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Batch- 79

DATE: 9-Dec-2025 Section - I DAY: Tuesday

Ans2: (a) Ans

Difference between a Star and a Planet

Basis of Comparison	Star	Planets
Meaning	Stars are the astronomical objects, that emit their own light, produced due to thermonuclear fusion, occuring at its core.	Planets refers to the celestial object that has a fixed path (orbit), in which it moves around the star.
Light	They have their own light.	They do not have their own light.
Position	Their position remain unchanged.	They change position.
Size	Big in size.	Small in size.
Shape	Dot shaped	Sphere shaped
Temperature	High	Low

Basis for Comparison	Star	Planet
Number	There is only one star in whole solar system.	There are eight planets in our solar system.
Twinkle	Star twinkle	Planets do not twinkles.
Matter	Hydrogen, Helium and other light elements	Solid Liquid or gases or a combination thereon.
Heat	A star possesses its own heat.	A planet does not have heat.

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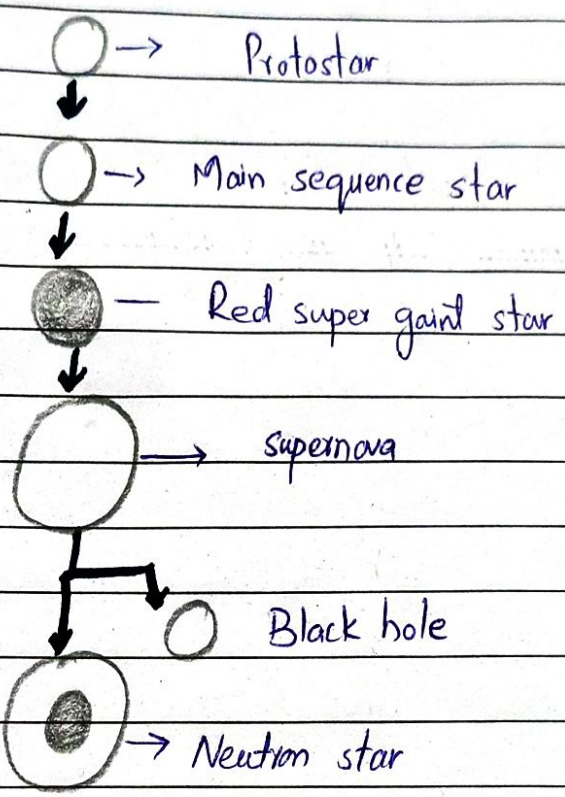
Life cycle of Star

All stars begin life in the same way. A cloud of dust and gas. also known as a nebula becomes a protostar, which goes on to become a main sequence star.



Life cycle of star

Nebula:

A star forms from massive clouds of dust and gas in space, also known as a Nebula. Nebula are mostly composed of hydrogen.

Protostar:

Gravity beings to pull the dust and gas together. As the mass falls together it gets hot. A star is formed when it is hot enough for the hydrogen nuclei to fuse together to make helium. The fusion process release

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energy, which keeps the core of the star hot.

Main sequence star:

During this stable phase in the life of a star, the force of gravity holding the star together is balanced by higher pressure due to the high temperatures. The Sun is at this stable phase in its life.

Red gaint star:

When all the hydrogen has been used up in the fusion process, larger nuclei begin to form and the star may expand to become a red giant.

White drawf:

When all the nuclear reactions are over, a small star like the Sun may begin to contract under the pull of gravity. In this instance, the star becomes a white dwraf which fades and change colour as it cools.

Supernova:

A large star with more mass will go on making nuclear reactions, getting hotter and expanding until it explodes as a supernova.

An expanding supernova throws hot gas into space.

Neutron star or black hole:

Depending on the mass at the start of its life, a supernova will leave behind either

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a neutron star or a block hole.

(b) Semiconductor:

A semiconductor is a material with electrical conductivity between a conductor (like metal) and an insulator (like glass), whose ability to conduct current can be precisely controlled by adding impurities (doping) or changing conditions like light/heat, making it the fundamental building block for modern electronics like LEDs, transistors, microchips and solar cells. The common semiconductors include chemical elements and compounds such as silicon, germanium, selenium, gallium arsenide, zinc selenide and lead telluride. They are used to create integrated circuits that power computers, phones and virtually all digital technology.

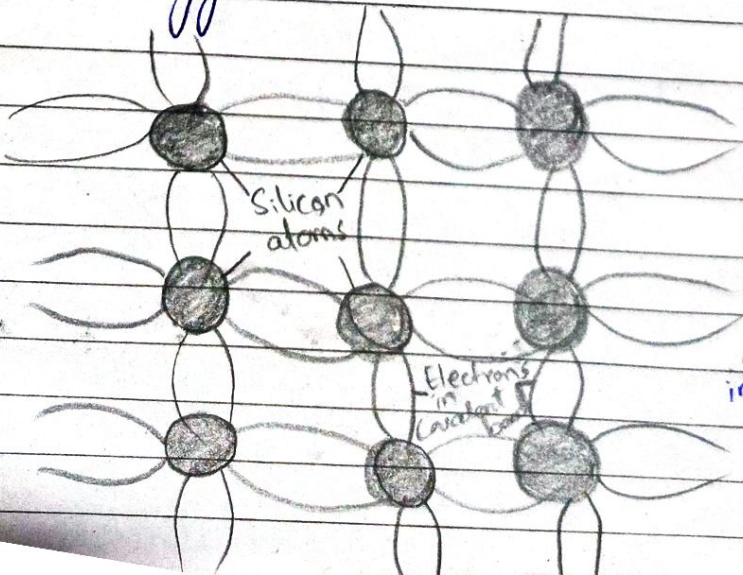

Figure: Arrangement of electrons in a semiconductor material

Difference between n-type and p-type semiconductor

n-type semiconductor	p-type semiconductor
→ N-type semiconductor are formed due to dopping of pentavalent impurities.	→ P-type semiconductor are formed due to dopping of trivalent impurities.
→ For dopping Group V elements for example arsenic, phosphorus, bismuth, antimony etc. used.	→ For dopping Group III elements for example; boron, gallium, indium aluminium etc.
→ Also known as donor atom due to the existence of additional electron.	→ Also known as acceptor atom because of presence of additional hole.
→ Its majorities carries electrons	→ Its majorities carries holes.
→ Its minorities carries holes	→ Its minorities carries electrons.
→ Conductivity of presence of ~~holes~~ electrons.	→ Conductivity due to presence of holes.

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Modern Applications:

Light-Emitting Diode (LED)

The light-emitting diode (LED) is one of today's most energy-efficient and rapidly developing lighting technologies. LEDs use a combination of n-type and p-type semiconductors to produce trough the p-n junction. It consists of a chip of semiconducting material doped with impurities to create a p-n junction.

Advantages:

→ Energy efficient - LEDs are now capable of outputting 135° lumens/watt.

→ Long life time - 50,000 hours or more if properly engineered.

→ No warm up period - LEDs light instantly in nanoseconds.

→ Not affected by cold temperatures - LEDs "like" low temperatures and will start up even in sub zero weather.

→ Directional - With LEDs you can direct the light where you want it, thus no light is wasted.

→ Excellent color Rendering - LEDs do not wash out colors with other light sources such as fluorescent, making them perfect for displays and retail applications.

→ LEDs can be controlled by brightness.

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Memory chip:

A memory chip is a type of semiconductor made up of n-type and p-type junction that stores data in the form of electrical charges. Its a crucial component in modern computers, enabling fast and efficient data storage and retrieval. A thin layer of insulating material like silicon dioxide separates the substrate from the conductive layers. Thin layers of conductive material, such as polysilicon or metal form the memory cells and interconnects. The fundamental storage units, typically consisting of a transistor and a capacitor (in DRAM) or a flip-flop (in SRAM).

Advantages:

→ Memory chip can access data quickly allowing fast processing and execution of instructions.

→ It consume relativelky low power, making them suitable for battery-powered devices.

→ It inexpensive to produce, making them a cost effective solution for data storage.

→ Some types are flash memory, retain data even when power is turned off.

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(c) Global Warming:

Global warming is the long-term increase in Earth's average surface temperature due to human activities, primarily the burning of fossil fuels, which increase the concentration of heat-trapping green house gasses in the atmosphere.

This phenomenon is a primary driver of climate change, which refers to broader, long-term shifts in climate patterns. The current warming trend is proceeding at an unprecedented rate and is the result of human activity since the mid-20th century.

Mechanism of Green house Effect:

When sunlight reaches Earth's surface, it can either be reflected back into space or absorbed by Earth. Once absorbed, the planet release some of the energy back into the atmosphere as heat (also called infra-red radiation). Greenhouse gases (GHGs) like water vapour (H_2O), carbon dioxide (CO_2) and methane (CH_4) absorb energy, slowing or preventing the loss of heat to space. In this way, (GHGs)

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act like a blanket, making Earth warmer than it would otherwise be. This process is commonly known as the "greenhouse effect". Without greenhouse gases, heat energy absorbed and reflected from earth's surface would easily radiate back out of space, leaving the planet with an inhospitable temperature close to -19°C (2°F), instead of the present average surface temperature of 15°C (59°F).

Since the industrial revolution began around 1750, human activities have contributed substantially to climate change by adding CO_2 and other heat-trapping gases to the atmosphere.

Those greenhouse gas emissions have increased the greenhouse effect and caused Earth's surface temperature to rise. Therefore, it is called Enhanced Green House Effect.

Greenhouse Gases:

Carbon dioxide:

Carbon dioxide has chemical formula CO_2, its anthropogenic sources are fossil fuel combustion, land use conversion and cement production and its atmospheric lifetime ~100 year and GWP is 1.

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Methane: CH_4 chemical formula and anthropogenic sources are fossil-fuel, rice paddies and waste dumps with atmospheric lifetime 12 years and GWP 25.

Nitrous oxide:

N_2O is chemical formula and anthropogenic sources are fertilizers, industrial processes and combustion with lifetime 114 year and GWP 298.

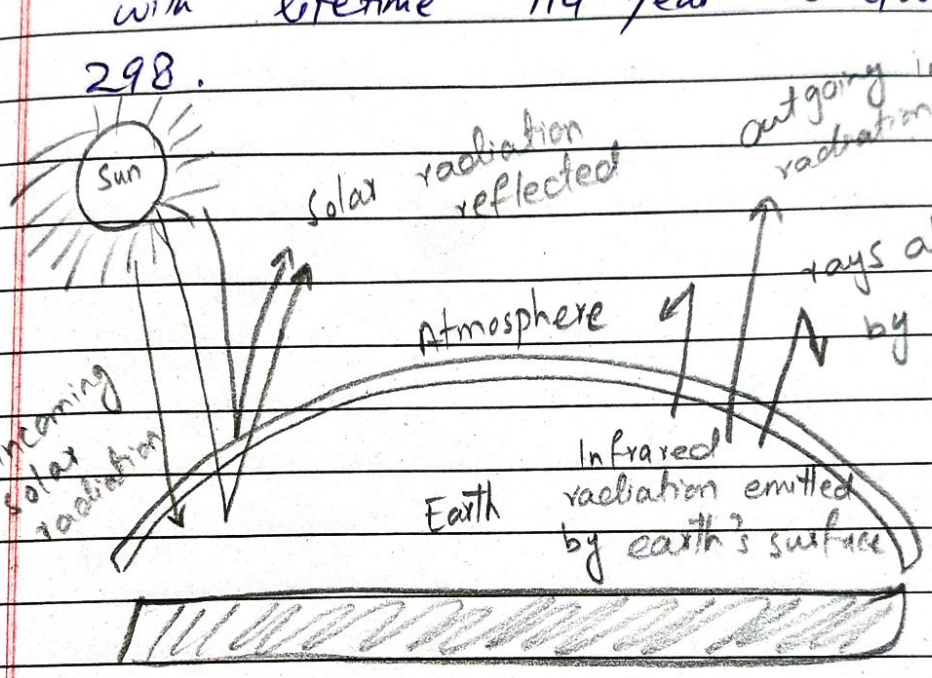

Figure: Green House Effect and Global Warming.

(d) Tsunami:

Tsunami is a Japanese word meaning "harbour wave", and used as the scientific term for a class of abnormal sea wave that can cause catastrophic damage when it hits a coast line. A tsunami is a series

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of waves caused by a rapid displacement of a body of water (ocean, lake). Almost 80% of tsunamis occur within the Pacific "Ocean's Ring of Fire" This is due to the almost amount of earth quake and volcanic activity in the area, which occur due to the tectonic shifts in the earth's plates.

Cause of Tsunami:

Tsunami can be generated by an undersea earthquake, an undersea land slide, erupsion of an undersea volcano, or by the force of an asteriod crashing into the ocean. The most frequent cause of tsunamis is an undersea earthquake. When the ocean floor is uplifted or offset during an earthquake, a set of waves is created similar to the concentric waves generated by an object dropped into the water.

Natural Processes that Tigger Tasunamis:

1→ Earth quakes: The most common trigger typically occuring at subduction zones where tectonic plates collide. When the plates suddenly move, they displace the ocean water above, generating tsunami waves.

2→ Landslides:

Underwater landslides, rockfalls

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or sediment slides can displace water and generate tsunami waves.

3- Meterotic Impacts: Rarely, a large meteorite can strike the ocean, generating a tsunami.

Potential impact on Coastal areas:

→ Flooding: Tsunami waves can inundate coastal areas, causing widespread flooding and damage to infrastructure, buildings and agriculture.

→ Wave Damage: Powerful waves can destroy coastal structures, sweep away vehicles and uproot trees.

→ Loss of Life: Tsunamis can be devasting causing significant loss of life, especially in densely populated coastal area.

→ Environment Impact: Tsunamis can pollute water sources, damage ecosystems, and disrupt marine life.

→ Economic Impact/ Consequences: Tsunamis can have a significant economic impact, affecting industries like fishing, tourism and trade.