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PART II

SECTION - I

Q# 02 (a):

ANSWER:

DIFFERENTIATE BETWEEN STAR AND PLANET:

Introduction:

The universe is a grand stage in which celestial bodies, often distinguished as stars and planets, play distinct roles. Understanding their difference by the evolutionary journey of a star from its birth in a nebula to its possible end as a black hole.

DIFFERENCE:

1. NATURE OF LIGHT PRODUCTION:

Star: Emit its own light through nuclear fusion.

Planet: Has no internal fusion, only reflects sunlight as starlight.

Dos and Don'ts for the General Science & Ability Paper

I'll there — you've prepared well!! Remember, knowing the content is one thing, but presenting it in the paper exactly as required is another. Here are a few key points to keep in mind:

1. For a 5-mark part, aim to write at least 2 and at most 3 sides of the answer sheet.
2. Often a question has two or three parts, and the marks are divided accordingly — so address each part fairly.
3. Manage your time wisely — you have about 35 minutes per full question, which comes down to around 8 minutes for each 5-mark part. Stick to this to avoid rushing later.
4. Make your answers look scientific, not just theoretical. Use flowcharts and diagrams wherever they add clarity.
5. Neatness matters — keep your handwriting clean, avoid cutting or overwriting.
6. Mind your spelling and grammar — while GSA doesn't deduct marks for these, your expression leaves an impression.
7. In the ability portion, explain analytical ability questions in words. For a 5-mark part, show all steps and provide clear explanations.

Good luck for CSS 2026 — you're going to ace it, in sha Allah! 🌟

2. **COMPOSITION:**

Star: Mostly hydrogen and helium gases.

Planet: Rocky (terrestial) or gaseous (giant) but non-fusing.

3. **TEMPERATURE:**

Star: Extremely hot, especially in the core.

Planet: Much cooler than star.

4. **LIFE CYCLE:**

Star: Has a full evolutionary life cycle - birth, main sequence death.

Planet: Lacks such a lifecycle as star.

5. **ORBIT:**

Star: Other bodies orbit around it

Planet: Orbits a Star

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

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1- **NEBULA**

Nebula is also known as the birthplace of star. A Nebula is vast cloud of gas and dust. Gravitational disturbances cause it to collapse inward, forming dense regions that begin star formation.

2. **PROSTAR:**

In prostar the early formation of star occurs. As the collapsing mass heats up, it becomes a prostar, glowing due to gravitational compression but not yet conducting fusion.

3. **MAIN SEQUENCE:**

When the core temperature reaches about 10 million °C, hydrogen fusion ignites. The star enters the main sequence, its longest and most stable stage - like our sun today.

4. **RED GIANT / SUPER GIANT:**

When hydrogen depletes, the core contracts while the outer layers expand. Medium stars become

Red giants. Massive stars becomes Supergiants, capable of fusing heavier elements up to iron.

5. **SUPERNOVA:**

Massive stars collapse and explode violently, creating a supernova. The explosion disperses heavy elements into Space, enriching the Cosmos.

6. **BLACK HOLE:**

If the remaining core is over three solar masses, gravity overcomes all forces, creating a Black Hole, a region from which not even light can escape.

CONCLUSION

A star is an active, self luminous power house, a planet is passive, light-reflecting body shaped by the star's energy. The life cycles of a star explains the cosmic cycle of birth, transformation, and death that continually reshapes the universe.

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تاریخ

(Q#2 (b)

ANSWER:

INTRODUCTION.

Semi Conductors are the backbone of the modern technological world. They are materials whose electrical conductivity lies between that of conductors and insulators, and can be precisely controlled through temperature, impurities, or external fields. This controllability makes them the foundation of all electronic devices from microscope to solar cells.

SEMI CONDUCTORS:

A semi-conductor is a material, such as silicon or germanium, whose conductivity can be modified by adding impurities (a process known as doping). They conduct electricity better than insulators and or but worse than metals. Their unique properties enable signal amplifications, switching and energy conversion.

DIFFERENCE BETWEEN N-TYPE AND P-TYPE SEMICONDUCTOR:

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1- **DOPING ELEMENT:**

N-TYPE: Doped with pentavalent impurities (5 valence electrons) such as ~~boron, gallium, or iodium.~~ phosphorous, arsenic, antimony

P-TYPE: Doped with trivalent impurities (three valence electrons) such as boron, gallium, iodium.

2- **CHARGE CARRIES**

N-TYPE: "Extra electrons becomes the majority charge carriers.

P-TYPE: "Holes" (positive vacancies) becomes the majority charge carriers.

3. **BEHAVIOR:**

N-TYPE: Conductivity increases due to the presence of free electrons.

P-TYPE: Conductivity increases due to an as moves to fill holes.

4. **MEANING:**

N-TYPE: "N" refers to negative charge carriers (electrons)

P-TYPE: 'P' refers to positive charge Carriers (holes).

APPLICATIONS:

1. **INTEGRATED CIRCUITS (ICs) and MICRO-PHONES**

All smart-devices - computers, smartphones, dyetal watches use semi-conductor-based ICs for processing and memory.

2. **SOLAR CELL AND PHOTOVOLTICS:**

P-n junction semiconductors convert sunlight into electricity, powering renewable energy systems world wide.

CONCLUSION:

In essence, semi conductors are the essential building blocks of modern electronics, offering controlled conductivity and enabling efficient data processing and memory/energy conservation.

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Q# 2(c):

INTRODUCTION:

Global warming has emerged as one of the most pressing environmental challenges of the 21st century. It refers to the long-term rise in the Earth's average temperature due to increasing concentrations of heat-trapping gases in the atmosphere.

GLOBAL WARMING:

"Global warming is the gradual increase in the earth's atmospheric surface temperature caused primarily by the excessive accumulation of greenhouse gases from human activities such as industrial emissions, deforestation, and burning of fossil fuels."

MECHANISM OF GREEN HOUSE EFFECT:

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The Green House Effect is a natural process that keeps Earth warm enough to support life. However, human induced intensification of this effect leads to abnormal temperature rise.

STEP BY STEP MECHANISM:

Solar radiation reaches Earth → Earth emits Infrared radiation

Infrared radiation → Green house Gases absorb heat.

Green house Gases absorb heat → Re-radiation toward Earth

Re-radiation toward Earth → Temperature Rise.

THREE MAJOR GREEN HOUSE GASES:

1. CO_2: Carbon dioxide emitted by fossil fuel burning, deforestation, cement production
2. Methane (CH_4): released from livestock, rice paddies and fossil fuel extraction
3. N_2O: Nitrous Oxide generated from agricultural fertilizers and industrial activities.

CONCLUSION:

Global warming is the direct outcome of an intensified greenhouse effect, caused by rising concentrations of heat trapping gases. While the greenhouse effect is essential for maintaining life - friendly temperatures, its human-driven amplification threatens ecosystems, weather patterns, global stability

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Q#2 (d)

INTRODUCTION:

Among the deadliest natural hazards, tsunami stands out for its sudden onset, immense energy, and devastating coastal impact. It is a series of extra-ordinarily large sea waves generated by the abrupt displacement of water.

TSUNAMI:

A Tsunami is a series of long, high energy sea waves produced by the sudden displacement of a large volume of ocean water. These waves

travel at very high speeds in deep water and rise to destructive heights as they approach shallow coastal areas.

NATURAL PROCESS THAT TRIGGER A TSUNAMI:

1. **Undersea Earthquake:**
   Vertical movement of tectonic plates in subduction zones uplifts or depresses the seafloor, pushing water upward.
2. **Volcanic Eruptions:**
   Explosive eruptions or the collapse of volcanic islands displace large volumes.
3. **Submarine Landslides:**
   Sudden movement of sediment or rock under the sea generates waves.
4. **Glacial Calving:**
   Large ice masses falling into the ocean can create localized tsunamis.

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POTENTIAL IMPACT ON COASTAL AREAS:

1- Large Scale flooding, infrastructure destruction and loss of life.
2- Contamination of Soil and freshwater sources.
3- Severe economic losses of fishers, ports, tourism.
4- long-term environmental and Social disruption.

CONCLUSION:

Tsunami is an extraordinary natural phenomenon triggered by powerful geological forces such as under water earthquakes, Volcanic eruptions, and land slides. It's destructive potential is immense, capable of reshaping coastlines and disrupting human life on a massive scale.

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Q#3(a):

INTRODUCTION:

Animal cell contain specialized organelles that perform life-sustaining functions. Among them mitochondria and ribosomes are critical to energy production and protein synthesis, making them vital for cellular growth, maintenance and survival.

MITOCHONDRIA:

STRUCTURE:

Mitochondria are double-membrane organelles. The outer membrane is smooth. The inner membrane is folded into cristae, increasing surface area for reactions. The internal matrix contains enzymes, mitochondrial DNA, and ribosomes.

FUNCTION:

They perform cellular respiration, breaking down glucose to produce ATP (adenosine triphosphate). Mitochondria also regulate metabolism and contribute to programmed cell death (apoptosis)

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MITOCHONDRIA (POWER HOUSE OF CELL):

The mitochondria is called the power house of cell because they generate most of the cell's ATP, the energy molecule required to run all cellular activities— movement, synthesis, transport — mitochondria act like the cell's power station, hence the title power house.

RIBOSOME:

STRUCTURE:

Ribosomes are [illegible] particles composed of Ribosomal RNA and proteins. They consist of two subunits a) Small Subunit, b) Large Subunit. They occur freely in the cytoplasm or attached to the rough endoplasmic reticulum.

FUNCTION:

Ribosomes are responsible for protein synthesis, translating genetic information in mRNA into proteins. Free Ribosomes makes proteins for internal use. Attached Ribosome produces proteins for secretion or cell membranes.

CONCLUSION:

Mitochondria supplies the cell with energy via ATP production, ribosomes manufacture proteins needed for growth and function. Together, these organelles ensure that the cell remains active, productive and capable of sustaining life.

Q#3(b):

INTRODUCTION:

Enzymes are biological catalysts that regulate the chemical reactions essential for life. They accelerate reactions without being consumed, ensuring that metabolic processes occur efficiently under mild cellular conditions.

ENZYMES:

"An enzyme is a protein molecule that increases the rate of a biochemical reaction by lowering the activation energy, without being permanently altered."

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Each enzyme is highly specific to the substrate it acts upon.

LOCK AND KEY MODEL:

The lock and key model was proposed by Emil Fischer, explains enzyme specificity:

1. The enzyme has an active site shaped precisely to fit a specific substrate.
2. The substrate binds to the enzyme like a key fits into a lock, forming an enzyme-substrate complex.
3. The enzyme catalyst/catalyzes the reaction, converting the substrate into products.
4. The products are released, and the enzyme remains unchanged, ready for another reaction.

FACTORS AFFECTING ENZYME:

Temperature: Moderate temperature increases activity, but extreme heat denatures enzyme.

P.H: Each enzyme has an optimum P.H. Deviations can reduce activity or cause denaturation.

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Q#3 (c):

INTRODUCTION:

Energy fuels the development of nations, yet its sources vary in availability and environmental impact. While energy renewable offers sustainability and minimal ecological damage, non-renewable energy provides high output but at the cost of depletion and pollution. Among renewables, wind energy has emerged as promising alternative to meet future global energy demands.

DIFFERENCE BETWEN RENEWABLE AND NON-RENEWABLE ENERGY RESOURCES:

Source Availibility:

R.E: Naturally replenished (solar, wind, hydro).

NRE: Finite resources (gas, oil, coal).

Environmental Impact:

R.E: Minimal emissions: sustainable.

NRE: Pollution, green house [illegible] environmental degradation.

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Longevity:

R.E: Infinite as long as natural cycles continue.

NRE: Limited, will be exhausted over time.

Cost: Init

R.E: Initial set up costly, long-term cheap.

: Extraction and Consu[illegible] may be cheap initially but unsustainable.

examples:

R.E : Solar, wind, biomass, hydro

NRE: Coal, petroleum, natural gas nuclear (uranium)