

General Science and Ability

AMMARA - BATCH 80

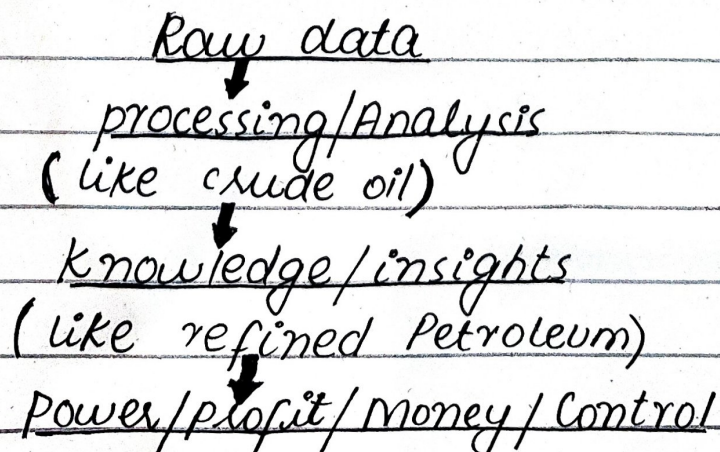
Part II

Section-I

Q # 2.

a. "Data is the new oil" Do you agree? Justify with your simple opinion and 3 everyday examples.

This statement is highly valid in the context of the 21st century digital economy. Just as oil fueled industrial growth in the past, data has become the central driver of innovation, economic power, and decision making, today. However, similar to crude oil, raw data is meaningless until it is refined, analyzed, and strategically utilized.



Everyday examples

1. Fitness Apps

Fitness apps, such as Fitbit, track steps, heart rate, and sleep patterns; this is analyzed to provide personalized health recommendations and can also be shared as anonymized insights for research or insurance purposes.

2. Social media Platforms

Platforms like Instagram, Youtube, Twitter, and Tiktok collect data on users' likes, shares, comments, and browsing habits. This data is analyzed to create detailed user profiles, which are then used to show targeted advertisements, influence trends, and generate massive revenue for the platform.

3. Ride-Hailing Apps

Uber and Indrive gather location and travel data from users. This data is processed to optimize routes, predict demand, and to increase efficiency and profit.

b. Universe is expanding, how it resembles with balloon blowing in working?

The expansion of the universe can be understood through the balloon analogy. Imagine the surface of a balloon as a space and dots on it as galaxies. When the balloon is blown up, the surface stretches and all dots move away from each other. Similarly as the universe expands, space itself stretches. This cause galaxies to recede from each other.

Importantly, each galaxy observe all others moving away, just as any dots on the balloon sees the rest receding.

Before Expansion

• • •

(galaxies close)
space smaller

After Expansion

• • •

galaxies move
apart, space
stretches

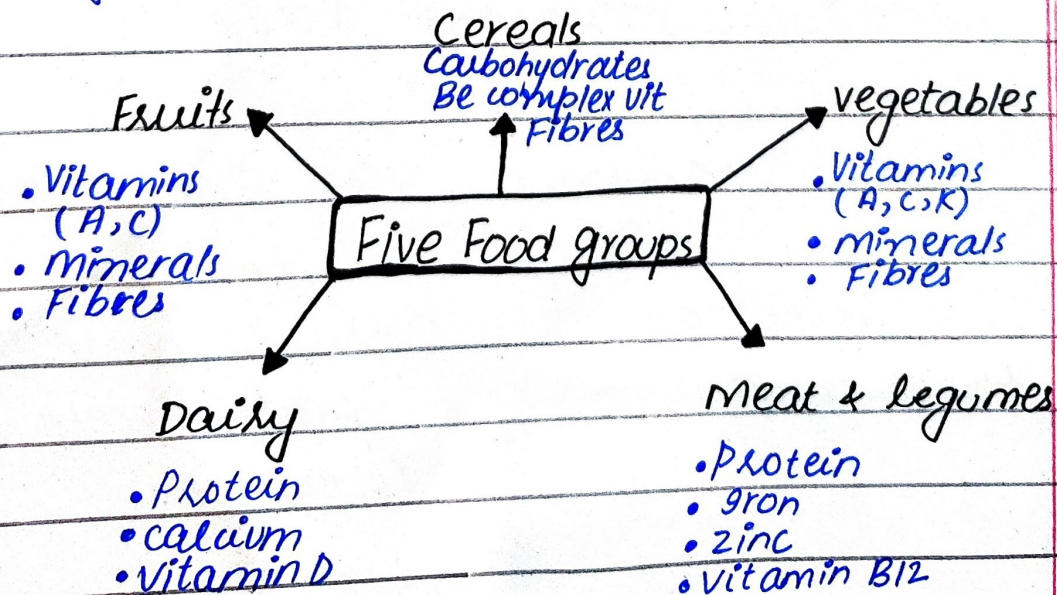
Q. What is balanced diet?

Deficiency of vitamin A, D, and E can result into what type of imbalances in body?

Balanced diet:

"Let thy food be thy medicine,
Let thy medicine be thy food."

A balanced diet is one that provides adequate portions of food from all 5 basic food groups: cereals, fruits, vegetables, dairy, and meat or legumes, so that body receives all essential nutrients in proper amounts to maintain health, growth, and normal body functions.



Vitamin Deficiencies and their effects

• Vitamin A Deficiency

Vitamin A is essential for Vision, Skin health, and immune function.

Its deficiency can lead to:

- ⇒ Night blindness
- ⇒ Dry skin and musous membranes.
- ⇒ Weakened immunity

• Vitamin D Deficiency

Vitamin D is vital for calcium absorption and bone health. Its deficiency can result in:

- ⇒ Rickets in children (soft and deformed bones)
- ⇒ Osteomalacia in adults (weak and brittle bones)
- ⇒ muscle weakness

• Vitamin E deficiency

Vitamin E is an anti-oxidant and protects cell membranes. Its deficiency may cause:

- ⇒ Neuromuscular problems
- ⇒ Hemolytic anemia (destruction of red blood cells)
- ⇒ impaired immune function

d. Working of GPS. What is fiber optic? How 2D and 3D locations are measured?

1. Working of GPS

GPS (Global Positioning System) is a satellite-based navigation system that provides location and time information anywhere on earth.

Working: It works on the principle of triangulation:

I. Satellites transmit signals including their position and time.

II. A GPS receiver on earth receives signals from at least four satellites.

III. By calculating the time delay of each signal, the receiver determines the distance to each satellite.

IV. Using these distances, the receiver computes its exact position (latitude, longitude, and altitude).

2. Optic Fiber

Fiber optic is a thin, flexible strand of glass or plastic that

transmits data as pulse of light. It is used in telecommunications, internet, and medical instruments, because it allows high-speed, long-distance, and low-loss data transmission.

Key feature: Light travels through total internal reflection, staying within the fiber even along curves.

3. Measurement of 2D and 3D Locations by Satellite

- **2D Location** (latitude and longitude): By receiving signals from at least 3 satellites, a GPS receiver calculates its latitude and longitude using triangulation.
- **3D Location** (latitude, longitude, and altitude): By receiving signals from four or more satellites, the GPS receiver can additionally determine altitude, giving a full 3D position:

2D: 3 satellites $\rightarrow$ Determines (Lat, Long)

3D: 4 satellites $\rightarrow$ Determines (Lat, Long, Alt)

Q no 4

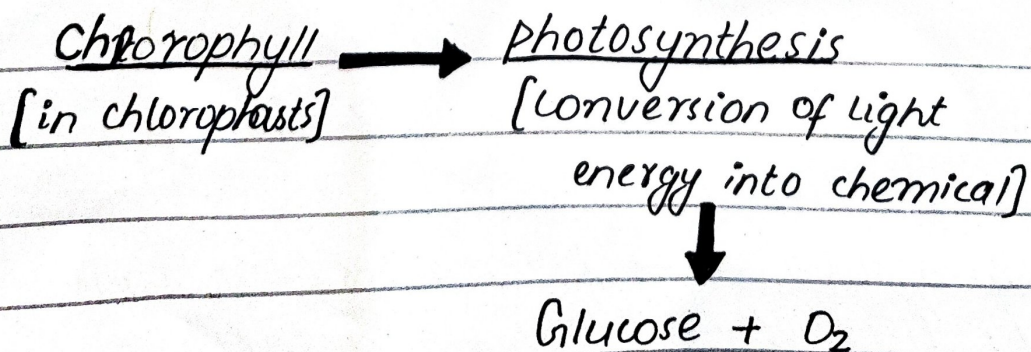
a) Plant Kingdom - Chlorophyll

Chlorophyll is a green pigment found in the chloroplasts of plants. It is essential for photosynthesis, the process by which plants convert sunlight into chemical energy (glucose) using water (H_2O) and carbon dioxide (CO_2).

Property $\Rightarrow$ Chlorophyll absorbs light energy, mainly in the blue and red regions, and reflects green light, giving plants their color.

Key features:

- Located in chloroplasts
- Absorbs sunlight for energy conversion.
- Vital for plant growth and energy production.



b) Role of Ribosomes in Protein Synthesis

Ribosomes are cellular organelles responsible for protein synthesis

Working:

- I- mRNA binds to the ribosome, carrying the genetic code from DNA
- II- tRNA molecule bring amino acids matching the codons on mRNA
- III- Ribosomes link amino acids together via peptide bonds to form a polypeptide chain

Key point: Ribosomes are found in cytoplasm or attached to rough endoplasmic reticulum (RER), and are essential for all living cells.

c. Methods of Solid waste Management

Solid waste management includes collection, treatment, and disposal of waste to minimize

environmental pollution.

Common methods:

I- Landfills: waste is dumped in designated areas and compacted; modern landfills include liners to prevent contamination.

II- Incineration: Waste is burnt at high temperature, reducing volume and sometimes generating energy.

III- Recycling: Materials like plastic, paper and glass are reused to make new products.

IV- Composting: Organic waste decomposes naturally to form fertilizers.

V- Biogas: Organic waste is converted to methane gas for energy.

d) Define the terms

i) Biofuel: Fuel produced from biological resources like plants, algae, or animal waste; used as an alternative to fossil fuels.

ii) Adulteration: The contamination

or addition of inferior substances to food, medicine, or other products, reducing quality and safety.

iii) Hydrosphere: The entire water component of the Earth, including oceans, rivers, lakes, groundwater, and ice.

iv) Troposphere: The lowest layer of Earth's atmosphere, where weather occurs and temperature decreases with altitude.

v) Isotopes: Atoms of the same element with equal number of protons but different numbers of neutrons, often having different atomic masses.

Examples $\Rightarrow$ Hydrogen isotopes (Protium, Deuterium, Tritium)

$\Rightarrow$ Carbon isotopes
 ^{12}C , ^{13}C , ^{14}C

Section II

Q # 6

(a) Ratio of Apple: Berry: Cherry: Date
3 : 6 : 2 : 5

- Let the common factor be x .

$$\text{Apple} = 3x$$

$$\text{Berry} = 6x$$

$$\text{Cherry} = 2x$$

$$\text{Date} = 5x$$

- Apple - Date = 35

$$3x - 5x = 35$$

$$-2x = 35$$

$$x = -17.5$$

- Berry = $6x = 6(-17.5)$

$$\text{Berry} = 105 \text{ candies}$$

(b) Camera price = \$200

Discount = 25%.

Tax = 6%.

- Price after discount = $200 - (25\% \text{ of } 200)$
 $= 200 - 50$
 $= 150$

- Tax = 6% of 150 = $0.06 \times 150 = 9$
Total amount paid = $150 + 9 = 159$

$$= \$159$$

(c) Distance = 36 km
Speed = 18 km/h
Start time = 1:00 pm

- $$\text{Time} = \frac{\text{Distance}}{\text{speed}}$$

$$\text{Time} = \frac{36}{18} = 2 \text{ hrs.}$$

- $1:00 \text{ pm} + 2 \text{ hours} = 3:00 \text{ pm}$

3:00 pm

(d) Unscramble math terms

1. STSTAICITS → STATISTICS

2. LGEBMAR → ALGEBRA

Q# 7

(a) Diameter = $d = 14 \text{ cm}$
radius = $r = d/2 = 7 \text{ cm}$

- $V = \frac{4}{3} \pi r^3$

$$V = \frac{4}{3} \times \frac{22}{7} \times 7^3$$

$$V = \frac{4}{3} \times \frac{22}{7} \times 343$$

$$V = 1437.33 \text{ cm}^3$$

(b) Total savings = 25000Rs

$$\text{Ratio} = 1:2:3:4:5$$

- $1+2+3+4+5 = 15$
- value of one part = $\frac{25000}{15}$

$$= 1666.67 \text{ Rs}$$

- Smallest share = 1666.67 Rs

(c) Series: 2, 6, 18, 54, 162, 486

- Check pattern
multiply by 3 each time
 $2 \times 3 = 6, 6 \times 3 = 18, 18 \times 3 = 54 \dots$
- Sequence is correct

(d) Triangle Sides

$$a = 5, b = 12, c = 13$$

- Pythagoras for checking right triangle:

$$5^2 + 12^2 = 25 + 144 = 169 = 13^2$$

Right triangle

- Right angle opposite hypotenuse:
 $C = 90^\circ$

$$\sin A = \frac{\text{opposite}}{\text{hypotenuse}} = \frac{5}{13}$$

$$\Rightarrow A = 22.62^\circ$$

$$\Rightarrow B = 90 - A = 67.38^\circ$$