Q28) DIFFERENCE BETWEEN STAR AND A PLANET:

STAR:

DEFINITION: A star is a massive, luminous sphere of plasma held together by gravity, producing energy via nuclear fusion of hydrogen into helium at its core. Stars emit their own light and heat

PLANET:

DEFINITION: A planet is a celestial body orbiting the star, massive enough to be rounded by the gravity, but it doesnot produce its own light, planet reflects light from their parent star.

DIFFERENCE BETWEEN PLANET AND STAR:

STAR	PLANET
1) A star emits its own light	Doesnot produces it own light, reflects light from parent stars.
2) Produces energy via nuclear fusion	It mostly has gravitational/ thermal energy.
3) Its mass is very high.	Its mass is lower than stars

STAR	PLANET
4) Temperature is very high (millions of °C in core)	It's temperature is lower.
5) A star forms, evolve and die. It can later become a nebula stars or a black hole.	Planets have stable orbits. No life cycles like star.
6) Example: Sun, Sirius	Example: Earth, Mercury

LIFE CYCLE OF A STAR FROM NEBULA TO THE BLACK HOLE:

1. NEBULA: 1) Stars from giant clouds of gas or dust are called nebula.

2) Gravity causes condensation of the gases which ends up forming protostar.

2. PROTOSTAR:

1) A protostar later contracts under gravity, the core temperature rises.

2) Fusion begins when temperature exceeds approximately 10 million K.

3) This becomes a main sequence star.

3. MAIN SEQUENCE STAR:

1) It's a stable phase when hydrogen fuses into helium.

2) Star shines for millions to billions of the years (Sun approximately 10 billion years)

3) Size and mass of it later determine evolution.

4 RED GIANT / SUPER GIANT:

1) Hydrogen exhaustion contracts the core and expands outer layer. This results in formation of Red Giant (Medium star) or Super Giant (massive star)

2) Helium fusion occurs producing heavier elements (Carbon, Oxygen, Neon)

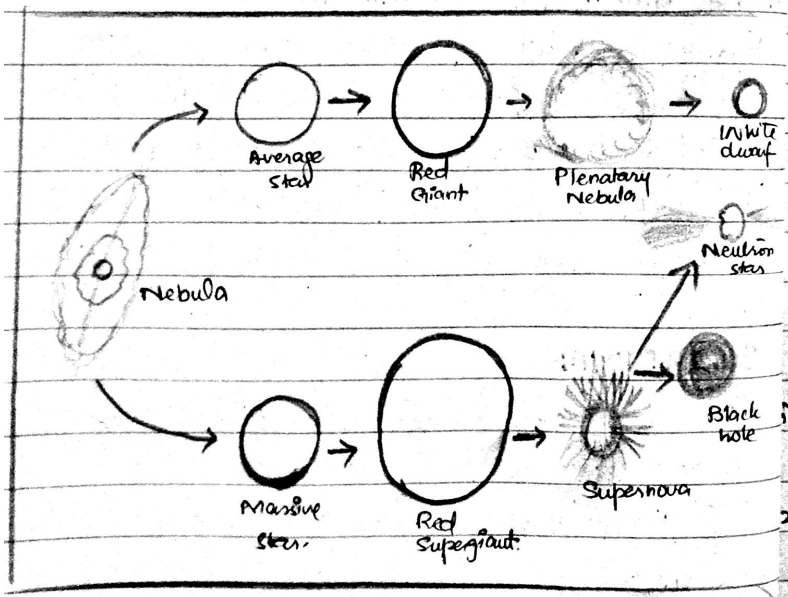
5. SUPER NOVA:

1) Core collapses for massive star producing violent explosion called super nova.

2) This violent explosion disperses heavy elements into space, which results in formation of further stars and planets.

6. NEUTRON STAR / BLACK HOLE (END STAGE)

1) Low to medium mass stars forms white dwarfs which upon cooling become black dwarfs.
2) Massive star's core collapses ~~from~~ beyond neutron degeneracy results in formation of Blackhole.
3) Black holes have intense gravity and even gravity cannot escape.



Q2b) SEMI-CONDUCTORS:

DEFINITION:

A semiconductor is a material where electrical conductivity is between that of a conductor and an insulator. It can only conduct electricity under certain conditions and act as an insulator under other conditions. Most of the semi-conductors are crystalline solids. For example Silicon and Germanium. Their electrical conductivity increases with temperature. Semi conductors form the foundation of the modern electronics including diodes transistors and integrated circuits.

DIFFERENCE BETWEEN N-TYPE AND P-TYPE OF SEMI CONDUCTORS:-

N-TYPE:-

1) DOPING ELEMENT: They are doped with pentavalent elements. For example phosphorous.
2) MAJORITY CHARGE CARRIER: Electrons are majority charge carriers.
3) MINORITY CHARGE CARRIERS: Their holes are minority charge carriers.

4) CONDUCTIVITY TYPE: They conduct via negative charge carriers (Electrons)

5) SYMBOL: Denoted by "n"

P- TYPE:-

1) DOPING ELEMENT: They are doped with trivalent elements eg Boron.

2) MAJORITY CHARGE CARRIER: Holes are majority charge carrier.

3) MINORITY CHARGE CARRIER: Electrons are minority charge carrier.

4) CONDUCTIVITY TYPE: They conduct via positive charge carrier (Holes)

5) SYMBOL: Denoted by: "p"

MODERN APPLICATIONS OF SEMICONDUCTORS

1) DIODES AND TRANSITTORS:

i. They are used in switching, amplification and rectification of electronics.

ii. Examples: Mobile phones, computers and power electronics.

2) SOLAR CELLS (PHOTOVOLTIC DEVICES)

i. Semiconductors converts light energy electrical energy.

ii. Example: Solar panels for energy generation

02c) GLOBAL WARMING

DEFINITION:- Global warming is the gradual increase in the temperature of Earth surface and oceans, primarily due to human activities like burning fossil fuels, industrial emission, and deforestation. Global warming is gradually becoming an environmental and socio economic threat as it leads to climate change, sea-level rise and extreme weather conditions.

MECHANISM OF THE GREEN HOUSE EFFECT:-

The greenhouse effect is a process by which certain gases in Earth's atmosphere trap heat and prevent it from escaping into space, hence warming the planet

1) Radition from solar energy reaches the Earth.

2) The Earth's surface absorbs energy and emits it as infrared radiation.

3) Greenhouse gases in the atmosphere trap some of this infrared raditions reflecting it back to the surface.

4) This trapped heat maintains the Earth's temperature; approximately 15°C but the excess gases causes global warming.

THREE MAJOR GREEN HOUSE GASES:-

1) Carbon Dioxide: (CO_2)

- Carbon dioxide is produced by fossil fuel burning, deforestation, and cement production.

2) Methane: (CH_4)

- The main sources of methane gas are live stock, landfills, and rice paddies.

3) Nitrous Oxide: (N_2O)

The main sources are fertilizers, industrial processes and vehicle emission.

Other gases: CFCs, Ozone (O_3), water vapours.

8.2d) TSUNAMI

DEFINITION:- A tsunami is series of large, fast moving ocean waves caused by sudden displacement of water due to under sea disturbances. Tsunami, unlike normal waves is driven by wind, They are caused by geological events and can travel at upto 800 km/h in deep water. The waves increases high dramatically as they approach shallow coastal areas.

NATURAL PROCESSES THAT TRIGGER TSUNAMI:

1) UNDERSEA EARTHQUAKE:

Sudden movements of the tectonic waves causes vertical displacement of the seabed, generating massive waves. Most tsunamis approximately 80-90% are due to subduction zone earthquakes

2) VOLCANIC ERUPTIONS:

Explosive underwater eruptions displaces water, causing volcanic tsunamis.

Example: Krakatoa eruption (1883)

3) UNDERWATER LAND SLIDES:

Sudden collapse of the seabed material displaces large volume of water. This often occurs after earthquake or volcanic activity.

4) METEORITE IMPACTS:

Rare, but large impacts in ocean can generate tsunami waves.

POTENTIAL IMPACTS ON COASTAL AREAS:-

1) HUMAN AND ECONOMIC LOSS:

- Massive loss of life in densely populated coastal regions
- Destruction of homes, businesses, ports, infrastructure

2) ENVIRONMENTAL IMPACT:

- Flooding of farmlands and contamination with saltwater
- Damage to ecosystem such as mangroves, coral reefs

3) SECONDARY HAZARDS:

- Fires, disease outbreaks and disruption of water supply.
- Long-term economic setback for affected regions.

Q58) **BALANCED DIET:**

DEFINITION:- A balanced diet is a diet that provides all essential nutrients in the right proportion to maintain health, growth and energy.

It must include carbohydrates, proteins, fats, vitamin, mineral, water and fiber. A balanced diet prevents malnutrition, boost immunity and support normal physiological functioning.

Example: 50-60% carbohydrates, 10-15% proteins, 20-30 % fats, with vitamins and minerals as required.

FUNCTIONS OF CARBOHYDRATES IN HUMAN

1) Primary Source Of Energy: Carbohydrates are broken down into glucose, which fuels muscles and the brain.

2) Energy Storage: Excess glucose is stored as glycogen in liver and muscles to be used later.

3) Structural Role: Some carbs like cellulose aid in digestion and bowel movement.

4) Protection of Protein and Fats: Adequate carbs protect protein breakdown for energy, sparing protein for growth.

FUNCTIONS OF PROTEIN IN HUMAN BODY

1) Growth and Repair: Protein are building blocks of muscles, tissues, skin, hair and enzymes
2) Enzyme and Hormone production:- Protein forms enzymes that catalyze biochemical reactions and hormones like insulin.
3) Immune Functions: Antibodies are protein that fight infection.
4) Energy Source (secondary): Protein provide energy only when carbs and fats are insufficient.

(Q5b)

FOOD PRESERVATION:

Food preservation is a process of preventing or delaying spoilage of food, maintaining its nutritional values, taste and safety for consumption over extended periods. Food preservation aims to inhibit microbial growth, enzymatic activity and chemical changes in food. Proper preservation of food can reduce wastage, ensure food availability and improve public health.

PASTEURIZATION:

Pasteurization is a heat treatment process that kills pathogenic microorganisms in food and beverages without significantly affecting its taste and nutritions.

PRINCIPLES OF PASTEURIZATION:

1) Uses moderate heat (60-85°C) for a short time
2) Destroys disease causing microbes such as Salmonella, Listeria and E.coli.
3) Doesnot sterlize but increases shelf life.

Application: Milk, fruit juices, beer, dairy products

CANNING:

Canning is a method of storing food in air tight containers and heating to destroy spoilage microorganism, allowing storage at room temperature.

PRINCIPLES OF CANNING:

1) Heating food in a sealed containers destroy bacteria, yeast and mold.
2) Air removal and air tight sealing prevent recontamination.

3) Ensure long term preservation (months to years)

~~Examples~~: Applications: Vegetables, meat, fish.

Q5c) INTERNET OF THINGS (IoT)

The Internet of Things refers to a network of interconnected devices, sensors and objects that can collect, share and exchange data over the Internet without direct human intervention. Internet of Things connects physical objects to the digital world, enabling automation and smart decision making.

Eg: Includes smart homes, wearable health devices and industrial sensors.

TRANSFORMATION OF DAILY LIFE AND BUSINESS:

DAILY LIFE:

1) SMART HOMES: IoT enables automated lighting, security and temperature controls

2) HEALTH CARE: Wearables: monitor heart rate, sleep, and activity sending alert to smartphones and smartwatches or to doctors.

3) CONVIENENCE: Connected appliances reduce manual effort and optimize energy use.

BUSINESS AND INDUSTRY:

1) SUPPLY CHAIN MANAGEMENT: IoT track inventory, shipments and storage conditions in real time.

2) PREDICTIVE MAINTAINANCE: Sensors in machines detect faults before breakdowns reducing down time

3) DATA DRIVEN DECISIONS: Business uses IoT data to optimize operations ~~improve~~ improve efficiency and reduce costs.

REAL WORLD EXAMPLES:

1) SMART THERMO STAT:

1) Automatically adjust home temperature based on users behavior and weather forecast.

2) Saves energy and reduces bills.

2) AMAZON GO STORES:

i- Retail stores uses IoT sensors, cameras, RFID tags to automate checkout.

ii- Customers pick product and leave, payments are processed automatically.

ADDITIONAL EXAMPLES:-

1) Fitbit and Apple watches (monitor health)
2) Tesla connected cars (real time vehicle diagnosti

5d) DIFFERENCE BETWEEN RAM AND ROM:

RANDOM ACCESS MEMORY:- (RAM)

Random Access Memory is a volatile memory used by the computer to store data and instructions temporarily while the CPU is processing tasks. The content of RAM are lost when the computer is turned off making it a short term workplace. It allows quick read and write operations which is essential for multi tasking and running application smoothly. The more RAM a system has, the faster and more efficiently it can process multiple programs simultaneously. RAM acts as a working desk of the computer where active programs are loaded with immediate processing

2. READ ONLY MEMORY (ROM):-

Read Only Memory is a non-volatile memory that retains its data permanently even when the computer is shut down. It stores firmware or pasmanent instructions such as BIOS, which are essential for booting the computer and initializing hardware components. Unlike RAM, ROM is read only during normal operations, meaning the CPU can access its contents but cannot modify them easily. ROM is like a library of permanent reference books, providing essential instructions needed for the computer to start and function correctly.

BASIC ARCHITECTURE OF A COMPUTER (CPU, ALU, CU)

The Central Processing Unit (CPU) is the brain of the computer responsible for executing instructions and coordinating all operations.

The CPU mainly consist of 2 units: ALU (Arithmetic Logic Unit) and the CU (Control Unit). The ALU performs all the Arithmetic Operations such as Additions, Substractions, Multiplications and Division as well as logical operations like comparision and Boolean functions. The CU on the other hand directs the flow of the data and instructions, fetching them from RAM, decoding and signaling other components to execute them. Together the ALU, CU enables the CPU to process instructions, manage memory access and communicate with input/output devices forming core of computers operations.

SECTION - II

Q8: a) ROAD = UADG
LAKE = OCNH

R+3 = U		L+3 = O
O+2 = A	=	A+2 = C
A+3 = D		K+3 = N
D+3 = G		E+2 = H.

Q8b) The woman is married to the man's nephew.
Man's nephew = husband of woman

The woman is man's niece in law

Q8c)
a) 4, 12, 6, 18, 9, 27, 13.5
(×3 ÷2) (×3 ÷2) (×3 ÷2)

4 × 3 = 12
6 × 3 = 18
9 × 3 = 27

ii) 1, 2, 6, 24, 120 ...

1, 2, 6, 24, 120, 720

factorial sequence = Ans 720.

Q80)

R < P < Q < S < T

Shortest to tallest: R, P, Q, S, T

Third tallest = Q

Max. Possible Range = 180 − 150 = 30cm

Q6a) A = 10 hours = $\frac{1}{10}$

B = 15 hours = $\frac{1}{15}$

C = 30 = $\frac{1}{30}$

$A + B + C = \frac{1}{10} + \frac{1}{15} + \frac{1}{30}$

$\frac{3}{30} + \frac{2}{30} - \frac{1}{30} = \frac{4}{30} = \frac{2}{15}$

7.5 hours.

= 7hrs 30 mins

Q6b) Let x = 4k, y = 5k, z = 7k

New y = 5k × 101 = 5.5k

New z = 7k * 0.7 = 5.25

x stay same 4k

= 14.75k

$= \frac{1,69,500}{14.75} = 11,500$

X = 46000

Q6c) Work done = $\frac{3}{5}$ = W × 60 (work per worker)

$20(W+10) \cdot \frac{1}{1500W} = \frac{2}{5}$

10W = 10

Q6d) 98 + 95 + 92 + 90 + 85 = 460

A = 75

$\frac{78N - 460}{N - 5} = 75$

Total students 28.