

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.

GSA

SECTION - I

Q. 2) Yes, I agree with the statement that data

is the new oil. Just like oil data can be called as a raw resource because although it exists in human brain, it needs to be filtered

(extracted in case of oil), processed and used appropriately where needed (ethical use in case of oil). It now drives our economy and daily life decisions.

Explanation: Data helps companies, government and people in making smarter choices. It powers technologies like Artificial Intelligence (AI) and online services. Unlike oil, data can be used without running out, but it still needs good systems, careful studies and clear rules to make sure it is used safely and not controlled by selected by a few powerful groups.

EVERYDAY EXAMPLES:

1) Google Maps: Used popular location data to show traffic, locate to desired destinations and find out faster, shorter routes for them.

2) Online Shopping: Online shopping app or website uses your search or purchased data to suggest what you might like to buy.

3) Smart Watches: Used in tracking health data detects environment and monitor sleep data help individuals identify their health conditions.

CONCLUSION

To conclude data has become an important part of daily life and life without it is hard to imagine. It has become key resource of modern world just like oil. But conscious use of it is really important.

Q. 2(b): UNIVERSE IS EXPANDING.

When Scientist claims that the Universe is expanding they actually means that the space itself is stretching which is causing the galaxies to move apart from each other. This is seen similar to a balloon blowing.

When air is blown into the balloon its surface expands, causing it to get bigger. Consider a balloon with dots on it. When the balloon is blown, the dots move farther apart from each other. Now to understand, galaxies are like dots on the balloon, as it inflates, the distance between the dots grow bigger but those dots don't move on the surface themselves, only the space between them stretches.

Q. 6

a) Candy ratio problem

Given: Packets in flavors Apple : Berry : Cherry : Date = 3 : 6 : 2 : 5.

Asked: If Apple candies exceed Date candies by 25, how many Berry candies are

HUBBLES LAW: Hubble's law of expansion of Universe explains this phenomenon. It proves that galaxies are not flying away but are being carried away due to expansion. The law explains that astronomers can tell if the galaxies are moving away or towards the Earth, and with what speed by observing spectrum of light from a star or galaxy. The galaxies moving away from Earth show lights shifting to longer, redder wavelengths. This is called as "red shift."

CONCLUSION: The example of the balloon analogy can be taken as a perfect example of the universe expanding.

Q2(c): **BALANCED DIET:**

A balanced diet is the one that includes all sort of nutrients in balanced amounts. These nutrients include: carbohydrate, protein, fats, vitamins, minerals, fibers and water for the body to function properly and get its energy. It needs to perform functions of daily life, grow, generate energy and to stay healthy. A balanced diet helps to maintain body weight, strengthen

immunity and support daily life functions.

DEFICIENCY EFFECTS:

Vitamin A Deficiency: It causes night blindness, dry eyes, weak immunity and can also have effects over skin.

Vitamin D Deficiency: Vitamin D deficiency puts the bone in weaker condition and can also cause breakage in severe conditions. In children, the deficiency of vitamin D leads to rickets (soft and weak bone) and in adults it can cause osteoporosis (bone pain, muscle weakness).

Vitamin E Deficiency: This can result in nerve and muscle damage, poor coordination and weak end immunity because of its role as an antioxidant.

CONCLUSION: A balanced diet is important to keep up with the daily life functioning and to keep healthy and deficiency of any of them can have adverse effects over human health.

Q2(d) **GLOBAL POSITIONING SYSTEM (GPS):**

The Global Positioning System (GPS) is a network of about 30 satellites orbiting around

the Earth. A GPS receiver (like in phones or cars) picks signals from atleast four satellites. By measuring the time taken for these signals to reach the receiver, the system calculates the user's exact location, speed and time. This process is called trilateration.

FIBER OPTICS:

Fiber optic is a thin flexible glass or wire that transmits data as light pulses instead of the electrical signals. It allows for faster, clearer communication and long distance data transfer with minimal loss.

2D and 3D locations:

2D Locations (Latitude and Longitude) Measured using signals from these satellites, giving position on Earth's surface.

3D Locations (Latitude, Longitude and Altitude): Require signals from atleast 4 satellites which also helps determine height or elevation.

Q3(b): NEED OF ORGANELLES:

The cytoplasm of the cell contains various organelles which are responsible to perform different functions in an organized and efficient way. Each organelle works like a small machine inside the cell, doing a specific task each - such as making energy, building protein and removing waste. This division of labor helps the cell work efficiently.

MITOCHONDRIA:

Mitochondria is called the "power house of the cell" and is responsible for breaking down glucose and oxygen to produce energy in the form of Adenosine Triphosphate (ATP) through a process called cellular respiration.

MEMBRANES:

It has two membranes:

Outer - smooth membrane

Inner folded membrane (cristae) that increase the surface area for energy production.

Mitochondria have their own DNA and they can make some of their own proteins. This also plays a role in cell growth, metabolism and death (apoptosis).

Q3b): **DOPING**

Doping is adding a small amount of impurity to a pure semi-conductor (like silicon or germanium) to improve their conductivity. The impurity changes the number of free electrons or holes allowing the semiconductor to conduct the current more efficiently.

TYPES OF SEMI CONDUCTORS

1) **N-Type Semiconductor**: Formed by adding elements with five valence electrons (phosphorus or arsenic) to pure silicon.

- These extra electrons become free charge carriers, making electrons the majority carriers and holes the minority carriers.

2) **P-Type Semiconductors**: Formed by adding elements with three valence electrons (boron or gallium).

- This creates holes (the positive charge carriers) as majority and electrons (the negative charge carriers) as minority.

CONCLUSIONS: To conclude, doping increases the conductivity of semi conductors, in which N-type have extra electron and P-type have extra holes. Together they are used in electrical devices like diodes & transistors.

Q3(c): **MERITS OF THE VOLCANIC ERUPTIONS:**

- 1) **Fertile Soil**: Volcanic ash breaks down into minerals that make soil rich and productive for farming.
- 2) **Mineral Resources**: Volcanic eruptions bring valuable minerals like copper, gold and sulphur to the surface.
- 3) **Geothermal Energy**: Heat from volcanoes can be used to produce clean electricity.
- 4) **Tourism**: Volcanic eruptions attract tourists, helping local economies.

DEMERITS OF VOLCANIC ERUPTIONS:

- 1) **Loss of Life and Property**: Explosive lava, ash clouds destroy settled settlements, killing people.
- 2) **Polluted air**: Gases like sulphur dioxide pollute the air and cause acid rain.
- 3) **Climate Effect**: Large eruptions can block sunlight, lowering the temperature temporarily.
- 4) **Loss of Property / Displacement**: People living in such areas are often displaced and lose means of their livelihood.

Q3(d): DENGUE FEVER:

Dengue fever is a viral disease transmitted to human being by the bite of female mosquito "Aedes Aegypti". It is common in tropical and sub-tropical regions during rainy seasons.

CAUSATIVE AGENT: The disease is caused by Dengue virus (DENV) which has four groups (DENV-1, DENV-2, DENV-3, DENV-4) belonging to flavivirus group.

SYMPTOMOLOGY:

- 1) Sudden high fever.
- 2) Severe headache and pain in eyes.
- 3) Joints and muscle pain hence called breakbone fever.
- 4) Skin rash, vomiting, fatigue.
- 5) In severe cases: Dengue Haemorrhagic Fever & Potential bleeding, shock, low platelets, death in severe cases.

PREVENTION: There's no specific antiviral drug. It is mainly controlled by rest, fluid and fever control.

- Avoid aspirin or Ibuprofen (can increase bleeding)
- Remove dirty, standing water.
- Use mosquito repellents, nets and sprays.
- Public awareness and vector control.

SECTION - II

Q6(a): Let common ratio factor be x .

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

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

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

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

Apple candies exceed date candies by 35

$$= 5x - 3x = 35$$

$$= 2x = 35$$

$$x = 35/2$$

$$\Rightarrow x = 17.5$$

Number of berry candies: $6x$

$$6x = 6 \times 17.5 = 105$$

There are 105 berry candies in store.

Q6(b) Price of camera = \$200

$$\text{Discount} = 25\%$$

$$\text{Sales tax} = 6\%$$

$$= \frac{25}{100} \times 200 = 50$$

Discounted price = $200 - 50 = \$150$

= Adding 6% tax on discounted price
 $= \$150 \times \frac{6}{100} = 9$

So total amount paid = $150 + 9 = \boxed{\$159}$

Q6(c) Distance = 36 km

Speed = 18 km/h

Time = 1:00 pm $\Rightarrow$?

Time = $\frac{\text{Distance}}{\text{Speed}}$

Time = $\frac{36 \text{ km}}{18 \text{ km/h}} = 2$

Time = 2 hours.

Total time = 1:00 pm + 2 hours = $\boxed{3:00 \text{ pm}}$

Q6(d): i) STATISTICS

ii) GAMBLER

Q7a): Diameter = 14 cm

Radius = $\frac{14}{2} = 7 \text{ cm}$

$\pi = \frac{22}{7}$

Volume of sphere = $V = \frac{4}{3} \pi r^3$

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

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

$\frac{22}{7} \times 343 = 22 \times 49 = 1078$

$V = \frac{4}{3} \times 1078 = \frac{4312}{3}$

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

Q7b) Ratio 1:2:3:4:5

Total savings: Rs 25,000

Adding all parts: $1+2+3+4+5 = 15$

$15x = 25000$

$$x = \frac{15 \times 100}{15 \times 3} = 100$$

$$x = 1666.67$$

$$\text{Smallest value} = 1x = 1666.67$$

Q7(c) i) 2, 6, 18, 54, 162, 486

No number is out of fit.

ii) 3, 5, 7, 13, 17

3, 5, 7, 11, 13, 17 (prime numbers)

Q7(d): Sides: $a = 5 \text{ cm}$

$$b = 12 \text{ cm}$$

$$c = 13 \text{ cm}$$

Find all 3 angles = ?

Check if it's a right angle triangle:

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

Right angle opposite the longest side
hence it's a right angle Δ .

Angle A opposite side = $a = 5$

$$\sin A = \frac{a}{c} = \frac{5}{13} \Rightarrow A = \sin^{-1}\left(\frac{5}{13}\right)$$

$$A \approx 22.6^\circ$$

Angle B opposite $b = 12 \text{ cm}$

$$\sin B = \frac{b}{c} = \frac{12}{13} \Rightarrow B = \sin^{-1}\left(\frac{12}{13}\right)$$

$$B \approx 67.4^\circ$$

Angle C (right angle Δ): $C = 90^\circ$