



National Officers
ACADEMY
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Test Series Batch-2
CSS-2026 (September 2025)
GK-I (General Science & Ability) Test-1

INSTRUCTIONS

***SOLVE** any **TWO** of the following questions*

***ALLOCATE** 40 minutes to each question*

***ANSWER** all parts of the question*

***ASSIGN** proportionate weightage to each part*

*Each question carries **TWENTY** marks*

Test 1

Question 1

- (a) What is a galaxy, and what are its main components? Discuss the different types of galaxies and their characteristics. How does our solar system fit into the Milky Way galaxy?
- (b) What are proteins, and why are they essential for the human body? Discuss the different types of proteins (complete and incomplete) and provide examples of protein-rich foods. How do proteins contribute to overall health and development?
- (c) Describe the internal structure of the Earth, including the crust, mantle, outer core, and inner core. Discuss the characteristics of each layer and their roles in geological processes. How does the Earth's internal structure impact plate tectonics and earthquakes?
- (d) What are the different methods of food preservation, and how do they work? Discuss the importance of food preservation in maintaining food safety and quality. Provide examples of traditional and modern food preservation methods, such as refrigeration, freezing, canning, and dehydration.

Question 2

- (a) What is food contamination, and how can it occur at different stages of the food supply chain? Discuss the different types of food contaminants

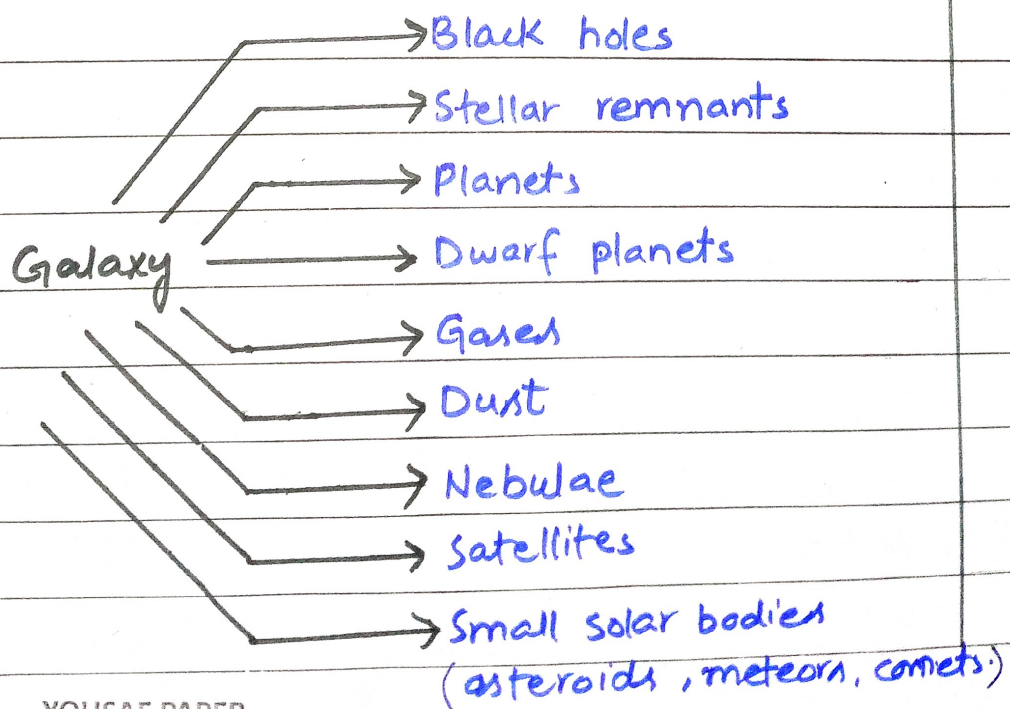
Question: 1

(a)

Galaxy

Galaxy is a gravitational bound system of stellar remnants, dust, gases, stellar bodies and dark matter. The word galaxy is derived from Greek word "galaxias" meaning "milky". 100-200 billion galaxies are believed to exist in the entire universe.

Main components of galaxies



Types of galaxies and their characteristics

Hubble classification system of galaxies classifies galaxies into 3 main types:

Spiral galaxies



Flat, rotating disc with multiple spiral arms and bulging center.



Consist of gases, dust, old, and new stars; site of new star formation



Examples include Milkyway galaxy and Andromeda



Elliptical galaxies



Round or Oval-shaped galaxies



Mostly consist of old stars with minimal gases and dust



M49, M60, M87 galaxies



Irregular galaxies



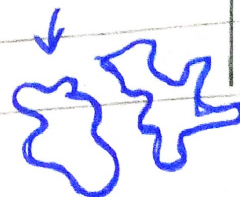
Lack any defined shape and structure, often appeared chaotic and unstructured



Lot of gas, dust and young stars



Large and small Magellanic clouds



Solar system fitting into Milky way galaxy

Milky Way is a spiral galaxy and encapsulates our solar system, consisting of sun, planets, dwarf planet, moons, asteroid belt, comets, meteors, and other objects. Our solar system is present in the **Orion arm** of Milky Way galaxy, between Sagittarius and Perseus arm, **30,000 light years** away from galactic center. Sun takes **250 million years** to orbit around the Milky way.

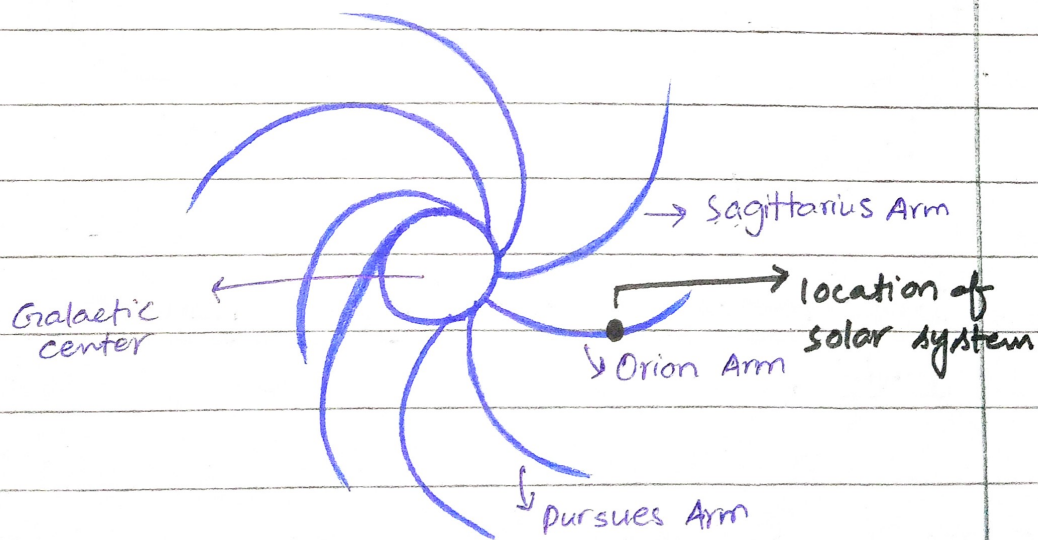
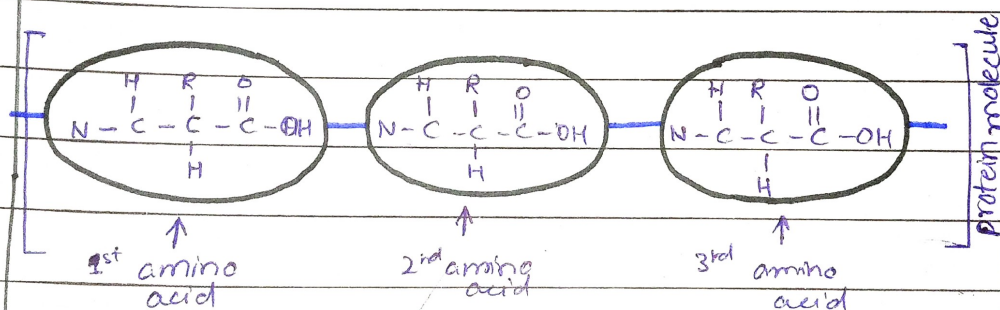


Fig: Milky Way galaxy and solar system's location

(b)

proteins

Proteins are the polymers made up of monomers called **amino acid**. Amino acids are relatively small nitrogen-containing compounds, serving as building blocks of proteins and other organic compounds. Out of 22 **amino acids** present in nature, 20 **amino acids** are present in body and perform various functions.



Importance of proteins for human body

→ Protein build new **tissues** and maintain and repair old tissue.

→ They are present in **hair, nails, beaks**,

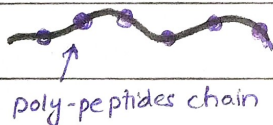
horns and feathers.

- They protect body against pathogens and antibodies
- Help in movement of body as actin and myosin form basic structure of muscles.
- Carries molecules from one place of body to other place, as haemoglobin
- Provide energy to body
- Perform regulatory activities as enzymes and hormones.

Different types of proteins

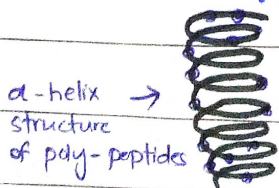
On the basis of structure:

1- Primary structure : → a single chain of amino acids arranged in a particular sequence



→ These are non-functional in nature

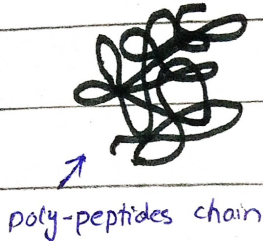
2- Secondary structure : → It forms when a poly-peptides chain is coiled into a spiral or helix have a three-dimensional structure via hydrogen bonding.



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→ Keratin and silk fibres

3-Tertiary structure: It forms when a poly-peptides chain becomes more stable by further coiling and foldings, by ionic bonding or disulphide bonds



→ Globulin protein

4-Quaternary Structure:

→ It forms when two or more poly-peptides chains join by coiling with each other



↑
2 poly-peptides chain
joined together

→ Haemoglobin, Insulin

On the basis of functions:

1-Enzymatic proteins: → Speed up chemical reaction in body.

→ Urease, catalase, Cytochrome

2-Structural proteins: → Make up bodily structures and strengthen and protect them.

→ collagen, elastin, Keratin

3-Transport proteins: → Help in ions or molecules transport

→ Haemoglobin, myoglobin

4- Storage proteins: provide food to developing embryo and store ions or molecules

Examples of protein-rich foods

Protein's plant sources

- Beans
- Pulses
- Groundnuts

Protein's animal sources:

- Egg
- Milk
- Cheese
- Fish
- meat

Proteins' contribution to overall development are health

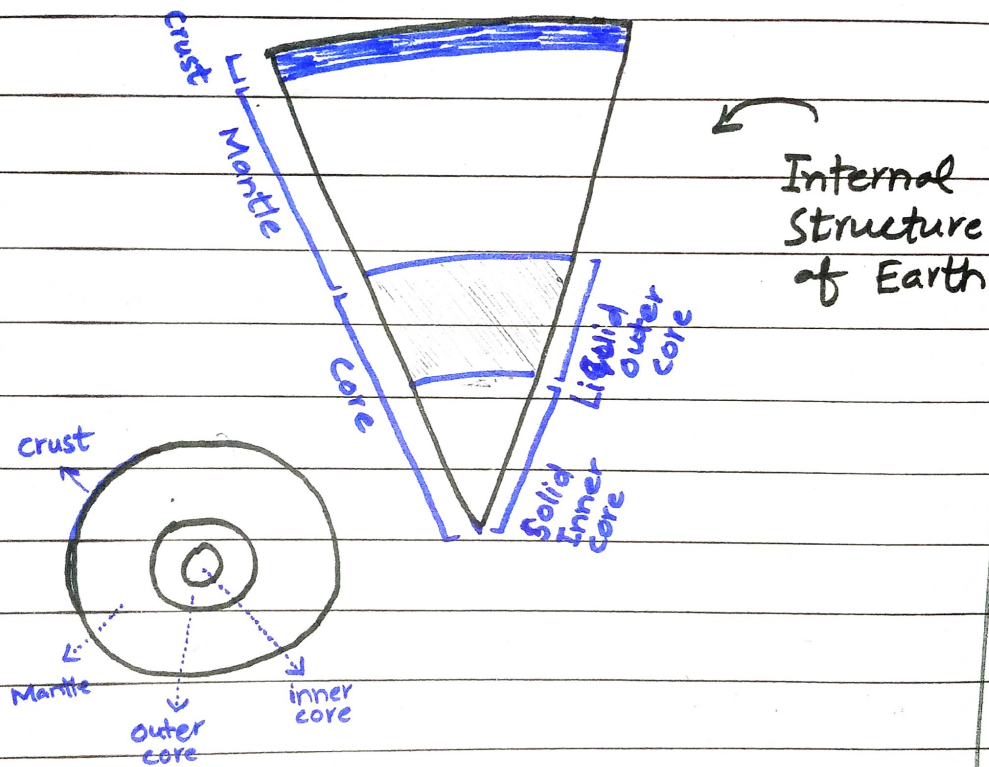
Proteins are the chief-builders of the body. They provide protection, structure and, stability to body, allowing it to perform its daily functions and growth. Moreover, damaged body parts are also nourished by proteins until they^{get} repaired again.

x — x

(C)

Internal structure of the Earth

Internal structure of the Earth is divided into ~~three~~ major parts.



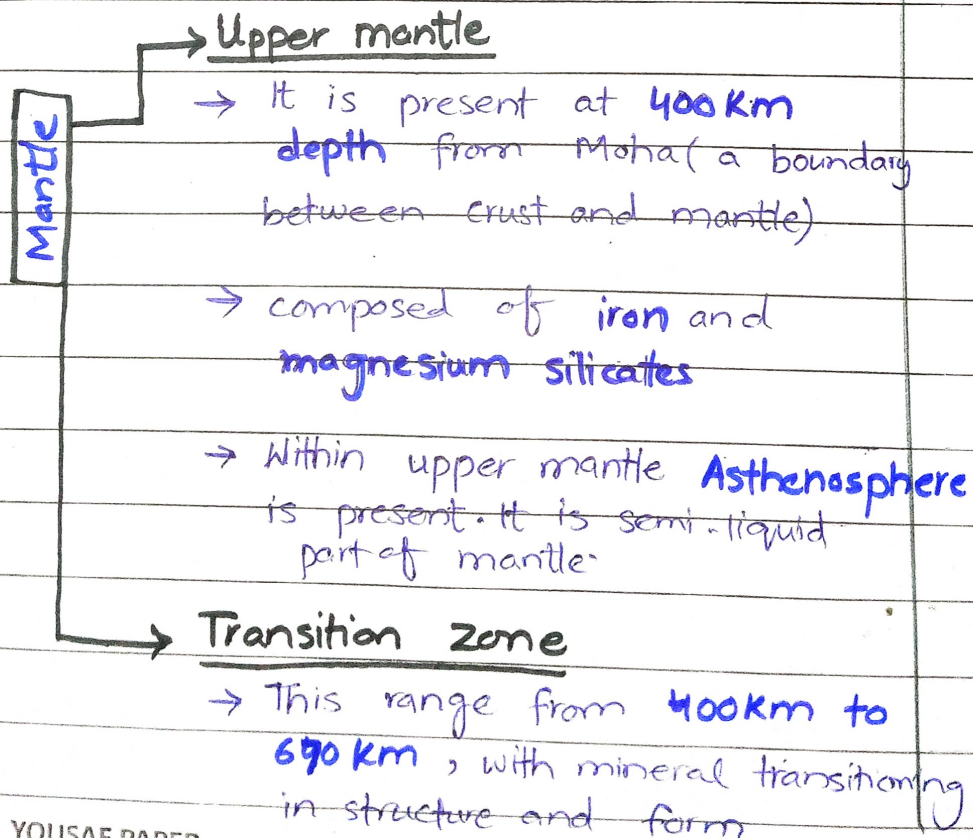
1- Crust

It is outer-most layer of Earth, comprising of oceans and continents. Its depth varies with 40-70 km in continents and 5-10 km in oceans. It is composed of

aluminosilicates. It also contains three types of mountains/rocks that are sedimentary, metamorphic and igneous rocks. At the deepest point, temperature may reach 870°C and $3/4$ part of crust is covered with water.

2- Mantle

The next layer is mantle is divided into three parts. Overall it's 2900 km deep. Conventional currents develop here.



→ Lower mantle

→ It is below **670 km**, consisting of **iron, silicon, magnesium**

→ **Denser** than upper ^{mantle} and transition zone

3- Core

It is the inner-most part of Earth and divided into two parts

Core → **Liquid outer core**

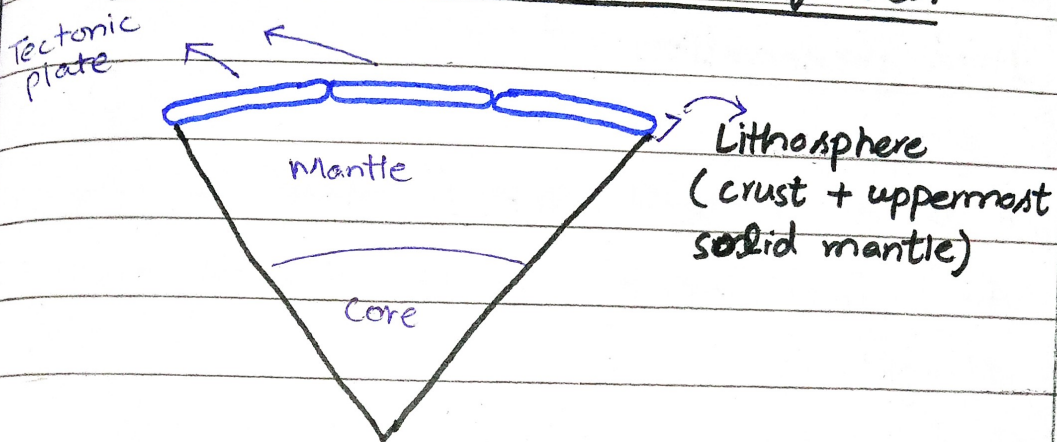
- **2300 km** thick
- composed of **Nickel-iron alloy**
- Controls magnetic field of **Earth**

→ **Solid outer core**

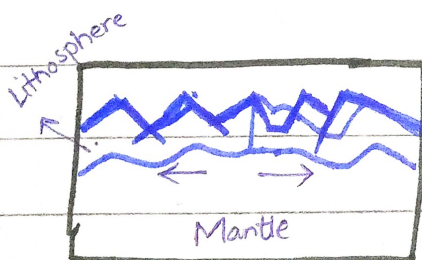
- **1200 km** thick
- composed of **iron**
- Due to high pressure, it is solid despite high temperature.

→ Earth structure also contains **Lithosphere** and **Asthenosphere**.

Earth tectonics and Earthquakes

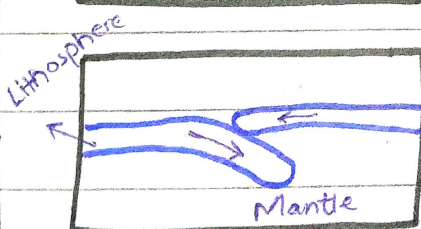


Uppermost solid parts of mantle and crust collectively make **Lithosphere**, which float over semi-liquid layer called **Asthenosphere**. Lithosphere sphere is divided into broken parts called **tectonic plates**. These plates when collide, slides or tear apart, earthquakes occur.



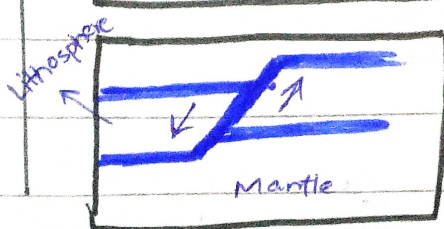
Tearing apart:

Tectonic plates moving apart allowing magma to rise and create new crust, forming rifts or ridges.



Colliding:

Tectonic plates collide, causing denser plate to slide under the other, releasing energy and causing earthquakes.



Sliding:

Tectonic plates moving in opposite direction, creating stress and causing earthquakes.

(d) Food preservation

It is a method that is used to keep food from spoilage after harvest or slaughter

→ There are a number of methods that are used aiming at killing or inhibiting the growth of microorganisms and reducing or eliminating factor responsible for food spoilage

Causes of food spoilage

- Germs / Microorganisms
- Temperature
- Moisture
- Light
- Enzyme
- Physical stress
- Time
- parasites / rodents / insects

Methods of food preservation

1- Freezing

→ slows down the growth of microorganisms

→ used for preserving fruits, milk, meat etc.

2- **Heating**

- kills microorganisms
- preserves milk, meat, fish etc

3- **Canning**

- Involves using ^{extreme} heat to preserve packed food
- canned fruits, juices etc

4- **Pasteurization**

- milder heat treatment to preserve food and inhibits or kill microorganisms.
- Pasteurized milk

5- **Fermentation**

- Breakdown of substances such as sugars in the food by microorganisms (bacteria, yeast) in absence of oxygen
- Bread, cheese, making

6- **Pickling**

- Preserving food by using acidic environment in food, killing microorganisms
- Adding vinegars in pickles

7- **Sugaring and salting**

- placing food in salty and sugary syrups to preserve them

→ canned fruits, jams

8- **Drying** → Preserving food by removing moisture out of it

→ Dried vegetables or dried mangoes

9- **Smoking** → Smoke containing various chemicals like formaldehydes is used to preserve food.

→ Meat, fishes

10- **Chemicals** → Chemicals like Sorbic acids, Sodium benzoate are used to preserve food

→ Kill or inhibit microorganisms' growth

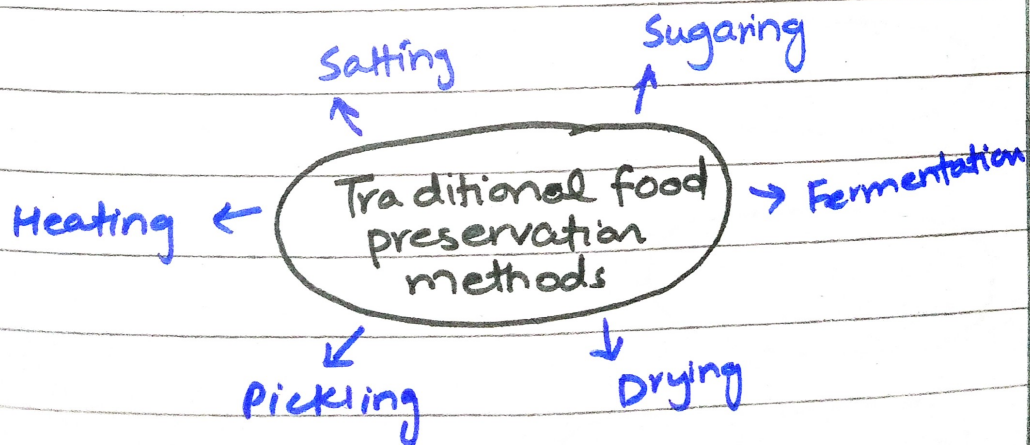
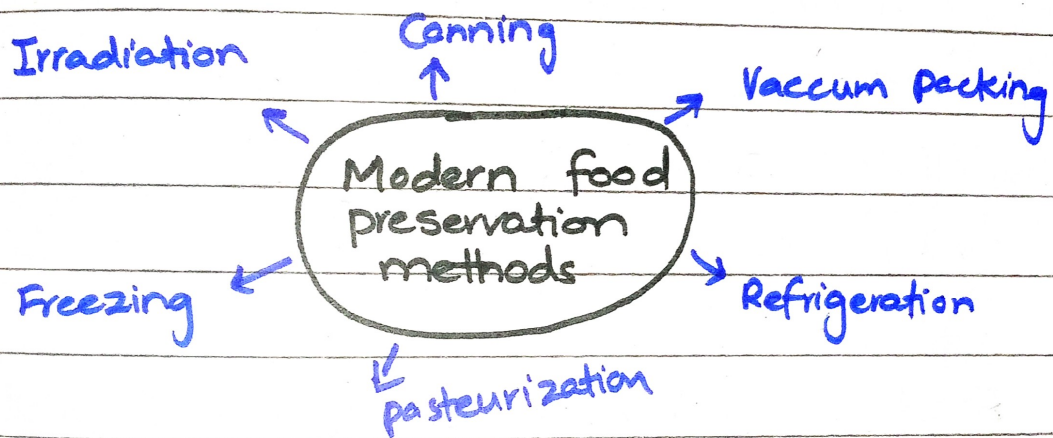
11- **Vacuum packing** → Food is preserved by packing them in air-tight packages, preventing oxidation of food, hence killing microorganism

→ Vacuum packed Spices

Irradiation

→ Raditions like X-rays are used for food preservation and they kill or inhibit fungal or bacterial growth

→ Irradiated spices.



x — x