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General Science and Ability

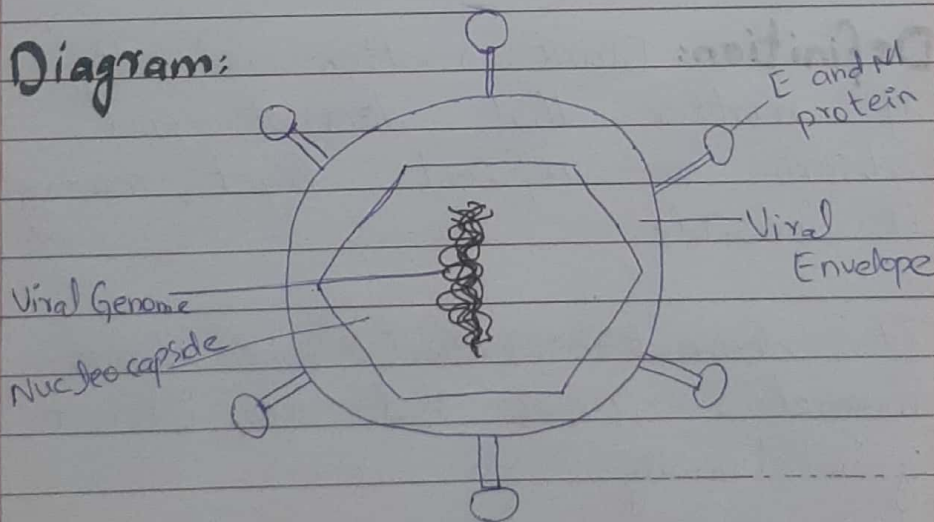
Part II Section - 1

Question - 2:

a. Dengue:

Dengue is a viral infection caused by the dengue virus, which is transmitted to humans primarily through the bites of infected *Aedes aegypti* mosquitoes. These mosquitoes typically bite during the day, especially at dawn and dusk.

Diagram:



Curative Agents:

The dengue virus has four types. If someone catches one type, they get immune to that type. This

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means a person can catch dengue virus more than once, if they are bitten by different type of the virus

Symptoms:

Symptoms of dengue virus includes:
High fever, Severe headache, joint and muscle pain, pain behind the eye, nausea and vomiting, skin rash.

b. Dark Matter:

Definition: Dark matter is a type of matter that does not emit, absorb or reflect light, making it invisible.

It does not interact with electromagnetic forces but does interact gravitationally.

Role in the universe: It makes up about 27% of the universe's mass and energy content. Its gravitational effect helps in holding galaxies together. Without dark matter, galaxies

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would fly apart because visible matter doesn't provide enough gravitational pull.

Evidence: The evidence of existence of dark matter is its gravitational effect on visible matter such as stars and galaxies.

Also, the observation of galaxy rotation curves support the presence of dark matter.

Dark Energy:

Definition: Dark energy is an unknown form of energy that's driving the accelerated expansion of the universe.

Role in the Universe: Dark energy makes up about 68% of the universe's total energy density.

Dark energy pushes things apart leading to expansion of universe to speed up over time.

Evidence: The observation of distant

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Supernovae, large scale-structure show that the universe is expanding fastly thus implying an unknown force.

C. Mitochondria:

Mitochondria are membrane-bound organelles found in nearly all eukaryotic cells.

Structure of Mitochondria:

1. **Outer Membrane:** The smooth outer membrane encloses the mitochondrion and serves as a barrier between it and the rest of the cell.

2. **Inner Membrane:** The inner ^{membrane} folds has many folds called cristae, which increase its surface area. It is involved in ATP synthesis.

3. **Intermembrane space:** This is the space between inner and outer membrane.

4. **Matrix:** The central compartment inside the inner membrane is

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called matrix. It contains enzyme for the krebs cycle, mitochondrial DNA and ribosomes.

Function of Mitochondria:

Mitochondria are essential organelles. The main function of mitochondria is to generate adenosine triphosphate (ATP), the cell's primary energy carrier, through a process called cellular respiration. This process contains several steps:

1. Glycolysis: This occurs in cell's cytoplasm and break down glucose into pyruvate. Pyruvate then enters the mitochondria. Small amount of ATP is produced.

2. Krebs Cycle: Inside the mitochondrial matrix, pyruvate undergoes further break down. It produces electron carriers NADH and FADH. ATP is also produced.

3. Electron Transport Chain: The ETC is located along the inner membrane. Here, FADH and NADH donates electrons to the chain. The proton (H^+ ions) are pumped from the matrix into the intermembrane space, creating a proton gradient.

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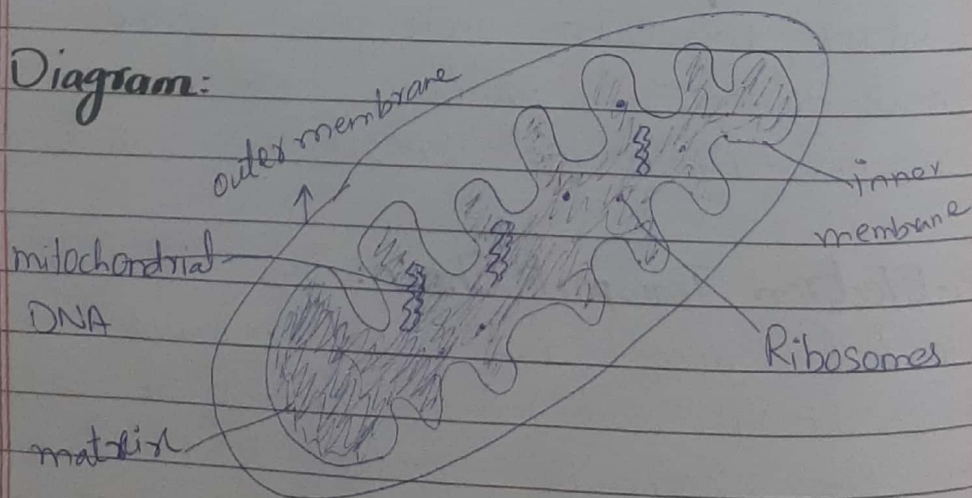
4. ATP Synthesis: The proton gradient in the inner membrane spaces cause proton to flow back into the matrix through a protein called ATP synthase. This flow drives ATP synthase to produce ATP from ADP and inorganic phosphate.

Powerhouse of the Cell:

Mitochondria are termed as powerhouse of the cell because of their critical role in producing ATP, the main energy currency of the cell. ATP generated by mitochondria powers many cellular processes such as:

1. Muscle contraction
2. Biosynthesis of molecules.

Diagram:



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d. Covalent Bond:

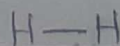
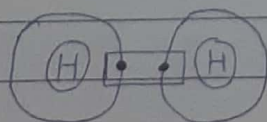
Covalent Bond are a type of chemical bond where atoms share pairs of electrons to achieve stability, typically aiming to complete their outer electron shells.

This type of bond often forms between non-metals atoms that have similar electronegativities, as the shared electrons help both atoms reach a more stable electron configuration.

Types of Covalent Bond:

1. **Single Covalent Bond:** In this bond, two atoms share one pair of electrons. This is the simplest and common type of covalent bond.

Example: Hydrogen (H_2), Chlorine (Cl_2)

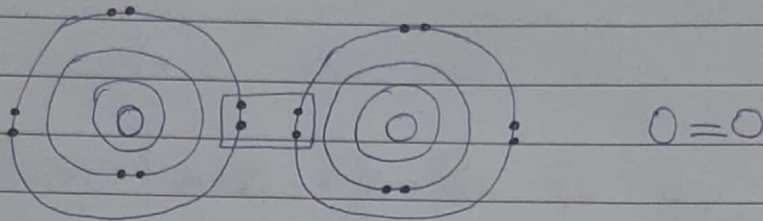


2. **Double Covalent Bond:** In a double covalent bond, two pairs of electrons

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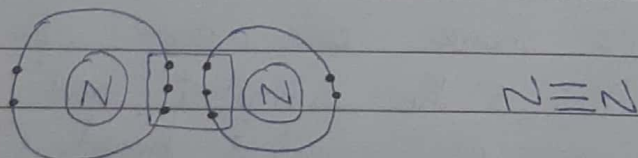
are shared. This bond is stronger and shorter than a single bond.

Example: Oxygen (O_2), Carbon dioxide (CO_2)



3. Triple Covalent Bond: In a triple covalent bond, three pairs of electrons are shared between two atoms. This bond is even stronger and shorter than double bonds.

Example: Nitrogen (N_2), Cyanide (CN^-)



Question-4

a. Noise Pollution;

Noise Pollution is the excessive or disturbing sound that negatively impacts the environment, health and quality

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of life.

Effects of Noise Pollution:

1. **Health Issues:** Constant exposure to loud noise can lead to stress, high blood pressure, hearing impairment, and sleep disturbance.

2. **Mental Health Issues:** High noise levels can cause anxiety, irritability and reduced concentration affecting mental health.

3. **Environmental Impact:** Noise pollution disrupts the natural behavior and communication of wildlife. This affects their survival and leads to ecosystem imbalance.

4. **Sleep Disturbance:** Disturbing sound especially at night can interfere with sleep patterns leading to fatigue.

Ways to curb Noise Pollution:

1. **Use of noise barriers:** Installing soundproof barriers around highways

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and noisy industrial areas can help limit the spread of noise.

2. Strict Regulations: Enforcing laws to limit noise levels especially during night times can help curb noise pollution.

3. Public Awareness: Educating people on the impacts of noise pollution and encouraging responsible behaviour like limiting honking and reducing volume can contribute to a quieter environment.

b. Importance of Fibers in Diet:

Dietary fibers are crucial for maintaining digestive health and overall well being. There are few essentials of fibers in diet:

1. Promote Digestive Health: Fibers add bulk to the stool, making it easier to pass and reducing the risk of constipation.

2. Aid in weight management: High fiber food is more filling, helping

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to reduce appetite and control weight by keeping you full for longer periods.

3. Regulate Blood Sugar Level: Fibers, especially soluble fibers, slow down the absorption of sugar which helps in maintaining stable blood glucose levels.

4. Low Cholesterol: Soluble fibers can help lower LDL cholesterol levels by binding with cholesterol particles and removing them from the body, reducing the risk of heart disease.

Characteristics of balanced food Platter:

A balanced food platter consists of variety of nutrients in a right proportion.

1. Protein: Lean proteins like fish, chicken, legumes are essential for muscle repair and growth.

2. Carbohydrates: whole grains (brown rice, whole-wheat products) that provide

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Sustained energy and are rich in fibre for digestive health.

3. Fats: Healthy fats such as nuts, seeds, olive oil and avocados are essential for brain health and hormone regulation.

4. Vegetables: A variety of colourful vegetables which are high in vitamins, minerals and fiber.

5. Fruits: Fresh fruits provide natural sugars, vitamins and antioxidants. They also add fiber and hydration to the diet.

6. Dairy or Dairy Alternatives: These provide calcium, vitamin D and protein. Options include yogurt, cheese or fortified plant-based alternatives.

7. Water: Hydration is essential for overall health, supporting digestion, nutrient transport and cellular function.

c. Quality and Standard of Drinking Water:

Drinking water quality and standards

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refers to the safe drinking water levels for public consumption.

The quality of water is checked on different bases such as physical standards, chemical standards, biological standard, radiological level, WHO and National Standard, and health and safety implications.

d. Lithosphere:

Lithosphere is the outermost layer of earth. It comprises the crust and the uppermost part of the mantle.

It is the rigid, solid shell that forms the planet's surface, where all terrestrial life exists.

The lithosphere includes both continental crust (landmasses) and oceanic crust (beneath oceans) and is broken into tectonic plates that float on the semi-fluid asthenosphere beneath. These plates move, leading to phenomena like earthquake, volcanic eruption and mountain formation.

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Rocks: Rocks are naturally occurring solids made up of one or more minerals. They are the basics of lithosphere.

Minerals: Minerals are naturally occurring inorganic substances with a specific chemical composition and crystal structure. They are the building blocks of rocks.

Section - II

Question-6

a. Given Data:

$$\text{Arithmetic Mean} = 15$$

Required Data:

Value of k

Formula:

$$\text{Arithmetic Mean} = \frac{\text{Sum of all terms}}{\text{Numbers of terms}}$$

Solution:

Putting the values in formula

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$$15 = \frac{9+8+10+k+12}{5}$$

$$\text{Sum of all values: } 9+8+10+12 \\ = 39$$

$$15 = \frac{39+k}{5}$$

$$5 \times 15 = 39+k$$

$$75 = 39+k$$

$$75-39 = k$$

$$36 = k$$

$$\boxed{k = 36} \text{ Ans.}$$