

(General Science and Ability)

PART - II

Q-3]

A-

1 - The Big Bang

This theory was proposed by Sir Fred Hoyle in 1950. This explains the origin of Universe. The theory propounds that

The universe began as just a single point, then expanded and stretched to grow as large as it is right now - and it is still stretching.

This theory proposes that the universe came into existence in singularity, it means that there was nothing found before it. The whole universe was compacted in a massive ball like structure. There emerged a point when this ball exploded and it was the time, the universe that we know was formed. And this theory also suggests that the universe keeps expanding.

II - Dark Matter and Dark Energy's Role in Expansion of Universe

The dark matter and dark energy comprises the 95% mass and energy found in the universe.

The dark matter is:

An invisible substance that interacts through gravity, holding galaxies and cosmic structures together.

The dark energy is:

A mysterious force causing the universe's accelerated expansion.

The dark matter and dark energy works combinely to maintain the structure of universe. These phenomenons make sure that there is not enough acceleration to give structure to universe and not enough contraction to make the structures collide.

III - Key Evidences Supporting Big Bang

The theory of bigbang is a widely accepted theory for the origin of universe. The theory was not only supported by prominent physicists like Einesfine and Stephen Hawkings but, is also supported and found in different religious books, most accurately in the Holy Quran -

B. galaxy is a collection of stars and gas.

1 - Galaxy

Galaxy is a

Massive aggregate of hundreds of millions of stars, all gravitationally interacting and orbiting about a common centre.

The galaxies are classified on the basis of their structure. The main types of galaxies are: Spiral, Elliptical and Irregular.

1a) - Spiral Galaxy

A spiral galaxy is shaped like a disk, usually with a bulge in the centre and arms that spiral outwards as galaxy rotates.

The example of spiral galaxy is our Milky way galaxy.

1b) - Elliptical Galaxy

The elliptical galaxy consists of older stars and very little gas and dust.

The example of elliptical galaxy is M87

(c) - Irregular Galaxy

An Irregular galaxy has lots of young stars, dust and gas and does not have a defined shape. The example of irregular galaxy is LMC.

2- Structure and Composition of Milky Way.

a- Composition: The milky way is a barred spiral galaxy composed of atleast 100 billion stars.

It is approximately 100,000 lightyears across and about 1000 lightyears thick. The dark matter forms most of the mass of the milky way.

b- Structure:

i- Galactic Bulge: It is the dense, spherical region at the center of milky way. It contains mostly old stars, gas and dust.

ii- Galactic Disk: It is a flat, rotating structure that forms the main visible part of the Milky way.

iii- Galactic Halo: It is a roughly spherical region surrounding the disk and bulge.

3- Formation and Evolving of Galaxies

a- Formation of Galaxies:

The most widely accepted theory about the formation of universe is bigbang theory. The galaxies were formed after the Big Bang. The early universe was filled with hydrogen and helium gas. Under the pull

of gravity, matter clumped together to form protogalaxies. Dark matter acted as gravitational framework, helping gas and stars gather. Within a billion years, the first galaxies appeared.

b. Evolution of Galaxies:

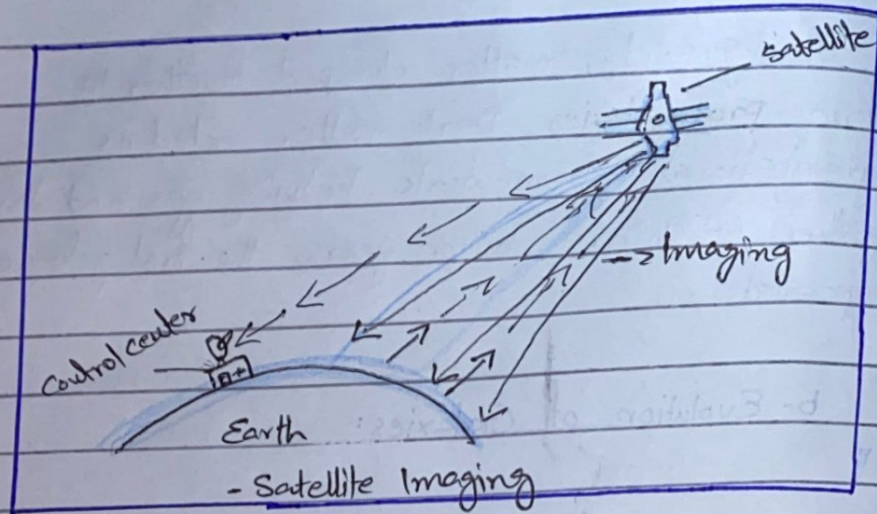
Over time, galaxies evolve due to star formation, collisions and black hole activity. Gas clouds collapse to form stars, but once a star gas is used up, star formation slows down. Galaxies often collide and merge, changing their size and shape. The Milky Way itself will merge with Andromeda Galaxy in about 4 billion years.

C -

1- Remote Sensing

Remote sensing means gathering information about an object or body without being in direct contact with it. It is through visuals or images to keep a record of the events happening on Earth.

The technology of remote sensing is used in the observation of weather patterns, visual representation and for different means. The idea of remote sensing is made possible through satellites, drone, and planes.

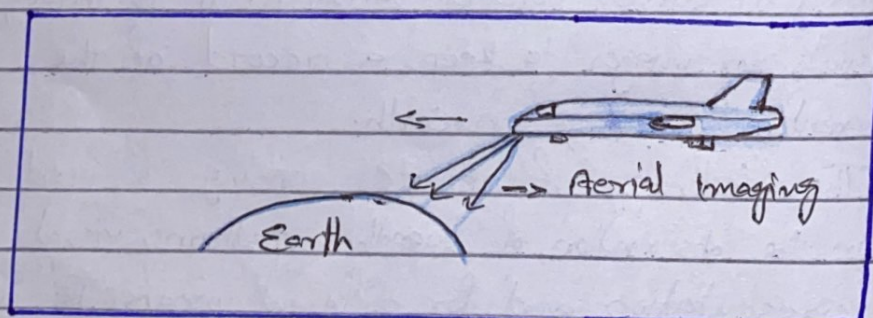


11 - Types of Remote Sensing

a - Satellite Imaging :

In satellite imaging, the waves are used to collect the information from the land. The time taken to reach the signals is calculated to determine the weather pattern as well as other figures like any building or moving thing.

b - Aerial Photography:



In this type of remote sensing, aeroplanes and drone are used to capture the image of land for studies.

11 - Using Remote Sensing for Monitoring Environmental Changes and Natural Disasters

The technology of remote sensing is the best medium to analyse weather patterns. It can be used to image and calculate the direction and speed of winds and any other patterns.

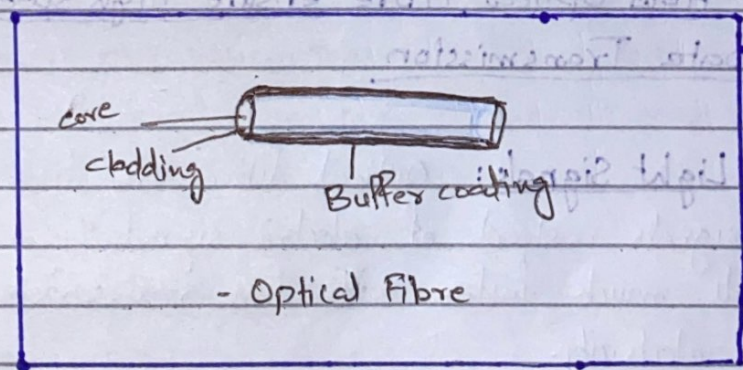
Moreover, in any natural calamity, it is used to have an accurate view of the damaged area along with looking for survivors.

Q4]

A-

1 - Understanding Fibre Optics

Fibre optics is a technology that uses light to transmit information through a thin, flexible strand.



a - Core: The core is the inner hollow area, it is where the light is transmitted to be passed from one medium to another.

b. Cladding: The cladding is the inside surface surrounding the core. It is reflective and ensures that light travels in a medium.

c. Buffer Coating: Buffer coating is the outer protective layer that surrounds the optical fibre.

II. Advantages of Optical Fibre over Traditional Copper Wire

The technology of optical fibre comes with many advantages that are:

- 1- Cheap to install.
- 2- Uninterrupted supply.
- 3- Faster data transmitting.
- 4- Immune to electromagnetic interference.
- 5- Light weight and thin.

III. How Optical Fibre ensure High Speed Data Transmission

a. Light Signals: Optical fibre uses light signals instead of electric signals. Light travels much faster with less resistance than electricity.

b. Total Internal Reflection: The fibre core is surrounded by cladding with a lower refractive index. This traps the light inside the core allowing it to travel long distance.

c- High Bandwidth: Light waves carry huge amount of data at once. This makes the signals and data reach faster.

B-

1. Causes and Effects of Earthquake

a. Causes of Earthquake:

The earthquake is the sudden shaking of the earth surface. There are many reasons that can cause an earthquake.

1- Tectonic Plates movement:

The major and most common cause of earthquake is the movement of tectonic plates. The earth is believed to be divided into 7 major and some minor divisions. When these plates collide or get away from one another, it causes sudden jerk in earth's surface.

2- Volcanic Eruption:

The earth is full of volcanoes, some are active with some being dormant and inactive. When there is an eruption in volcano, it can cause earthquake or sometimes, the earthquake is responsible for

eruption of volcano -

3- Release of Energy:

Another cause of earthquake is when the rocks underneath the surface of earth and water releases the energy, in rocks the energy is build up which causes them to break. This leads to earthquake.

4. Isostatic Adjustment:

It occurs when weight is poured on one side of the tectonic plate making it sink, this sinking of one side directs the other side to rise. A natural phenomenon, this leads to earthquake.

5- Local Causes:

There are many local causes that are landsliding, avalanche, explosions in mines or mountains. These factors also lead to earthquake.

6- Effects of Earthquake

Earthquakes occur due to many natural phenomena that are unavoidable by the humans. There are many effects caused by earthquakes.

1- Surface Rapture:

Earthquake cause cracks to be appeared on the ground damaging pipelines, railways and structures.

2- Ground Shaking:

The ground shaking caused by earthquakes lead to collapse of buildings, bridges and roads along with loss of human life.

3- Landslides and Avalanches:

Earthquake triggers those which in result bury homes and roads.

4- Business Loss:

Factories, markets and offices destroyed by earthquake often halt the economic activity of that area.

5- Damage to Ecosystem:

Forests, farmland, and wildlife habitats get destroyed due to earthquakes.

(II) Types of Seismic Waves

Seismic waves are divided into two main types, the first is Body waves and the latter is Surface waves -

A- Body waves

The body waves travel through the Earth's interior and are of two types.

1- Primary waves: Also known as P-waves are the fastest, move in a back and forth compressional motion, and can travel through solids, liquids and gases.

2- Secondary waves: Also known as S-waves are slower, move in a side to side or up and down transverse motion, can only pass through solids, making them more destructive than P-waves.

B- Surface waves

They move along the earth's outer layer and cause major damage. These waves are of two types.

1- Love waves:

These waves shake the ground horizontally.

2- Rayleigh waves:

They roll like ocean waves, producing both vertical and horizontal movement.

(iii) Reducing the Impacts of Earthquake

The earthquake-resistant construction and preparedness can reduce the impacts and devastation caused by earthquake.

a- Earthquake resistant construction:

When buildings are designed in a way to resist the impact, they cause less severity in the destruction. These types of construction is ensured by reinforced concrete, steel frame, shock absorbers, flexible foundation and quality building codes. This type of construction is more reliable and can face severe shocks by the earthquake.

b- Preparedness Measures

Preparedness measures like early warning systems, emergency response planning, evacuation drills and awareness can reduce severe implications that might be caused by unpreparedness.

C1

1- Balanced diet

The diet is said to be balanced when it contains all the essential nutrients & vitamins in adequate proportion required by the body.

11- Why is it essential?

Living things are composed of different substances. The bodies need different macro and micro nutrients for its proper functioning. Without a proper balanced diet, the body can not function well, the same goes if something is taken in excess, therefore a balanced diet is essential for maintaining good health.

11- Importance of Macronutrients and Micronutrients in a Balanced Diet

In a balanced diet, the right proportion of both macronutrients and micronutrients is essential.

a- Macronutrients' Importance

They provide energy and structure to the body. There are various kinds of macronutrients, that are:

1- Carbohydrates: Provide quick and main energy for daily activities.

2- Proteins: Essential for growth, repair of tissues and strong immunity.

3- Fats: Store energy, protect organs, and help absorb vitamins.

b. Importance of Micronutrients

Micronutrients help in regulation and protection of the body. The below are some kinds:

1- Vitamins: Regulate body processes.

2- Minerals: Strengthen bones and teeth, form blood, control nerves and muscles.

IV - How Balanced Diet Help Prevent Chronic Diseases

As balanced diet contain different substances, they help improving the immune system of the overall body. Some nutrients such as Vitamin K help in blood clotting, others like proteins, Vitamin A and Vitamin C helps in boosting immunity, defence against night blindness and from scurvy, respectively.

D1

1- Sources and Effects of Water Pollution

Water pollution is the contamination of bodies like lakes, seas, oceans and rivers by addition of harmful substances.

a- Sources of Water Pollution

Water pollution is caused due to many reasons. The sources of water pollution are:

1- Factories: Factories produce waste that is sometimes due to weak accountability and less control measure dumped into water bodies. These resultantly pollute the water.

2- House holds: Waste from the homes of people is directly ~~threw~~ thrown into sewages which fall into rivers causing the river water to be polluted.

3- Fertilizers: Fertilizers used for better crop, is drawn away into streams which is harmful and contains chemicals like nitrates and phosphates. They also cause the water to be polluted.

4- Eutrophication: The growth of Blue-Green Algae, that is oxygen consuming pollutes the water and absorbs oxygen making it difficult for aquatic life to survive.

b. Effects of Water Pollution

Water pollution causes direct effect on the ecosystem, animal health and human health.

1- Effect on Ecosystem: When the water is full of pollutants, it severely impacts the growth of plants, and has direct influence on marine life. Along with this, the contaminated water during the natural water cycle takes chemicals such as sulphur dioxide and nitrogen oxide with it causing Acid Rain.

2- Effect on Animal Health: Animals cannot differentiate between clean and polluted water. They drink whenever they find any source, when consuming polluted water, their body develop different bacteria which leads to their death.

3- Effect on Human Health: Contact to polluted water causes different skin diseases and even cancer. If polluted water is consumed, it leads to severe illnesses such as diarrhea, cholera and leads to death.

II - Impact of Water Pollution on Human Health and Environment

a. Impact on Human Health

Water pollution impacts human health in multiple ways. It exposes human to different kind of bacteria and viruses. When it is in form of acid rain, it affects the skin and leads to diseases. Water pollution can kill a person along with making him extreme sick.

b. Impact on Environment

Water pollution damages the environment overall. It leads to land pollution and air pollution. It damages plants and forests when it is poured in the shape of rain.

III - Prevention and Controlling Measures

Water pollution can be prevented and controlled via different measures.

a. Installing water treatment plants: The water which is from the factories and from municipal should first reach treatment plants where it should be purified as much as possible before being rushed into rivers and

streams.

b. Reuse of treated water: People should be encouraged to reuse the treated wastes to save the new water to be polluted.

c. Strict Regulations over Industries: Strict policies and regulatory measures should be taken to ensure that industries do not dump harmful chemicals directly into water bodies.

d. Recycling waste: The waste that is dumped into water bodies should be recycled and reused.

e. Safe handling of sanitary waste: Sanitary waste should be handled with care and it should be ensured that it is first purified before being dumped into water.