Chapter 1 The Facts of Life: Chemistry Is the Logic of Biological Phenomena

MULTIPLE CHOICE

1. Which of the following is a distinctive property of living systems?
   a. Biological structures play a role in the organism's existence.
   b. Living organisms are relatively simple.
   c. The living state is characterized by the flow of glucose through the organism.
   d. Living organisms are uncomplicated.

   ANS: A PTS: 1 REF: 2-3 BLM: Higher Order

2. Even though the building blocks have fairly simple structures, macromolecules are exquisitely organized in their intricate 3-dimensional architecture. Which of the following is the term for this type of architecture?
   a. configuration
   b. conformation
   c. sequence
   d. structural maturation

   ANS: B PTS: 1 REF: 3 BLM: Remember

3. Which of the following activities does NOT require the presence of ATP or NADPH?
   a. protease degradation
   b. biosynthesis
   c. movement of muscles
   d. light emission

   ANS: A PTS: 1 REF: 3-4 BLM: Higher Order

4. Which of the following are the 4 most common elements in the human body?
   a. hydrogen, calcium, oxygen, and sodium
   b. iron, hydrogen, oxygen, and carbon
   c. carbon, hydrogen, oxygen, and nitrogen
   d. nitrogen, oxygen, carbon, and iron

   ANS: C PTS: 1 REF: 5 BLM: Remember

5. Which of the following reasons makes carbon such an abundant element in biomolecules?
   a. It can form up to 5 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.

   ANS: D PTS: 1 REF: 6 BLM: Higher Order

6. Which of the following is NOT a major precursor for the formation of biomolecules?
   a. nitrate
   b. water
   c. carbon dioxide
   d. iron

   ANS: D PTS: 1 REF: 6 BLM: Higher Order

7. Which of the following is the sequence for making complex biomolecules from the following major precursors?
   a. metabolites, building blocks, macromolecules, supramolecular complexes
   b. macromolecules, building blocks, metabolites, supramolecular complexes
   c. building blocks, macromolecules, supramolecular complexes, metabolites
   d. supramolecular complexes, metabolites, macromolecules, building blocks

   ANS: A PTS: 1 REF: 6-8 BLM: Higher Order

8. The structural integrity of supramolecular complexes (assemblies) of multiple components is a result of bonding to each other. Which of the following is responsible for such bonding?
   a. covalent bonds
   b. hydrogen bonds
   c. hydrophobic interactions
   d. ionic interactions

   ANS: A PTS: 1 REF: 8 BLM: Higher Order

9. Which of the following are 3 attributes of organelles?
   a. occur only in prokaryotic cells; are membrane bound; have a dedicated set of tasks
   b. occur only in eukaryotic cells; are membrane bound; have a dedicated set of tasks
   c. occur only in eukaryotic cells; are seldom membrane bound; have a dedicated set of tasks
   d. occur only in prokaryotic cells; are membrane bound; are multi-functional

   ANS: B PTS: 1 REF: 8-10 BLM: Higher Order

10. Which of the following forces primarily maintain membrane structures?
    a. hydrophobic interactions
    b. covalent bonds
    c. hydrogen bonds
    d. ionic interactions

    ANS: A PTS: 1 REF: 10 BLM: Higher Order

11. Which of the following is a characteristic of membranes?
    a. They have identical protein and lipid composition in the major organelles.
    b. They are micromolecular assemblies.
    c. They define boundaries of a select few cellular components.
    d. They are spontaneous assemblies resulting from hydrophobic interactions.

    ANS: D PTS: 1 REF: 10 BLM: Higher Order

12. Which of the following groups of interactions is in the correct order by INCREASING strength?
    a. ionic, hydrogen bond, van der Waals, covalent single bond
    b. hydrogen bond, van der Waals, ionic, covalent single bond
    c. van der Waals, ionic, hydrogen bond, covalent single bond
    d. covalent single bond, van der Waals, ionic, hydrogen bond

    ANS: C PTS: 1 REF: 10-12 BLM: Higher Order

13. Weak forces create constantly forming and breaking interactions at physiological temperatures. Which of the following forces do NOT cumulatively impart stability to biological structures as a result of their collective activity?
    a. hydrogen bonds
    b. van der Waals forces
    c. covalent bonds
    d. ionic interactions

    ANS: C PTS: 1 REF: 12 BLM: Higher Order

14. Which of the following regarding non-covalent bonds is a correct?
    a. All non-covalent bonds are formed between oppositely charged polar functions.
    b. Hydrogen bonds, ionic bonds, and hydrophobic interactions all carry a degree of specificity, while van der Waals interactions are induced.
    c. van der Waals interactions are not affected by structural complementarity, while hydrogen bonds, ionic bonds, and hydrophobic interactions are affected by structural complementarity.
    d. Hydrogen, van der Waals, and hydrophobic interactions do not form linear bonds.

    ANS: B PTS: 1 REF: 12 BLM: Higher Order

15. Which of the following regarding the nature of the hydrogen bond is correct?
    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. A hydrogen bond is weaker than van der Waals forces.

    ANS: B PTS: 1 REF: 12 BLM: Higher Order

16. Which of the following is a characteristic of electrostatic forces?
    a. They include ionic interactions between negatively charged carboxyl groups and positively charged amino groups.
    b. They average about 2 kJ/mol in aqueous solutions.
    c. They are typically directional, like hydrogen bonds.
    d. They require a precise fit, like van der Waals interactions.

    ANS: A PTS: 1 REF: 14 BLM: Higher Order

17. Which of these is a feature of hydrophobic interactions?
    a. Hydrophobic interactions result from hydrogen bonds between water and hydrophobic molecules.
    b. Hydrophobic interactions result from the weak tendency of water to exclude non-polar groups or molecules.
    c. Hydrophobic interactions result because water molecules prefer the stronger interactions that they share with one another, compared to their interactions with non-polar molecules.
    d. Hydrophobic interactions result in polar regions of biological molecules being buried in the molecule's interior to exclude them from the aqueous milieu.

    ANS: C PTS: 1 REF: 12-14 BLM: Higher Order

18. Which of the following pairs is NOT a specific molecular recognition mechanism based on structural complementarity?
    a. a protein with a metabolite
    b. a strand of DNA and its complementary strand
    c. sperm and an egg
    d. hormone receptor and a second messenger

    ANS: D PTS: 1 REF: 14-15 BLM: Higher Order

19. Which of the following statements regarding structural complementarity is correct?
    a. It produces strong irreversible interactions.
    b. It is the interaction of a biological macromolecule and its ligand.
    c. It is the basis of a select few biological functions.
    d. It is the means of ceasing bimolecular interactions.

    ANS: B PTS: 1 REF: 14-15 BLM: Higher Order

20. Which of the following statements best characterizes molecular recognition?
    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.

    ANS: C PTS: 1 REF: 15 BLM: Higher Order

21. Biological molecules are functionally active only within a narrow range of environmental conditions. Which of the following will NOT cause denaturation in biological molecules?
    a. a dramatic increase in temperature
    b. a change in ionic strength
    c. refrigeration
    d. the addition of strong acid or base

    ANS: C PTS: 1 REF: 16 BLM: Higher Order

22. Which of the following regarding metabolism is correct?
    a. It occurs only inside organelles.
    b. It is rarely organized into pathways.
    c. It always results in production of ATP.
    d. It has 2 components: anabolism and catabolism.

    ANS: D PTS: 1 REF: 17 BLM: Higher Order

23. Which of the following is a function of enzymes?
    a. An increase in their activity increases the amount of energy produced.
    b. They help to catalyze a select few metabolic reaction.
    c. They mediate the rates of cellular reaction unproportionally to cellular requirements.
    d. They are used as a catalyst to increase reaction rates many orders of magnitude.

    ANS: D PTS: 1 REF: 17 BLM: Higher Order

24. Which of the following is NOT a characteristic of prokaryotic cells?
    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 mitochondria, but no ribosomes.

    ANS: D PTS: 1 REF: 17-18 BLM: Higher Order

25. Which of the following structural features of a prokaryotic cell is composed of peptidoglycan, a rigid framework of polysaccharide cross-linked by short peptide chains?
    a. cytosol
    b. ribosome
    c. nuclear area
    d. cell wall

    ANS: D PTS: 1 REF: 17-18|19-21 BLM: Remember

26. Which of the following is NOT a specialized structure of the internal membrane of eukaryotic cells?
    a. nucleus
    b. endoplasmic reticulum
    c. ribosome
    d. mitochondrion

    ANS: C PTS: 1 REF: 21-22|24 BLM: Remember

27. Which of the following arrays of filaments in eukaryotic cells give the cell its shape and its capacity to move?
    a. Golgi body
    b. smooth endoplasmic reticulum
    c. cytoskeleton
    d. lysosome

    ANS: C PTS: 1 REF: 21-22|24 BLM: Higher Order

28. Which of the following supramolecular complexes of nucleic acid are encapsulated in a protein coat and, in some instances, surrounded by a membrane envelope?
    a. viruses
    b. plasmids
    c. nucleosomes
    d. ribosomes

    ANS: A PTS: 1 REF: 23|26 BLM: Remember

29. Viruses are acellular. Why do they, however, act as cellular parasites?
    a. to reproduce
    b. to protect themselves
    c. to grow in size
    d. to gain genetic information

    ANS: A PTS: 1 REF: 26 BLM: Higher Order

30. What are rough ER "studded" with?
    a. lysosomes
    b. ribosomes
    c. peroxisomes
    d. nucleosomes

    ANS: B PTS: 1 REF: 24-25 BLM: Remember

31. Which of the following describes the integration of viral genetic elements into the host chromosome and subsequent quiescence?
    a. cytolytic
    b. lysogeny
    c. propagational
    d. autonomy

    ANS: B PTS: 1 REF: 26-28 BLM: Higher Order

32. Which of the following defines prions?
    a. ions with an inappropriate number of protons
    b. ions about to form
    c. ionic proteins that bind DNA
    d. proteinaceous infectious particles

    ANS: D PTS: 1 REF: 28 BLM: Higher Order

33. Which of the following is NOT correct regarding prion diseases?
    a. They include atherosclerosis.
    b. They are genetic and infectious.
    c. Their occurrence may be sporadic.
    d. They are dominantly inherited.

    ANS: A PTS: 1 REF: 28 BLM: Higher Order

