

MOCK EXAM

PART-II

QUESTION NO:- 3

"STRUCTURE AND FUNCTION OF MITOCHONDRIUM AND RIBOSOMES IN AN ANIMAL CELL"

Mitochondrion and ribosomes are essential organelles responsible for "energy production" and "protein synthesis" in animal cells.

MITOCHONDRION

Structure of
Mitochondrion

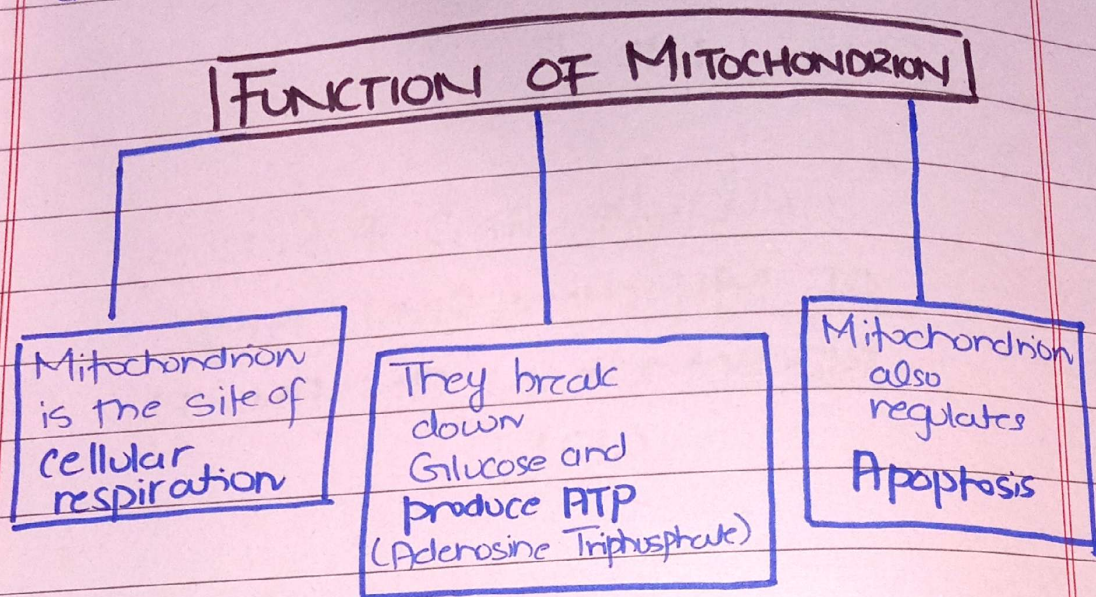
→ Mitochondrion are double membrane organelles

→ The outer membrane is smooth and permeable to small molecules

→ The inner membrane is folded into cristae increasing surface area for biochemical

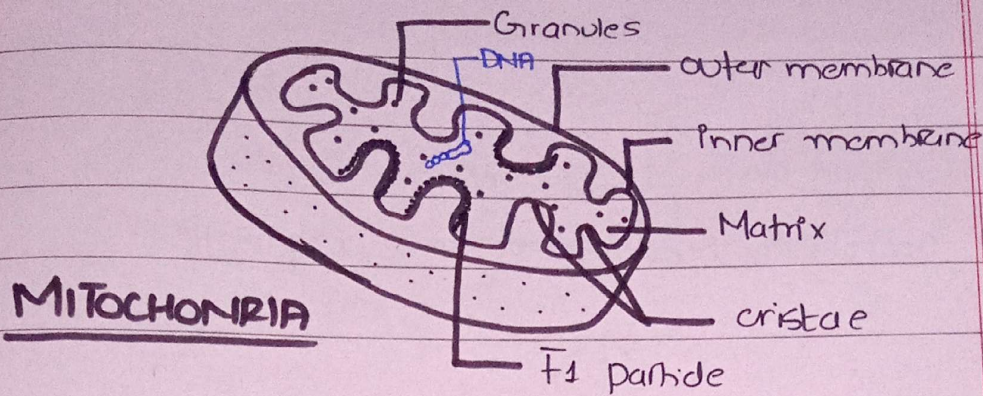
reactions.

→ The space inside is the matrix, containing enzymes, mitochondrial DNA, and ribosomes.



MITOCHONDRION AS THE POWER HOUSE OF THE CELL

Mitochondrion is the power house of the cell because it generates majority of ATP through oxidative phosphorylation. Since ATP fuels almost all cellular activities, mitochondria effectively supply the cell with usable energy.



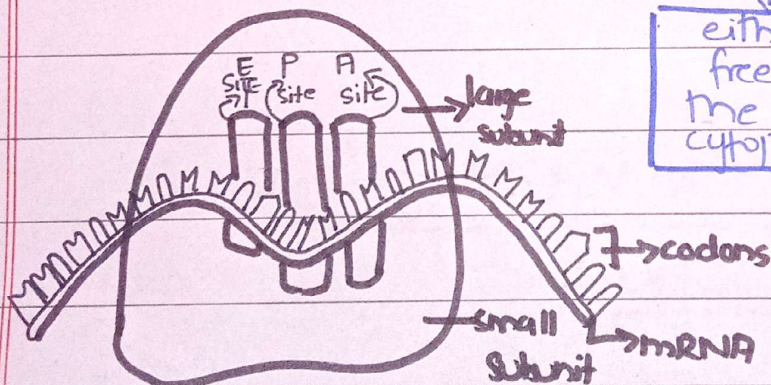
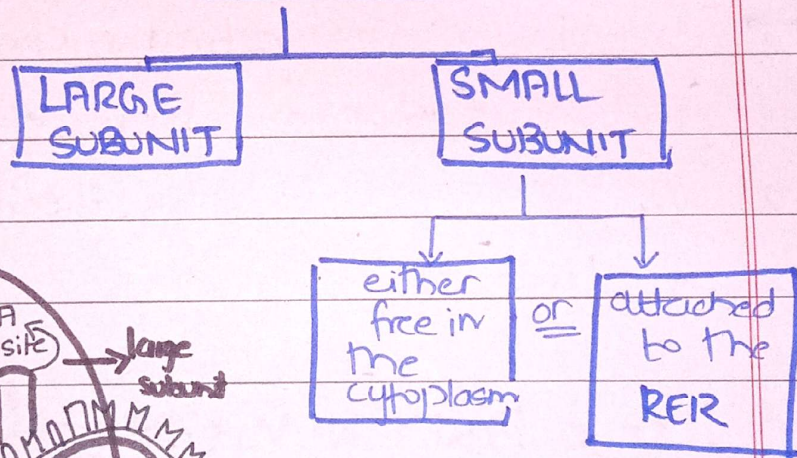
MITOCHONRIA

RIBOSOMES

STRUCTURE

→ Ribosomes are small, non-membranous structures made of rRNA and proteins

→ They exist as two subunits:



Structure of Ribosome

FUNCTION OF RIBOSOMES:-

- Ribosomes are responsible for protein synthesis

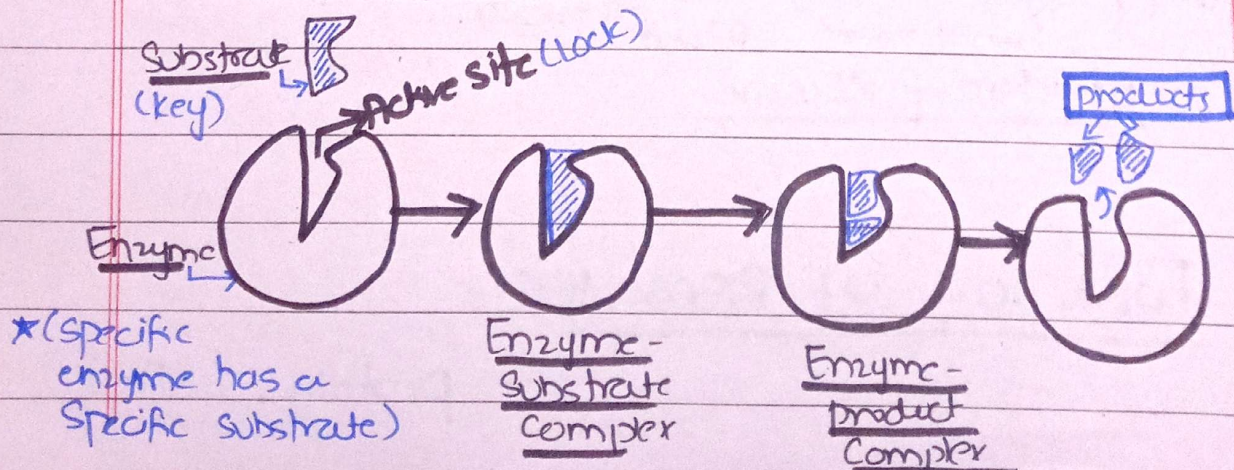
- Free ribosomes make proteins used within the cell
- Ribosomes on RER make proteins for secretion, membranes, and organelles.

(b)

ENZYMES:-

- Enzymes are biological catalysts, mostly proteins that speed up the biochemical reactions in living cells without being consumed in the process.
- They lower the activation energy, making reactions faster and more efficient.
- Each enzyme is highly specific for its substrate.

LOCK AND KEY MODEL OF ENZYME ACTION:-



②

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- Lock and key model was proposed by Emil Fischer (1894), this model explains enzymes specificity.
- An enzyme has a fixed, rigid, Active Site similar to a lock.
- The substrate has a complementary shape, acting as the key.
- only the correct substrate fits exactly into the Active site, forming Enzyme substrate complex
- The substrate is converted into products, which leave the active site while the enzyme remains unchanged.
"only the right key (substrate) can fit into the lock (enzyme) explaining the high specificity of enzymes"

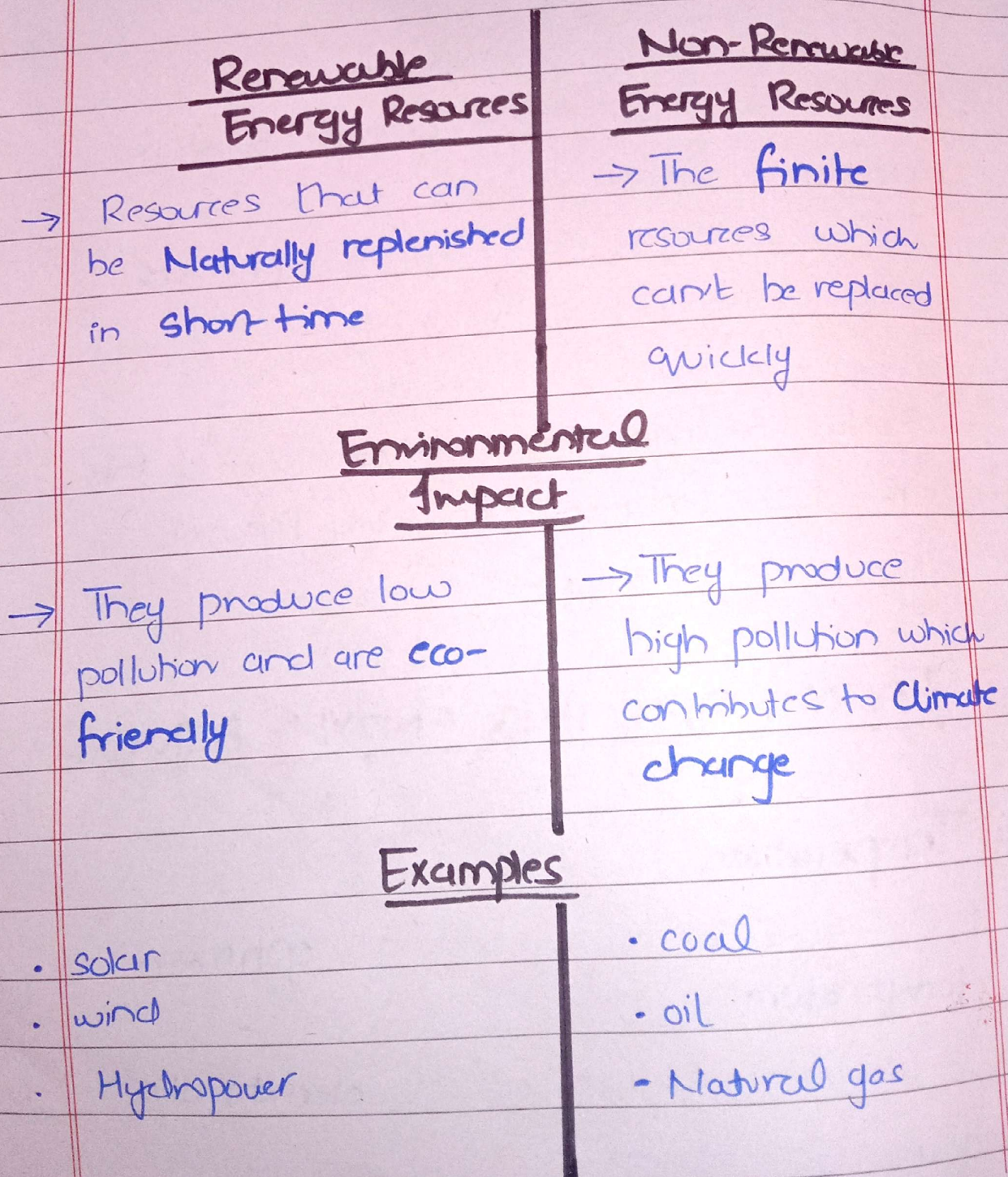
FACTORS AFFECTING ENZYME ACTIVITY:-

(i) Temperature

- each enzyme works best at optimum temperature.
- Too high temperature causes denaturation, decreasing activity.

(ii) pH :-

- Enzymes have an optimum pH.
- Any deviation (too acidic or too alkaline) alters the active site and reduces activity.

(c)

Wind Energy as a Sustainable Source:-

Wind energy can be used as a sustainable source due to following factors:-

- Renewable and clean:

produces electricity without greenhouse gases

- Abundant:

Wind is available globally and it's naturally replenished.

- Economic Benefits:

Creates jobs in manufacturing and maintenance.

- Challenges:-

↳ Intermittent Supply

↳ requires storage and high initial investment

Thus, Wind energy is a promising, sustainable source of energy for the future, especially if combined with other renewables.

(d)

DENIGUE FEVER:-

- Dengue Fever is a viral infection caused by the Dengue virus, transmitted to humans by infected mosquitoes.

It is common in tropical and sub-tropical regions.

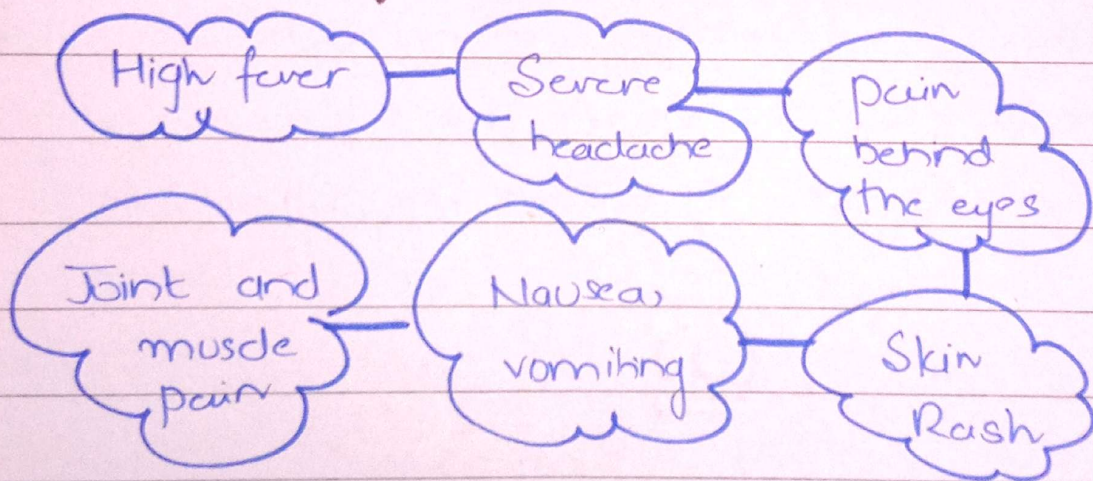
Vector Responsible for Dengue Fever:-

- The primary vector is *Aedes aegypti* mosquito.

Features of the mosquito:-

- Black and white striped body and legs
- Daytime feeder (active in early morning and late afternoon)
- Breeds in stagnant water like containers, tires, flower pots

Common Symptoms:-



Preventive measures:-

1. Eliminate mosquito breeding sites - empty water containers and clean gutters

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2. Use mosquito repellents, nets, and screens.
3. Wear protective clothing - long sleeves and pants.
4. Community awareness and fogging in high risk areas.

QUESTION NO:-5

(a)

Balanced diet:- "Let thy food be thy medicine"

A balanced diet provides all the **essential nutrients** (carbohydrates, proteins, fats, vitamins, minerals, water, and fiber) in **adequate amounts** to maintain health, growth, and proper functioning of the body.

→ **5 groups**:-

- ↳ milk
- ↳ Meat
- ↳ Green leafy vegetables
- ↳ Beans, pulses, cereals
- ↳ Nuts & fruits

• A balanced diet is planned according to the following factors:-

1. Age of a person
2. Gender
3. Caloric Requirement of a person
4. Economic Status
5. Food must be inculcated from all the 5 groups

7 nutrients are derived:

- ↳ carbohydrates
- ↳ proteins
- ↳ fats
- ↳ minerals
- ↳ vitamins
- ↳ fiber
- ↳ water

Functions of Carbohydrates:-

- Main source of energy for the body
- Excess carbohydrates are stored as Glycogen in the liver and muscles
- Helps in proper functioning of the brain and nervous system

Function of proteins:-

- proteins Build and repair tissues (muscles, organ, skin)
- proteins form Enzymes, hormones, and antibodies.
- proteins serves as Secondary source of energy when carbohydrates are insufficient.

CONCLUSION:-

A balanced diet ensures the body gets energy, growth and protection from diseases, with carbohydrates providing energy and proteins supporting growth and repair.

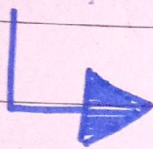
(b)

Food Preservation :-

Food preservation is the process of preventing or slowing down food spoilage caused by microorganisms, enzymes or chemical changes thereby extending the shelf life of food.

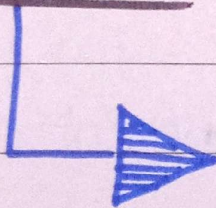
Pasteurization :-

↳ Definition:



Pasteurization is the process of heating food (usually liquids) to a specific temperature for a set time to kill microorganisms without affecting taste or nutritional value.

↳ Principle :-



- Microorganisms that cause spoilage and diseases are destroyed by heat.
- Food is then cooled rapidly to prevent further microbial growth.

Example :-

Milk is heated at $63^{\circ}\text{--}65^{\circ}\text{C}$ for 30 minutes (or 72°C for 15 sec in modern high Temperature short-time method) to kill the microorganisms.

Canning :-

↳ Definition : Canning is the method of preserving food in sealed containers after heating to destroy microorganisms.

↳ Principle :

- Food is heated to kill bacteria and enzymes
- Sealed containers prevent re-contamination, creating an anaerobic environment that stops microbial growth.

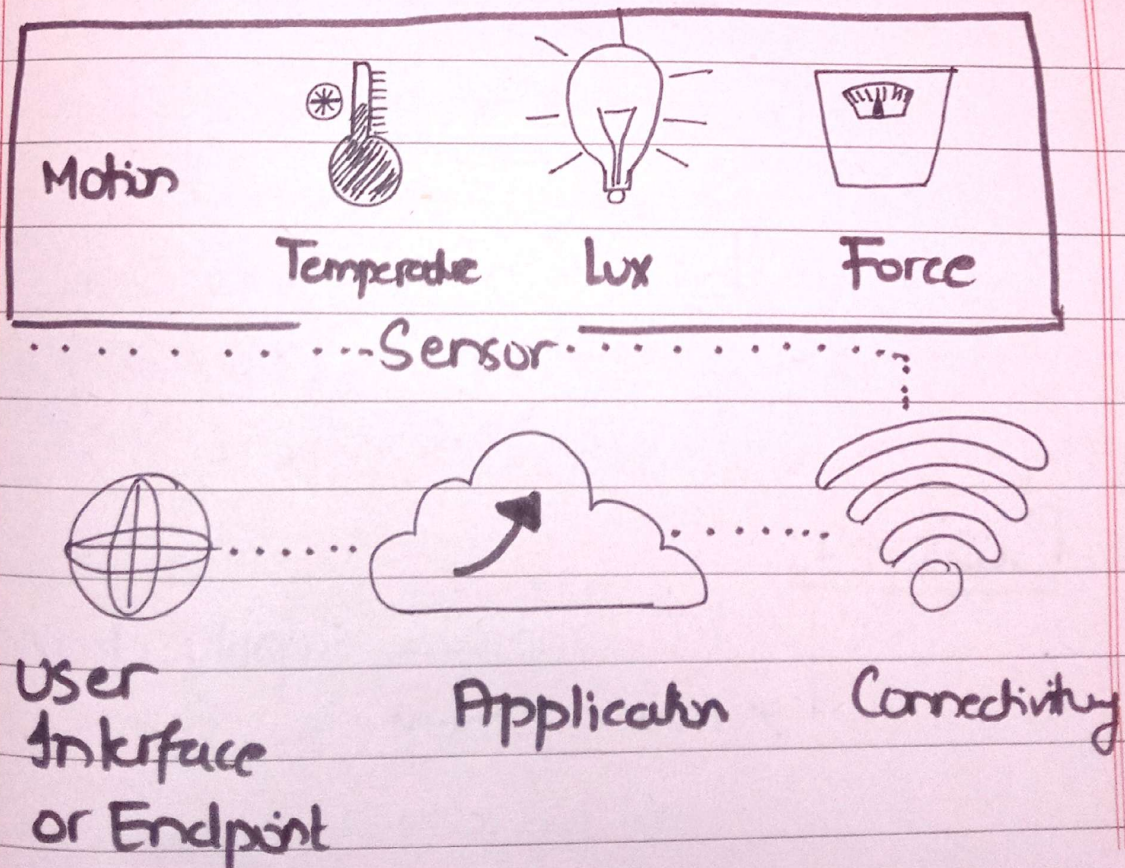
Example : vegetables, fruits, and meats are preserved in cans or jars.

CONCLUSION:-

Both pasteurization and canning control food deterioration by destroying harmful microbes and preventing their regrowth, ensuring safety and longer shelf life.

(c)

Internet of Things (IoT):



Definition: The Internet of Things refers to a network of physical devices, sensors, and appliances connected to the internet, allowing them to collect, exchange and act on data without direct human intervention.

Transformation of Daily life and business:-

Daily life: IoT enables smart homes with automated lighting, thermostats, and security systems.

↳ Wearable devices (smart-watches, fitness trackers) monitor health in real time.

Business:

↳ IoT improves supply chain management through real time tracking of goods

⑤

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↳ It Enables predictive maintenance of machinery, reducing downtime and costs.

Real World

Examples:

↳ Smart Thermostats:

(e.g: Nest) - automatically adjust home temperature based on user behaviour.

↳ Amazon Go Stores:

use IoT sensors and cameras to track items, allowing check out free shopping.

CONCLUSION:

IoT is transforming life and business by enhancing convenience, efficiency, and data-driven decision making, making both daily routines and industrial processes smarter and more connected.

(d)

Difference between RAM and ROM:

RAM

- Random Access Memory

ROM

- Read only Memory

Definition

- Volatile memory used for temporary storage while programs run

- Non-volatile memory used for permanent storage of instructions

Data Storage

- Read and write

- Read only (data pre-stored)

Volatility

- Lost when power is off

- Retained when power is off

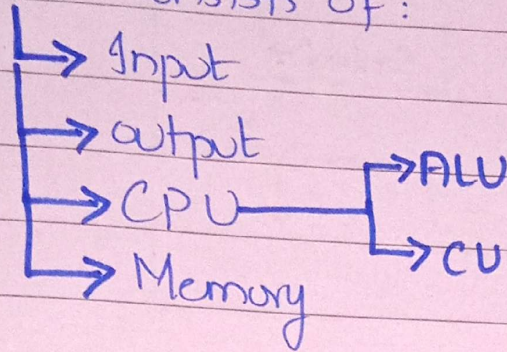
Purpose

- Stores running programs and data

- Stores firmware/boot instructions

Basic Architecture of a Computer :

A computer consists of :



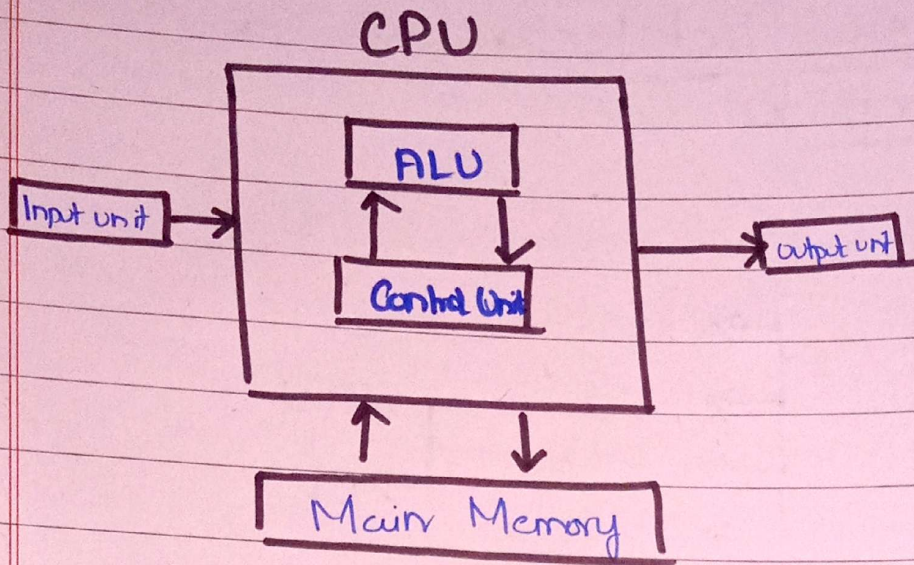
The CPU has two main components:

(i) ALU - Arithmetic logic unit :

- performs all Arithmetic operations i.e; addition, subtraction, multiplication, division
- performs logical operations (Comparison, AND, OR, NOT)

(ii) CU - Control unit :

- Directs the flow of data between CPU, memory, and peripherals.
- Decodes instructions from memory and tells ALU and other components what to do.



Conclusion:

RAM provides temporary workspace,
ROM stores permanent instructions,
and the CPU, with its ALU and CU,
processes data and executes instructions
to perform computing tasks.

SECTION-II

QUESTION No:- 8

(a)

What are given:

6

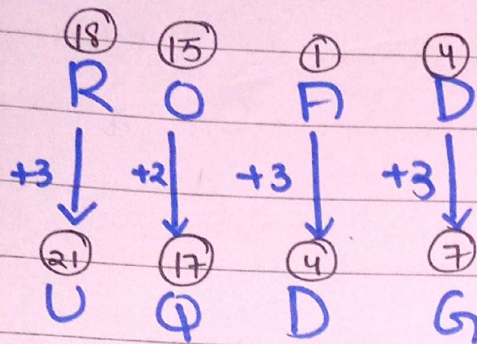
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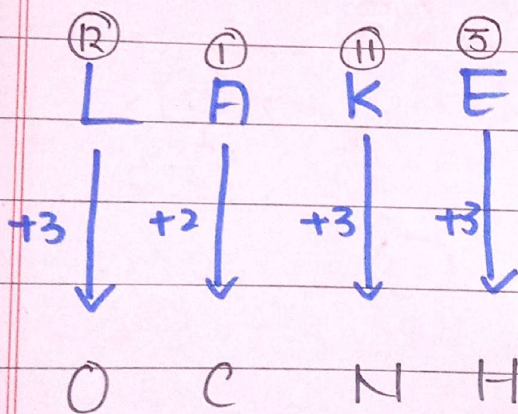
ROAD $\rightarrow$ UQDG

We need to find:

LAKE $\rightarrow$?



Similarly, for,



Answer:- LAKE is coded as **OCNH**

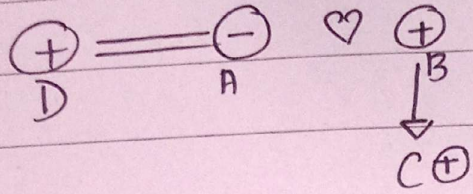
The rule is that each letter is shifted forward by 2 or 3 positions as observed from the coding pattern of ROAD $\rightarrow$ UQDG.

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(b)

Suppose: Man is represented by letter "D"



A = sister

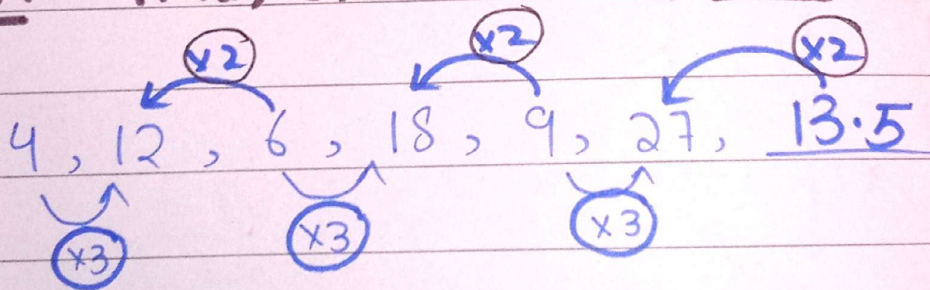
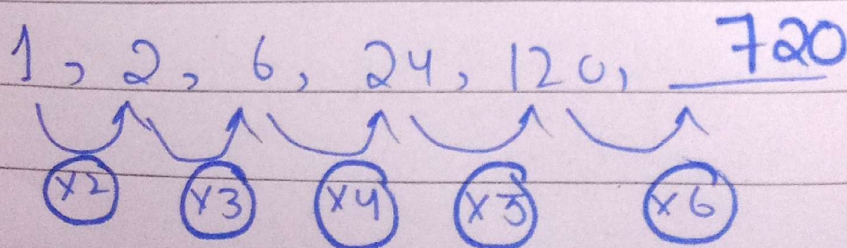
B = sister's husband

C = son of B

How is D related to A?

Answer:-

The woman is the Man's
Sister

(c)(i): 4, 12, 6, 18, 9, 27, _____(ii) 1, 2, 6, 24, 120, _____

(d)

Soln:-

Form 1: $R < P < Q$

Form 2: $Q < S < T$

Combining both forms:

T	(Tallest = 180cm)
S	
Q	
P	
R	(shortest = 150cm)

• Identify the third Tallest = Q is the third Tallest

• Maximum possible range of heights: Range = Tallest - shortest
 $= 180 - 150$
 $= 30 \text{ cm}$

Maximum possible Range = 30 cm

QUESTION NO:-7

(a)

Given,

Total people = 100

people who watch cricket = 65

people who watch hockey = 40

people who watch neither = 20

To find,

no. of people who watch both cricket and hockey = ?

Soln:-

- Let x be the no. of people who watch both cricket and hockey
- people who only watch cricket = $65 - x$
- people who only watch hockey = $40 - x$
- people who watch neither = 20

Total people equation:

$$(65 - x) + (40 - x) + x + 20 = 100$$

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Solve for x :

$$65 - x + 40 - x + x + 20 = 100$$

$$125 - x = 100$$

$$125 - 100 = x$$

$$\boxed{x = 25}$$

Thus, 25 people watch both hockey and cricket

(b)

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

$$\text{Perimeter} = 72 \text{ m}$$

$$\text{depth} = 2.5$$

To find: V of water?

Soln:-

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

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

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

$$72 = 4w + 8$$

$$\boxed{w = 16 \text{ m}}$$

find the length:-

$$L = w + 4 = 16 + 4 = 20 \text{ m}$$

find volume:-

Day: _____

Date: _____

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

$$V = 20 \times 16 \times 2.5$$

$$V = 800 \text{ m}^3$$

Thus, Volume of water = $\boxed{800 \text{ m}^3}$

(c)

Soln:-

Train 1 (from A): 60 km/hr

Train 2 (from B): 40 km/hr

Relative velocity

$$V_{\text{relative}} = 60 + 40$$

$$\boxed{V_{\text{relative}} = 100 \text{ km/hour}}$$

Time to meet:

$$\text{Time} = \frac{\text{distance}}{\text{relative speed}}$$

$$\text{Time} = \frac{400}{100}$$

$$\boxed{\text{Time} = 4 \text{ hrs}}$$

Meeting time:-

Start time = 8:00 am

Time taken = 4 hrs

The trains will meet at 12:00 noon

(d)

Given:-

present age = Father + son = 75 years

10 years ago:

Father's age = $4 \times$ Son's age

Let;

Father's present age = F

Son's " " = S

present age = $F + S = 75 \rightarrow (i)$

10 years ago = $F - 10 = 4(S - 10) \rightarrow (ii)$

Solve eq (ii)

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

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

$$\boxed{F = 4S - 30}$$

Substitute into eq (i):-

$$F + S = 75$$

Date: _____

Day: _____

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

$$5S - 30 = 75$$

$$\boxed{S = 21}$$

find father's age:-

$$F = 75 - S$$

$$F = 75 - 21$$

$$\boxed{F = 54 \text{ yrs}}$$

Thus: Father's age = 54 years
Son's age = 21 years