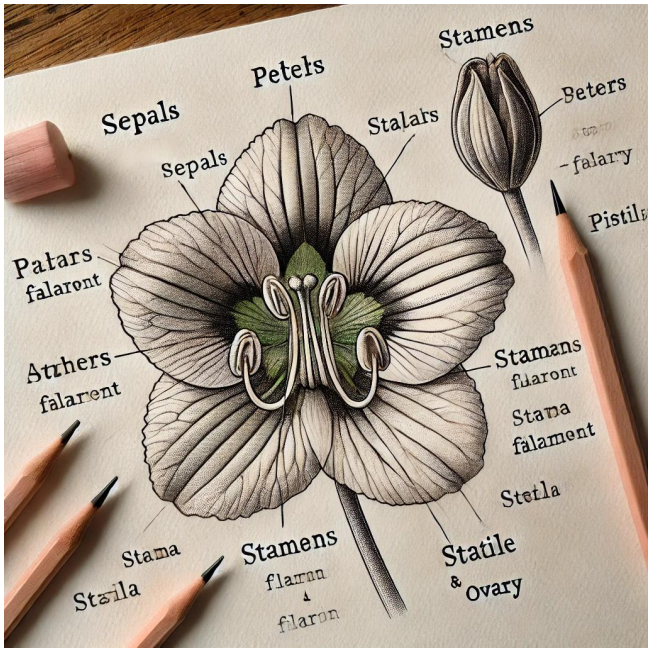
A) Draw the internal structure of a flower with labeling.

Solution: The internal structure of a flower consists of several key parts, including the sepals, petals, stamens (anther and filament), and pistil (stigma, style, and ovary). These structures play essential roles in reproduction.

Quick Tip

The reproductive organs of a flower are the stamens (male part) and the pistil (female part), which work together to facilitate pollination and fertilization.

B) Draw the excretory system in man with labeling.


Stamens
Petels
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Solution: The human excretory system consists of two kidneys, two ureters, a urinary bladder, and a urethra. It is responsible for filtering blood, removing metabolic waste, and maintaining fluid balance.

Quick Tip

The kidneys filter waste from the blood, which is then transported through the ureters to the bladder and expelled via the urethra as urine.

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13. Write the differences between sensory (afferent) nerves and motor (efferent) nerves.

Solution: Sensory and motor nerves play crucial roles in the nervous system, transmitting information between the brain, spinal cord, and various body parts. The differences between them are as follows:

Sensory (Afferent) Nerves	**Motor (Efferent) Nerves**
Transmit signals from sensory organs (skin, eyes, ears, etc.) to the brain and spinal cord.	Carry commands from the brain and spinal cord to muscles and glands for response.
Responsible for detecting external stimuli like touch, pain, temperature, and sound.	Responsible for executing voluntary and involuntary movements.
Originate from sensory receptors in peripheral organs and enter the central nervous system (CNS).	Originate from the CNS and extend to muscles and glands to initiate responses.
Examples include optic nerve (vision) and auditory nerve (hearing).	Examples include the sciatic nerve (leg movements) and facial nerve (expressions).

Sensory nerves help in perception, while motor nerves enable movement and responses, both essential for bodily coordination.

Quick Tip

A simple way to remember: Sensory nerves ”sense” information, while motor nerves ”move” the body.

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14. Why should we conserve forests?

Solution: Forests are vital ecosystems that provide oxygen, support biodiversity, regulate climate, and sustain livelihoods. Conservation is crucial for the following reasons:

1. Oxygen Production & Air Purification: Forests act as the ”lungs of the Earth,” absorbing carbon dioxide and releasing oxygen, essential for life.

2. Biodiversity Protection: They provide habitats for millions of species, maintaining ecological balance. Deforestation leads to habitat destruction and species extinction.

3. Climate Regulation: Trees absorb greenhouse gases, reducing global warming. They also regulate rainfall patterns and prevent desertification.

4. Prevention of Soil Erosion: Forest roots bind soil, preventing erosion and landslides, ensuring agricultural productivity.

5. Water Cycle Maintenance: Trees help in groundwater recharge and regulate water cycles, reducing the risk of droughts and floods.

6. Livelihood and Economy: Many communities depend on forests for food, medicine, and employment in industries like timber, paper, and tourism.

7. Aesthetic and Recreational Value: Forests provide natural beauty, promoting eco-tourism and mental well-being.

Deforestation leads to environmental disasters, affecting both wildlife and humans. Sustainable practices such as afforestation, responsible logging, and conservation efforts are essential.

Quick Tip

Forest conservation is key to a sustainable future. Plant more trees, reduce deforestation, and support eco-friendly initiatives.

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15. Suggest some methods to prevent soil pollution in view of avoiding pesticides.

Solution: Soil pollution due to excessive pesticide use poses a significant threat to agriculture, biodiversity, and human health. To prevent soil pollution while avoiding pesticides, the following methods can be adopted:

1. Organic Farming: Encouraging the use of organic manure, compost, and bio-fertilizers instead of chemical pesticides helps maintain soil fertility.
2. Crop Rotation Companion Planting: Rotating crops and planting complementary species reduce pest populations naturally without relying on synthetic pesticides.
3. Biological Pest Control: Introducing natural predators like ladybugs, spiders, and birds to control pests is an eco-friendly approach.
4. Neem-Based Herbal Pesticides: Using neem oil, garlic extract, or other plant-based pesticides ensures effective pest control without harming the soil.
5. Integrated Pest Management (IPM): A combination of biological, mechanical, and cultural methods helps manage pests efficiently while minimizing soil contamination.
6. Mulching Cover Crops: Mulching with organic materials or planting cover crops like clover helps suppress weeds and pests naturally.
7. Reduced Chemical Dependency: Using controlled-release fertilizers and limiting pesticide use only when necessary minimizes soil degradation.
8. Rainwater Management: Preventing pesticide runoff by adopting rainwater harvesting and proper irrigation techniques reduces soil contamination.

By adopting these sustainable agricultural practices, soil fertility can be preserved while ensuring effective pest management.

Quick Tip

Reducing pesticide use protects soil, water sources, and biodiversity. Switching to eco-friendly alternatives benefits both farmers and the environment.

SECTION - IV

Note:

1) Answer all the questions.

2) Each question carries 8 marks.

3) Each question has an internal choice.

16. Explain the way how plants get water by osmosis through root hair.

Solution: Plants absorb water from the soil through **root hairs** by the process of **osmosis**. This mechanism is essential for maintaining water balance, nutrient transport, and overall plant health. The process occurs in several stages, described below:

1. Root Hairs and Soil Water:

- Root hairs are microscopic extensions of the root epidermal cells, increasing the surface area for maximum water absorption.
- These structures make direct contact with the moist soil, where water and dissolved minerals are available.

2. The Osmosis Process:

- **Osmosis** is the movement of water molecules from an area of higher water concentration (soil) to an area of lower water concentration (root hair cells) through a semi-permeable membrane.
- The root hair cell membrane allows water molecules to pass through while restricting larger molecules like salts and organic compounds.

3. Water Potential Gradient:

- Water potential is a measure of the tendency of water molecules to move from one region to another.
- The soil solution has a higher water potential, while the root hair cells have a lower water potential due to the presence of solutes such as sugars, amino acids, and minerals.
- Due to this concentration difference, water moves into the root hair cells by osmosis, ensuring a continuous flow of water into the plant.

4. Movement of Water to Xylem:

- Once inside the root hair cell, water moves from cell to cell by two pathways:

(a) Apoplast Pathway – Water moves through the cell walls of adjacent cells without crossing the plasma membrane.
(b) Symplast Pathway – Water moves through the cytoplasm of cells via plasmodesmata (cytoplasmic connections).
- Water eventually reaches the **xylem**, the main water-conducting tissue in plants.
- From the xylem, water is transported upwards due to **capillary action, root pressure, and transpiration pull**.

5. Importance of Osmosis in Plants:
- Osmosis allows plants to absorb water and minerals from the soil efficiently.
- It plays a significant role in maintaining turgor pressure, which keeps plant cells firm and prevents wilting.
- The absorbed water is essential for photosynthesis, providing raw materials for food production.
- Water movement through osmosis helps in cooling the plant via transpiration, maintaining an optimal internal temperature.
- Ensures a steady supply of nutrients dissolved in water, aiding in metabolic activities and cellular growth.

6. Factors Affecting Osmosis in Root Hairs:
- Soil Moisture: Dry soils reduce the availability of water for osmosis, leading to dehydration in plants.
- Soil Salinity: High salt concentration in the soil lowers water potential, making it difficult for plants to absorb water.
- Root Hair Development: Well-developed root systems enhance osmosis efficiency.
- Temperature & Humidity: High temperatures increase transpiration, indirectly influencing water uptake through osmosis.

Conclusion: Osmosis is a vital process for plant survival. It enables water absorption, nutrient transport, cell expansion, and growth. Without osmosis, plants would not be able to sustain physiological functions, leading to dehydration and eventual death.

Quick Tip

Water absorption through root hairs is crucial for plant survival. Proper soil moisture and mineral balance help in efficient water uptake.

OR

17. How does sex determination happen in humans?

Solution: Sex determination in humans is controlled by chromosomal inheritance. It is determined at the time of fertilization based on the combination of sex chromosomes (X and Y) contributed by the parents.

1. Role of Sex Chromosomes:

- Humans have 46 chromosomes (23 pairs), out of which 22 pairs are autosomes and one pair are sex chromosomes.
- Males have XY sex chromosomes, while females have XX sex chromosomes.

2. Contribution of Gametes:

- Egg (Ovum) from the mother: Always contributes an X chromosome (as females have two X chromosomes: XX).
- Sperm from the father: Can contribute either an X chromosome or a Y chromosome (as males have XY chromosomes).

3. Mechanism of Sex Determination:

- If a sperm carrying an X chromosome fertilizes the egg, the resulting child will be XX (female).
- If a sperm carrying a Y chromosome fertilizes the egg, the resulting child will be XY (male).
- The presence of the Y chromosome determines male characteristics, as it carries the SRY gene (Sex-determining Region Y), which triggers male development.

4. Role of the SRY Gene:

- The SRY gene present on the Y chromosome is responsible for the development of male reproductive organs.
- In the absence of the Y chromosome, the embryo develops into a female by default.

5. Exceptions and Disorders:
- Turner Syndrome (XO): A female has only one X chromosome (45 chromosomes instead of 46).
- Klinefelter Syndrome (XXY): A male has an extra X chromosome, leading to developmental differences.

Conclusion: Sex determination in humans follows a chromosomal pattern, where the sperm determines the sex of the child. The father's sperm decides whether the offspring will be male (XY) or female (XX), making it a genetically controlled process.

Quick Tip

The father determines the sex of the baby because only the sperm can carry either an X or Y chromosome, while the mother's egg always carries an X chromosome.

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18. What experiment do you conduct to prove that carbon dioxide is required for photosynthesis?

Solution: To demonstrate that carbon dioxide (CO_2) is essential for photosynthesis, an experiment known as the Moll's half-leaf experiment can be conducted.

Materials Required:
- A healthy potted plant
- A wide-mouth glass bottle
- A split cork
- Potassium hydroxide (KOH) solution
- Iodine solution
- A beaker and burner

Procedure:

1. A potted plant is kept in complete darkness for 24-48 hours to destarch its leaves (this ensures that any starch previously present is used up).
2. A healthy leaf from the plant is inserted into a glass bottle containing KOH solution, which absorbs carbon dioxide from the air inside the bottle.
3. The leaf remains partially inside the bottle while the other half is exposed to normal air. A split cork is used to hold the leaf in place and seal the bottle.
4. The setup is kept in sunlight for a few hours to allow photosynthesis to take place.
5. After some time, the leaf is removed and tested for starch presence using iodine solution.

Observation:

- The part of the leaf inside the bottle (without CO_2) does not turn blue-black with iodine, indicating no starch formation.
- The part of the leaf outside the bottle (with CO_2) turns blue-black, confirming starch formation due to photosynthesis.

Conclusion: This experiment proves that carbon dioxide is essential for photosynthesis, as the part of the leaf deprived of CO_2 did not produce starch.

Quick Tip

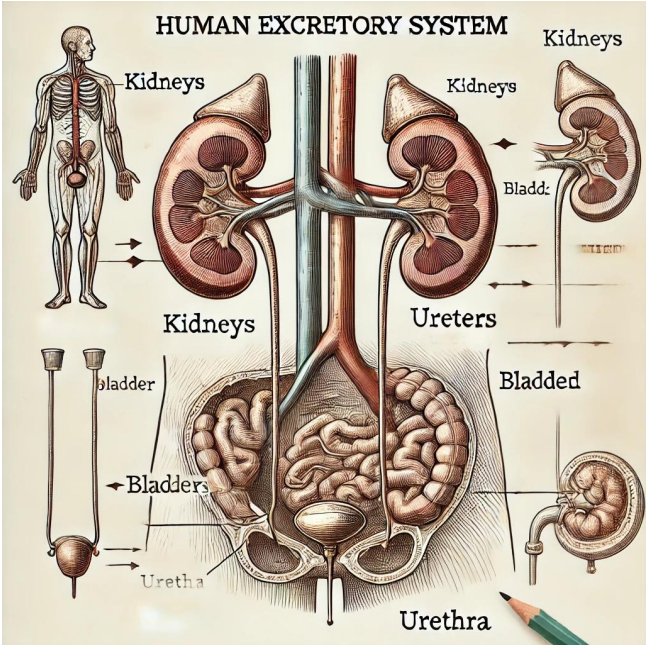
For photosynthesis to occur, plants require carbon dioxide, sunlight, water, and chlorophyll. Limiting any one of these factors affects the process.

OR

Observe the given experiment and answer the questions.

1) What is the aim of the experiment?

Solution: The aim of this experiment is to demonstrate that carbon dioxide CO_2 is released during respiration. The experiment shows that when living organisms respire, they produce carbon dioxide, which can be detected using lime water.


HUMAN EXCRETORY SYSTEM
Kidneys
Kidneys
Kidneys
Kidneys
Ureters
Bladded
Urethra

Quick Tip

Respiration is a process in which organisms break down glucose to release energy, producing carbon dioxide as a byproduct.

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2) What are the materials required to conduct this experiment?

Solution: The materials required for this experiment include:

1. A glass jar with a tightly sealed lid.
2. Fresh seeds or germinating seeds (e.g., pea or bean seeds).
3. Lime water (calcium hydroxide solution).
4. A small container to hold the lime water.
5. Cotton wool or a stand to support the seeds in the jar.

Quick Tip

Lime water is used in this experiment because it turns milky in the presence of carbon dioxide, helping to confirm respiration.

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3) Write a precaution to get a correct result in this experiment.

Solution: To obtain accurate results in this experiment, the following precautions should be taken:

1. Ensure that the jar is airtight to prevent outside air from affecting the results.
2. Use fresh germinating seeds, as they respire actively, producing more carbon dioxide.
3. Keep the setup undisturbed for a few hours to allow sufficient gas accumulation.
4. Do not shake the jar, as excessive movement can cause incorrect lime water reactions.
5. The lime water should be fresh to react effectively with carbon dioxide.

Quick Tip

Any leakage in the jar can allow external air to mix with the gases inside, leading to inaccurate results.

4) What observation do you make in this experiment?

Solution: After some time, the following observations can be made:

1. The lime water inside the jar turns milky, indicating the presence of carbon dioxide.
2. The seeds appear fresh and actively respiring, confirming that they are producing CO_2.
3. No external air enters the jar, ensuring that the carbon dioxide is produced solely by the seeds.

Quick Tip

The milky appearance of lime water is a confirmatory test for carbon dioxide, proving that respiration has occurred.