

Dos and Don'ts for General Science & Ability Paper

Hi there, you've done well. Know that acquiring knowledge is one thing and reproducing it in paper according to what's asked is another. There are a few things I would like to highlight.

1. A 5 marks part requires at least 2 and at max 3 sides of a paper. Know that there can be two or three parts of a question and their marks are divided accordingly. So, address all of them in a just manner.

2. Focus on time management. You get 35 minutes to solve one question and about 8 minutes per 5 mark part. Manage your time accordingly.

3. You need to understand that your paper is supposed to look more scientific than theoretical. So, add flowcharts and diagrams where required.

4. Your handwriting and neatness can be really impactful. Avoid cutting and overwriting.

5. Focus on your spellings and your grammar. Here, in GSA there's no deduction in marks but your expression will definitely create an impact.

6. In ability portion, give explanation for analytical ability question in words. You need to understand that a 5 mark part requires all steps written and explained.

Good luck for CSS 2025. You're gonna rock in sha Allah. :)

Give early, critical and recovery symptoms

1. High fever (Sudden onset at high temperature)
2. Severe headache
3. Joint and muscle pain (in limbs)
4. Fatigue (Exhaustion may develop)
5. Skin rash (A rash may develop)
6. Mild bleeding (Symptoms like nose bleeding)
7. bleeding and

Some times and in some cases Dengue can leads to (dengue hemorrhagic fever) which can lead to serious complications such as bleeding and even death.

Q Discuss the structure and function of mitochondria? How is it the power house?

Mitochondria:

Mitochondria are called the power house of the cell because they produce which is required by the cells. They are unique and they are present in all eukaryotic cells.

Structure of Mitochondria:

Outer membrane:

The outer layer is smooth and acts as a protective barrier.

It contains proteins called porins which allow small molecules and ions to pass.

Inner membrane:

- 1) Inner membrane is folded into structure called cristae
- 2) These folds increase the surface area required for energy production.
- 3) The inner membrane is impermeable to most substances which helps create an environment inside the mitochondria.

Intermembrane space:

This is the space between outer and inner membrane that requires a key role in energy production.

Matrix:

The innermost space is filled with gel-like fluid that is the matrix. Matrix contains enzymes, ribosomes, mitochondrial DNA that is needed for metabolic processes.

Functions of Mitochondria:

Mitochondria are primarily responsible for producing ATP (Adenosine Triphosphate) the main energy currency of the cell.

They do this through several key processes:
Cellular Respiration

Mitochondria plays a key role in converting nutrients into Adenosine Triphosphate (ATP)

following three of the steps:

Glycolysis: Occurs in cytoplasm where glucose is broken down into pyruvate

Krebs cycle: Pyruvate enters mitochondria and produces electron carriers NADH and FADH₂

ETC: Located in inner membrane. It uses NADH and FADH₂ to create proton gradient as protons flow back to matrix through ATP synthase to produce ATP

Regulation of metabolism:

Mitochondria help regulate various metabolic pathways including the breakdown of fats and metabolism of amino acids.

Apoptosis:

Mitochondria can release proteins that trigger cell death when cells are damaged or no longer needed. This is important for maintaining healthy tissue.

Calcium storage:

Mitochondria stores calcium ions which is important for signaling function.

Heat production:

In some specialized cells like the brown-fat cell, mitochondria generate heat instead of ATP through a process called non-shivering thermogenesis.

Q/Why are mitochondria called the power house of cell?

Mitochondria are referred as the power house of the cell because they are the site for main ATP production through cellular respiration. ATP serves as a vital energy source for many cellular respiration including muscle contraction, nerve impulse or biosynthesis of molecules. Without mitochondria, the cell would struggle to produce the energy needed for life.

PART B

1 Explain functions of enzymes in detail with examples:

Enzymes are biological catalysts that accelerate the chemical reaction in the body. They are crucial for various physiological processes and play a key role in digestion, metabolism and DNA replication.

Catalysis:

Enzymes lower the activation energy required for reaction to occur. This means reaction can occur faster and at lower temperature.

Example

Amylases:

This enzyme is found in saliva that catalyzes the breakdown of starch into simple sugars like maltose and glucose.

Specificity

Enzymes that are highly specific mean they catalyze a specific type of reaction that fit in the specificity of substrate.

Example

Lactase:

This enzyme is found in sugar in milk. It is the breakdown of lactose into glucose and galactose.

Regulation:

Enzyme activity can be regulated by various factors including temperature, pH and ion concentration of substrates or inhibitors. This regulation allows cell to control metabolic pathways and respond to change in environment.

Example:

Phospho Fructo Kinase:

This enzyme plays a key role in glycolysis and regulated by the level of ATP and ADP in the cell. High level of ATP inhibit activity while high level of ADP activates it helping the cell to manage it.

Cofactor and Coenzyme:

Many enzymes require additional molecules to function properly. Cofactors are usually metals or zinc ions like magnesium while coenzymes are organic molecules that is derived from vitamins.

Example:

Hexokinase:

This enzyme which catalyzes the phosphorylation of glucose requires magnesium ion to help stabilize the negative charge of ATP.

Enzyme Substrate Complex Formation

Chymotrypsin: This digestive enzyme cleaves peptide bonds in proteins. Binds to substrate and catalyzes the reaction an

releasing smaller peptides.

Feedback Inhibition:

In many metabolic pathways, the end product can inhibit an earlier step, preventing overproduction of substances.

~~Threonine Deaminase:~~

~~This enzyme is involved in biosynthesis of amino acid isoleucine. When isoleucine is high, it binds to threonine deaminase and inhibits it.~~

Energy Transformation:

Enzymes are responsible for transforming energy from one to another which is crucial for cellular processes.

~~ATP Synthetase:~~ Essential for production of ATP during cellular respiration. It utilizes the proton gradient that is generated by electron transport chain to synthesize ATP from ADP and inorganic phosphate.

Q Are earthquakes and volcanic eruptions interconnected? If yes then how?

Ans Yes earthquake and volcanic eruptions are interconnected because they occur as a result of tectonic plates.

Tectonic plate movement:

Earthquakes are caused by the movement of tectonic plates. When these plates shift, this creates stress that leads to earthquakes. Volcanic eruptions occur at plate boundaries specially at divergent or convergent boundaries.

Magma movement:

The movement of magma within the earth can trigger earthquakes. As magma ascends through crust, it causes the surrounding rocks to fracture, leading to seismic activity. This occurs before the volcanic eruption as the pressure of accumulating magma increases.

Aftershock and Volcanic activity:

After a significant earthquake, there can be increased volcanic eruption. Earthquake may change the pressure and stress conditions in crust allowing magma to move more freely.

Monitoring and Prediction.

Seismologists often monitor seismic activity around volcanoes to predict eruption. Increased seismic activity can indicate that magma is moving towards surface providing warning of potential eruption.

Question no. 4:
What is noise pollution? Give its harmful effects and ways to curb?

Noise pollution definition:

Noise pollution refers to unwanted or harmful effects of sound in the environment or resulting from industrial activities, traffic, construction and urbanization.

Harmful effects:

Health Issues:

Prolong exposure to loud noise will lead to hearing loss, hypertension, stress, and sleep disturbance.

Impaired Communication:

Excessive noise can hinder ineffective communication leading to misunderstanding.

Impact on Wildlife:

Disrupt animal behavior by affecting mating, feeding, and navigation.

Reduced Quality of life:

Overall it will create irritability and diminished and decreased sense of overall well-being.

Q. What is the importance of fiber in diet?

Digestive health: Fiber aids in digestion by promoting regular bowel movement & preventing constipation.

Management of health by weight control

High fiber is also fulfilling which can control appetite.

Blood Sugar level Control

Soluble fiber slows the absorption of sugar.

Improve heart health.

Soluble fiber can lower the cholesterol level.

Nutrient Intake: Fiber makes you feel full, so you eat less, which helps with weight management.

Characteristics of balanced food platter:-

1. Fruit & Vegetables

Aim for the variety of fruits that include minerals, vitamins and antioxidants.

2. Whole grains

Include type, whole grain rice, quinoa, whole wheat bread and oat fibre and energy.

3. Proteins

Include poultry, fish, legumes, beans and so.

4. Dairy alternatives

Choose low fat dairy products or fortified plant based alternative for calcium and Vitamin D.

Proportionality

Fruits & vegetables: It make half of the plate

Grains: Fill about a quarter of plate

Proteins: Fill about a quarter of plate

Healthy Fats: Healthy fats like olive oil, avocados and nuts in proportion

Last Section.

Internet Standards:

Internet standards are technical specifications and guidelines that ensure interoperability, functionality and security of internet and its various components.

Purpose of Internet Standards:

Interoperability: Different system and devices connect together.

Consistency: Provide uniformity in how data is received and sent.

Security:
Establish protocol for safe data transmission and protection against threats

Key Organizations:

- IETF** Internet engineering task force
Develop and promote voluntary internet standards particularly related to TCP/IP
- W3C** (World Wide Web Consortium)
Focus on standards of web including HTML, CSS and accessibility guidelines
- ISO** (International Organization for Standardization)
Develop international standards that include internet technology

Types of Standards:

Protocol: Set rules for data communication
(eg HTTP for web traffic, SMTP for email)

Format: Define data structure (eg JSON, XML)
that data can be read and processed by different systems

Security Standards:

Establish guidelines for secure communication.
(eg HTTPS, SSL/TLS)

Importance of Standards:

Innovation: Provide a foundation for developers to create new applications and services

User trust: Enhance security (privacy, fostering trust among users and business)

Global reach: Enable a universally accessible internet that can be used by anyone or anywhere

Fat Soluble Vitamins:

They are group of vitamins that dissolve in fats and oil allowing them to be stored in body's fat tissue and liver. There are four main types of fat soluble vitamins: A, D, E and K.

Vitamin A Essential for vision, immune function and health.

Vitamin D

Bone absorption and calcium absorption. Regulate calcium and phosphorus in body.

Vitamin E

Act as antioxidant, protecting cells from oxidative damage. Vital for immune system and skin health in preventing blood clots.

Vitamin K:

Crucial for blood clotting & bone health.

Sources:

Vitamin A:

Carrots, Sweet potato, Spinach, liver.

Vitamin D:

Exposure to sunlight, fatty fish, dairy products.

Vitamin E:

Nuts, seeds, vegetable oil, green leafy vegetables.

Vitamin K:

leafy green (such as kale & spinach), broccoli and fermented food.