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Q. No.2.ii What is dengue? Give a brief account of its causative agents and its symptoms.

1⇒. What is dengue:-

Dengue is a mosquito-borne viral disease that has rapidly spread in all regions in recent years. Dengue virus is transmitted by a female mosquitoes mainly of the species Aedes aegypti.

1. Aedes mosquito transmits chikungunya, yellow fever and Zika infection.
2. Dengue is widesspread throughout the tropics, with local variations in risk influenced by rainfall, temperature and unplanned rapid urbanization.

2⇒. Give a brief account of it's causative agents and its symptoms.

2.1. Dengue Haemorrhagic Fever:- Severe

dengue also known as Dengue Haemorrhagic fever was first recognized in the 1950s during dengue epidemics in philippines and Thailand. Today, severe dengue affects most Asia and Latin American countries, has become leading cause of hospitalization and death among children and adults.

2.2 Serotypes of virus:-

Serotypes of virus cause dengue.

i. DEN-1
ii. DEN-2
iii. DEN-3
iv. DEN-4

⇒. Recovery from infection by one provides lifelong immunity against that particular serotype. Cross-recovery to the other serotypes after recovery is only partial and temporary.

3. Symptoms of Dengue:-

i. Fever
ii. flue-like illness
iii. Severe headache
iv. Pain behind eyes
v. muscle and joint pains
iv. nauser and vomiting.

3.1. Symptoms last for 2–7 days after an infection period 4–10 days after bite from infected mosquito.

4. Transmission of Dengue.

4.1. The Aedes aegypti mosquito is the primary vector of dengue, and virus is transmitted to humans through female mosquitoes.

5. Immunization:-

In late 2015 and early 2016, the first dengue vaccine, Dengvaxia (CYD-TDV). by Sanofi Pasteur, use in 9–45 years of age living in endemic areas.

6. Prevention and control:-

1. Preventing mosquitoes from accessing egg-laying habitats by environmental management and modification.
2. Covering, emptying and cleaning of domestic water storage containers.
3. Applying appropriate insecticides to water storage outdoors containers.
4. Improving community participation and mobilization for sustained vector control.

Q.2. (ii) Explain dark matter and dark energy.

Dark Matter	Dark Energy
1. Invisible: Dark matter doesn't emit, absorb, or reflect any electromagnetic radiation, making it invisible.	**1. Mysterious component:** Dark energy drives the accelerating expansion of the universe.
2. Unseen mass: Dark matter's presence is inferred through gravitational effects on visible matter.	**2. 68% of Universe:** Dark energy comprises approximately 68% of the universe's total mass-energy density.
3. 27% of Universe: Dark matter comprises approximately 27% of the universe's total mass-energy density.	**3. Negative Pressure:** Dark energy comprises approximately 68% of the universe's total mass-energy density.
4. Galaxy [redacted] Rotation: Dark matter helps explain the rapid rotation curves of galaxies.	**4. Accelerating expansion:** Dark energy causes the universe's expansion to accelerate.
5. Galaxy clusters. Dark matter binds galaxy	**5. Cosmic inflation:** Dark energy may be linked to

Dark matter	Dark energy
Clusters togather	cosmic inflation in the early universe
6. Large-scale structure: Dark matter influences the universe's large-scale structure.	6. Distance and redshift: Dark energy affects the relationship between distance and redshift.
7. Weak interaction: Dark matter particles likely interact via weak nuclear force and gravity.	7. Type 1a supernovae: Observations of type 1a supernovae helped discover dark energy.
8. Cold dark matter: Most popular model assumes dark matter particles are cold, meaning they move slowly.	8. Quintessence model: One theory suggests dark enenergy is a dynamic field.
9. Detection efforts: Scientists use indirect detection methods, such as gravitational lensing gamma-ray searches.	9. Vacuum energy: Dark energy might be related to [redacted] vacuum energy.
10. Unknown Composition: Dark matter's exact composition remains unknown.	10 Unknown origin: Dark energy's origin and nature remain unknown.

Q. 2 (c) Discuss Structure and function of mitochondria. How is it the powerhouse?

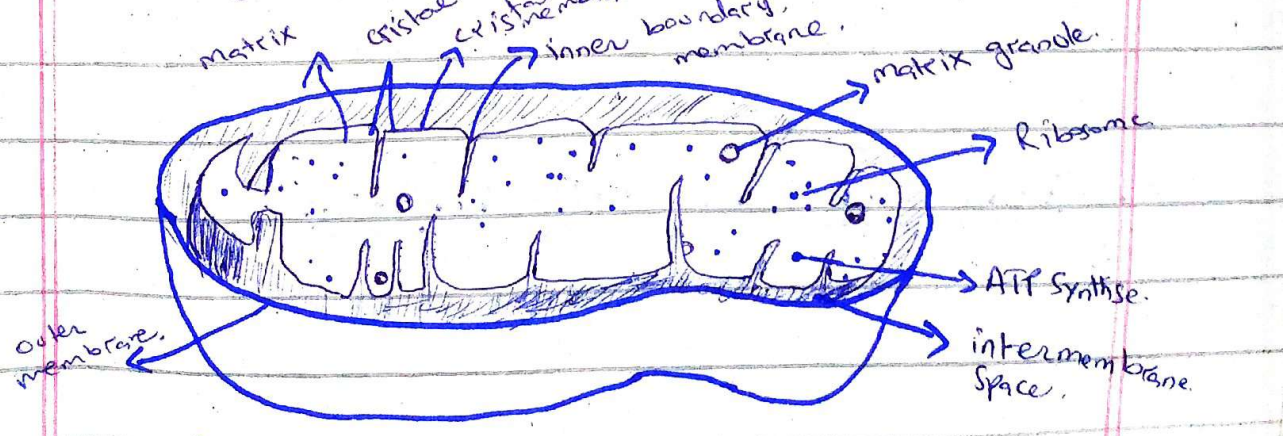
1. Discuss Structure and function of mitochondria:-

1.1. Introduction:- Mitochondria are very important organelles. They are present only in 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.

2. Structure of Mitochondria:-

There are five distinct parts to a mitochondrion:

(i) The outer mitochondrial membrane.
(ii) The intermembrane space (the space between the outer and inner membrane)
iii. The inner mitochondrial membrane
iv. The cristae space (formed by infoldings of the inner membrane)



(Structure of Mitochondria)

v. The matrix (space within the inner membrane) which is a fluid.

vi. Mitochondria have folding to increase surface area, which in turn increase ATP production.

vii. Mitochondria is roughly oval-shaped.

viii. It is called energy-house of the cell because it synthesis ATP.

3. Chemical composition of Mitochondria:-

i. Mitochondria composed of proteins and lipids.

ii. The mitochondrial matrix contains a large number of enzymes, coenzymes, organic and inorganic cells.

iii. Mitochondria also contain DNA and ribosomes.

4. Formation of New mitochondria:-

Mitochondria are self-replicating organelles. It means new mitochondria are formed by division of old mitochondria.

5. Functions of Mitochondria:-

i. Many important metabolic processes take place in mitochondria.

ii. These are Kerbs cycle, aerobic respiration, fatty acid metabolism, etc.

iii. ATP Provides energy to cell on demands and ATP is broken to ADP. This ADP absorbs energy from mitochondria and again because ATP.

6. → **How is it the powerhouse?:-**

i. **Efficient energy Production:-** Mitochondria generate 36-38 ATP molecules per glucose molecule.

ii. **High-energy yield:-** Mitochondria Produce 15-20 times more ATP than glycolysis

iii. **Cellular energy regulation:-** Mitochondria adjust energy production according to cellular demands.

Q.2. (d) What are covalent bonds? Explain types along with elaborating structures

1 ⇒ **What are covalent bond:-**

Covalent bonds are chemical bonds between atoms that share one or more pairs of electrons to form a stable molecule. This sharing

of electrons leads to a strong and stable connection between the atoms.

2. Characteristics of covalent bonds:-

i. **Shared electrons:** Covalent bonds involve sharing of electron pairs.

ii. **Strong bond:** Covalent bonds are relatively strong and stable.

iii. **Directional:** Covalent bonds have specific directions and angles.

iv. **Polar or nonpolar:** Covalent bonds can be polar or nonpolar.

3 ⇒ Explain the types along with structures:-

There are different types of covalent bond.

3.1. Sigma (σ) Bonds:-

i. Formation : End-to-end overlap of atomic orbitals.

ii. Structure : Linear, head-on overlap.

iii. Examples : Hydrogen (H_2), CH_4.

$H-H$.

3.2. Pi (π) Bonds :-

i. Formation : Side-by-side overlap of atomic orbitals.

ii. Structure : Parallel, side-by-side overlap.

iii. Examples : C_2H_4, C_2H_2, $H-C\equiv C-H$.

3.3. Single Covalent Bonds:

i. One shared electron pair.

ii. Structure: Sigma σ bond, e.g. H-H.

3.4. Polar covalent Bonds:

i. Unequal sharing of electrons.

ii. Structured: Bent or V-shaped.

iii. Examples: Water H_2O, NH_3.

3.5 Non-Polar Covalent Bonds:-

i. Equal sharing of electrons.

ii. Typically found in molecules with similar electronegativities.

iii. Structure: Linear or Symmetrical.

iv. Example: CH_4. H−C−H.

3.6. Coordinate Covalent Bonds:-

i. One atom donates both electrons in the shared pair.

ii. Typically found in molecules with lone pairs.

iii. Structure: Variable.

iv. Example: NH_4^+.

Q.4. (a): What is noise pollution? Give its harmful effects and ways to curb.

1⇒. What is noise Pollution:-

Noise pollution, also known as

Sound pollution, is the excessive, unwanted, or disturbing sounds that interfere with the natural environment and affect human heath, wildlife and quality of life.

2. Sources of Noise Pollution:-

i. Transportation (traffic, airports, trains)
ii. Industrial activities (factories, construction)
iii. Music and entertainment
iv. Household appliances
v. Construction and demolition
vi. Maritime activities
vii. Sirens and alarms

3 ⇒ Give its harmfull effects and ways to curb:-

3.1. Physical Health:

i. Hearing Loss.
ii. Sleep Disturbances.
iii. High blood Pressure.
iv. Headaches and Migraines.

3.2. Mental Health:

i. Stress and Anxiety.
ii. Fatigue and Irritability.
iii. Depression.
iv. Mood Swings.

4 ⇒ Ways to Curb Noise Pollution:-

4.1 Individual Actions:-

i. Wear Earplugs
ii. Keep Volume Low.
iii. Avoid Loud Noises.

4.2. Community Actions:-

i. Impliment noise regulations.
ii. Organize noise-reduction initiatives.
iii. Support noise-reduction research.

4.3. Government Initiatives:

i. Enact noise pollution laws.
ii. Set noise standards.
iii. Promote noise-awareness campaigns.

Q. No. 4 (b). What is the importance of fibers in diet? How would be a platter of food considered balanced?

1 ⇒ What is the importance of fiber in diet:-

Dietary fibers are essential nutrients that play a crucial role in maintaining a healthy digestive system, promoting overall well-being, and reducing the risk of chronic diseases.

2 ⇒ Importance of fiber in diet:-

2.1. Digestive Health:-

i. Supports healthy gut bacteria
ii. Prevents constipation.
iii. Reduces diarrhea risk.

2.2. Chronic Disease Prevention:-

i. Lower cholesterol levels.
ii. Regulates blood sugar level.
iii. Reduces inflammation.

2.3. Additional Benefits of fiber:-

i. Enhances nutrient absorption
ii. Promotes satiety and reduces hunger.
iii. May reduce cancer risk.

3. How would be a platter of food considered balanced :-

3.1. Carbohydrates (45-65%):-

i. Whole grains (brown rice, whole wheat)
ii. Fruits (apples, bananas, berries)
iii. Vegetables (leafy greens, carrots)

3.2. Protein (15-20%)

i. Lean meats (chicken, fish)
ii. Nuts and seeds (almonds, chia seeds)
iii. Dairy (milk, yogurt, cheese)

3.3. Healthy fats (20-35%)

i. Avocado
ii. Nuts and seeds (walnuts, chia seeds)

iii. Fatty fish (salmon,).

3.4. **Fiber-Rich Foods (25-30 grams):-**

i. Fruits (apples, bananas, berries).

ii. Legumes (beans, peas).

iii. Whole grains (brown rice, whole wheat).

Q.2.(c). Elaborate drinking water quality and standards.

1. What are the standards of drinking water:-

Drinking water standards are crucial for ensuring the water we drink is safe and healthy. The world Health organization (WHO) has set guidelines for drinking water quality, which include parameters such as pH, temperature, tibidity, total dissolved solids, hardness, chloride, fluoride, and microbiological contaminants.

2. Physical Parameters:-

1. **PH.** According to Pakistan Standards PH is 6.5-8.5 and According to WHO Standards PH is 6.5-8.5.

2. **Temperature:-**

Less than or equal to 30°c.

3. **Colour:-**

≤ 15 true colour units.

4. **Turbidity:-** Less than or equal to 1 NTU (Nephelometric Turbidity Units)

5. **Taste:-** Non objectionable.

6. **Odour:-** Non objectionable / Acceptable.

3⇒ **Chemical Parameters:-**

i. **Total Dissolved Solids (TDS):-**

Less than or equal to 500 mg/L.

ii. **Hardness:-** Less than or equal to 200 mg/L.

iii. **Chloride:-** Less than or equal to 250 mg/L.

iv. **Fluoride:-** Between 0.5 and 1.5 mg/L.

3⇒ **Bacterial / Microbiological Parameters:-**

i. **E. Coli:-** E. coli must not be detectable in any 100 ml sample.

Q. 4. (d): Explain Lithosphere. What are rocks and minerals?

1⇒ **Explain Lithosphere:-**

The lithosphere is the outermost solid layer of the earth, comprising the crust and the uppermost part of the mantle. It is broken

into several large plates that float on the more fluid asthenosphere.

2. Composition of lithosphere:-

i. Crust: 5-70 km thick, composed of rocks and minerals.

ii. Upper mantle: 35-410 km thick, composed of hot, viscous rock.

3. Characteristics of Lithosphere:-

i. Rigid and brittle.

ii. Broken into tectonic plates.

iii. Varies in thickness and composition.

4. Types of Lithosphere:-

A. Continental lithosphere.

B. Oceanic lithosphere.

C. Transitional lithosphere.

2. What are rocks and minerals:-

Rocks and minerals are building blocks of earth's lithosphere.

Rocks	Minerals
1. Definition: A rock is naturally occuring solid mass of mineral material	1. Definition:- A mineral is a naturally occuring inorganic solid substances
2. Types: Igneous, Sedimentary and Metamorphic.	2. Types: oxides, silicates, carbonates, and Halides.

3. Formation: Rocks are formed through geological processes such as cooling and compression.	**3. Formation:** Minerals form through geological processes such as crystallization.
4. Importance: Rocks are used in construction, energy production, and metal extraction.	**4. Uses:** Minerals are used in jewelry, electronics, construction, industrial applications.

Section - II

Q.No 6 (a)

Determine the "k" value if the arithmetic mean of 9, 8, 10, k, 12 is 15.

Arithmetic mean = 15

Total count of numbers = 5

Sum of given numbers = $9+8+10+K+12$

$= 39+K$

Arithmetic mean $= \frac{39+k}{5}$

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

$75 = 39+K$

$K = 75-39$

$\boxed{K = 36}$

Value of k is 36.

Q. 6(b). A mixture contains sugar solution and colored water in the ratio of 4:3. If 10 liters of colored water is added to the mixture, the ratio becomes 4:5. Find the initial quantity of sugar solution in the given mixture.

Initial ratio of colored water = 4:3.

Let-

initial quantity of sugar solution = 4 liters.

initial quantity of colored water = 3 liters.

Initial total mixture = $4x + 3x = 7x$ liters.

After adding 10 liters colored water.

then.

New quantity of colored water = $3x + 10$.

Total mixture = $4x + (3x + 10)$

$= 7x + 10$.

new ratio of sugar solution to colored water = 4:5

So $\frac{4x}{(3x+10)} = \frac{4}{5}$

by cross multiplying.

$20x = 4(3x + 10)$.

$20x = 12x + 40$.

$x - 12x = 40$

$x = 40$

$x = 5$.

initial quantity of sugar solution $= 4x$

$4(5) = 20$ liters.

So initial quantity of sugar solution in the mixture is 20 liters.

Q.6 (c) What will be the volume of a football with a radius of 12 cm?

Sol.

Formula for volume of football

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

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

$$V = \frac{4}{3} \times 3.14 \times 1728$$

$$V = 7234.2\ cm^3$$

Converting to liters. So $V \simeq 7.23$

Volume of football is 7.23.

Q.6 (a). Given a series $-10, -8, 6, 40, 120$? Find what number would come in place of the question mark?

Sol.

Given Series.

$-10, -8, 6, 40, 120, ?$

$-10+2 = -8.$

$-8 \times -1 + 4 = [redacted] = 12$

$12 \times 2 + 80 = 104$

$104 \times 3 = 312.$

So next no. is 312.

Q. No. 7. (a) If 20% of $x = y$, what is the value of y% of 20 in terms of x?

$$20\% \text{ of } x = y.$$

$$y = 0.2x.$$

$$y\% \text{ of } 20 = \frac{y}{100} \times 20.$$

$$= \frac{0.2x}{100} 20.$$

$$= 0.04x.$$

So, $y\%$ of $20 = 0.04x$

$$\boxed{y\% \text{ of } 20 = 0.04x}$$

Q. No. 7. (b) P and Q have an average salary (monthly) is Rs. 5050. Q and R have an average monthly income Rs = 6250, while P and R have an average monthly income Rs. 5200. Find the monthly salary of P?

$$\frac{P+Q}{2} = 5050$$

$$P+Q = 10100 \quad \rightarrow (1)$$

$$\frac{Q+R}{2} = 625$$

$$Q+R = 12500 \quad \rightarrow (2)$$

$$\frac{P+R}{2} = 5200$$

$$P+R = 10400 \quad \rightarrow (3)$$

Adding equation (1), (3), and -(2) then

$$(P+Q)+(P+R)-(Q+R) = 10100 + 10400 - 12500$$

$$2P = 8000$$

$$P = 4000$$

So monthly salary of P is 4000.