

## UNIT I

**1. Which biomolecule is the primary source of energy for most cells?**

- a) Protein
- b) Carbohydrate
- c) Lipid
- d) Nucleic Acid

**2. DNA and RNA are classified as:**

- a) Carbohydrates
- b) Lipids
- c) Nucleic Acids
- d) Proteins

**3. The building blocks of proteins are:**

- a) Monosaccharides
- b) Fatty Acids
- c) Amino Acids
- d) Nucleotides

**4. Which type of carbohydrate is used for structural support in plants?**

- a) Glucose
- b) Fructose
- c) Starch
- d) Cellulose

**5. Phospholipids are a type of lipid found in:**

- a) Cell membranes
- b) Energy storage
- c) Insulation
- d) All of the above

**6. The function of mRNA in protein synthesis is:**

- a) Store genetic information
- b) Carry amino acids
- c) Copy genetic information
- d) Provide instructions for protein assembly

**7. The primary structure of a protein refers to:**

- a) The folding of the polypeptide chain
- b) The sequence of amino acids
- c) The 3D shape of the protein
- d) The interaction with other molecules

**8. Which amino acid has the simplest side chain?**

- a) Glycine
- b) Tyrosine
- c) Arginine
- d) Tryptophan

**9. Enzymes are biological catalysts made primarily of:**

- a) Carbohydrates

- b) Lipids
- c) Proteins
- d) Nucleic Acids

**10. The complementary pairing between adenine (A) and uracil (U) occurs in:**

- a) DNA-DNA bonding
- b) DNA-RNA bonding
- c) RNA-RNA bonding
- d) All of the above

**11. Which term refers to the usable energy available in a system for cellular processes?**

- a) Enthalpy ( $\Delta H$ )
- b) Entropy ( $\Delta S$ )
- c) Gibbs Free Energy ( $\Delta G$ )
- d) Redox Potential ( $E^\circ$ )

**12. A reaction with a negative  $\Delta G$  is considered:**

- a) Endergonic and requires energy input
- b) Endergonic and releases energy
- c) Exergonic and requires energy input
- d) Exergonic and releases energy

**13. Which equation relates free energy change ( $\Delta G$ ) to enthalpy change ( $\Delta H$ ) and entropy change ( $\Delta S$ ) at constant temperature?**

- a)  $\Delta G = \Delta H - T\Delta S$

b)  $\Delta G = \Delta H + T\Delta S$

c)  $\Delta S = \Delta G / \Delta H$

d)  $\Delta H = \Delta G \times T\Delta S$

**14. Entropy ( $\Delta S$ ) is a measure of:**

- a) Heat absorbed or released
- b) Disorder or randomness in a system
- c) Strength of chemical bonds
- d) The rate of a reaction

**15. In cellular respiration, the electron transport chain is an example of:**

- a) An endergonic reaction requiring ATP input
- b) An endergonic reaction releasing energy
- c) An exergonic reaction requiring ATP input
- d) An exergonic reaction releasing energy through a series of redox reactions

**16. A higher positive redox potential ( $E^\circ$ ) indicates:**

- a) A stronger tendency to lose electrons (reducing agent)
- b) A weaker tendency to lose electrons (reducing agent)
- c) A stronger tendency to gain electrons (oxidizing agent)
- d) A weaker tendency to gain electrons (oxidizing agent)

**17. Standard hydrogen electrode (SHE) has a defined redox potential of:**

- a) 0 V
- b) +1.0 V
- c) -0.1 V

d) It varies depending on the reaction

**18. The movement of electrons in redox reactions is directly coupled to:**

- a) ATP synthesis
- b) Protein synthesis
- c) DNA replication
- d) All of the above (depending on the cellular process)

**19. Which molecule readily accepts electrons and protons in the electron transport chain?**

- a) Oxygen (O<sub>2</sub>)
- b) Carbon dioxide (CO<sub>2</sub>)
- c) Glucose (C<sub>6</sub>H<sub>12</sub>O<sub>6</sub>)
- d) Water (H<sub>2</sub>O)

**20. Coupling exergonic reactions to endergonic reactions in a cell allows for:**

- a) Increased entropy
- b) Violation of the second law of thermodynamics
- c) Overall energy transfer and cellular work
- d) Spontaneous conversion of all energy into usable forms

**21. Energy-rich compounds are characterized by the presence of:**

- a) Strong covalent bonds
- b) Weak phosphodiester bonds
- c) High-energy phosphate bonds
- d) Peptide linkages

**22. Which of the following is NOT a common classification of high-energy compounds?**

- a) Pyrophosphates
- b) Acyl phosphates
- c) Carbohydrates
- d) Guanido phosphates

**23. The biological significance of ATP lies in its ability to:**

- a) Store genetic information
- b) Provide energy for cellular processes
- c) Transport molecules across membranes
- d) Act as a structural component of cells

**24. Cyclic AMP (cAMP) is derived from:**

- a) Glucose
- b) ATP
- c) Amino acids
- d) Nucleic acids

**25. The primary function of cAMP in cells is:**

- a) Energy storage
- b) Cellular signaling
- c) Enzyme activation
- d) All of the above (depending on the cellular context)

**26. The hydrolysis of ATP releases approximately how much free energy?**

- a) -2 kcal/mol

- b) -7.3 kcal/mol
- c) -14.6 kcal/mol
- d) -20 kcal/mol

**27. Compared to ATP, cAMP has:**

- a) Higher energy content
- b) Lower energy content
- c) Identical energy content
- d) No energy-storing ability

**28. The breakdown of glucose through cellular respiration ultimately leads to the production of:**

- a) Only ATP
- b) Only cAMP
- c) Both ATP and cAMP
- d) Neither ATP nor cAMP directly

**29. Which of the following statements about ATP is INCORRECT?**

- a) It is the "universal currency" of cellular energy transfer.
- b) It can be recycled through cellular respiration.
- c) Its hydrolysis is an endergonic reaction.
- d) It provides energy for a variety of cellular processes.

**30. Mutations in enzymes involved in cAMP signaling can lead to:**

- a) Increased ATP production
- b) Disrupted cellular communication
- c) Enhanced protein synthesis

d) None of the above

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