

Q.2

(b)

Section - 1

Ans:

The Big Bang Theory and its Significance

The Big Bang Theory proposes that the universe began approximately 13.8 billion years ago from a singular, extremely hot and dense point. It marks the origin of time, space and matter and has since become the foundation of modern cosmology.

Significance:

This theory offers a scientific explanation for the expansion of the universe, the formation of galaxies and distribution of elements, enabling scientists to trace the universe's evolution from its earliest moments to its current state.

Key Supporting Evidence:

1.

Cosmic Microwave Background (CMB)

It was detected by Arno Penzias and Wilson in 1965. This faint radiation is considered the thermal remnant of the early universe and strongly supports the Big Bang model, confirming that the universe was once extremely hot and dense.

2. Redshift of Galaxies (Hubble's Law):

Edwin Hubble observed that galaxies are moving away from each other, the universe is expanding outward from a single origin point, supporting the idea that it began with a massive explosion.

3. Elemental Abundance:

The observed proportions of light elements, such as hydrogen and helium, align with predictions made by Big Bang nucleosynthesis.

Conclusion:

The Big Bang Theory not only explains the origin of the universe but also provides a predictive model that aligns with observable phenomenon. It continues to evolve with modern discoveries in astrophysics and quantum mechanics.

Q.2 (c)

Ans:

Global Warming: Causes, Effects and Mitigation

Global warming refers to the gradual increase in Earth's average temperature, mainly due to the accumulation of greenhouse gases such as carbon dioxide, methane and nitrous oxide.

Causes:

Major contributors include fossil fuel combustion, deforestation, urbanization and agricultural emissions. These factors enhance the greenhouse effect by trapping more heat in the atmosphere.

Human Role:

Human activities are the primary drivers of global warming. Industrial development, energy consumption and unsustainable land use have accelerated the natural climate cycle and pushed the planet toward dangerous warming levels.

Effects:

Global warming has led to rising sea levels, melting glaciers, frequent extreme weather events, biodiversity loss and growing public health threats.

Mitigation Strategies:

Solutions include transitioning to renewable energy, afforestation, promoting energy efficiency, implementing climate agreements like Paris Agreement and raising public awareness -

Conclusion:

Global warming, largely caused by human actions, poses a global threat. Combating it requires urgent, collective and sustained efforts across all sectors -

Q2 (d)

Ans: A disaster management plan provides a structured approach to prevent, prepare for it, respond and recover from natural or man-made disasters. It aims to reduce loss of life, minimize property damage and restore affected communities efficiently -

Key Components:

The major elements include risk assessment, preparedness through early warning systems and public training, emergency response via coordinated relief operations and recovery through rehabilitation and infrastructure restoration.

Importance of Preparedness, Response and Recovery:

Preparedness ensures readiness and reduces vulnerability. An effective response limits casualties and damage during the disaster.

Recovery enables long-term rebuilding and stability. Together, they form a comprehensive system to mitigate disaster impacts.

Examples of Successful Strategies:

1. Japan's earthquake management includes strict building codes and regular drills.
2. Pakistan's NDMA has implemented flood early warning systems and coordinated national disaster responses.

Conclusion:

Effective disaster management requires planning, coordination and public participation. A well-implemented strategy can transform potential catastrophe into manageable challenges.

Q.3 (b)

Ans

Biofuels are renewable energy sources derived from organic materials such as crops, animal fats and agricultural waste. The most common types include ethanol, produced through the fermentation of crops like corn and sugarcane and biodiesel, made via transesterification of vegetable oils or animal fats.

Advantages:

Biofuels are **renewable**, biodegradable and emit fewer greenhouse gases than fossil fuels. They can be produced locally, reducing dependence on imported energy and enhancing energy security.

Disadvantages :

Biofuel production competes with food crops, leading to the food vs fuel debate. It may cause deforestation, biodiversity loss and requires significant land and water resources. Additionally, production costs are often high and energy output is lower than fossil fuels.

Contribution to Emission Reduction:

Sustainably produced biofuels are considered carbon-neutral, as the CO_2 emitted during combustion is offset by CO_2 absorbed during biomass growth.

Conclusion:

Biofuels offers a 'cleaner' energy alternative but their large-scale adoption must balance environmental, economic and food security concerns-

Q.3 (d)

Ans

The Earth's interior is composed of four distinct layers: the **crust**, **mantle**, **outer core** and **inner core**. The crust is the outermost solid layer, which is divided into **continental crust**, which is thicker and less dense, and **oceanic crust** which is thinner and more dense. Beneath the crust lies the **mantle**, a semi-solid silicate-rich layer, followed by the **liquid outer core** and the **solid inner core**, both composed mainly of iron and nickel.

Differences in Crust Types:

The continental crust is older, granitic and lighter, while oceanic is basaltic, younger and denser.

Plate Tectonics:

The Earth's lithosphere is broken into tectonic plates that float over the semi-fluid asthenosphere. Their movement causes earthquakes, volcanic eruptions and the formation of mountains and oceanic trenches.

Conclusion:

Understanding the structure of Earth and plate tectonics is essential for explaining surface features and predicting geological hazards.