Mock : 03

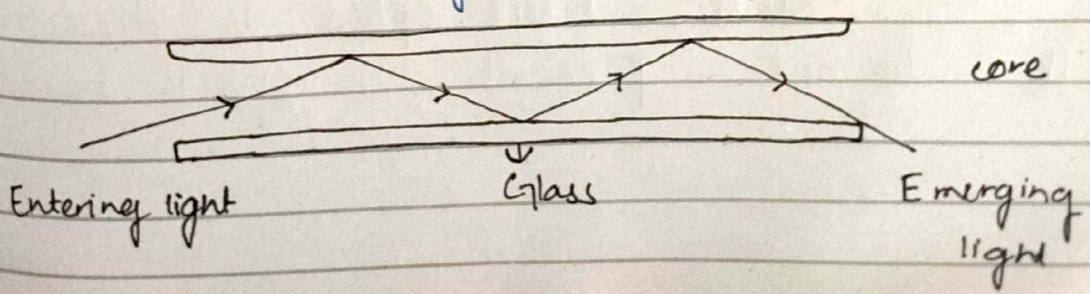
Q No : 04 (a)

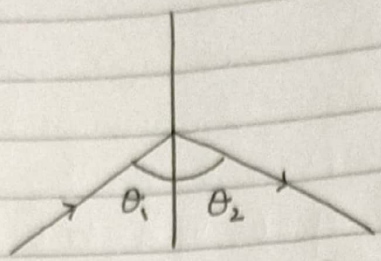
Fiber Optics:

Fiber-optic lines are strands of optically pure glass as thin as human hair that carries digital information in the form of light signals from one point to another. They are used in telecommunication. Fiber-optics is the branch of science that deals with optical fibres.

Working of Fiber Optics:

Fiber optics work on the phenomenon of total internal reflection. Light travels down a fiber-optic cable by bouncing repeatedly off the walls. If light hits the glass at a really shallow angle (less than 42 degrees), it reflects back in again as if glass were really a mirror. This phenomenon is called total internal reflection. It keeps the light inside the pipe. Total internal reflection occours at the core-cladding boundry.





Total internal reflection

Advantages of Fiber Optics over copper:

(i) Bandwidth:

Fiber optics have a much greater bandwidth that metal cables - The amount of information that can be transmitted per unit time of fibre as compared to copper wires is much greater.

(ii) Low power loss:

Fibre Optics allow less power loss. This allows transmission over long distances. Longest recommended copper distance is 100 m while for fibre optics it is 2,000 m.

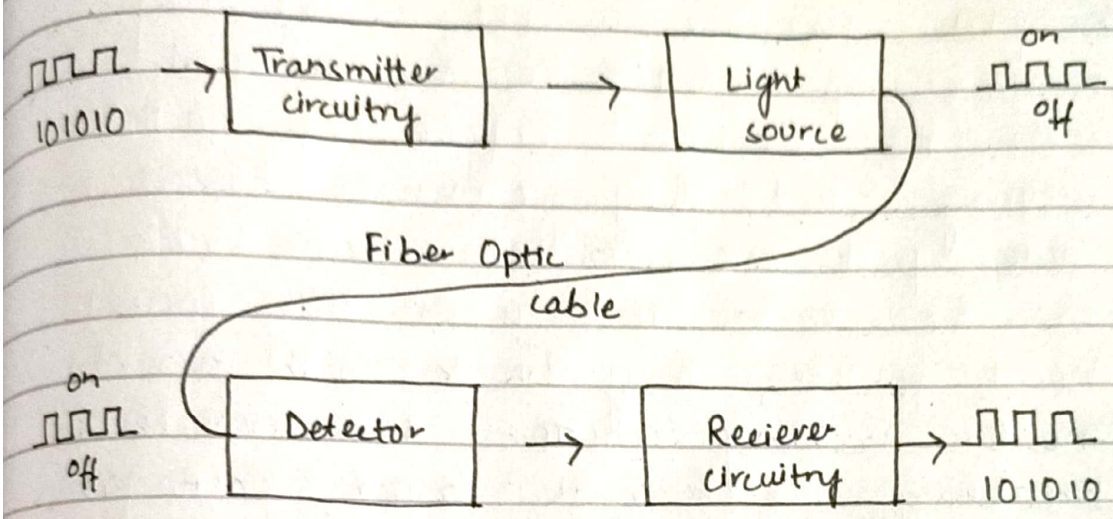
(iii) Interference:

Fibre optics are immune to electromagnetic interference so they can be run in electrically noisy environments.

(iv) Safety:

Since, Fibre optics is dielectric, it doesnot present a spark hazard.

Data Transmission through Fiber Optics:



Q No : 04 (b)

Causes and Effects of Earthquake:

Causes:

(i) plate tectonics is one of the major reasons of earthquake. Tectonic plates that cover the entire surface of earth are moving and they converge, diverge or slide past one another. strain builds up in the rocks and when they cannot bend further, they break with an abrupt move. Shaking motion that radiates from breaking rock is called earthquake.

(ii) Underground nuclear explosions can also cause earthquake

(iii) Human coordinated and synchronized activities such as jumping or dancing at concerts or stadiums can also trigger earthquakes.

Effects:

(i) Earthquakes can cause total or partial collapse of property and structures such as roads, bridges, rail networks and buildings.

(ii) Water levels in the sea could also rise due to earthquakes. It can cause floods in coastal areas and also trigger tsunamis.

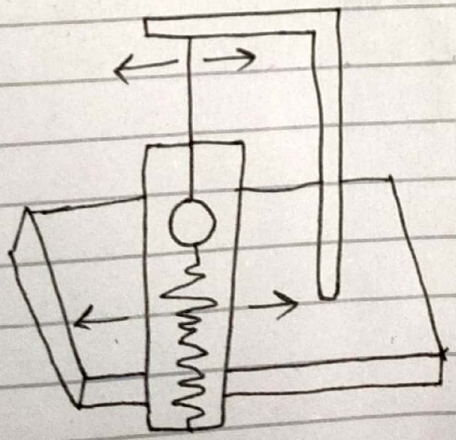
(iii) Earthquakes can also induce long-term psychological and socio-economic losses and deprivations.

Types of seismic waves:

Two types of seismic waves are called body waves and surface waves. Body waves travel from earthquake focus in all directions while surface waves travel around the earth rather than through it. surface waves are also slower than body waves.

Measurement of seismic waves:

A seismograph is used to measure the vibrations caused by earthquake. It plots these ~~measurments~~ vibrations of a paper. The strength or magnitude of these vibrations are then measured using a Richter scale which is numbered 0-10.



Seismograph

Earthquake resistant construction:

Base isolation technique:

It is an earthquake resistant building design that decouples a structure from the ground allowing it to move independently during earthquake by floating on flexible bearings or rubber pads.

Dampening technique:

This technique uses viscous damping by attaching an adjustable damper such as pendulum to absorb and dissipate energy. The pendulum sways and counters inertia.

Preparedness:

preparedness measures such as Risk assesment, risk zoning, planning, public awareness and making emergency plans coupled with Earthquake resistant construction can significantly reduce the impact of earthquakes.

Q NO : 04 (c)

Balanced diet:

A balanced died is a diet which includes right amount of all nutrients such as protein, vitamins, minerals, carbonydrates etc. for proper growth, development and normal functioning of the body.

Importance of balanced diet:

All the components of balanced died are essential for maintaing good health.

→ Carbohydrates: They are the main source of energy.

→ Proteins: They are essential for growth and repair of muscles.

→ Vitamins: They play a part in many chemical processes in the body.

→ Water: it is a vehicle for carrying other nutrients.

→ Dietry fibre: it is essential to the health of digestive system.

Macronutrients:

Nutrients such as carbonydrates, proteins, fats are needed in large amounts thats why they are called

macronutrients.

Carbohydrates.

i- They are chief source of energy. Glucose is broken down by glycosis to yield ATP.

ii- They form structural and protective components such as cell wall in plants.

(iii) They aid in regulation of nerve tissue.

Proteins.

(i) They build new tissues and replace old tissues.

(ii) proteins are protective as antibodies.

(iii) Keratin protein forms hair and nails.

Fats:

(i) They serve as energy reserve for the body.

(ii) They are important for fat soluble vitamins such as A, D, E and K.

(iii) They protect vital organs like heart and kidneys.

Micronutrients:

Micronutrients like vitamin and minerals are needed in small quantities. They donot provide

energy but are essential for body functioning

Vitamins & Mineral Importance:

(i) They both act as co-factors.

(ii) They enhance the body's use of carbohydrates, proteins and fats.

(iii) They are critical in the formation of blood cells, hormones, DNA and neurotransmitters.

Prevention of chronic deseases through balanced diet.

(i) Use of vitamin B9 can prevent anemia and birth defects in pregnant women.

(ii) Regular intake of calcium can prevent rickets, osteoporosis and convulsions.

(iii) Proper intake of carbohydrates, proteins and fats can help in avoiding malnutrition and dwarfism.

Q NO : 04 (d)

Water pollution:

Any change or modificatio in the physical, biological or chemical properties of water that will have a detrimental consequence of on living things is called water pollution

Sources and effects of pollutants:

(i) Organic matter: it's primary source is industrial wastewater and domestic sewage.
It decreases oxygen from water coloumn as it decomposes, stesc and suffocate aquatic life.

(ii) Nutrients: They usually runoff from agricultural lands and over-stimulate growth of algae which harms aquatic life.

(iii) Heavy metals: They end up in water reservoirs due to industries and mining sites. They accumulate in the tissues of fish and are toxic to both fish and humans who consume them.

Impacts of water pollution on human health and envirnment.

Contaminated water habours pathoge that cause waterborne diseases such as cholera, typhoid, dysentry

and hepatitus. Heavy metals, pesticides and other chemicals can result in neurological damage, cardiovascular problems and reproductive issues. Contact with contaminate water can cause irritation, rashes and infection.

Water pollution results in killing aquatic organisms which disrupts aquatic food chain and endangers entire ecosystems. water pollution degrades the quality of aquatic environments which makes them unsuitable for plants and and animals that rely on them for survival. Thus it can destroy an entire habitat.

Prevention and control of water pollution:

It can be done in following ways:

(i) proper disposal and containment of toxic chemicals before they can reach a reservoir.

(ii) By replacing toxic chemicals and sprays with eco-friendly chemicals.

(iii) Eco-friendly and recyclable materials should be used so that they are not disposed into water reserves.

Q NO: 03 (a)

Big Bang Theory: It is believed that universe began in a Big Bang about 13.7 billion years ago. It is the leading explanation of how the world began. 13.7 billion years ago univers was smaller than a pinhead. Whic was hotter and denser than anything and it suddenly explode Time, space and matter was born in that moment. The universe grew from a single atom to bigge than a galaxy and it is still expanding today.

Dark matter & Dark energy:

Dark energy causes the universe's accelarating expansion by acting as a repulsive force while dark matter provides the extra gravitational pull needed to form and hold galaxies together. Dark energy dominates the universe's contents and drives its ~~con~~ expansion while dark matter is crucial for the formation of cosmic structures within that expanding universe. Together Dark energy (68%) and dark matter (27%) account for 95% of universe's mass and energy.

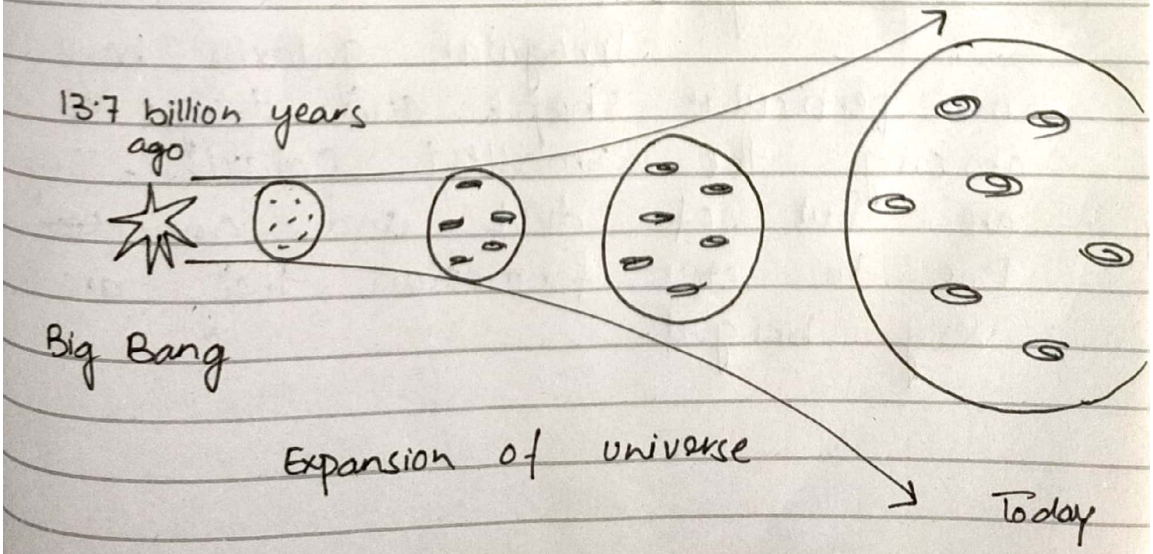
Evidence for Big Bang:

(i) Red shift:

If an object is moving away from Earth, it's light shifts to longer, redder wavelengths, an effect known as Red shift and it supports the bigbang theory. The light from distant galaxies is red shifted which means they are moving away from us. It aligns with the assumption of Big Bang theory which claims that the universe is expanding.

(ii) Cosmic microwave background radiation.

These radiation are recieved from all parts of the world and they are thought to be the heat leftover from the original expansion of bigbang. Thus this evidence also supports Big Bang theory.



Q No : 03 (b)

Galaxy:

A galaxy is a gravitationally bound system of stars, stellar ramnants, interstellar gas, dust and dark matter.

Classification of galaxies:

(i) Elliptical galaxies:

These galaxies bear shape of an ellipse, a streched-out circle.

(ii) Spiral galaxies:

In spiral galaxies, stars, dust and gas are gathered in spiral arms that spread outwards from the senter of galaxies. About 20% of all galaxies are spiral and they are of three main types depending on how tightly wound their arms are: Sa, Sb and Sb.

(iii) Irregular galaxies:

Irregular galaxies have no perticular shape and they are among the smallest galaxies. They are full of dust and gas. Due to star formation, they are very bright.

Milky Way galaxy:

Milky way is a large disk shaped galaxy that includes our solar system. It is a spiral galaxy and our solar system is located in its Orion Arm. In addition to sun Milky way contains about 200-400 billion other stars. Milky way is a part of cluster of 3 dozen galaxies called Local group.

Formation & Evolution of Galaxies:

Galaxies form when gravity pulls together clouds of gas, dust and darkmatter causing them to collapse into ~~spiral and elliptical galaxies~~. larger structures. Over years these galaxies interact, collide, merge and consume smaller galaxies through "cosmic cannibalism" and evolve into spiral and elliptical shapes.