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General Science And Ability

Question Number : 1

- a) Briefly explain lipids. What are some major types? What are their functions?

Ans:

Lipids:

Lipids are basically a diverse group of organic compounds that are insoluble in water but are soluble in non-polar solvents. They are primarily composed of carbon, hydrogen and oxygen. Some lipids may also contain phosphorus, sulphate and sulphur. Lipids play crucial roles in energy storage, structural integrity of cell membrane and signalling pathways.

Major types of lipids:

1. Fats and oils (Triglycerides): They are composed of glycerol and three fatty acids. Fats are solid at room temperature, while oils are liquid.
2. Phospholipids: They contain a glycerol backbone, two fatty acids and a phosphate group. They act as major component of cell membrane.

- 3) **Steroids:** They include cholesterol, hormones like testosterone and estrogen and bile salts. They have characteristics like that of rings.
- 4) **Waxes:** They are long-chain fatty acids and alcohol that provide protecting coating for plants and animals.

Functions of lipids:

- 1) They act as energy house and provide two times more energy than carbohydrates
- 2) They also have to perform structural roles for cell membrane, ensuring structural stability
- 3) The fat content of lipids provide insulation against changes in temperature and cushion vital organs.
- 4) Chemical signalling via steroids and hormones also happen because of lipids
- 5) Water proofing protect plants leaves and animal fur from water loss.

b) Enlist a few measures for energy conservation and its sustainable use.

Energy conservation as the name goes, is really an important process to carry out the daily tasks of life for human beings. Below mentioned are the few measures for energy conservation.

1. **Efficient Energy Use:** Light saving electronic devices such as energy inverters with A++ energy consumption grading helps a lot in domestic and commercial conservation of energy.
2. **Reliance on Renewable energy Sources:** The use of renewable energy resources such as solar, wind, hydro and hydrogen along with green energy helps in energy conservation in modern times.
3. **Building designs:** Building made with highly insulated materials for energy saving is a source of energy conservation as well.
4. **Transportation:** Promotion of public transport and shift towards electric vehicles is a necessary step.
5. **Behavioural changes:** Turning off lights, fans and other electronic appliances also helps in energy saving.
6. **Policy and awareness:** Implementation of energy consumption policies for efficient and effective use is a vital need of the hour.

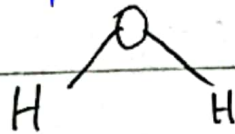
- c) What is hydrogen bonding? Give elaborating structure as examples?

Hydrogen bonding:

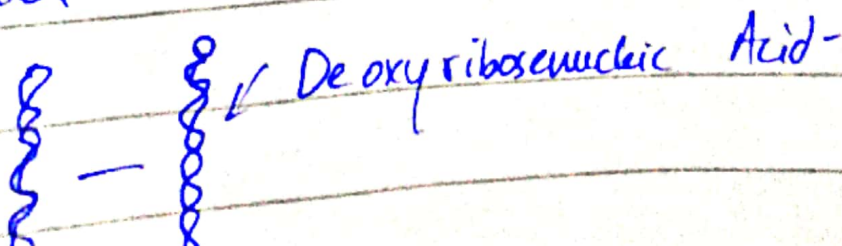
Hydrogen bonding is a weak inter-molecular force that occurs when a hydrogen bond covalently bonded to an electronegative atom (such as oxygen, nitrogen and fluorine) is attracted to another electronegative atom. The bonds provide a critical role in determining the physical and chemical properties of compound.

Examples and Structures:

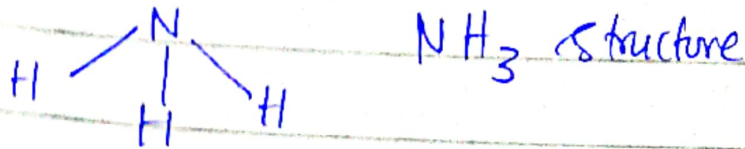
- 1) Water: (H-O-H) H_2O bonding: In a water molecule hydrogen bond form between the hydrogen atom of one molecule and oxygen atom of another molecule.



2. DNA: Deoxyribonucleic acid forms a hydrogen bond that occurs between adenine and thymine, and Guanine and cytosine - They hold the double helix structure



- 3) Ammonia: Hydrogen bond in ammonia occurs between the hydrogen atom of one molecule and the nitrogen atom of another.



- d) Discuss the nervous system of human body.

The nervous system of a human body is a complex network of neurons and interconnected supporting cells that coordinate to carry out the activities of the body for functioning.

The nervous system transmits signals between different parts of the body. It is predominantly divided into two main components: The central nervous system and the peripheral nervous system.

1- Central Nervous System:

Central nervous system comprises of Brain and Spinal cord. Major parts of brain are Cerebrum, Cerebellum, forebrain and brain stem. whereas, Spinal cord conducts the function of transmitting signals between the brain and rest of the body via reflex action mechanism.

2. Peripheral Nervous system:

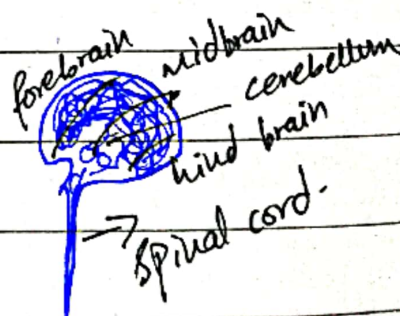
It is based on somatic nervous system that controls the voluntary movements by transmitting signals from the central nervous system to skeletal muscles.

Automatic nervous system regulates the involuntary functions like heart rate, digestion, breathing etc. It also depends on Sympathetic Nervous system i.e. flight and fight mode or responses, and parasympathetic nervous system that promotes rest and digest activities during sleep etc.

Functions of Nervous system:

- 1) Sensory input: Detect stimuli e.g. touch via organs.
- 2) Integration: Processes sensory information.
- 3) Motor output: Sending command to muscles to execute response.

Nervous are the life and blood of nervous system and conduct electrical and chemical signalling.



Structure:

Q4 What is Hepatitis? Explain its causes, symptoms and prevention.

Hepatitis: Hepatitis is a disease that affects the liver. It is actually an inflammatory condition of liver that is caused by viral infections. It causes autoimmune dysfunctioning. The potent factor behind this disease is substandard and unhygienic use of food and lifestyles. Unprocessed, uncooked and dirty elements containing food also becomes the reason for disease like hepatitis.

Cause of Hepatitis:

Hepatitis is characterized into categories like Hepatitis A, B, C, D and E. They are the most common infectious agents in the form of viruses.

- Hepatitis B and C: transmitted through blood transfusions and unprotected sexual activity resulting in AIDS etc.
- Hepatitis A and E: These kind of Hepatitis spread through food contamination and unclean water.

Symptoms of Hepatitis:

The symptoms of hepatitis include jaundice, loss of appetite, nausea, vomiting, weakened immunity, joint pain, dark urine, yellow eyes, pale stools etc.

Prevention: The first and foremost prevention against hepatitis include vaccination, hygiene practices, medical safety, use of sterilized medical products, safe blood transfusion, healthy lifestyle and safe diet.

b) Elaborate a few methods of food preservation.

Food preservation is a technique that has been in practice from centuries. It stretches back to stone age and is still in use even in twenty-first century. It helps in reducing microbial growth, enzymatic activity of decaying etc.

Methods of food Preservation:

- 1) Refrigerating and freezing: To avoid multiplying of growth of bacteria, a cold medium is needed for dairy products meats and vegetables etc.
- 2) Canning: The packaging of food in air tight tinned jars and tetra packaged layers help in preservation.
- 3) Drying: Removing moisture content from food such as fruits, meat, grains etc is also vital.
- 4) Pickling: Using vinegar sealed in air tight container and sometimes mustard oils help preserve food.
- 5) Fermentation: It is a process of beneficial growth of microbes. It occurs in coffees, yogurt, milk, cheese etc.

- 6) Vacuum packing: This process removes the air from the packaging hence reduced bacterial growth.
- 7) Chemical preservation: It helps in reduction of growth of microbial bacteria in food. So by this way the large amount of food can be utilized for a longer period of time.

c) Explain fertilizers. What are their types.

Fertilizers are the substances that are used to nourish the land and soil for proper growth of crop yield. They can be organic as well as synthetic. The raw and organic fertilizers include animal manure, etc while chemical fertilizers are processed ones.

Types of fertilizers:

- 1- Organic fertilizers: They are usually derived from plant and animal waste.

Examples: plants leaves, manure, bone meal.

Benefits: Improves soil structure, promotes chemical activity and provides long term and effective nutrition to the soil.

- 2- Inorganic fertilizers: They are synthetic one and are made chemically to supply nutrients

Examples: Ammonium, Urea, Potassium, nitrates

Benefits: Quick release of nutrients and easy application.

- 3 - Nitrogenous fertilizers: Provides nitrogen that is essential for leaf and stem growth.
Example: Urea
- 4 - Phosphatic fertilizers: Supply Phosphorus for root development and flowering: Single Superphosphate
- 5 - Potassic fertilizers: Contains Potassium to include disease resistance and water regulation. Potassium chloride
- 6 - Compound fertilizers: It is a mix of nutrients like NPK (Nitrogen, potassium and Phosphorus).
The examples include Diammonium Phosphate (DAP)

d) What is the anatomy of human tooth?

A human tooth is a complex structure that performs the functions such as biting, chewing and grinding of food. Teeth are embedded in the jawbones and consist of both visible and underlying parts. There are two stages of teeth growth: The milk teeth and adult growth of teeth. Usually human

beings contain 32 teeth in their mouth.

Anatomy of Human teeth:

- 1- **Crown:** It is the visible part of the teeth above the gum line. It is covered by enamel, which protects the teeth from decaying and wearing.
2. **Neck:** It is an area where the crown of the teeth meets the roots and surrounded by gums.
- 3- **Root:** It is embedded in the jaw bone, anchoring the tooth. Covered by cementum and attach tooth to periodontal ligament.
4. **Enamel:** It is the outer layer of the crown that serves as a protective barrier for the inner structure of teeth.
- 5- **Dentin:** It is located beneath the enamel and cementum. It is softer in composition than enamel and transmit sensation.
- 6- **Pulp:** It is the innermost part of the teeth that contains nerves, blood vessels and connective tissue.
7. **Gums:** They are soft tissues that hold the tissues in strength and provides support and protection.
- 8- **Alveolar bone:** It is a bone that forms the

Socket of the teeth.

Classification of teeth

The teeth are classified into four types

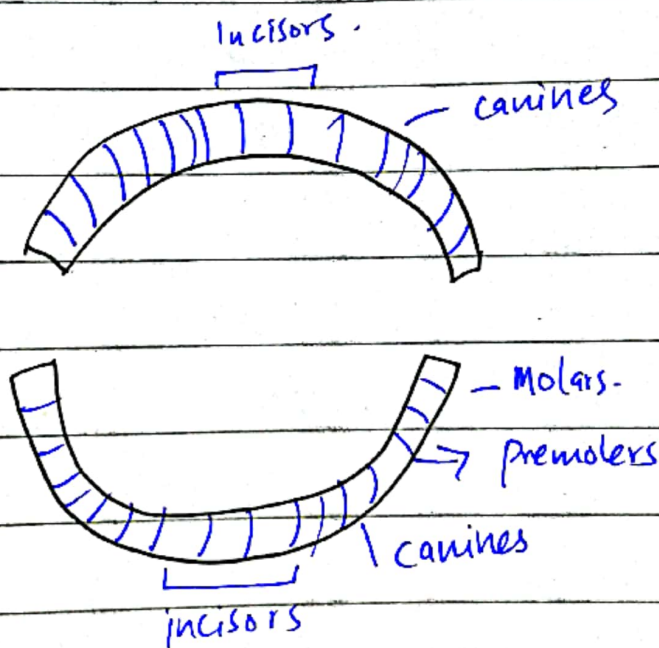
Incisors: Cutting of food.

Canines: Tearing of food happens here.

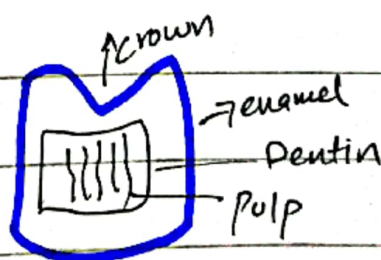
Premolars: Crush and grind food

Molars: Used for grinding of food.

Structure of teeth:



Teeth structure:



Section II

Q6:

Solution:

Let the three digit number be $100x + 10y + z$

x is 100 digit. y is 10 and z is unit.

Given:

$$x + y + z = 15 \quad \text{--- (1)}$$

$$y + z = 12 \quad \text{--- (2)}$$

$$y - z = 2 \quad \text{--- (3)}$$

From 3: $y = z + 2$ --- into 2

substituting $z + 2 + z = 12$

$$2z + 2 = 12$$

$$2z = 12 - 2$$

$$2z = 10$$

$$z = 10/2 = 5$$

$$\boxed{z = 5}$$

Substituting z into $y = z + 2$

$$y = 5 + 2 = 7$$

Substituting:

$y = 7$ and $z = 5$ into 1

$$x + 7 + 5 = 15$$

$$x = 15 - 12$$

$$x = 3$$

Thus the number is 375

b) Solution

Ratios of slices = 2 : 3 : 4

$$2x + 3x + 4x = 18$$

$$9x = 18$$

$$x = 2$$

- Small Pizza $2x = 4$ slices
- Medium Pizza $3x = 6$ slices
- Large Pizza $4x = 8$ slices

Step 2: Total weight = 40 gm each slice

$$18 \times 40 = 720 \text{ gm}$$

Price of Pizza each slice

$$\text{Small} = \text{Cost/slice} = \frac{320}{4} = 80 \text{ RS}$$

$$\text{Medium} = 6 \times 80 = 480 \text{ RS}$$

$$\text{Large} = 8 \times 80 = 640 \text{ RS}$$

Total price and weight =

$$320 + 480 + 640 = 1440 \text{ RS}$$

$$\text{Total weight} = 720 \text{ gm.}$$

Day

Date

c)

Circumference

$$C = \pi d = \pi \times 6 \approx 18.84 \text{ cm}$$

$$\text{Area} = A = \pi r^2 = \pi \times 3^2 = \pi \times 9 \approx 28.27 \text{ cm}^2$$

d)

i) 13, 24, 46, 90, 178 ?

$$13 \rightarrow 24$$

$$24 \rightarrow 46$$

$$46 \rightarrow 90$$

$$90 \rightarrow 178$$

Difference	= 11
	= 22
	= 44
	= 88

$$\text{Next difference} = 88 \times 2 = 176$$

$$\text{So, } 178 + 176 = 354$$

$$\text{Missing Number} = 354$$

ii) 5, 6, 9, 14, 21, ?

$$5 \rightarrow 6$$

$$6 \rightarrow 9$$

$$9 \rightarrow 14$$

$$14 \rightarrow 21$$

Difference	= 1
	= 3
	= 5
	= 7

$$\text{Next difference} = 9$$

$$21 + 9 = 30$$

$$\text{Missing number} = 30$$

Q7 Difference Between I.Q and E.Q.

→ Intelligence Quotient:

- It measures cognitive abilities such as logical reasoning, problem-solving and analytical thinking.
- Primarily determined by standardized tests.
- Remains relatively stable over time.
- Associated with intellect and academics.

Examples: Solving mathematics problems, understanding complex concepts etc.

→ Emotional Quotient:

- It measures the emotional intelligence of a person and the ability to sense, manage, understand and regulate emotions.
- Related to interpersonal skills, empathy, social interactions etc.
- can be developed over time and improve by learning.

Examples: Managing stress, resolving conflicts, understanding other's situation etc

b)

let Aman's age be = x

After 20 years = $x+20$

Ten year back wif age = y .

$$x+20 - 10y$$

$$x - y = 20 + 10$$

$$= 30$$

$$30 - 10 \quad 20 -$$

Given $\rightarrow x+20 = 10(x+10)$

$$x+20 = 10x-100$$

$$20 + 100 = 10x - x$$

$$120 = 9x$$

$$x = 13.3 \text{ years} \quad \text{age}$$

c)

To solve combined age, combined mowing rate
of Peter and John.

Peter's rate = $1/40$ lawn per minute

John's rate = $1/60$ lawns per minute

Combined rate = Peter's + John's

$$\frac{1}{40} + \frac{1}{60} = \frac{3}{120} + \frac{2}{120} = \frac{5}{120} = \frac{1}{24}$$

They can together mow = $1/24$ of lawn / minute

Day: _____

$$d) \text{ Correct result} = x + \frac{5}{3} = \frac{5x}{3}$$

$$\text{Incorrect result} = x + \frac{3}{5} = \frac{3x}{5}$$

Formulae

$$\text{Error} = \text{Correct result} - \text{Incorrect result}$$

$$= \frac{5x}{3} - \frac{3x}{5} = \frac{25x - 9x}{15}$$

$$= \frac{16x}{5}$$

Calculating Percentage error-

$$\text{Percentage error} = \left(\frac{\text{Error}}{\text{Correct error}} \right) \times 100$$

$$= \left(\frac{16x/5}{5x/3} \right) 100$$

$$= \frac{16}{15} \times \frac{3}{5} \times 100 = \frac{48}{15} \times 20$$

$$\text{Percentage error in cal.} = 64\%$$