

Chapter 1--Chemistry Is the Logic of Biological Phenomena

Student: _____

1. All are distinctive properties of living systems EXCEPT:
 - A. Living organisms are relatively simple.
 - B. Biological structures play a role in the organism's existence.
 - C. The living state is characterized by the flow of energy through the organism.
 - D. Living organisms are highly organized.
 - E. Living organisms are actively engaged in energy transformation.
2. Even though the building blocks have fairly simple structures, macromolecules are exquisitely organized in their intricate three-dimensional architecture known as:
 - A. configuration.
 - B. conformation.
 - C. sequence.
 - D. Lewis structure.
 - E. structural maturation.
3. All of the following activities require the presence of ATP or NADPH EXCEPT:
 - A. osmoregulation.
 - B. biosynthesis.
 - C. movement of muscles.
 - D. light emission.
 - E. none, they are all energy-requiring activities.
4. Which are the four most common elements in the human body?
 - A. hydrogen, calcium, oxygen and sodium
 - B. hydrogen, oxygen, iron and carbon
 - C. hydrogen, oxygen, carbon and nitrogen
 - D. oxygen, carbon, iron and nitrogen
 - E. oxygen, silicon, calcium and nitrogen
5. What makes carbon such an abundant element in biomolecules?
 - A. It can form up to five bonds by sharing its electrons.
 - B. It forms only single bonds.
 - C. It provides low bond energy.
 - D. It forms stable covalent bonds by electron pair sharing.
 - E. It does not usually bond to other carbons, allowing a more diverse combination of elements.

6. The major precursors for the formation of biomolecules include all EXCEPT:
- A. nitrate and dinitrogen.
 - B. water.
 - C. carbon dioxide.
 - D. ammonium ion.
 - E. none, all are major precursors.
7. From the major precursors, the complex biomolecules are made in which sequence?
- A. metabolites, building blocks, macromolecules, supramolecular complexes
 - B. macromolecules, building blocks, metabolites, supramolecular complexes
 - C. building blocks, macromolecules, supramolecular complexes, metabolites
 - D. metabolites, macromolecules, building blocks, supramolecular complexes
 - E. metabolites, building blocks, supramolecular complexes, macromolecules
8. The structural integrity of supramolecular complexes (assemblies) of multiple components are bonded to each other by all of the following forces EXCEPT:
- A. covalent bonds
 - B. van der Waals forces
 - C. hydrogen bonds
 - D. hydrophobic interactions
 - E. ionic interactions
9. Organelles have what three attributes?
- A. Only in prokaryotic cells, membrane bound, have a dedicated set of tasks.
 - B. Only in eukaryotic cells, membrane bound, have a dedicated set of tasks.
 - C. Only in eukaryotic cells, seldom membrane bound, have a dedicated set of tasks.
 - D. Only in prokaryotic cells, membrane bound, multi-functional.
 - E. In both prokaryotic cells and eukaryotic cells, membrane bound, have a dedicated set of tasks.
10. Membrane structures are maintained primarily by:
- A. hydrophobic interactions.
 - B. covalent bonds.
 - C. hydrogen bonds.
 - D. non-spontaneous assembly.
 - E. ionic interactions.
11. Membranes are all of the following EXCEPT:
- A. supramolecular assemblies.
 - B. define boundaries of cellular components.
 - C. spontaneous assemblies resulting from hydrophobic interactions.
 - D. identical protein and lipid composition in the major organelles.
 - E. none, all are true.

12. Rank the following interactions in order of increasing strength.
- A. ionic, hydrogen bond, van der Waals, covalent single bond
 - B. van der Waals, hydrogen bond, ionic, covalent single bond
 - C. van der Waals, ionic, hydrogen bond, covalent single bond
 - D. covalent single bond, van der Waals, ionic, hydrogen bond
 - E. ionic, van der Waals, hydrogen bond, covalent single bond
13. Weak forces that create constantly forming and breaking interactions at physiological temperatures, but cumulatively impart stability to biological structures generated by their collective activity include all EXCEPT:
- A. hydrogen bonds
 - B. van der Waals forces
 - C. covalent bonds
 - D. ionic interactions
 - E. hydrophobic interactions
14. Which of the following is a true statement about non-covalent bonds?
- A. They are all the result of electron sharing.
 - B. Hydrogen bonds, ionic bond and hydrophobic interactions all carry a degree of specificity while van der Waals interactions are induced.
 - C. All noncovalent bonds are formed between oppositely charged polar functions.
 - D. Van der Waals interactions are not affected by structural complementarity, while hydrogen bonds, ionic bonds and hydrophobic interaction are affected by structural complementarity.
 - E. Hydrogen, van der Waals, and hydrophobic interactions do not form linear bonds.
15. Which of the statements about the nature of the hydrogen bond is true?
- A. The donor is a hydrogen atom bonded to a carbon.
 - B. The more linear the bond, the stronger the interaction.
 - C. The acceptor must be similar in electronegativity to hydrogen.
 - D. It is a type of covalent bond.
 - E. A hydrogen bond is weaker than van der Waals forces.
16. Electrostatic forces
- A. include ionic interactions between negatively charged carboxyl groups and positively charged amino groups.
 - B. average about 2 kJ/mol in aqueous solutions.
 - C. typically are directional like hydrogen bonds.
 - D. require a precise fit like van der Waals interactions.
 - E. include ionic, induced dipole and permanent dipole interactions.

17. All are true about hydrophobic interactions EXCEPT:
- A. Hydrophobic interactions result from the strong tendency of water to exclude nonpolar groups or molecules.
 - B. Hydrophobic interactions result because water molecules prefer the stronger interactions that they share with one another, compared to their interactions with nonpolar molecules.
 - C. Hydrophobic interactions result from hydrogen bonds between water and the hydrophobic molecules.
 - D. The preferential interactions between water molecules "exclude" hydrophobic substances from aqueous solution and drive the tendency of nonpolar molecules to cluster together.
 - E. Hydrophobic interactions result in nonpolar regions of biological molecules being buried in the molecule's interior to exclude them from the aqueous milieu.
18. All are specific molecular recognition mechanisms based on structural complementarity EXCEPT:
- A. a protein with a metabolite.
 - B. a strand of DNA and its complementary strand.
 - C. sperm and an egg.
 - D. hormone and receptor.
 - E. none, all are true.
19. All of the statements about structural complementarity are true EXCEPT:
- A. Weak chemical forces mediate it.
 - B. It produces strong irreversible interactions.
 - C. It is the interaction of a biological macromolecule and its ligand.
 - D. It is the basis of many biological functions.
 - E. It is the means of recognition in bimolecular interactions.
20. Which of the following statements regarding molecular recognition is correct?
- A. Covalent bonds are a common interaction used in molecular recognition.
 - B. Molecular recognition takes place only between protein molecules.
 - C. For molecular recognition to occur, complementarity of the molecules is required.
 - D. Hydrogen bonds are not effective mediators of molecular recognition due to their low strength.
 - E. None of the above are correct.
21. Biological molecules are functionally active only within a narrow range of environmental conditions with denaturation occurring in all EXCEPT:
- A. dramatic increase in temperature.
 - B. change in ionic strength.
 - C. refrigeration.
 - D. addition of strong acid or base.
 - E. none, all will denature biological macromolecules.

22. Which of the following statements about metabolism is true?
- A. Metabolism only occurs inside of organelles.
 - B. Metabolism is rarely organized into pathways.
 - C. Metabolism always results in a production of ATP.
 - D. Metabolism has two components: anabolism and catabolism.
 - E. Metabolism is characterized by single reactions with large energy releases.
23. All of the following functions of an enzyme are true EXCEPT:
- A. Enzymes help to catalyze virtually every metabolic reaction.
 - B. Enzymes mediate the rates of cellular reaction in proportion to cellular requirements.
 - C. Enzymes are sensitive to temperature, pH, and concentration changes.
 - D. An increased activity of an enzyme increases the amount of energy produced.
 - E. Enzymes are used as a catalyst to increase reaction rates many orders of magnitude.
24. All are true for prokaryotic cells EXCEPT:
- A. Some have flagella.
 - B. They have a simple plasma or cell membrane.
 - C. They possess a distinct nuclear area, but no nucleus.
 - D. They have ribosomes, but no mitochondria.
 - E. All are true.
25. Composed of peptidoglycan, a rigid framework of polysaccharide cross-linked by short peptide chains, describes what structural feature of a prokaryotic cell?
- A. cytosol
 - B. ribosome
 - C. nuclear area
 - D. cell membrane
 - E. cell wall
26. All are internal membrane specialized structures of eukaryotic cells EXCEPT:
- A. peroxisomes.
 - B. nucleus.
 - C. endoplasmic reticulum.
 - D. mitochondria.
 - E. ribosomes.
27. Arrays of filaments in eukaryotic cells that give the cell its shape and its capacity to move are called the:
- A. plasma membrane.
 - B. smooth endoplasmic reticulum.
 - C. cytoskeleton.
 - D. lysosome.
 - E. Golgi body.

28. Supramolecular complexes of nucleic acid encapsulated in a protein coat, and in some instances, surrounded by a membrane envelope are called:
- A. viruses.
 - B. plasmids.
 - C. nucleosomes.
 - D. ribosomes.
 - E. all are true.
29. Viruses are acellular, but they act as cellular parasites in order to:
- A. reproduce.
 - B. protect themselves.
 - C. grow in size.
 - D. gain genetic information.
 - E. all are true.
30. Rough ER are "studded" with:
- A. lysosomes.
 - B. ribosomes.
 - C. peroxisomes.
 - D. nucleosomes.
 - E. all are true.
31. When viral genetic elements are integrated into the host chromosome and become quiescent, it is referred to as:
- A. cytolytic.
 - B. lysogeny.
 - C. hemolytic.
 - D. propagational.
 - E. autonomy.

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Key

1. A
2. B
3. E
4. C
5. D
6. E
7. A
8. A
9. B
10. A
11. D
12. C
13. C
14. B
15. B
16. A
17. C
18. E
19. B
20. C
21. C
22. D
23. D
24. E
25. E
26. E
27. C
28. A
29. A

30. B

31. B