

DATE: 9-12-25

DAY: Tuesday

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Batch 83 (41203)

Mock Exam III

GSA

SECTION - I

Q NO. 2

- (a) Differentiate between a Star and a planet. Briefly describe the life cycle of a star from Nebula to a Black Hole?

Answer

Star: A luminous celestial

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body made of hot gases that produces its own light and heat through nuclear fusion.

Planet: A celestial body that orbits a star and reflects its light, does not produce its own energy.

Difference

Features	Star	Planet
Light	Produces its own light	Reflects light from a star
Composition	Mostly hydrogen and helium	Rocks, metals, gases
Temperature	Very high	Relatively low
Mass	Very massive	low massive than stars.

Life cycle of a star:

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1 **Nebula:** Gas and dust cloud.

Protostar: Condensation, temperature rises

Main Sequence: Hydrogen fusion
Steady shining.

Red giant/Supergiant:

Expansion as fuel depletes.

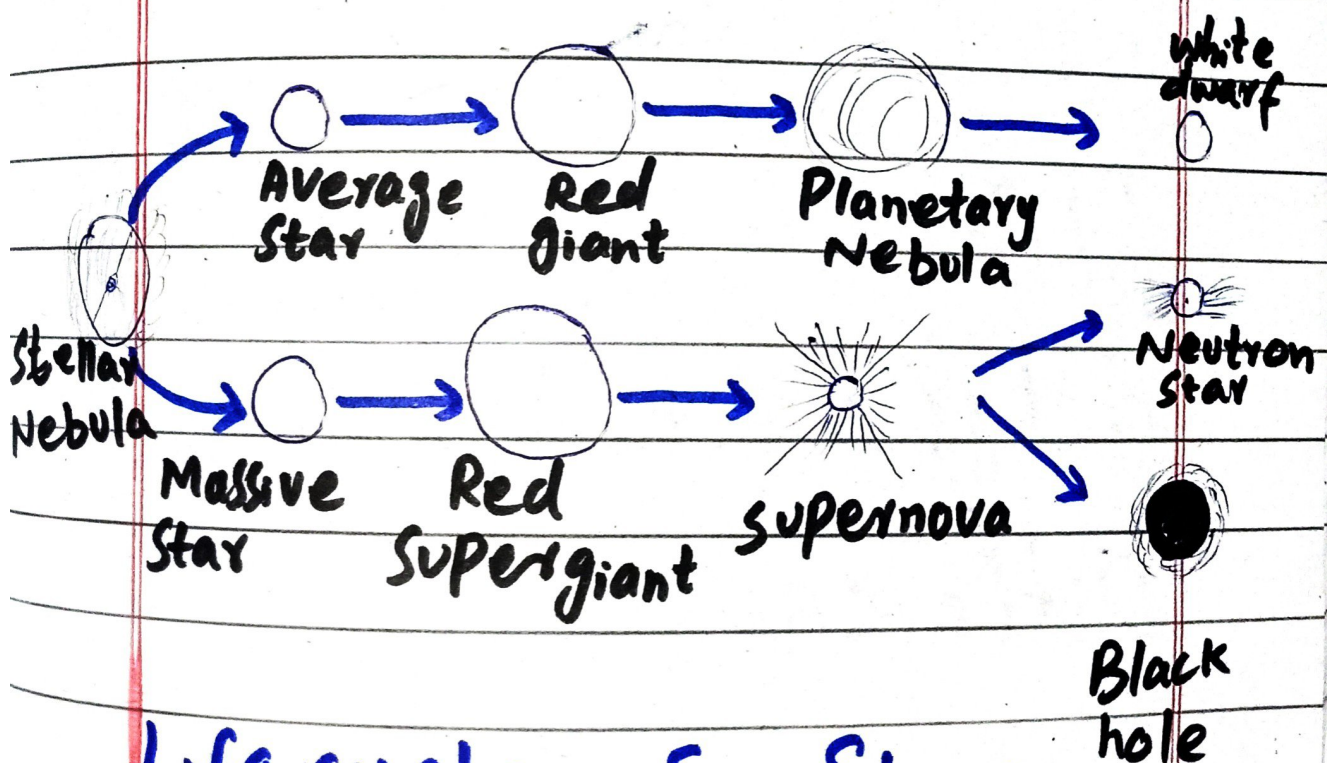
Final Stage:

→ **Low medium mass**

White Dwarf, Black dwarf

→ **High mass**

Supernova, Neutron star/Black hole



Life cycle of a Star

(b) What are semiconductors?
Explain the difference between n-type and p-type semiconductors and list two of their modern applications?

ANSWER

Semiconductors:

Materials with moderate electrical conductivity between conductors and insulators.

Types:

(i) n-type (ii) p-type

Difference

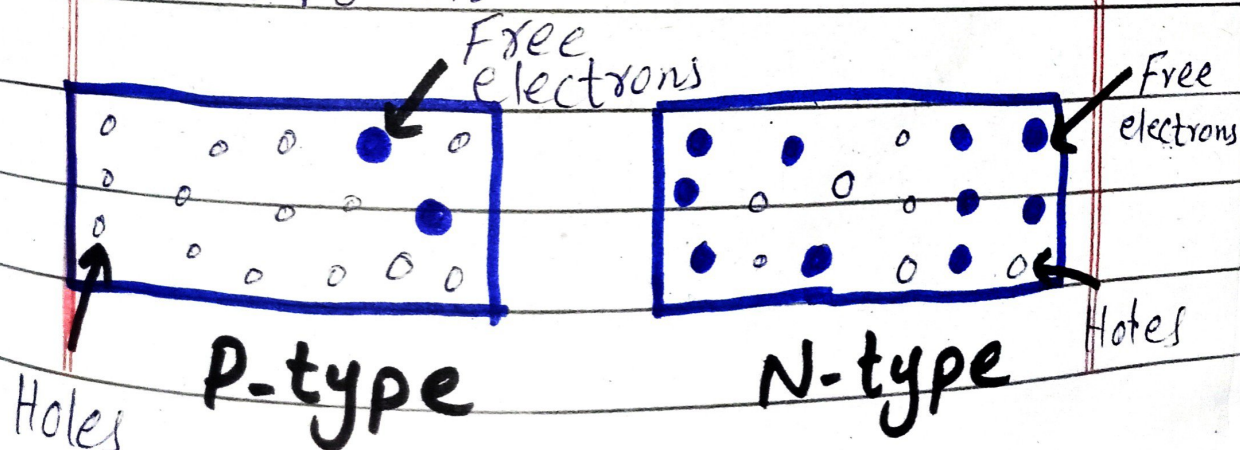
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Feature	n-type Semiconductor	p-type Semiconductor
Doping element	Doped with Pentavalent atoms (extra electrons)	Doped with trivalent atoms (electron deficient)
Charge carrier	Electrons (negative)	Holes (positive)
Conductivity	Due to movement of electrons	Due to movement of hole
Example	Phosphorus-doped Silicon	Boron-doped Silicon

Applications:

1. Diodes and transistors in electronic circuits.
2. Solar cells for energy conversion.



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c Define Global warming?
Explain the mechanism
of the Greenhouse
Effect and list three
major greenhouse gases?

ANSWER:

Global warming:

Global warming is the long-term rise in the average temperature of the Earth's atmosphere and oceans, primarily caused by excessive accumulation of greenhouse gases from human activities such as burning fossil fuels, deforestation and industrial emissions, leading to severe environmental and climatic changes worldwide.

Mechanism Of the Greenhouse Effect

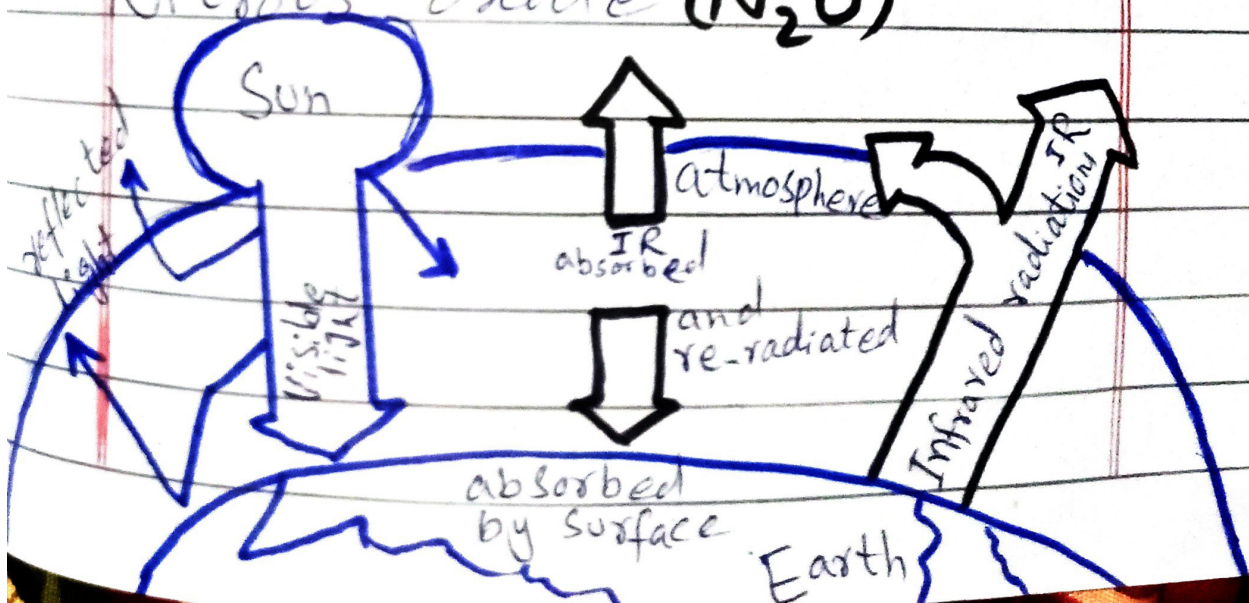
- 1 Sunlight reaches earth, surface absorbs and emits infrared radiation.
- 2 Greenhouse gases trap heat warming the atmosphere.
- 3 Excess gases cause global warming.

Major Greenhouse gases

Carbon dioxide (CO_2)

Methane (CH_4)

Nitrous oxide (N_2O)



(d) What is Tsunami? Explain the natural processes that trigger a tsunami and potential impact on coastal areas.

ANSWER

Tsunami: A Tsunami is a series of extremely large ocean waves generated by the sudden displacement of a large volume of water, usually caused by undersea earthquakes, volcanic eruptions, landslides or meteorite impacts which can travel across oceans at high speeds and cause devastating effects on coastal areas.

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Natural Triggers:

Undersea earthquakes
Volcanic eruptions
Landslides

Impact On Coastal Areas:

Flooding and destruction
of property.
Loss of human life
Coastal erosion and
ecosystem damage.

Q No. 3

- (a) Describe the structure and function of the Mitochondria and Ribosomes within an animal cell. Why is the mitochondria often

called the powerhouse
of the cell?

ANSWER

Definition

Mitochondria: Double membrane organelles with inner folds called cristae and a fluid matrix.

Ribosomes: Small spherical structures made of RNA and proteins, found free in cytoplasm or on rough ER.

Function:

Mitochondria: Site of cellular respiration produce ATP (energy) from glucose.

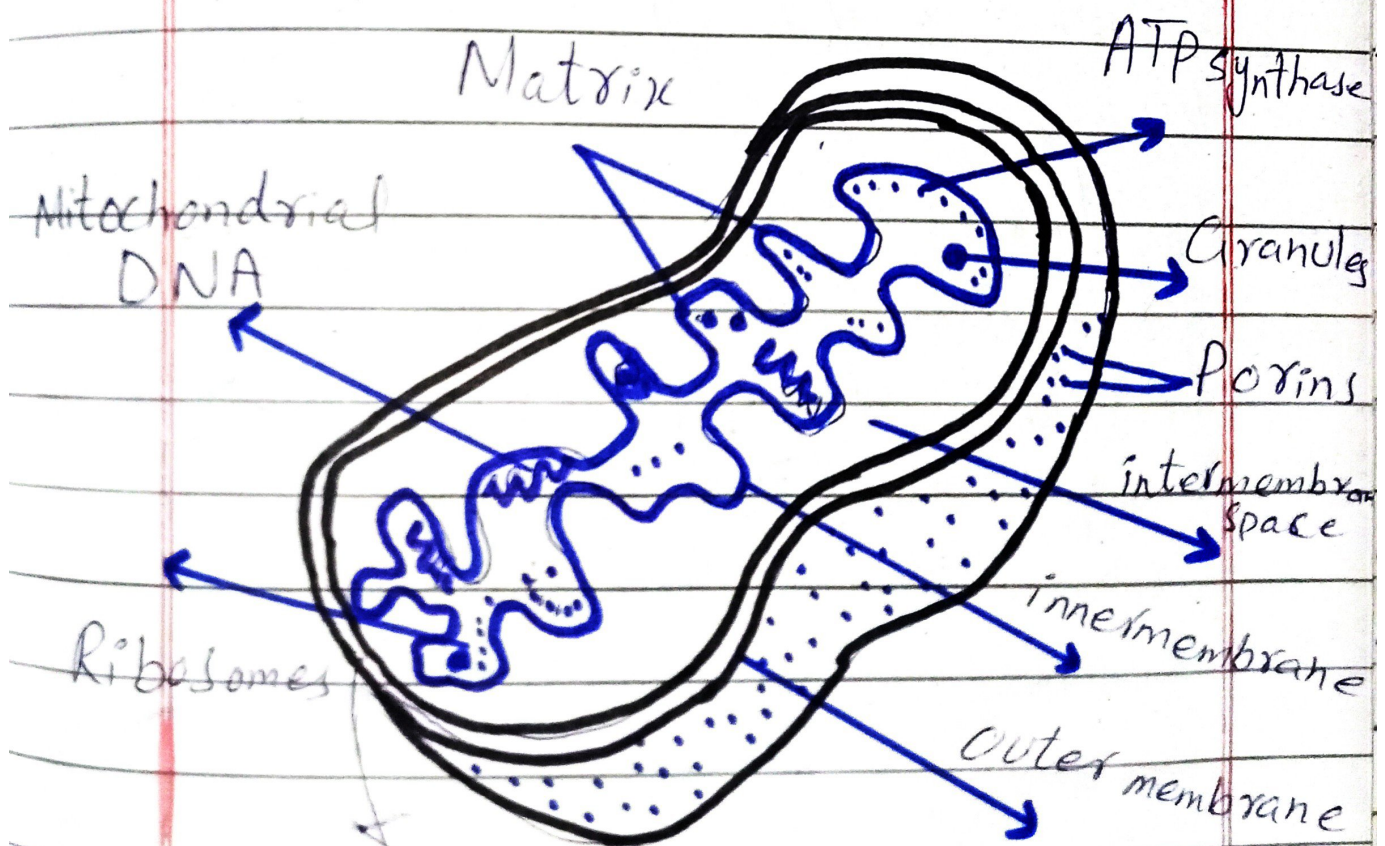
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Ribosomes: protein synthesis, translating mRNA into polypeptides.

Mitochondria is called Powerhouse

It generates most of the cell's energy in the form of ATP, which powers all cellular activities.



Mitochondrion

(b) What are Enzymes?
Explain the lock and key model of enzyme action and list two factors that affect enzyme activity:

ANSWER

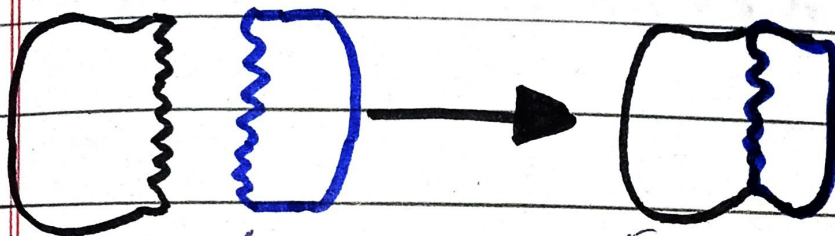
ENZYME: An enzyme is a biological catalyst made of proteins (or sometimes RNA) that speeds up specific chemical reactions in living organisms without being consumed in the process. Enzymes lower the activation energy required for reactions, making metabolic processes efficient and life-sustaining.

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Lock and key Model

The enzyme (lock) has a specific active site. The substrate (key) fits precisely into the active site, forming an **enzyme-substrate complex** which then produces the product.



Enzyme + Substrate

Enzyme substrate
Complex

Lock and key model is a model used to represent enzyme-substrate interaction

Factors Affecting
Enzyme Activity

Temperature: high or low extremes can denature enzymes

PH: Each enzyme works best at a specific PH.

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(C) Renewable vs. Non-Renewable. Discuss the potential wind energy

ANSWER

Renewable Energy:

Energy from sources that replenish naturally (e.g. solar, wind, hydro).

Non-Renewable Energy

Energy from sources that cannot be replaced easily (e.g. coal, oil, natural gas)

Wind Energy as Sustainable

Source:

Uses air movement to

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generate electricity
via turbines.

Advantages: Clean,
abundant, reduces greenhouse
gases.

Potential: Large scale
wind farms can meet
growing electricity demands
sustainability.

(d) **Dengue fever?**

Definition: Dengue fever
is a viral infection
transmitted by mosquitoes
causing high fever and severe
body pain.

Vector: Aedes aegypti,
mosquito, active mostly
during daytime.

Common Symptoms:

High fever, severe headaches, joint/muscle pain, rash, nausea.

Preventive Measures:

- 1 Eliminate Stagnant water where mosquitoes breed.
- 2 Use mosquito nets and repellents.
- 3 Maintain clean surroundings and community awareness.



SECTION-II

Q NO. 7

(a) Given

Total people = 100

Cricket = (C) 65

Hockey = (H) 40

Neither = 20

People watching at least
one sport:

$$100 - 20 = 80$$

People watching both cricket
and hockey

$$C + H - (80)$$

$$65 + 40 - 80 = \boxed{25}$$

25 people watching cricket + Hockey

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(b) Volume of water
in rectangular pool

Given

$$\text{Length (L)} = w + 4\text{m}$$

$$\text{Perimeter (P)} = 72\text{m}$$

$$\text{Depth (h)} = 2.5\text{m}$$

$$P = 2(L + w)$$

$$72 = 2(w + 4 + w)$$

$$72 = 4w + 8$$

$$72 - 8 = 4w$$

$$64 = 4w$$

$$w = \frac{64}{4} = 16$$

$$L = 16 + 4 = 20$$

Volume of water

$$V = L \times w \times h$$

$$20 \times 16 \times 2.5$$

$$\boxed{800\text{m}^3}$$

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(C) Meeting time of two trains

Given

Train A speed = 60 km/h

Train B speed = 40 km/h

Distance = 400 km

$$V_{\text{rel}} = 60 + 40 = 100 \text{ km/h}$$

Time to meet:

$$t = \frac{\text{Distance}}{\text{Relative Speed}}$$

$$= \frac{400}{100} = 4 \text{ hours}$$

$$8:00 \text{ AM} + 4 \text{ hours} = 12:00 \text{ PM}$$

12:00 PM



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(d) Ages of Father and Son ?

Given

$$\text{Present ages sum} = F + S = 75$$

$$20 \text{ years ago: } F - 10 = 4(S - 10)$$

$$F - 10 = 4(S - 10)$$

$$F - 10 = 4S - 40$$

$$F = 4S - 30$$

$$F + S = 75$$

$$(4S - 30) + S = 75$$

$$5S - 30 = 75$$

$$5S = 105$$

$$S = \frac{105}{5} = 21$$

$$F = 75 - 21$$

$$= 54$$

Father = 54 , Son = 21

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Q NO. 8

(a) Coding LAKE

Given

ROAD $\rightarrow$ UQDC

original

R O A D

coded

U Q D C

R $\rightarrow$ U (+3)

O $\rightarrow$ Q (+2)

A $\rightarrow$ D (+3)

D $\rightarrow$ C (+3)

Similarly

L $\rightarrow$ O (+3)

A $\rightarrow$ D (+3)

K $\rightarrow$ N (+3)

E $\rightarrow$ H (+3)

Answer LAKE $\rightarrow$ ODNH

Shifted 3 positions forward

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(b) The son of my Sister's husband is the father of your son.

Sister's husband = brother-in-law
 Son of sister's husband = himself
 Father of your son = you

The woman is the man's wife.

Answer: Wife

(c) Number Sequences.

(i) 4, 12, 6, 18, 9, 27, 13.5

305
 $\sqrt{21}$
 $\sqrt{2}$
 $\sqrt{7}$
 $\sqrt{6}$
 $\sqrt{10}$

multiply 3 then $\div$ by 2

$$4 \times 3 = 12$$

$$12 \div 2 = 6$$

$$6 \times 3 = 18$$

$$18 \div 2 = 9$$

$$9 \times 3 = 27$$

$$27 \div 2 = 13.5$$

13.5

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(iii) 1, 2, 6, 24, 120 720

$$1 = 1!$$

$$2 = 2!$$

$$6 = 3!$$

$$24 = 4!$$

$$120 = 5!$$

$$\begin{array}{r} 120 \\ \times 6 \\ \hline 720 \end{array}$$

Next number $6! =$

$$1 \times 2 \times 3 \times 4 \times 5 \times 6 = 720 \text{ A}$$



(d) Heights of 5 friends

Given:

$$P < Q \text{ but } P > R \rightarrow R < P < Q$$

$$S < T \text{ but } S > Q \rightarrow Q < S < T$$

$$\text{Shortest} = 150 \text{ cm}$$

$$\text{Tallest} = 180 \text{ cm}$$

$$\text{Tallest} = T$$

$$\text{Fourth} = S$$

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Third tallest = Q

Max Range of Height.

$$\text{Range} = \text{Tallest} - \text{Shortest}$$
$$180 - 150$$

30 cm

Third tallest = Q

maximum Range = 30 cm

30 cm

