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SECTION-I

QUESTION : 02

a) What is dengue? Give a brief account of its causative agents and its symptoms.

DENGUE:

According to World Health Organization, Dengue is a viral infection that spreads from mosquitoes to people. It is more common in tropical and sub-tropical climates.

Dengue is a viral infection transmitted primarily by Aedes mosquitoes, particularly Aedes aegypti. This infection can cause a range of symptoms, from mild fever to severe illness.

CAUSATIVE AGENTS:

Dengue, an acute febrile illness, is caused by infection with any four related single-steranded RNA viruses of the genus Flavivirus, dengue virus 1, 2, 3 or 4.

-Centers for disease control and Prevention.

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In more clear terms, dengue is caused by the dengue virus (DENV), which has four distinct serotypes:

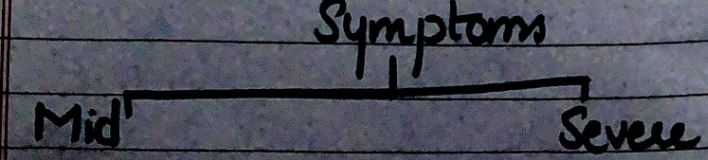
- DENV-1
- DENV-2
- DENV-3
- DENV-4

Infection with one ~~ster~~ serotype usually provides immunity to that specific type, but not to others, which can lead to severe dengue upon subsequent infections

SYMPTOMS:

Most people with dengue have mild or no symptoms and gets better in 1-2 weeks. In some cases dengue can be severe and life threatening.

If symptoms occur, they usually begin 4-10 days after infection and last for 2-7 days.



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Mild Symptoms:

- High fever (40°C / 104°F)
- Severe headache
- pain behind the eyes
- muscle and joint pains
- nausea
- vomiting
- swollen glands
- rash

Severe Symptoms:

Individuals who are infected for the second time are at a greater risk of severe dengue. These symptoms often come after fever has gone away.

- Severe abdominal pain
- Persistent vomiting
- Bleeding gums or nose
- Fatigue or restlessness
- Blood in vomit or stool
- Pale and cold skin.

(b) Explain dark matter and dark energy

OVERVIEW:

Everything that scientists can observe in the universe, from

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people to planets, is made of matter. Matter is defined as any substance that has mass and occupies space. But, there is more to the Universe than the matter we can see.

Dark matter and Dark Energy are two fundamental components of the universe that remain mysterious and are crucial to our understanding of 'Cosmology'.

DARK MATTER:

According to NASA, "dark matter is a form of matter that does not emit, absorb or reflect light, making it invisible and detectable only through its gravitational effects on visible matter and radiation"

Astronomers did not know about the existence of dark matter until the 20th Century.

Swiss astronomer Fritz Zwicky coined the term while studying Coma galaxy cluster. The speed at which a galaxy within a galaxy

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cluster move depends on the total mass and size.

Discovery of dark matter:
Zwicky observed that galaxies in the Coma cluster move faster than the amount of matter could explain.
In 1970's U.S astronomers confirmed the existence of dark matter by studying how individual galaxies rotated. They realized galaxies may contain invisible mass made of dark matter.

Composition of dark matter:
The exact composition of dark matter is still unknown but is believed to be made up of exotic particles that do not interact with electromagnetic forces such as axions.

DARK ENERGY:

Dark energy is a mysterious force that is thought to be responsible for the accelerated expansion of the universe.
Dark energy may compose

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roughly 68% of the universe, but scientists know even less about dark matter energy than they know about dark matter.

Discovery of dark energy:

Since the late 1920's, astronomers have known that the universe is expanding. In the 1990's, observations of distant star explosions, called supernova, showed that the universe expanded more slowly in the past than it does now. The reason remains unclear, but the leading explanation is that the universe contains something that has the gravitational effect repulsive it pushes the universe apart instead of pulling it back together. This phenomena is called dark energy by NASA.

Nature and composition of dark energy:

The nature of dark energy is not well understood, but is often associated with

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the cosmological constant, a term introduced by Elbert Einstein in his equations of general relativity.

Key differences:

Role:
Dark matter acts as a gravitational glue that holds ~~gto~~ galaxy clusters and galaxies together.
While, dark energy drives the accelerated expansion of the universse.

Proportion:
Dark matter constitutes about 27% of the universse's total mass-enegy content.
While, dark energy constitutes about 68%.

C) Discuss structure and function of mitochondria. How is it the poweerhouse?

MITOCHONDRIA:
~~Micho~~
Mitochondria are double-membrane-bound organelles found nearly in all

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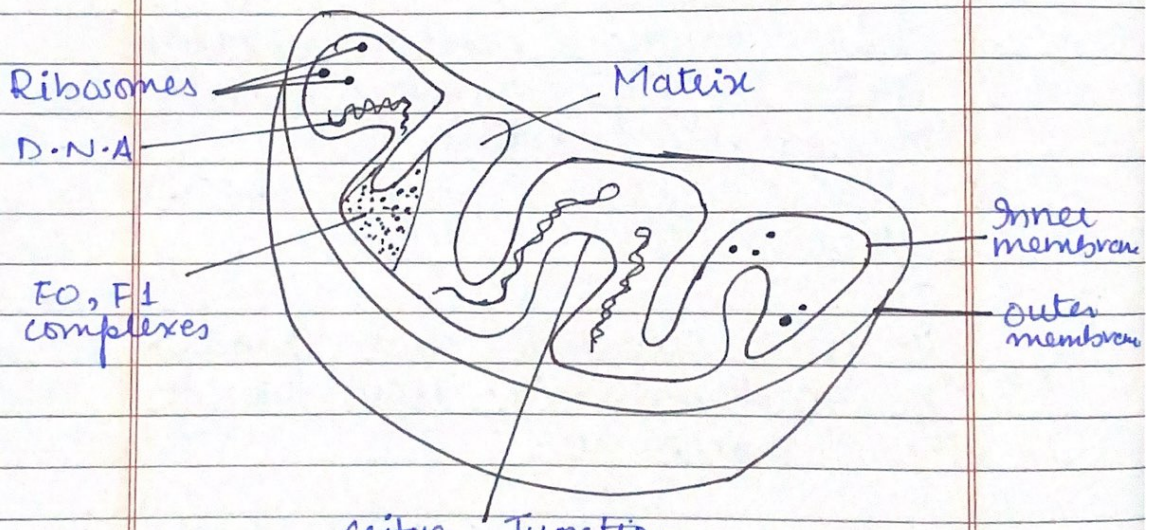
eukaryotic cells. They are involved in the manufacturing and supply of energy to the cell. Therefore mitochondria may be called Power-house of the cell. The size and number of mitochondria varies in different cells.

Structure of Mitochondria:

The structure of mitochondria includes:

Outer membrane
Inner membrane
Intermembrane space
Matrix



"Structure of Mitochondria"

The mitochondria may be vessicle rod-like or filament

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shaped. Mitochondria are bounded by two membranes.

Outer membrane:

→ Smooth and permeable to small molecules and ions.

Inner membrane:

The inner membrane is highly folded into structures called Cristae which increases the surface area for chemical reactions. The inner surface of cristae contains small knob like structures called F_1 particles. These F_1 particles are suspended inside the matrix.

Inter-membrane space:

The space between outer and inner membrane space. Plays a role in the electron transport chain as protons are pumped into this space.

Matrix:

The innermost compartment, containing enzymes for the citric acid cycle (Krebs' cycle), mitochondria DNA, ribosomes and various metabolic intermediates.

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FUNCTION OF MITOCHONDRIA:

Critical role in energy production
Many important metabolic processes takes place in mitochondria. These are:

- Kerbs Cycle
- Aerobic Respiration
- Fatty acid metabolism

Energy is released from organic food during these metabolic processes. This energy is transfered to ATP (adenosine triphosphate) rich compound
ATP provides energy to cell on demand s and ATP is broken to ADP.
This ADP absorbs energy from mitochondria and again becomes ATP.

ADP + energy → ATP.

MITOCHONDRIA AS THE POWERHOUSE OF A CELL:

Mitochondria are termed as the powerhouse of a cell because they are the primary site for ATP production through aerobic respiration. This processes is essential for

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meeting the energy demands of the cell, allowing it to perform various functions necessary for survival, growth and reproduction.

The efficiency of ATP production in mitochondria underlies many cellular activities including muscle contractions, nerve impulse propagation, and biosynthetic reactions.

d) What are covalent bonds? Explain types along with elaborating structures.

COVALENT BONDS:

Covalent bonds are chemical bonds formed when two atoms 'share' one or more pairs of electrons. The sharing of electrons allow each atom to achieve a stable electron configuration, often resembling that of noble gases.

Types of Covalent bonds:

- Single Covalend bond
- Multiple covalent bonds

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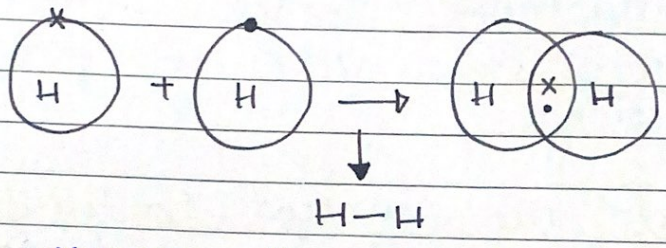
Single Covalent bond:

A single covalent bond is represented by a single line between the atoms.

e.g H – H.

Hydrogen gas forms the simplest covalent bond in the diatomic hydrogen molecule.



H–H

For attaining the nearest noble gas configuration, each hydrogen gas atom share its valence electron with other hydrogen atom and forms a covalent bond in hydrogen molecule.

Multiple Covalent bonds:

Some atoms can bond together by sharing:

two - pairs of electrons:
Double Covalent bond

three - pairs of electrons:
Triple Covalent bond

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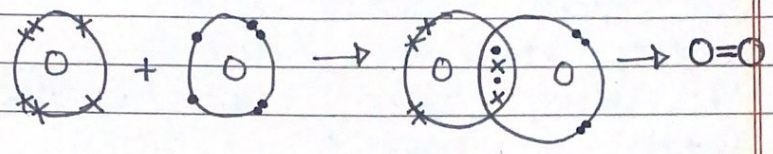
Double Covalent bond:

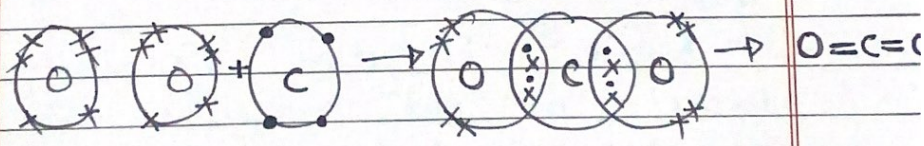


Two oxygen atoms (2,6)

Oxygen molecule

A double covalent bond is represented by a double line between the atoms for example O=O. Oxygen atoms each require two atoms to complete their outer shells, so they share two pair of electrons and thus, double covalent bond is formed.

Triple Covalent bond:



Two oxygen atoms (2,6) + Carbon atom (2,4)

Carbon dioxide molecule

Each oxygen atom needs to gain two electrons. But the Carbon atom requires four electrons to complete its outer shell.

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So, two oxygen atoms form two bonds with Carbon, so that carbon atom has eight electrons around it. In this way triple Covalent bond is formed.

QUESTION: 04

a) What is noise pollution? Give its haemful effects and ways to curb it.

NOISE POLLUTION:

According to the Envisonmental Protection Department of Punjab, Pakistan, noise pollution is the propagation of noise with ranging impacts on the activity of human or animal life.

Noise pollution generally refers to the excessive or hdemful levels of noise in the envisonment that can have negative effects on human health, wildlife, and overall quality of life.

Noise ⟶ deeived from ⟶ Nausea (sickness)
Latin word

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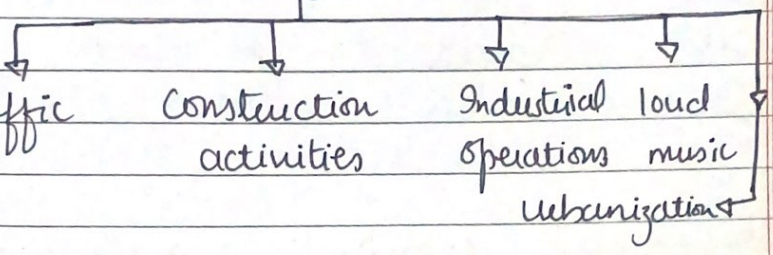
The intensity of sound is measured in decibles (dB). The faintest sound that humans can hear is 1dB.

Sources of Noise Pollution



Haemful effects of Noise pollution:
The haemful effects of noise pollution can be categorized as follows:

- Health issues
- Cardiovascular problems
- Impaired cognitive functions
- Impact on wildlife
- Reduced quality of life

Health issues:

- Noise pollution can cause hearing loss, as prolonged exposure to high noise levels can lead to permanent hearing damage.
- Chronic noise exposure can increase stress levels, leading to anxiety and mental health issues.

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- Noise pollution can also disrupt sleep patterns, leading to insomnia and fatigue.

Cardiovascular problems:
Numerous researches have linked high noise levels with increased to blood pressure, heart disease and other cardiovascular issues.

Impaired cognitive function:
Noise can negatively affect concentration, learning and memory particularly in children and students.

Impact on wildlife:
Noise pollution can interfere with animal communication, mating rituals, and hunting behaviours, disrupting ecosystems.

Reduced quality of life:
Excessive noise can decrease overall quality of life, leading to decreased productivity, social interaction, and enjoyment of recreational activities.

Ways to Curb Noise Pollution:
Following methods can be

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Noise Pollution:
s can be
incorporated to curb noise pollution:

- Urban Planning and zoning
- sound proofing and insulation
- Regulating noise levels
- Promoting public awareness
- Vegetation and landscaping

Urbanplaning and zoning:

- Implement zoning laws to separate residential areas from noisy industrial and commerical zone. Green spaces and buffer zones can be included in designs.

Soundproofing and insulation:
Encourage the use of soundproof materials in buildings, such as double glazed windows.

Promoting public awareness:
Educate the public about effects of noise pollution and encourage quieter practices.

Vegetation and landscaping:
Planting trees and shrubs create natural buffer zones which help to absorb noise and deflect noise pollution.

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5) What is the importance of fibers in diet? How would be a platter of food considered balanced?

Importance of Fibers in diet:

Dietry fibers are essential components of a healthy diet and plays several crucial roles in maintaing overall health.

- Digestive Health
- Weight management
- Blood sugar control
- Heart rate and health
- Reduced risk of certain diseases

Dietry fiber prevents from the risk of constipation, while supporting Gut health.

Dietry Fiber also tend to be more filling thus helping in reducing overall calorie intake.

Soluble fiber can slow down the absorption of sugar, which helps stabilize blood sugar levels.

Consuming adequate fiber is associated with a reduced risk of chronic diseases, including cardiovascular disease and obesity.

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Characteristics of a balanced food platter:

A balanced food platter should provide a variety of nutrients to meet the body's dietry needs.

Key components include:

→ Macronutrients:

Carbohydrates: fruits, vegies.
Proteins: Poultry, fish.
Fats: olive oil, nuts.

→ Fruits and vegetables:

Aiming for variety of colours and types to ensure a wide range of vitamins, minerals.

→ Fiber-rich foods:

Whole grains like brown rice, legumes.

→ Portion control:

Seeing appropriate portions is necessary.

→ Hydration:

Including water and other healthy beverages; like herbal teas, fresh fruit juices.

→ Moderation:

Limit on the intake of sugar, salts.

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c) Elaborate drinking water quality and standards

Drinking water quality refers to the chemical, physical, and biological characteristics of water that determine its suitability for human consumption. Ensuring safe drinking water is crucial for public health, and various standards and regulations are established to protect water quality.

World Health Organization guidelines for drinking water quality were set up in Geneva, 1993 and are the international reference points for standard setting and drinking water safety.

These standards are not binding, so any country can either follow these guidelines, or devise their own.

Pakistan Environmental Protection Agency finalised National Standards for Quality Drinking Water in 2 June 2008. These standards state that

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d) Explain rocks an

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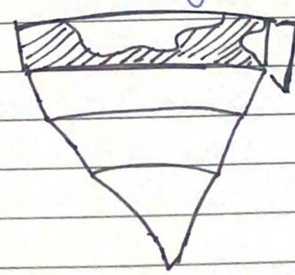
drinking water must be:

- Free of suspended solids
- Free of micro-organisms
- Free of toxic chemicals

d) Explain Lithosphere. What are rocks and minerals?

LITHOSPHERE:

The lithosphere is the outermost layer of the Earth. It is rigid, and composed of crust and the portion of the upper mantle that behaves elastically. The outermost shell of a rocky planet, the crust defined as the basis of its chemistry and mineralogy.



The lithosphere is approximately 100Km (62 miles) deep, but can vary in thickness depending upon location:

↳ It is thicker beneath land masses.

↳ It is thinner beneath Oceanic regions.

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Key Characteristics:

Composition:
The lithosphere consists of rocks and minerals that make up the Earth's crust. It contains silicate minerals.

Structure:
The lithosphere is divided into tectonic plates that float on the semi-fluid asthenosphere beneath.

Role in Earth System:
The Lithosphere interacts with the atmosphere, hydrosphere and biosphere, influences weather patterns, water drainage and habitats.

Resource Reservoir:
Lithosphere is critical source of natural resources including minerals, fossil fuels, and groundwater.

ROCKS and MINERALS:

Rocks and minerals are fundamental components of lithosphere.

Minerals:
Minerals are naturally occuring, inorganic solids, with a specific chemical comparition and a crystalline structure. They are

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the building blocks of rocks. Quartz (SiO_2), Mica are some common examples of minerals.

Rocks:

Rocks are aggregates of one or more minerals. They form through various geological processes and can be classified into three main types based on their formation

- Igneous rocks
- Sedimentary rocks
- Metamorphic rocks

Igneous rocks are formed after the cooling of molten rocks. examples include: Granite.

Sedimentary rocks are formed from the accumulation of mineral and organic particles e.g Sandstone, Limestone.

Metamorphic rocks are formed from existing rocks subjected to high heat and pressure e.g, marble.

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SECTION - II

(a)

→ Determine k if arithematic mean of 9, 8, 10, K, 12 is 15

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

$$= 9+8+10+K+12$$

$$= 39+K$$

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

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

$$75 = 39+K$$

$$K = 75 - 39$$

$$K = 36$$

Hence, the value of K = 36 so K is the missing value.

(b)

Let the initial quantity of sugar solution in mind be represented by 'S'.
Quantity of coloured water be represented by 'C'.
Given the 4:3 ; we can express the relationship as :

$$\frac{S}{C} = \frac{4}{3}$$

From this, we can write.

$$S = \frac{4C}{3}$$

Day:_____ Date:_____ Day:_____

SECTION - II

(a)

→ Determine k if arithematic mean of 9, 8, 10, k, 12 is 15

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

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

$$= \frac{39+K}{5}$$

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

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

$$75 = 39 + K$$

$$K = 75 - 39$$

$$K = 36$$

Hence, the value of K = 36 so K is the missing value.

(b)

Let the initial quantity of sugar solution in mind be represented by 'S'.
Quantity of coloured water be represented by 'C'.
Given the 4:3 ratio we can express the relationship as:

$$\frac{S}{C} = \frac{4}{3}$$

From this, we can write.

$$S = \frac{4C}{3}$$

Day: Date:

C can be expressed as:

$$C = \frac{3}{4}S.$$

Add Coloured water : 10 litres changing the quantity:

$C+10$

The new ratio is

$$\frac{S}{C+10} = \frac{4}{5}$$

Now substitute the value:

$$\frac{S}{\frac{3}{4}S + 10} = \frac{4}{5}$$

Cross mutiply:

$$5S = 4\left[\frac{3}{4}S + 10\right]$$

$$5S = 3S + 40$$

Isolate S:

$$5S - 3S = 40$$

$$2S = 40$$

$$\boxed{S = 20}$$

The initial quantity of sugar solution is 20 liters.

→ (C)

Given Radius = $r = 12cm$.

Formula:

$$V = \frac{4}{3}\pi(12)^3.$$

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$12^3 = 12 \times 12 \times 12 = 1728.$

Substituting the value:

$$V = \frac{4}{3}\pi (1728)$$

$$\frac{4}{3} \times 1728 = \frac{6912}{3} = 2304.$$

Multiplying by π.

$$V = 2304 \times 3.14$$

$$V = 7238.23 \text{ cm}^3.$$

The volume of football with a radius of 12cm is:

$7238.23 \text{ cm}^3.$