Science Investigates Life and Our Planet

i. Definition and Explanation

This area of science focuses on two interconnected fields: Life Science (Biology) and Earth Science (Geology).

Investigating Life: Science explores the vast diversity of living organisms, how they interact with each other and their environment in ecosystems, and the processes that sustain life.

Investigating Our Planet: Science examines the structure of the Earth, from its hot core to its protective atmosphere, and the processes that shape it, like plate tectonics and the water cycle.

ii. Key Points and Important Terms

- **Ecosystem:** A community of living organisms (biotic factors) interacting with their non-living environment (abiotic factors).
- **Biotic:** Living or once-living components of an ecosystem (e.g., plants, animals, fungi, bacteria).
- **Abiotic:** Non-living components of an ecosystem (e.g., sunlight, water, soil, temperature, air).
- **Food Chain:** A simple model that shows how energy is transferred from one living thing to another.
- **Producer:** An organism that makes its own food, usually through photosynthesis (e.g., plants).
- **Consumer:** An organism that gets energy by eating other organisms.
- **Decomposer:** An organism that breaks down dead organic material (e.g., bacteria, fungi).

Earth's Layers:

- **Crust:** The thin, rocky outer layer of the Earth.
- **Mantle:** The thick layer of hot, solid rock between the crust and the core.
- **Core:** The extremely hot, dense center of the Earth (made of an outer liquid core and an inner solid core).

iii. Detailed Examples with Solutions

Example 1

- **(Investigating Life):** A simple pond ecosystem.
- **Biotic Factors:** Fish, frogs, algae (a producer), insects, bacteria (a decomposer).
- **Abiotic Factors:** The water itself, sunlight providing energy for the algae, rocks at the bottom, the temperature of the water.
- **Simple Food Chain:** Algae (Producer) → eaten by a small insect (Primary Consumer) → eaten by a small fish (Secondary Consumer) → eaten by a heron (Tertiary Consumer).

Example 2

- **(Investigating Our Planet):** An earthquake.

Explanation: An earthquake is caused by the movement of tectonic plates, which are large pieces of the Earth's crust. Stress builds up along a fault line, and when it is suddenly released, it sends seismic waves through the Earth's layers (crust and mantle), causing the ground to shake. This demonstrates how processes deep within the Earth affect the surface where we live.

iv. Common Misconceptions and Clarifications

- **Misconception:** Plants get their food from the soil.
- **Clarification:** Plants make their own food through photosynthesis, using energy from sunlight, carbon dioxide from the air, and water. The soil provides essential nutrients (like nitrogen and phosphorus) and an anchor for the roots, but it is not the plant's "food" (energy source).
- **Misconception:** The Earth's crust is very thick.
- **Clarification:** Relatively speaking, the crust is extremely thin compared to the other layers. If the Earth were the size of an apple, the crust would be thinner than the apple's skin.

v. Practice Problems with Step-by-Step Solutions

Problem: You are studying a desert. Identify three biotic factors and three abiotic factors you might find there.

- **Step 1:** Think about what makes a desert a desert. It's hot and dry.
- **Step 2:** List living things found there. These are the biotic factors.

- **Step 3:** List non-living things found there. These are the abiotic factors.

Solution:

- **Biotic Factors:** Cactus (producer), lizard (consumer), scorpion (consumer). (Other answers: snakes, insects, desert shrubs).
- **Abiotic Factors:** Sunlight (intense), sand/soil, low rainfall/water, high temperature.