Class: 10th

Subject: Chemistry

Chapter 13: Biochemistry

Important MCQs:

1. What are carbohydrates chemically?

(a) Hydrocarbons

(b) Polyhydroxy aldehydes or ketones ✅

(c) Amino acids

(d) Alcohols

2. Which type of carbohydrates are unhydrolyzable and consist of 3 to 9 carbon atoms?

(a) Oligosaccharides

(b) Polysaccharides

(c) Monosaccharides ✅

(d) Disaccharides

3. Polysaccharides are:

(a) Sweet and crystalline

(b) Tasteless and amorphous ✅

(c) Soluble in water

(d) Made of amino acids

4. Which of the following is the main source of energy for humans?

(a) Proteins

(b) Lipids

(c) Vitamins

(d) Carbohydrates ✅

5. Proteins are made up of which building blocks?

(a) Monosaccharides

(b) Fatty acids

(c) Amino acids ✅

(d) Nucleotides

6. Which of the following is NOT a source of animal protein?

(a) Fish

(b) Eggs

(c) Butter

(d) Apples ✅

7. Lipids are composed of:

(a) Glucose

(b) Nucleotides

(c) Fatty acids ✅

(d) Amino acids

8. What is the structure of DNA?

(a) Single stranded

(b) Triple helix

(c) Double stranded ✅

(d) Branched

9. What is the role of RNA in cells?

(a) Energy storage

(b) Protein formation ✅

(c) Genetic storage

(d) Vitamin absorption

10. Which of the following are water-soluble vitamins?

(a) A, D, E, K

(b) B complex and C ✅

(c) A and C

(d) E and K

11. What is the general formula of carbohydrates?

(a) CH_4

(b) $C_6H_{12}O_6$

(c) $CO_2 + H_2O$

(d) $C(H_2O)$ ✅

12. Which process helps plants to synthesize carbohydrates?

(a) Fermentation

(b) Respiration

(c) Photosynthesis ✅

(d) Transpiration

13. In the presence of sunlight and chlorophyll, which carbohydrate is first formed in photosynthesis?

(a) Sucrose

(b) Cellulose

(c) Glucose ✅

(d) Maltose

14. Monosaccharides cannot be:

(a) Soluble in water

(b) Sweet in taste

(c) Hydrolyzed ✅

(d) Reducing in nature

15. Glucose is chemically a:

(a) Pentahydroxy ketone

(b) Pentahydroxy aldehyde ✅

(c) Trisaccharide

(d) Polysaccharide

16. Which of the following is a disaccharide?

(a) Glucose

(b) Fructose

(c) Sucrose ✅

(d) Cellulose

17. What are the physical properties of polysaccharides?

(a) Crystalline, sweet, water-soluble

(b) Amorphous, tasteless, water-insoluble ✅

(c) Sweet, reducing, soluble

(d) Colorless, crystalline, reducing

18. Which type of sugar is the main energy source for the brain?

(a) Fructose

(b) Sucrose

(c) Glucose ✅

(d) Lactose

19. Low sugar level in the human body causes:

(a) Hyperglycemia

(b) Hypoglycemia ✅

(c) High blood pressure

(d) Diabetes mellitus

20. Which statement about dietary fibre is correct?

(a) It raises blood sugar levels

(b) It supports muscle contraction

(c) It helps bowel function and regulates cholesterol ✅

(d) It increases body fat

21. Which elements are present in proteins?

(a) Carbon, Hydrogen, and Oxygen only

(b) Carbon, Hydrogen, Oxygen, and Nitrogen only

(c) Carbon, Hydrogen, Oxygen, Nitrogen, and Sulphur ✅

(d) Carbon, Hydrogen, Oxygen, and Sulphur only

22. How many amino acids are present in proteins?

(a) Less than 100

(b) More than 10,000 ✅

(c) Only 20

(d) About 1000

23. Which of the following is an essential amino acid?

(a) An amino acid that is synthesized in the body

(b) An amino acid that is not required by the body

(c) An amino acid obtained from diet ✅

(d) An amino acid produced during digestion

24. What type of bond links amino acids in a protein molecule?

(a) Hydrogen bond

(b) Ionic bond

(c) Peptide bond ✅

(d) Glycosidic bond

25. Which of the following is not a source of animal protein?

(a) Fish

(b) Eggs

(c) Pulses ✅

(d) Mutton

26. What are lipids made up of?

(a) Amino acids

(b) Glucose units

(c) Fatty acids ✅

(d) Nucleotides

27. What is the general name of the compounds formed by the reaction of fatty acids and glycerol?

(a) Proteins

(b) Polysaccharides

(c) Triglycerides ✅

(d) Disaccharides

28. Which of the following is a saturated fatty acid?

(a) Palmitic acid ✅

(b) Oleic acid

(c) Linoleic acid

(d) Acetic acid

29. Which of the following is liquid at room temperature?

(a) Butter

(b) Ghee

(c) Oil ✅

(d) Stearic acid

30. Which vitamin is not stored or supplied by lipids?

(a) Vitamin A

(b) Vitamin D

(c) Vitamin E

(d) Vitamin C ✅

31. What are the building blocks of nucleic acids?

(a) Amino acids

(b) Fatty acids

(c) Nucleotides ✅

(d) Glucose molecules

32. Which three components make up a nucleotide?

(a) Sugar, amino acid, phosphate

(b) Sugar, base, glycerol

(c) Nitrogenous base, pentose sugar, phosphate group ✅

(d) Ribose, deoxyribose, enzyme

33. Who discovered the structure of DNA and in which year?

(a) Charles Darwin in 1859

(b) Louis Pasteur in 1865

(c) Watson and Crick in 1953 ✅

(d) Franklin and Mendel in 1920

34. Which nucleic acid is double-stranded and forms a double helix?

(a) RNA

(b) DNA ✅

(c) mRNA

(d) tRNA

35. What is the main function of RNA in the cell?

(a) Stores genetic information permanently

(b) Transfers oxygen to cells

(c) Breaks down fats in the liver

(d) Directs protein synthesis by decoding genetic information ✅

36. Who proposed the term Vitamin for essential growth substances?

(a) Hopkins

(b) Pasteur

(c) Mendel

(d) Funk ✅

37. Which vitamin is also known as Vitamin B_1?

(a) Riboflavin

(b) Thiamin ✅

(c) Niacin

(d) Ascorbic acid

38. Which of the following vitamins are fat-soluble?

(a) Vitamin B_1, B_2, C

(b) Vitamin A, D, E, K ✅

(c) Vitamin C and B complex

(d) Vitamin D and C only

39. What happens if Vitamin D accumulates in the body in large quantity?

(a) It causes rickets

(b) It causes bone-pain and kidney deposits ✅

(c) It increases eyesight

(d) It enhances blood clotting

40. Why should vitamins be taken with meals?

(a) To increase weight

(b) To reduce body temperature

(c) Because vitamins cannot be absorbed without food ✅

(d) Because they are sweet in taste

Exercise Short Questions:

1. How do plants synthesize carbohydrates?

Answer:

Plants synthesize **carbohydrates** through the process of photosynthesis.

In this process, plants use carbon dioxide (CO_2) from the air and water (H_2O) from the soil, in the presence of sunlight and chlorophyll, to produce glucose (a simple carbohydrate) and release oxygen.

Equation:

$6CO_2 + 6H_2O \Rightarrow C_6H_{12}O_6 + 6O_2$

(in presence of sunlight and chlorophyll)

2. Give the characteristics of monosaccharides.

Answer:

- Monosaccharides are the simplest carbohydrates.
- They cannot be hydrolyzed into simpler sugars.

- They contain 3 to 9 carbon atoms.
- They are sweet in taste, crystalline in form, and soluble in water.

3. What is the difference between glucose and fructose?

Answer:

- **Glucose** is an aldose sugar (contains an aldehyde group).
- **Fructose** is a ketose sugar (contains a ketone group).
- Both have the same chemical formula: $C_6H_{12}O_6$.
- **Glucose** is found in fruits, vegetables, and blood.
- **Fructose** is mainly found in fruits and honey.
- **Fructose** is sweeter in taste than glucose.
- Their structure is different although both are **monosaccharides**.

4. Give an example of a disaccharide. How is it hydrolyzed into monosaccharides?

Answer:

An example of a disaccharide is sucrose (common table sugar).

Sucrose is hydrolyzed by water and enzymes into two monosaccharides:

- Glucose + Fructose

This reaction occurs during digestion with the help of the enzyme sucrase.

5. Give the characteristics of polysaccharides.

Answer:

- Polysaccharides are complex carbohydrates.
- They consist of hundreds or thousands of monosaccharide units.
- They are tasteless, amorphous solids, and insoluble in water.
- Examples include starch, glycogen, and cellulose

6. Where are the proteins found?

Answer:

Proteins are found in the following food sources:

- Meat
- Butter
- Chicken
- Fish
- Eggs

7. Describe the uses of carbohydrates.

Answer:

Carbohydrates are used for:

- Providing the main source of energy to the body
- Found in fruits, vegetables, cereal foods, and milk

8. Lactose is disaccharide; which monosaccharides are present in it?

Answer:

Lactose is made up of two monosaccharides:

- Glucose
- Galactose

9. Why are the ten amino acids essential for us?

Answer:

The ten amino acids are essential because:

- Our body cannot synthesize them naturally
- They must be taken through diet

10. How are proteins formed?

Answer:

- Proteins are formed in the following way:
- Thousands of amino acids join together
- They are bonded by peptide linkages

11. How is gelatin obtained?

Answer:

- Gelatin is obtained by boiling collagen.
- Collagen is a structural protein found in connective tissues of animals.

12. Give the general formula of the lipids.

Answer:

The general formula of lipids is:

$R-COOH$

Where:

R = Long hydrocarbon chain

COOH = Carboxylic acid group

13. Name two fatty acids with their formulae.

Answer:

1. Palmitic Acid $\Rightarrow C_{15}H_{31}COOH$

2. Oleic Acid $\Rightarrow C_{17}H_{33}COOH$

14. Give the types of vitamins.

Answer:

Vitamins are of two types:

1. Fat Soluble Vitamins – A, D, E, K

2. Water Soluble Vitamins – B-Complex and C

15. What is the significance of vitamins?

Answer:

- Help in proper growth and development
- Play a vital role in regulating metabolism
- Must be taken through diet or supplements

Essential for a healthy body

16. Describe the sources and uses of vitamin A.

Answer:

Sources:

- Carrots
- Milk
- Butter
- Egg yolk
- Green vegetables

Uses:

- Maintains healthy vision
- Promotes growth of skin and tissues
- Strengthens immune system

17. Justify that water soluble vitamins are not injurious to health.

Answer:

- Water soluble vitamins include B-complex and Vitamin C.

- They dissolve in water and are quickly excreted from the body.
- Even if taken in large amounts, they do not accumulate in the body.
- Therefore, they are not toxic or injurious to health.

18. What do you mean by genetic code of life?

Answer:

- The genetic code of life refers to the instructions stored in DNA.
- These instructions guide the formation of proteins in a cell.
- They determine the traits of an organism (e.g., man, tree, animal).
- It also specifies cell type (e.g., muscle cell, nerve cell).

19. What is the function of DNA?

Answer:

- DNA stores genetic information.

- It transfers this information from one generation to another.
- DNA controls the synthesis of RNA and proteins.
- It maintains the identity and functioning of each cell.

20. How do you justify that RNA works like a messenger?

Answer:

- RNA is synthesized by DNA.
- It receives and decodes genetic instructions.
- It helps in the formation of proteins.
- RNA delivers messages from DNA to ribosomes.
- Therefore, RNA functions like a messenger in the cell.

Exercise Long Questions:

🌟 **Q1: What are carbohydrates? How monosaccharides are prepared? Give their characteristics.**

❖ **Definition of Carbohydrates:**

- Carbohydrates are organic compounds made up of carbon, hydrogen, and oxygen, usually in the ratio $C_x(H_2O)_y$.
- They are polyhydroxy aldehydes or ketones or compounds that yield such substances upon hydrolysis.

🧪 **Preparation of Monosaccharides:**

- Monosaccharides are naturally synthesized in green plants through the process of photosynthesis.

In photosynthesis:

- Here, glucose ($C_6H_{12}O_6$) is the monosaccharide formed.

✅ **Characteristics of Monosaccharides:**

- They are simple carbohydrates.
- **Unhydrolyzable**: Cannot be broken down into smaller sugars.
- Composed of 3 to 9 carbon atoms.
- Sweet in taste.
- Crystalline solids.
- Soluble in water.

Common examples: Glucose, Fructose, Galactose.

📘 **Summary:**

Monosaccharides are the building blocks of carbohydrates. They are important as they are the primary source of energy for all living organisms.

🌟 **Q2: Explain oligosaccharides.**

❖ **Definition:**

Oligosaccharides are carbohydrates that hydrolyze to give 2 to 9 units of monosaccharides.

🔸 **Important Points:**

- They are moderate-sized carbohydrate molecules.

- Oligosaccharides are sweet, crystalline solids.
- Soluble in water.
- Formed by condensation of monosaccharides through glycosidic linkage.

🔹 **Examples of Oligosaccharides:**

1. Disaccharides (2 units):

- Sucrose = Glucose + Fructose
- Lactose = Glucose + Galactose
- Maltose = Glucose + Glucose

2. Trisaccharides (3 units):

Raffinose = Glucose + Fructose + Galactose

🧪 **Hydrolysis Reaction:**

When oligosaccharides are hydrolyzed in presence of acid or enzyme, they break down into simple sugars (monosaccharides).

🌟 **Q3: What are polysaccharides? Give their properties.**

❖ **Definition of Polysaccharides:**

Polysaccharides are complex carbohydrates made up of hundreds or thousands of monosaccharide units joined together by glycosidic linkages.

🧪 Formation of Polysaccharides:

They are formed by the polymerization of simple sugars (monosaccharides).

Example:

- Starch is formed by many units of glucose.
- Cellulose is also a polymer of glucose but with different linkage.

✅ Properties of Polysaccharides:

1. **Tasteless**: Unlike mono- or disaccharides, they are not sweet.

2. **Amorphous Solids:** They do not have a crystalline structure.

3. **Insoluble in Water**: They do not dissolve in water easily.

4. **High Molecular Weight**: Their large size makes them biologically significant.

5. **Biological Role**: Serve as energy storage materials (e.g., starch, glycogen) and structural components (e.g., cellulose in plants, chitin in insects).

6. **Non-Reducing Sugars**: Most polysaccharides do not act as reducing agents.

📃 Examples of Polysaccharides:

- Starch (plants – energy storage)
- Cellulose (plants – cell wall)
- Glycogen (animals – energy storage in liver and muscles)
- Chitin (exoskeleton of insects)

📘 Summary:

Polysaccharides are vital macromolecules for both plants and animals. Their structural and storage functions make them essential for survival.

🌟 Q4: Explain the sources and uses of proteins.

❖ Definition of Proteins:

- Proteins are nitrogen-containing organic

compounds made up of amino acids joined by peptide bonds.

- They are essential macromolecules required for the growth, repair, and functioning of all living cells.

🌾 Sources of Proteins:

✅ Animal Sources:

- Meat
- Chicken
- Fish
- Eggs
- Milk and Butter

✅ Plant Sources:

Pulses (Lentils, Beans)

- High in protein, fiber, and essential minerals like iron and folate
- Low in fat and cholesterol-free
- Excellent for maintaining blood sugar and digestive health

🥜 Nuts (Almonds, Peanuts)

- Packed with healthy fats (especially monounsaturated and polyunsaturated)
- Good source of protein, vitamin E, and magnesium
- Support heart health and brain function

🌿 Soybeans

- Complete protein containing all essential amino acids
- Rich in isoflavones, which may support hormonal balance
- Versatile—used in tofu, tempeh, soymilk, and more

🌾 Whole Grains (Wheat, Maize)

- Provide complex carbohydrates for sustained energy
- High in dietary fiber, helping digestion and satiety
- Contain B vitamins, iron, zinc, and antioxidants

🧪 Uses / Functions of Proteins:

1. Cell Formation:

Proteins are vital in forming protoplasm, the living content of cells.

2. Growth and Repair:

Proteins help in the growth of body tissues and repair damaged tissues.

3. Enzymes & Hormones:

Many enzymes and hormones are proteins and are essential for metabolic regulation.

4. Immunity:

Proteins form antibodies which help fight diseases.

5. Transport:

Proteins like hemoglobin transport oxygen in blood.

6. Energy Source:

In the absence of carbohydrates and fats, proteins can be used as an energy source.

🌟 **Q5: Explain that amino acids are building blocks of proteins.**

❖ Introduction:

Proteins are one of the most important macromolecules in the human body. They are made up of amino acids, which are called the building blocks of proteins.

🧪 What are Amino Acids?

- Amino acids are organic compounds containing:
- an amino group ($-NH_2$)
- a carboxylic acid group ($-COOH$)
- a unique side chain (R group)

There are 20 different amino acids commonly found in proteins.

🧱 How Amino Acids Build Proteins:

1. Peptide Bond Formation:

- Amino acids are joined together by peptide bonds through a condensation reaction.
- A molecule of water (H_2O) is removed when two amino acids join.

2. Polypeptide Chain:

- Many amino acids link together to form a polypeptide chain.
- This long chain folds into a specific 3D structure, becoming a functional protein.

3. Sequence Matters:

The sequence of amino acids determines the shape and function of the protein.

🔸 Types of Amino Acids:

- Essential Amino Acids: Must be taken from diet (e.g. lysine, leucine).
- Non-Essential Amino Acids: Can be synthesized in the body (e.g. alanine, glutamic acid).

📌 Importance of Amino Acids:

They help in:

- Tissue repair and growth
- Enzyme formation
- Hormone production

- Immune system support

📘 **Summary:**

Amino acids are fundamental units of proteins. Without amino acids, proteins cannot be formed, and without proteins, life cannot exist.

🌟 **Q6: Explain the sources and uses of lipids.**

❖ **Introduction:**

Lipids are organic macromolecules composed of fatty acids and glycerol. They include fats and oils and serve as a rich source of energy.

🌱 **Sources of Lipids:**

✅ **Animal Sources:**

- Butter
- Ghee
- Fat in meat
- Fish oil
- Eggs

✅ **Plant Sources:**

- Mustard oil
- Coconut oil
- Olive oil
- Sunflower oil
- Nuts (almonds, peanuts)

✅ Microbial Sources:

Some microorganisms also synthesize lipids naturally.

🧪 Structure of Lipids:

Made up of:

- Glycerol (alcohol)
- Fatty acids (saturated or unsaturated)

🔧 Uses / Functions of Lipids:

1. Energy Storage:

Lipids provide more than double the energy as compared to carbohydrates.

2. Insulation:

Fat under the skin helps in heat insulation.

3. Protection:

Lipids cushion vital organs (like kidneys, heart).

4. Cell Membranes:

Lipids are essential components of cell membranes (phospholipids).

5. Vitamin Absorption:

Help in the absorption of fat-soluble vitamins (A, D, E, K).

6. Waterproofing:

Waxy lipids protect leaves and feathers from water.

🌟 **Q7: Give the importance of vitamins.**

❖ **Introduction:**

Vitamins are organic compounds required in small amounts for the proper growth, development, and functioning of the human body. They do not provide energy, but they are essential for life.

🔹 **Main Importance of Vitamins:**

1. ✅ **Regulate Body Functions:**

- Vitamins help in regulating metabolism,

digestion, and other bodily processes.

2. ✅ **Strengthen Immune System:**
   - Certain vitamins like vitamin C and E boost the body's immunity to fight infections.
3. ✅ **Healthy Skin, Eyes, and Hair:**
   - Vitamin A maintains good vision, skin health, and proper functioning of body tissues.
4. ✅ **Bone Health:**
   - Vitamin D helps in calcium absorption and bone development.
5. ✅ **Wound Healing:**
   - Vitamin K plays a key role in blood clotting.

Vitamin C helps in tissue repair and wound healing.

6. ✅ **Energy Production:**
   - B-complex vitamins are essential for converting food into energy.
7. ✅ **Prevent Deficiency Diseases:**

Vitamins prevent many deficiency disorders like:

- Rickets (due to lack of vitamin D)
- Scurvy (due to lack of vitamin C)
- Night blindness (due to lack of vitamin A)

📘 **Summary:**

Vitamins, though required in small quantities, are vital for health and survival. A balanced diet including fruits, vegetables, dairy, and grains ensures that the body receives sufficient vitamins.

🌟 **Q8: Describe the sources, uses and deficiency symptoms of water-soluble vitamins.**

❖ **Introduction:**

Water-soluble vitamins include Vitamin B-complex and Vitamin C. They are not stored in the body and any excess is excreted in urine. Hence, they need to be taken regularly through diet.

🔹 **1. Vitamin B-Complex**

✅ **Sources:**

- Whole grains
- Milk

- Eggs
- Meat
- Green vegetables

⚙ Uses:

- Helps in energy production
- Maintains nervous system
- Aids in digestion and growth
- Helps in formation of red blood cells

⚠ Deficiency Symptoms:

- Fatigue and weakness
- Mental depression
- Poor digestion
- Beriberi (Vitamin B1 deficiency)
- Pellagra (Vitamin B3 deficiency)

🔹 2. Vitamin C (Ascorbic Acid)

✅ Sources:

- Citrus fruits (lemon, orange)
- Guava

- Tomatoes
- Green vegetables

⚙ Uses:

- Helps in wound healing
- Strengthens immune system
- Aids in absorption of iron
- Maintains healthy gums and skin

⚠ Deficiency Symptoms:

- Scurvy (bleeding gums, joint pain)
- Weak immunity
- Delayed wound healing
- Rough and dry skin

Note:

This chapter is designed to provide a solid foundation of knowledge, with the goal of deepening understanding and encouraging further

exploration of the subject. The content has been carefully selected to support effective learning and inspire students to engage with the topic more deeply.

Author: Muhammad Asghar

Purpose: To contribute to education by offering insightful, valuable content that enhances learning and understanding.

Copyright & Usage Policy