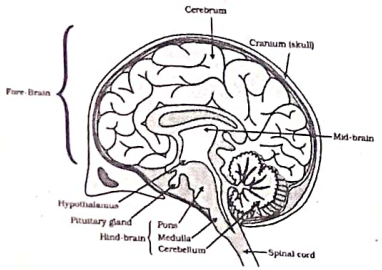
- The outer dark coloured region is called as the cortex
- The inner light coloured region is called as the medulla
- **Function**: The Cerebrum controls thinking, memory, emotions, and voluntary actions like moving arms and legs.

2. **Cerebellum**:
   - **Details**: It's located at the back of the brain, below the cerebrum.
   - It is the second largest part of the brain commonly called as the little brain
   - **Function**: Coordinates muscular activities and maintains equilibrium of the body.
3. **Medulla Oblongata**:
   - **Details**: Located at the base of the brain.
   - It connects the brain to the spinal cord.
   - **Function**: Controls involuntary actions like breathing, heartbeat, and digestion.
4. **Hypothalamus**:
   - **Details**: Seen just below the Thalamus
   - **Function**: Regulates body temperature, hunger, thirst, and sleep.
   - It also controls the release of hormones by working with the pituitary gland.
5. **Thalamus**:
   - **Details**: Located above the hypothalamus
   - **Function**: Acts as a relay center, sending sensory information (like touch and sound) to the cerebrum.
   - it helps in processing and directing sensory signals.

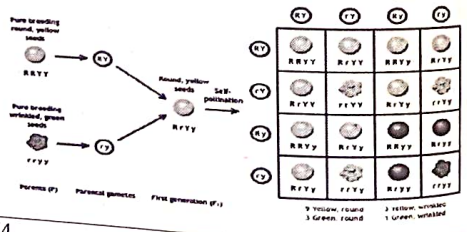
Each part of the brain has a specific role, and they all work together to keep our body functioning properly.



Human brain

17. B) Mendel's Dihybrid Experiment:

1. **Objective**:
   - Gregor Mendel wanted to understand how two different traits are inherited together. So, he conducted an experiment on pea plants, focusing on ***two traits at the same time:*** seed color (yellow or green) and seed shape (round or wrinkled).
2. **Selection of Parent Plants**:
   - Mendel chose pure-breeding plants with two contrasting traits:
     - One parent had **yellow, round seeds.**
     - The other parent had **green, wrinkled seeds.**
3. **First Generation (F1 Generation)**:
   - Mendel crossed the two parent plants. All the offspring in the F1 generation had **yellow, round seeds.**
   - This showed that yellow color and round shape are **dominant traits.**
4. **Second Generation (F2 Generation)**:
   - Mendel then allowed the F1 plants to self-pollinate.
   - In the F2 generation, he observed four types of seeds:
     - **Yellow, round**
     - **Yellow, wrinkled**
     - **Green, round**
     - **Green, wrinkled**
5. **Results**:
   - The F2 generation showed a **9:3:3:1 ratio**:
     - 9 plants with yellow, round seeds
     - 3 plants with yellow, wrinkled seeds
     - 3 plants with green, round seeds
     - 1 plant with green, wrinkled seeds
6. **Conclusion**:
   - Mendel concluded that each trait is inherited independently, following the **Law of Independent Assortment.**
   - This means the inheritance of one trait (like color) does not affect the inheritance of another trait (like shape).



GENERAL SCIENCE PAPER - II
BIOLOGICAL SCIENCE
MODEL PAPER - III

(20E)

Class : X Max.Marks : 50 Time : 2hrs.15min.

Instructions :

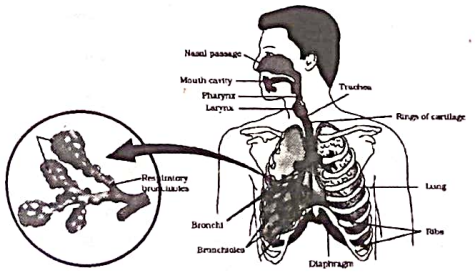
1. Question paper consists of 4 sections and 17 questions.
2. Internal choice is available only for Q.No.12 in section III and for all the questions in section IV.
3. In the duration of 2 hours, 15 minutes of time is alloted to read the question paper.
4. All answers shall be written in the answer booklet only.
5. Answers shall be written neatly and legibly.

SECTION - I **6 × 1 = 6 M**

1. Answer **all** the questions.
2. Each question carries **1** marks.

1. What is a catabolic process? Give an example for it.
2. What is the main function of the ozone layer?
3. What is the role of DNA in genetics?
4. Look at the number pyramid showing the trophic levels, based on the number of organisms in each trophic level, which group of organisms has the highest (most) individuals and which group has the Fewest?

5. What is a Pedigree chart?
6. Observe the diagram of human respiratory system and identify the circled part and name it.

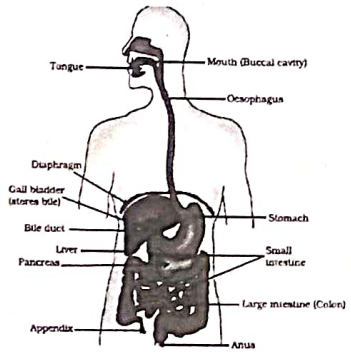


Human respiratory system

SECTION - II **4 × 2 = 8 M**

1. Answer all the questions.
2. Each question carries 4 marks.

7. Why is the use of iodised salt advisable?
8. Observe the diagram and answer the following questions.



Human alimentary canal

i. What is the longest part of the alimentary canal?
ii. Which part connects the mouth and stomach?

9. What is the role of decomposers in the ecosystem?
10. What is ozone and how does it affect an ecosystem?

SECTION - III **5 × 4 = 20 M**

1. Answer all the questions.
2. Each question carries 4 marks.

11. Write differences between autotrophic nutrition and heterotrophic nutrition.
12. Observe the diagram and answer the following questions.

Schematic sectional view of the human heart

i. How many Chambers are there in the human heart?

ii. Which Chamber of the heart receives deoxygenated blood?

iii. Which chamber pumps oxygenated blood to the body?

iv. Where is the tricuspid valve located?

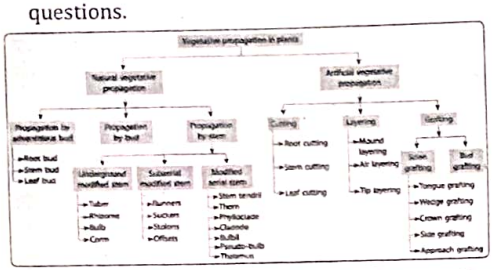
(OR)

12 (B) Draw a neat labelled diagram of human male reproductive system.

13. Explain the process of nutrition in Amoeba with the help of a diagram.

14. What is a food chain? Explain with a suitable example.

15. Observe the flowchart and answer the following questions.



i. What are the two main types of vegetative propagation in plants?

ii. Name the three methods of artificial vegetative propagation?

iii. Which category of vegetative propagation does grafting belong to?

iv. Give two examples of natural vegetative propagation.

SECTION - IV **2 × 8 = 16 M**

1. Answer all the questions.
2. Each question carries 8 marks.
3. Each question has internal choice.

16. A) Write an experiment to prove the action of saliva on starch?

(OR)

16. B) Write differences between binary fission and multiple fission.

17. A) What is the difference between the manner in which movement takes place in a sensitive plant and the movement in a leg?

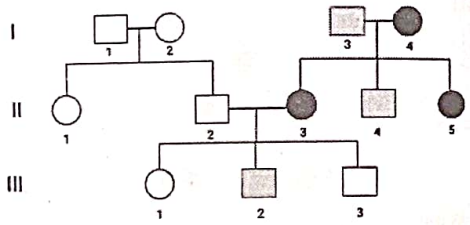
(OR)

17. B) Write about Mendel's Monohybrid experiment.

ANSWERS

SECTION – I

1. A metabolic reaction that breaks down large molecules into smaller ones, releasing energy.
Example: Cellular respiration, where glucose is broken down to produce energy in the form of ATP.
2. The main function of Ozone layer (O3) is to protect the earth by absorbing most of the sun's harmful ultraviolet rays (UV rays), which can be dangerous to the living things on the earth.
3. DNA - Deoxyribo Nucleic Acid, carries genetic information from parents to off springs and serves as the hereditary material
4. The producers are the most numerous(highest), while the tertiary consumers are the fewest in number in the given number pyramid.
5. A Pedegree chart is a diagram that shows the genetic relationships and connections among a set of individuals in a family over several generations. it includes symbols representing individuals and lines showing relationships



6. The labelled part is identified as alveoli.

SECTION – II

7. i. Iodine is essential for making thyroid hormones, like thyroxin and tri-idothyronine (T3 and T4).
ii. Thyroxin regulates carbohydrates and protein metabolism in our body.
iii. When there is insufficient iodine in the diet, the thyroid gland enlarges in size.
iv. This enlargement of thyroid is called as simple goitre.
v. Therefore to prevent goitre the use of iodized salt is recommended.

8. i. Small intestine is the longest part of the alimentary canal.
ii. Oesophagus connects the mouth to the stomach.

9. **Role of decomposers in the ecosystem:**
i. Decomposers like bacteria and fungi breakdown dead plants and animals.
ii. This process releases nutrients back into the soil which plants use to grow.
iii. Decomposers play a critical role in the flow of energy through an ecosystem.
iv. They recycle matter in ecosystem, keeping environment clean and supporting new life.

10. Ozone is a gas made up of three oxygen atoms (O3). It is found in the earth's atmosphere, mostly in ozone layer

Effects on ecosystem:
i. Ozone absorbs harmful UV rays, protecting living beings from radiation that can cause skin cancers, eye damage and the other health issues.
ii. Ozone helps plants grow properly, which is essential for food chains and O2 production

11. **Autotrophic nutrition VS Heterotrophic nutrition:**

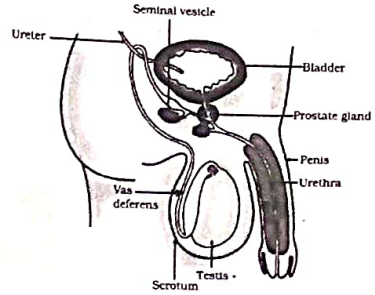
S. No	AUTOTROPHIC NUTRITION	HETEROTROPHIC NUTRITION
1	Food is synthesized from simple inorganic raw materials such as CO2 and water	Food is obtained directly indirectly from autotrophs, which is broken down with the help of enzymes
2	Presence of green pigment (chlorophyll) is necessary	No pigment is required in this type of Nutrition
3	Food is generally prepared during the day time	Intake of food takes place at any time
4	All green plants and some bacteria exhibit this type of Nutrition	All animals and fungi exhibit this type of Nutrition

SECTION – III

12.A). I. There are four Chambers in the heart.
II. The right Atrium receives deoxygenated blood from the body.
III. The left ventricle pumps oxygen blood to the entire body via the Aorta
IV. Tricuspid valve is located between the right Atrium and the right ventricle in the heart

(OR)

12.B)



Human–male reproductive system

13. The process of nutrition in Amoeba involves five steps
1. Ingestion
2. Digestion
3. Absorption
4. Assimilation
5. Egestion

Amoeba obtains food by Phagocytosis

1. Ingestion:
Amoeba engulfs food particles such as small algae and bacteria. The pseudopodia fuse over the food particle forming a food vacuole.

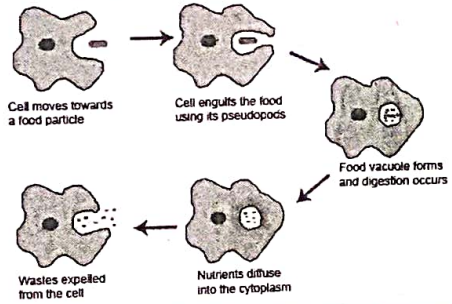
2. Digestion:
Inside the food vacuole Complex food substances are broken down into simple ones

3. Absorption:
The digested simple substances are diffused into the cytoplasm

4. Assimilation:
The digested food is utilized for the metabolic activities.

5. Egestion
The remaining undigested waste material is moved near the surface of the unicellular body of amoeba and expelled from the cell

Nutrition in Amoeba



14. **Food chain:** A food chain is a sequence that shows how energy and nutrients flow from one organism to another in an ecosystem.

An example of a simple food chain is that operating in grassland

Grass (Producer) à Deer (Herbivore)à lion (Carnivore)

1. **Producers (Autotrophs):** Organisms that produce their own food through photosynthesis or chaemosynthesis. They are usually plants or algae that convert Sunlight into energy.

   Example: Grass is a producer, because it uses sunlight to produce its own food through photosynthesis.

2. **Primary consumers(Herbivores):** These are organisms that feed directly on producers. They are herbivores that consume plants for their energy

   Example: A rabbit is a primary consumer, because it eats grass

3. **Secondary consumer (Carnivores or omnivores):** Secondary consumers are animals that survive by eating animals that eat plants. If they eat only meat, they are called carnivores. If they eat both plants and animals, they are called omnivores

15. i. The two main types of vegetative propagation in plants are 1. Natural vegetative propagation and 2. Artificial vegetative propagation

    ii. Three methods of artificial vegetative propagation are cutting, layering and grafting

    iii. Grafting belongs to artificial vegetative propagation.

    iv. Two examples of natural vegetative propagation are Runners (Strawberry) and tubers (potatoes).

SECTION – IV

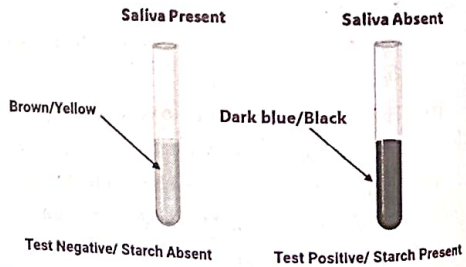
16. A) **Aim:** To demonstrate the action of saliva on starch

Materials Needed:

- Starch solution (1-2% concentration)
- Test tubes (at least 2)
- Fresh saliva sample (from rinsed mouth)
- Iodine solution (indicator for starch)
- Water bath (optional, to maintain temperature)
- Dropper

Procedure:

1. **Collect a Saliva Sample:** Rinse your mouth with water, then wait a few minutes and collect a small amount of saliva in a clean container (e.g., test tube).
2. **Prepare Test Tubes:**
   - Label two test tubes as **A** and **B**.
   - In both tubes, add 5ml of the starch solution.
3. **Add Saliva:**
   - In test tube **A**, add 1ml of saliva.
   - Do not add saliva to test tube **B**
4. **Incubate the Test Tubes:**
   - Place both test tubes in a water bath at around 37°C (body temperature) for 10–15 minutes. This temperature is optimal for enzyme activity in saliva.
   - Alternatively, you can leave the tubes at room temperature if a water bath is not available.
5. **Test for Starch with Iodine:**
   - After incubation, add a few drops of iodine solution to both test tubes.
   - Observe the color change in each test tube.



Observation:

- **Test Tube A (with saliva):** The solution should remain brown or yellow (the color of iodine) if starch has been broken down by the saliva.
- **Test Tube B (without saliva):** The solution should turn blue-black, indicating the presence of unbroken starch.

Results and Conclusion:

- **Interpretation:** If the solution in test tube **A** does not turn blue-black, it indicates that the starch has been broken down into simpler sugars by the amylase enzyme in saliva.
- **Conclusion:** This experiment demonstrates that saliva contains an enzyme (amylase/Ptylin) that can break down starch into simpler sugars.

(OR)

16. B) **Differences between binary fission and multiple fission:**

Feature	Binary Fission	Multiple Fission
Definition	Division of a single organism into two equal parts.	Division of a single organism into many smaller parts.
Number of Offspring	Produces two daughter cells.	Produces multiple daughter cells.
Process	The cell splits into two after duplicating its genetic material.	The nucleus divides repeatedly to form several nuclei, followed by cell division.
Example Organisms	Bacteria, Amoeba, Paramecium	Plasmodium (malaria parasite), some amoebae
Environmental Conditions	Commonly occurs in favorable conditions.	Often occurs in unfavorable conditions for survival.
Speed of Process	Usually quick; takes less time.	Takes more time as multiple divisions occur.
Genetic Similarity	Offspring cells produced are generally of similar size to the parent cell	Offspring cells produced are often similar in size to the parent cell.

17. A. Comparison between movement in a sensitive plant and movement in a leg:

Feature	Sensitive Plant (e.g., *Mimosa pudica*)	Movement in Leg (Human/Animal)
Type of Movement	Plant movement (non-muscular)	Animal movement (muscular)
Control System	Triggered by touch (not controlled by brain) – Classified as tropic or nastic movement	Controlled by the nervous system, specifically the brain and spinal cord
Cause of Movement	Changes in water pressure in cells	Muscle contraction and relaxation
Energy Requirement	Less energy, based on internal water pressure changes	Requires more energy (ATP) for muscle contraction
Response Time	Quick, but slower than muscles	Very fast response due to direct nerve impulses
Example	Leaf folds when touched	Leg bends or moves upon nerve signals from the brain

17. B) **1. Introduction:**

- Gregor John Mendel, known as the "Father of Genetics," conducted experiments on pea plants to understand how traits are passed from one generation to the next. He chose pea plants because they have easily observable traits and can be easily cross-pollinated.

2. Trait Selection:

- Mendel focused on *one trait at a time* to keep the experiment simple. For example, he chose plant height as a trait, with two variations: *tall* and *short*.

3. Parental Cross (P Generation):

- Mendel selected two *pure-breeding parent plants*: one tall and one short. "Pure-breeding" means that these plants consistently produced the same trait over many generations. He cross-pollinated the tall parent plant with the short parent plant.

4. First Filial Generation (F1 Generation):

- All plants in the first generation, called the *F1 generation*, were *tall*. The short trait seemed to disappear, which suggested that tallness was *dominant* over shortness.

5. Self-Fertilization of F1 Plants :

- Mendel then allowed the tall F1 plants to self-pollinate (fertilize themselves) to produce the next generation, called the *F2 generation*.

6. Second Filial Generation (F2 Generation):

- In the F2 generation, both tall and short plants appeared. About *75% of the plants were tall*, and *25% were short*, showing a 3:1 ratio of tall to short plants.

7. Conclusion:

- Mendel concluded that traits are controlled by "factors" (now known as *genes*) that exist in pairs. Each parent passes one factor to the offspring. In the case of plant height, the tall factor was *dominant*, while the short factor was *recessive*. This experiment laid the foundation for the *laws of inheritance* in genetics.