

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

Hi 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. Often, a question has two or three parts, and the marks are divided accordingly — so address each part fairly.

2. 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.

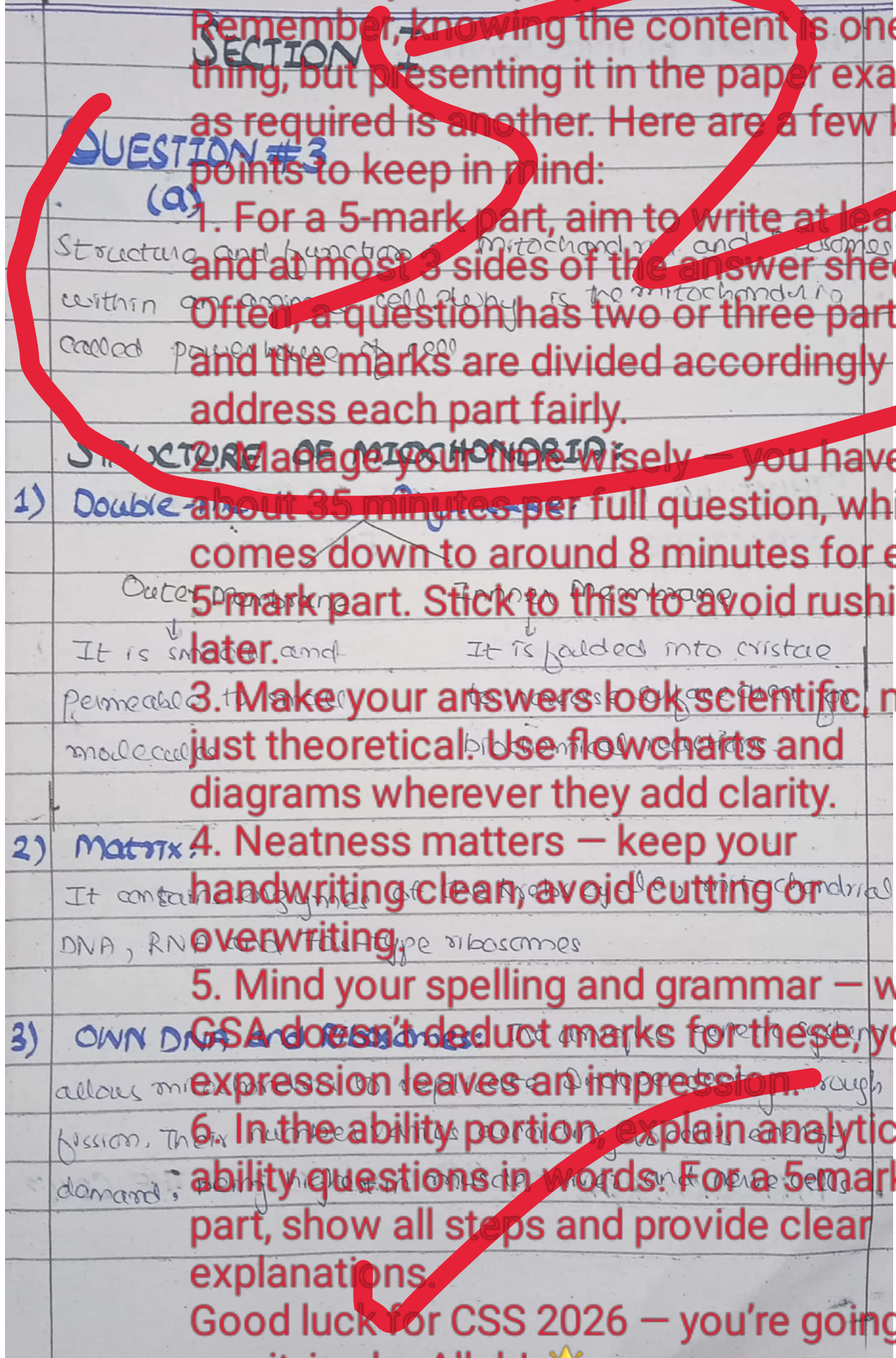
3. Make your answers look scientific, not just theoretical! Use flowcharts and diagrams wherever they add clarity.

4. Neatness matters — keep your handwriting clean, avoid cutting or overwriting.

5. Mind your spelling and grammar — while GSA doesn't deduct marks for these, your expression leaves an impression.

6. 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! 🌟



Functions of Mitochondria:

- Site of aerobic respiration: Mitochondria break down glucose with oxygen to release energy.
- ATP (Adenosine triphosphate) production: They generate ATP i.e. the energy currency of cell.
- Heat generation: They are also involved in heat production especially in brown adipose tissue.
- Also regulate cell metabolism and apoptosis.

STRUCTURE AND FUNCTIONS OF RIBOSOMES:

STRUCTURE

FUNCTIONS

- 1) Ribosomes are small, non-membrane bound organelles.
 - 2) Made up of rRNA (ribosomal ribonucleic acid) and proteins.
 - 3) Ribosomes consist of 2 subunits.

Small

40s in Eukaryotes

Large

60s in eukaryotes
 - 4) Ribosomes are found

Free in cytoplasm

Attached to RER (Rough Endoplasmic Reticulum)
- Free Ribosomes

Make proteins used within a cell.

Bound Ribosomes

Make proteins for secretion & membrane insertion.

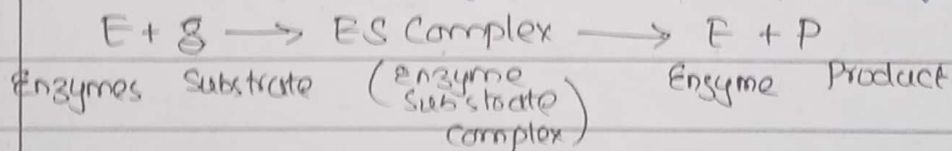
• MITOCHONDRIA AS "POWERHOUSE OF THE CELL"

Mitochondria produce the maximum yield of ATP through oxidative phosphorylation, a process far more

efficient than anaerobic respiration. Since ATP fuels essential activities such as active transport, muscle contraction, biosynthesis and nerve transmission, mitochondria serves as the primary energy generating units. Their role in supplying usable chemical energy justifies the title "powerhouse of the cell".

(b) What are Enzymes? Explain "Locke and Key" model of enzyme. List 2 factors affecting enzymatic activity.

ENZYMES:- Enzymes are protein based biological catalysts that speed up the rate of chemical reactions by forming a temporary enzyme-substrate complex and reducing the activation energy required.

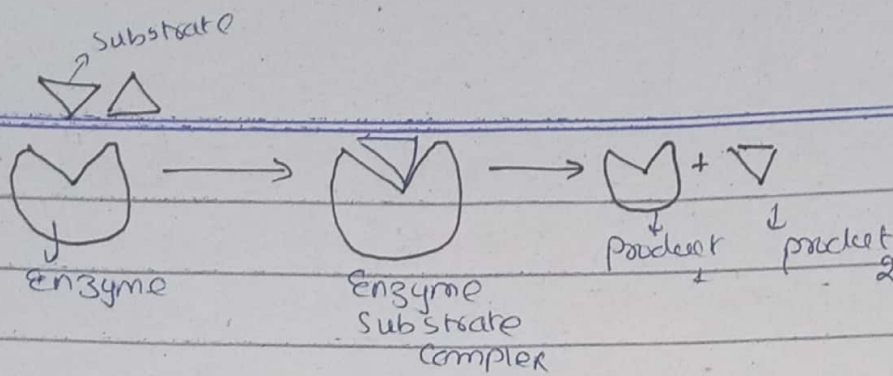


"LOCKE AND KEY MODEL" OF ENZYME ACTION.

Locke and Key model was proposed by Emil Fischer in 1894. According to this model:

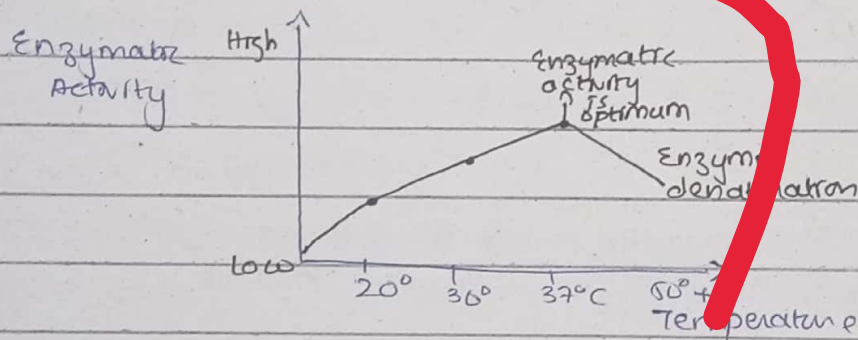
"The Enzyme's active site has a definite sized and complementary shape like a lock. The substrate molecule has a shape complementary to the active site like a key."

"Only a specific or correct shaped substrate can fit into active site of enzyme, forming enzyme substrate complex. After catalysis the substrate is converted into products which are released, leaving the enzyme unchanged and ready for reuse."



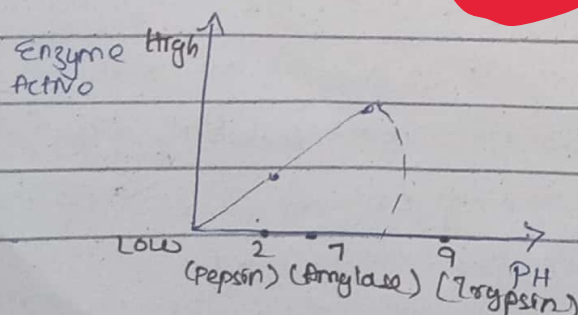
FACTORS AFFECTING THE ENZYME ACTIVITY:

i) **Temperature:** Enzyme activity increases with temperature due to faster molecular movement, reaching an optimum limit (37°C in humans). Beyond the optimum, high temperature denatures the enzyme's protein structure, sharply decreasing activity.



ii) **pH:**

Each enzyme works best at a specific pH. Change in pH alters ionic bonds, disrupt tertiary structure and reduce enzyme efficiency.



(c) Differentiate between Renewable and Non-Renewable energy resources. Discuss the potential of wind as sustainable source for future.

Renewable Energy Sources

"Sources that are naturally replenished over time and don't deplete with use"

Availability: They are practically unlimited; replenished in short cycles.

Environmental Impact

Low carbon emissions, environmentally friendly.

Cost trend:

Declining costs trend due to technology and scale.

Sustainability: High sustainability, supports long term energy security.

Global Policy Preference: Promoted for climate goals

Non-Renewable

Non Re

Sources that exist in limited quantities and take millions of years to form.

They are finite and exhaustible.

High carbon dioxide emissions, pollution, contributes to climate change.

Increasing extraction cost as reserves decline.

Low sustainability as there is future depletion risk.

Phased down due to

and green transition.

global decarbonization commitments

Examples:

Solar, wind, hydro

Coal, oil, natural gas,
uranium.

power, geothermal etc.

• POTENTIAL OF WIND ENERGY AS A SUSTAINABLE FUTURE SOURCE:

a) Abundant and

Renewable Energy Source

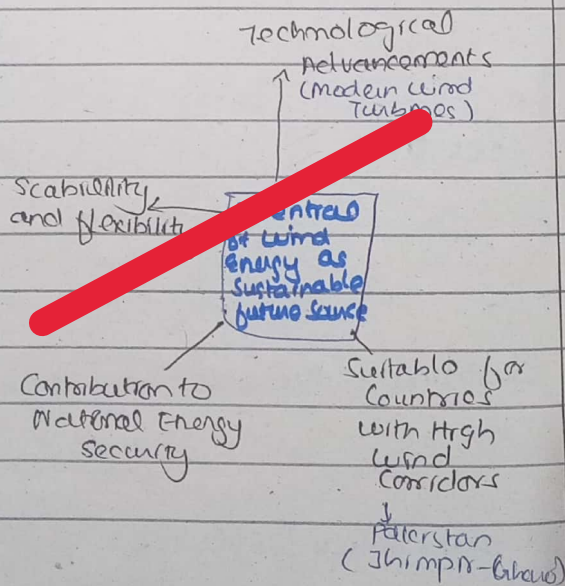
Naturally replenished resource available across continents and oceans. It does not deplete with use, making it ideal for long term sustainability.

b) Low Environmental Impact:

Wind energy produces zero greenhouse gas emissions and reduces reliance on fossil fuels. Life cycle emissions are among lowest of any energy source.

c) Cheapest Source / Economic

Viability: Wind power has become cheapest sources of electricity in many countries. Costs have decreased due to mass production, economies of scale.



part (d) Dengue fever symptoms, preventive

DENGUE FEVER:

caused by the Flavivirus transmitted through the bite of an infected mosquito. Symptoms range from mild to severe.

Dengue fever (classical)

VECTOR RESPONSE

Aedes Mosquito (Aedes aegypti)

- These mosquitoes are day biting.
- They are day biting in early morning and late afternoon.
- Their breeding sites are plant pots, open water, etc.
- They have black and white stripes called "tiger marks".
- Female mosquitoes bite person and subsequently spread the virus.

Common Symptoms

Infection.

- 1) Sudden high fever.
- 2) Severe headache.
- 3) Pain behind the eyes.

part (d) Dengue fever? Vector responsible for transmission, symptoms, preventive measures.

DENGUE FEVER: It is an acute viral infection caused by the Flavivirus. It enters the human bloodstream through the bite of an infected mosquito. It ranges from mild to severe forms.

- | | | |
|----------------------------|----------------------------------|-------------------------------|
| • Dengue fever (classical) | • Dengue hemorrhagic fever (DHF) | • Dengue shock syndrome (DSS) |
|----------------------------|----------------------------------|-------------------------------|

VECTOR RESPONSIBLE FOR TRANSMISSION:

Aedes mosquito (Aedes aegypti and Aedes albopictus)

- These mosquitoes are primary vectors of dengue.
- They are day biting mosquitoes mostly active during early morning and late afternoon.
- Their breeding sites are clean, stagnant water such as plant pots, open buckets, water coolers etc.
- They have black body with white strips on legs often called "tiger mosquito".
- Female mosquitoes transmit virus after biting an infected person and subsequently infecting others.

Common Symptoms: Usually appears after 4-10 days after infection.

- 1) Sudden high fever.
- 2) Severe headache.
- 3) Pain behind the eyes (retro-orbital pain)

- 4) Severe muscle, bone and joint pain.
- 5) Nausea and vomiting.
- 6) Skin rash
- 7) Fatigue and weakness.

Preventive measures:

- i) Mosquito control → By eliminating stagnant water from containers and covering storage containers properly. Using biological control in large water bodies.
- ii) Personal protection:
By using mosquito repellents, wearing long sleeved clothes, installing window screens and using mosquito nets.
- iii) Community level measures:-
Regular fumigation in outbreak area, Public awareness campaigns about breeding site reduction, waste management to reduce open containers.
- iv) Health monitoring:
Early detection through blood tests during outbreaks, Hydration and medical consultation during fever, monitoring platelet count in suspected cases.

QUESTION # 5:

(a) Balanced Diet? Functions of Proteins and Carbs in human body.

BALANCED DIET:-

"A Diet that provides all essential nutrients like carbohydrates, proteins, fats, vitamins, minerals fibre and adequate water in correct proportions to meet the body's daily energy and nutritional requirements". Is called balanced diet.

It ensures the proper growth, tissue repair, immunity and overall health.

FUNCTIONS OF CARBOHYDRATES:

1) Energy production:

Carbohydrates produce energy by breaking down into glucose which fuels muscles, brain and organ systems.

2) Protein Sparing Actions:

When adequate carbohydrates are available, the body does not break down proteins for energy.

3) Fat metabolism:

Necessary for complete oxidation of fats; its deficiency leads to ketone accumulation.

4) Storage of Energy: Excess glucose is stored as glycogen in liver and muscles for later use.

5) Body temperature maintenance: Carbohydrates provides energy for metabolic heat production.

• FUNCTIONS OF PROTEINS:

- 1) Growth and Tissue Repair:
Proteins form muscle, skin, hair, nails, enzymes and hormones.
- 2) Enzyme and Hormone Formation:
Almost all enzymes and many hormones are protein in nature, controlling metabolism.
- 3) Immune Function:-
Antibodies (Immunoglobulins) are proteins that defend against infection.
- 4) Transport and Storage:
Haemoglobin, transferrin and albumin transport oxygen and nutrients.
- 5) Energy source (when needed): In starvation of carbohydrates or deficiency, proteins can be converted to energy.

(b) Define food Preservation, principle behind pasteurization and canning to control food deterioration.

FOOD PRESERVATION:

"It refers to techniques and processes used to prevent food spoilage, extend its shelf-life and maintain its nutritional value, flavor and safety."

• PRINCIPLES BEHIND

- 1) Destruction of Microorganisms:
Pasteurization kills *E. coli*, *Mycobacterium* etc.
Heat treatment.
- 2) Reduction of Microbial Load:
It signifies reduction of microbial load, slowing down growth.
- 3) Heat Below Boiling Point:
Since the temperature is below boiling point, the nutritional value is preserved.
- 4) Use of Time-Temperature Relationship:
2 methods

LTLT

(low temperature long time)

At 63°C for 30 min

⇒ PRINCIPLES

- 1) Air-tight Seals:
Cans or glass jars are sealed to prevent microbial growth.

• PRINCIPLES BEHIND PASTEURIZATION:

1) Destruction of Pathogenic Microorganisms:

Pasteurization kills harmful bacteria such as *Salmonella*, *E. coli*, *Mycobacterium tuberculosis* through controlled heat treatment.

2) Reduction of Spoilage Microbes:

It significantly reduces the microbial load, slowing deterioration.

3) Heat Below boiling Point:

Since the temperature remains below 100°C , the nutritional value and taste are preserved.

4) Use of Time-Temperature Combination:

2 methods are used:

LTLT

(Low temperature
long time)

At 63°C for 30 minutes

HST

(High temperature
short time)

At 72°C for 15
seconds

• PRINCIPLES BEHIND CANNING:

- 1) Air-tight Sealing: Food is placed in sterile metal cans or glass jars and oxygen is removed to prevent microbial growth and oxidation.

2) Heat Sterilization: The filled container is heated to destroy all spoilage organisms including spores. High acid foods (fruits) are processed at 100°C . Low acid foods (vegetables and meats) are processed at $116-121^{\circ}\text{C}$ under pressure.

3) Creation of Vacuum Seal: On canning, a vacuum is formed preventing ~~can~~ contamination.

4) Enzyme Inactivation: Heat destroys natural enzymes in food, preventing texture, color and flavor changes.

(C) What is Internet of things (IoT) - How it is transforming life and business, 2 world example

INTERNET OF THINGS (IoT):-

"It is a network of physical devices, vehicles, home appliances and other objects embedded with sensors, software, connectivity to allow them to collect, exchange and process data over the Internet".

These devices can communicate with each other and with central systems enabling automation, monitoring and decision making without human intervention.

IOT'S TRANSFORMATION IN DAILY LIFE:

- 1) Smart Homes: Devices like smart thermostats, lighting systems and security cameras can be remotely controlled via smartphones, optimizing energy use and enhancing security.
- 2) Health and Fitness: Wearable devices like fitness trackers and smartwatches monitor heart rate, sleep pattern and physical activity in real time, enabling personalized healthcare.
- 3) Transportation: Smart traffic systems and GPS (Global positioning system) enabled navigation reduce congestion and optimize travel routes.

IOT'S TRANSFORMATION IN BUSINESS:-

- 1) Supply chain Management: Sensors track inventory levels, monitor shipping conditions, reducing waste and improving efficiency.
- 2) Predictive Maintenance: In manufacturing, IoT sensors monitor machine health and predict failures before breakdowns reducing downtime and operational costs.
- 3) Customer Experience: Businesses collect usage data from IoT enabled products to tailor services, improve product design and offer personalized recommendations.

Real-World Examples,

1) Smart Cities,

In Singapore IoT enabled traffic and waste management system monitor congestion and optimize waste collection, improving urban efficiency.

2) Amazon Go Stores:

IoT sensors and computer vision track products in real time, allowing customers to shop without checkout lines - demonstrating automation and data driven retail.

(d) Differentiate b/w RAM and ROM. Explain Basic Architecture of computer focusing on CPU & its components (ALU and CU).

data when

Purpose:

It stores data currently executed

(Central pro

Read/Write

In RAM both read and write are

Speed:

Faster than active pro

Examples:

DDR4, S

DIFFERENCE BETWEEN RAM AND ROM

RAM (Random Access Memory)

Definition:

It is volatile memory used for temporary storage of data and instructions currently in use.

Volatility:

RAM is volatile. It loses

ROM (Read Only Memory)

Non volatile memory that permanently stores essential instructions.

ROM is non volatile.

• BASIC AR

It consists of processing unit (CPU) and output devices.

data when power is off.

It retains data even without power.

Purpose:

It stores programs and data currently being executed by the CPU (Central processing unit)

Stores firmware/bootloader required to start the computer.

Read/Write:

In RAM both read and write are possible.

Usually read-only; some type (EPROM/EEPROM) are rewritable.

Speed:

Faster memory for active processing.

Slower than RAM. Used for permanent storage.

Examples:

DDR4, SDRAM

BIOS chip, Firmware ROM,

• **BASIC ARCHITECTURE OF A COMPUTER:**

It consists of Input, output, memory and processing unit. The CPU (Central Processing Unit) is the brain of the computer and carries out all the instructions.

ROM
(Read Only
Memory)

Memory
primarily stores
instructions

volatile.

COMPONENTS OF CPU:

1) Arithmetic Logic Unit (ALU):

It performs all the arithmetic operations like addition, subtraction, multiplication, division.

- Handles logical operations i.e. comparisons like greater than, equal to, AND, OR.
- Also act as a decision making unit for programs.

2) Control Unit (CU)

It manages the flow of data and instructions between memory, ALU and input/output devices.

- It Decodes instructions fetched from memory and signals the ALU or other components to execute them.
- It also ensures synchronization and control over all computer operations.

SECTION II:

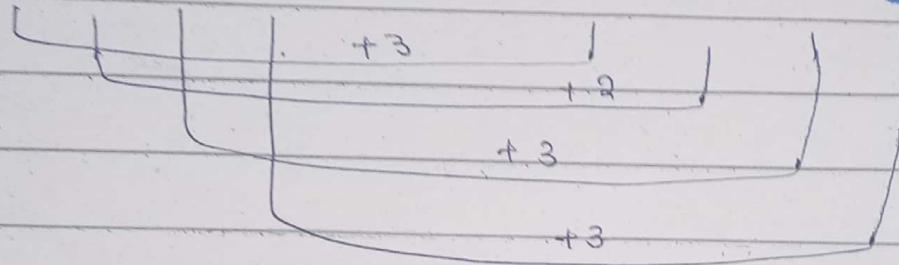
QUESTION # 8:

(a) 'ROAD' is coded as 'UQDN'. how
Lake will be coded in the same language.

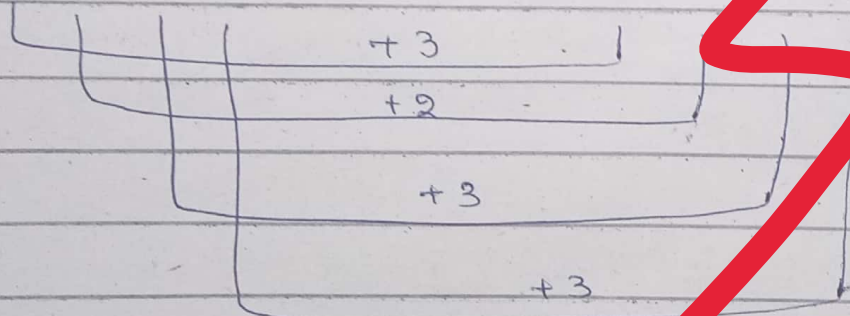
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ROAD → UQDN

18 15 4 4 21 17 4 7
R O A D → U Q D N



12 1 11 5 15 13 8
L A K E U C N H



part (b):

→ Niece of man.
law

→ Woman is
man's nephew's wife.

son of my son

nephew

(father of man's
daughter son)

husband of woman

(d) P, C

P is son

17

S is son

2

short

so far

Order

3rd

Maximum

7

m

(c)

1) 4, 12, 6, 18, 9, 27

4, 12, 6, 18, 9, 27 13

+6 +9

+2 +3 +4

It is obtained by adding 2 in the first number to
obtained the 3rd and similarly by adding 1 more in
third will give the 4th no. so on.

2) 1, 2, 6, 24, 120

1, 2, 6, 24, 120 720

x2 x3 x4 x5 x6

It is obtained by multiplying each number
with other number (next no.)

(d) P, Q, R, S, T → friends.

P is shorter than Q but taller than R

$$1) R < P < Q$$

S is shorter than T but taller than Q

$$2) Q < S < T$$

Shortest = 150cm Tallest = 180cm.

So from (1) & (2) we get

$$R < P < Q < S < T$$

Order from tallest → shortest

T, S, Q, P, R

3rd tallest = Q.

Maximum possible range = 180 - 150 = 30cm.

Third tallest = Q

Maximum possible range of heights = 30cm.

QUESTION #6:

part (a)

Pipe A, 10 hours = w

$$\text{Pipe A, 1 hr} = \frac{w}{10}$$

Pipe B, 15 hours = w

$$\text{Pipe B, 1 hr} = \frac{w}{15}$$

Third pipe C, empty pipe in 30 hr = $-w$

$$C, 1 \text{ hr} = \frac{-w}{30}$$

$$n \left(\frac{w}{10} + \frac{w}{15} - \frac{w}{30} \right) = w$$

$$n \left(\frac{1}{10} + \frac{1}{15} - \frac{1}{30} \right) = 1$$

$$n \left(\frac{3+2}{30} - \frac{1}{30} \right) = 1$$

$$n \left(\frac{5}{30} - \frac{1}{30} \right) = 1$$

$$n \left(\frac{4}{30} \right) = 1$$

$$\frac{30}{4}$$

$$n = 7.5$$

$$\begin{array}{r} 7.5 \\ 4 \overline{) 30.0} \\ \underline{28} \\ 20 \\ \underline{20} \\ 0 \end{array}$$

Part (b)

Ratio of 3 salaried individuals

$$X : Y : Z = 4 : 5 : 7$$

$$X = 4n$$

$$Y = 5n$$

$$Z = 7n$$

$$Y = 5n + 5n \times \frac{10}{100} = 5n + \frac{n}{2} = \frac{11n}{2}$$

$$Z = 7n - 7n \times \frac{25}{100}$$

$$Z = \frac{21}{4}n$$

$$4n + \frac{11}{2}n + \frac{21}{4}n = 169800$$

$$4n + \frac{22n + 21n}{4} = 169800$$

$$\frac{89n}{89} = \frac{169800 \times 4}{89}$$

$$= \frac{678000}{89}$$

$$n = 114152$$

$$X = 4(114152) \\ = \text{RS } 456608.00$$

part(c)

Workers = Work = Days

$$n = \frac{3}{5} W = 60$$

$$n+10 = \frac{2}{5} W = 20$$

$$\frac{n+10}{n} = \frac{\frac{3}{5} W \times 360}{\frac{2}{5} W \times 20}$$

$$\frac{n+10}{n} = \frac{3 \times 3}{2}$$

$$\frac{n+10}{n} = \frac{9}{2}$$

$$2(n+10) = 9n$$

$$2n + 20 = 9n$$

$$20 = 7n$$

$$\frac{20}{7} = n$$

$$n = 2.85 \approx 3 \text{ workers}$$

part (d)

Average
Top

78

75

rem

part

78 =

78n =

78

n =

part (d)

Average of student = 78

Top scores = 98 + 95 + 92 + 90 + 88

$$78 = \frac{98 + 95 + 92 + 90 + 88 + \text{remaining scores}}{n} \quad \text{--- (1)}$$

$$75 = \frac{\text{remaining scores}}{n-5}$$

$$\text{remaining scores} = 75(n-5) \quad \text{--- (2)}$$

Putting (2) in (1)

$$78 = \frac{460 + 75(n-5)}{n}$$

$$78n = 460 + 75n - 375$$

$$78n - 75n = 85$$

$$3n = 85$$

$$n = \frac{85}{3} \approx 28 \text{ students}$$

