Biochemistry - A Short Course 5th edition Hines Test Bank

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Name:_____ Class:_____ Date:_____

Chapter 1

1. What underlies the unity of biochemistry?
   a. Some organisms are highly uniform at the molecular level.
   b. All living beings are highly uniform at the organismal level.
   c. Organisms are highly uniform at the cellular level.
   d. All organisms are highly uniform at the molecular level.
   e. Some living beings are highly uniform at the cellular level.

ANSWER: d

2. How many times more carbon is contained in organisms than in Earth's crust?
   a. 60 times
   b. 50 times
   c. 9.5 times
   d. 10 times
   e. 100 times

ANSWER: b

3. Why is carbon preferable to be the chemical base for life?
   a. Carbon dioxide is essentially insoluble in water.
   b. It escapes the biochemical circulation once it is utilized.
   c. The stability and strength of the carbon–carbon bonds make it a good base for larger molecular complexes.
   d. By reacting with hydrogen, it can undergo combustion, which provides organisms with energy.
   e. Carbon dioxide is a strong construction material.

ANSWER: c

4. What is NOT a primary function of proteins?
   a. signal receptors
   b. energy storage
   c. signal molecules
   d. structural units
   e. defensive agents

ANSWER: b

5. What does being a catalyst mean?
   a. slowing down the rate of reactions to increase control over them
   b. being fully utilized in the course of a reaction; causing no unnecessary change in the reaction components
   c. repeatedly enhancing the rate of chemical reactions without being consumed
   d. repeatedly decreasing the rate of chemical reactions without being affected by enzymes
   e. enhancing the rate of chemical reactions being permanently affected during their course to control the environmental changes

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ANSWER: c

6. Which structure CANNOT be a nucleotide?
   a. a five-carbon sugar attached to a base and at least one phosphoryl group
   b. a five-carbon sugar attached to a heterocyclic ring structure and one phosphoryl group
   c. a five-carbon sugar attached to a base and two phosphoryl groups
   d. a five-carbon sugar attached to a base and four phosphoryl groups
   e. a five-carbon sugar attached to a heterocyclic ring structure and three phosphoryl groups

ANSWER: d

7. What determines the nature of an organism?
   a. the information stored in proteins
   b. the information contained in deoxyribonucleotides
   c. the information stored in the deoxyribonucleic acid
   d. the information stored in biological polymers
   e. the information contained in the ribonucleic acid

ANSWER: c

8. What is NOT a nucleotide?
   a. adenine
   b. thymine
   c. uracil
   d. cytosine
   e. adenosine

ANSWER: e

9. Which statement about compositional differences between DNA and RNA is TRUE?
   a. Ribonucleotides contain an additional hydroxyl group.
   b. Ribonucleotides exploit three different bases, while deoxyribonucleotides exploit four.
   c. Deoxyribonucleotides contain an additional hydroxyl group.
   d. Deoxyribonucleotides contain a five-carbon sugar, whereas RNA bases contain a six-carbon sugar.
   e. Ribonucleotides exploit four different bases, while deoxyribonucleotides exploit three.

ANSWER: a

10. What is the molecular basis for establishing intracellular compartments?
    a. the formation of membranous barriers due to ability of proteins to form extended linear structures
    b. the ability of lipids to form barriers due to their dual properties regarding solubility in water
    c. the formation of lipid barriers due to the small size of lipids
    d. the development of lipid barriers due to hydrophilic interactions within lipid molecules
    e. the formation of lipid barriers due to the dual nature of lipids regarding their interactions with proteins

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ANSWER: b

11. What can serve as sites of cell-to-cell interactions?
    a. molecules of glycogen
    b. branched chains of carbohydrates
    c. branched proteins
    d. hydrophobic tails of lipids
    e. hydrophilic heads of lipids

ANSWER: b

12. Choose the CORRECT statement about functions of lipids and proteins.
    a. They both can be involved in signal transduction.
    b. They both form a cell skeleton.
    c. They both act as receptors for signal molecules.
    d. They both can provide large amounts of cellular energy upon combustion.
    e. They both are involved in the transfer of biological information.

ANSWER: a

13. What determines the function of a cell or tissue?
    a. information contained in the genome
    b. selective transcription of RNA
    c. translation of RNA
    d. replication of DNA
    e. selective expression of genes

ANSWER: e

14. What is the central dogma?
    a. the flow of information across all biomolecules of a cell
    b. the scheme proposed by Francis Crick to describe complex cell-to-cell interactions
    c. the basic scheme of the flow of information in the cell for eventual rendering of the genetic information into a functional form
    d. the scheme proposed in 1958 to describe the genome
    e. the basic scheme of selective replication of DNA

ANSWER: c

15. What is the basic unit of life?
    a. DNA
    b. protein
    c. RNA
    d. cell
    e. biomolecular complexes

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ANSWER: d

16. What constitutes the cell membrane?
    a. a lipid bilayer organized through interaction of lipid hydrophobic heads with each other and lipid hydrophilic tails with the environment
    b. the outer layer of a cytoplasm
    c. a lipid bilayer organized through interaction of lipid hydrophobic tails with each other and lipid hydrophilic heads with an aqueous environment
    d. the periplasmic space
    e. a lipid bilayer organized by interaction with membrane proteins

ANSWER: c

17. How can one distinguish eukaryotic and prokaryotic cells?
    a. Eukaryotic cells do not have any membranous compartments.
    b. The cytoplasm is present only in eukaryotic cells.
    c. The DNA is free in the cytoplasm of eukaryotic cells.
    d. Membrane-enclosed compartments are absent in prokaryotes.
    e. Eukaryotic cells are surrounded by two membranes with the periplasmic space in between.

ANSWER: d

18. What are two biochemical features that are obligatory for a cell to exist?
    a. plasma membrane and nucleus
    b. nucleus and cytoplasm
    c. storage for genetic information and a lipid bilayer
    d. plasma membrane and nucleoid
    e. plasma membrane and cytoplasm

ANSWER: e

19. What is an example of the structural function of carbohydrates?
    a. formation of branched complexes involved in cell-to-cell interaction
    b. construction of a cell wall
    c. formation of glycogen polymers
    d. modification of proteins
    e. construction of starch in plants

ANSWER: b

20. Which is an organelle?
    a. ribosome
    b. cytoskeleton
    c. plasma membrane
    d. secretory granule

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e. cell wall

ANSWER: d

21. Which sequence of steps preceding DNA replication is TRUE?
    a. The DNA polymerase gene is transcribed in the nucleus → the DNA is translated into the enzyme on ER → the enzyme is translocated through nuclear pores into the nucleus.
    b. mRNA of the DNA polymerase gene is synthesized in the nucleus → the mRNA is transferred to the cytoplasm → the DNA polymerase is synthesized on the ribosome → the enzyme is translocated through nuclear pores into the nucleus.
    c. The DNA polymerase gene is translated in the nucleus → the mRNA is transferred to the cytoplasm → transcription takes place in the ribosome → the enzyme is translocated through nuclear pores into the nucleus.
    d. mRNA of the DNA polymerase gene is translated in the cytoplasm→ the enzyme is transferred to the nucleus → transcription takes place in the ribosome.
    e. mRNA of the DNA polymerase gene is synthesized in the cytoplasm → the mRNA is transferred to the nucleus → the DNA polymerase is synthesized on the ribosome → the enzyme is translocated through nuclear pores out of the nucleus.

ANSWER: b

22. In which organelles is chemical energy generated?
    a. nucleus and mitochondrion
    b. chloroplast and nucleus
    c. mitochondrion and endosome
    d. mitochondrion and chloroplast
    e. nucleus and endosome

ANSWER: d

23. What is the source of cellular energy?
    a. glucose
    b. mitochondrion
    c. adenosine triphosphate
    d. glycogen
    e. lipids

ANSWER: c

24. The quantity of which organelle in liver cells can be markedly changed by increasing the ingestion of drugs by an organism?
    a. smooth ER
    b. zymogen granules
    c. rough ER
    d. the Golgi complex
    e. ER lumen

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ANSWER: a

25. What organelles is NOT surrounded by two membranes?
    a. nucleus
    b. chloroplast
    c. mitochondrion
    d. the Golgi complex
    e. chromoplast

ANSWER: d

26. Which statement about a plant cell is TRUE?
    a. The conversion of sunlight into a form of energy useful for a cell takes place in the plant vacuole.
    b. The plant cell wall is constructed from linear polymers of amino acids.
    c. The conversion of sunlight into a form of energy useful for a cell takes place in the mitochondrion.
    d. Chloroplasts power the whole living world.
    e. The plant cell wall is constructed mostly from branched polymers of carbohydrates.

ANSWER: d

27. How big is a human microbiome in relation to the number of human cells?
    a. relates as 0:1
    b. relates as 2:1
    c. relates as 13:1
    d. relates as 1:2
    e. approximately equal

ANSWER: e

28. What is the role of DNA polymerase?
    a. It catalyzes the transcription of DNA.
    b. It structures the collection of genes.
    c. It is the catalyst of synthesis of new strands of DNA.
    d. It selectively expresses heritable information of an organism.
    e. It is the catalyst of separation of DNA strands.

ANSWER: c

29. Where are secreted proteins modified?
    a. smooth ER and transport vesicle
    b. the Golgi complex and smooth ER
    c. rough ER and transport vesicle
    d. the Golgi complex and transport vesicle
    e. rough ER and the Golgi complex

ANSWER: e

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30. What regions of the endoplasmic reticulum can lack ribosomes?
    a. rough ER and budding-off secretory vesicles
    b. smooth ER and transport vesicles budding off the rough ER
    c. smooth ER and secretory vesicles budding off the rough ER
    d. rough ER and transport vesicles budding off the smooth ER
    e. smooth ER and sequestered plasma membrane

ANSWER: b

31. Which statement about the difference between endocytosis and phagocytosis is TRUE?
    a. Endosomes formed only in phagocytosis can be fused with lysosomes.
    b. Small amounts of material can be taken into the cell by phagocytosis but only large ones by endocytosis.
    c. Endosomes formed only in endocytosis can be fused with lysosomes.
    d. Large amounts of material can be taken into the cell by phagocytosis but only small ones by endocytosis.
    e. Only immune cells can endocytize cholesterol.

ANSWER: d

32. Which process is similar to the formation of lysosomes?
    a. formation of secretory granules
    b. endocytosis
    c. phagocytosis
    d. formation of transport vesicles
    e. stacking of membranes

ANSWER: a

33. Where does sorting of proteins take place?
    a. rough ER
    b. transport vesicle
    c. the Golgi complex
    d. smooth ER
    e. secretory vesicle

ANSWER: c

34. What components can assist in protein folding?
    a. stacked membranes
    b. chaperons
    c. zymogens
    d. ribosomes
    e. lipids

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ANSWER: b

35. Which organelles are unique for plant cells?
    a. chloroplasts and plant vacuole
    b. chloroplasts
    c. cell wall and plant vacuole
    d. chloroplasts and filaments

ANSWER: a

36. What characterizes the matrix of the mitochondria?
    a. membrane that is in touch with the cytoplasm
    b. highly invaginated membrane
    c. combustion of fuel molecules
    d. intermembrane space
    e. actin filaments

ANSWER: b

37. Which is common between the biomolecules that contribute to the transfer of biological information?
    a. diverse three-dimensional structure
    b. dimerization
    c. dual chemical nature
    d. repeating units in the linear structure
    e. repeating units in the branched structure

ANSWER: d

38. In higher organisms, what is a polymer with double-stranded phosphodiester-linked monomers?
    a. RNA
    b. DNA
    c. protein
    d. carbohydrate
    e. lipid

ANSWER: b

39. What determines folding of a protein?
    a. hydrophobic or hydrophilic environment
    b. the location of a protein in the cell
    c. the pH of the cytoplasm
    d. the sequence of amino acids that constitute the protein
    e. interactions of proteins with lipids

ANSWER: d

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40. The half-life of what molecule is likely to be the shortest?
    a. protein
    b. lipid
    c. carbohydrate
    d. DNA
    e. mRNA

ANSWER: e

41. What is another function of a plasma membrane apart from its barrier function?
    a. providing to the interior of the cell an enclosed environment that no molecules may cross
    b. providing a selectively permeable barrier with the aid of transport proteins
    c. giving eukaryote and prokaryote cells structural strength
    d. allowing only a free passage of water in and out of the cell
    e. facilitated entrance of hormones

ANSWER: b

42. Poisons that kill an organism as a result of a loss of high-energy ATP molecules are MOST likely to target which organelle?
    a. mitochondria
    b. cytoskeleton
    c. cytoplasm
    d. endoplasmic reticulum
    e. nucleus

ANSWER: a

43. A secreted protein would be processed through organelles in what order?
    a. nucleus, secretory vesicle, Golgi complex
    b. cytoplasm, Golgi complex, cytosol, secretory vesicle
    c. endoplasmic reticulum, secretory vesicle, Golgi complex
    d. nucleus, cytoplasm, endoplasmic reticulum, Golgi complex, secretory vesicle
    e. endoplasmic reticulum, Golgi complex, secretory granule

ANSWER: e

44. Extracellular material is taken into the eukaryotic cell via:
    a. exocytosis.
    b. phagocytosis.
    c. formation of zymogen granules.
    d. secretory pathway.
    e. diffusion.

ANSWER: b

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45. If substance X inhibits secretion of the labeled protein but fully synthesized, folded, and glycosylated protein is still found in the cell, where is the most likely site for substance X to act?

a. nucleus during translation
b. budding off the secretory granule
c. translation on the ribosome
d. enzyme modification in the Golgi complex
e. nucleus during transcription

ANSWER: b

46. Which match between the loss of a particular organelle with the associated disease is TRUE?

a. hypercholesterolemia – smooth endoplasmic reticulum
b. diabetes – endosome
c. Tay-Sachs disease – lysosome
d. muscle degeneration – mitochondria
e. stroke – Golgi body

ANSWER: c

47. What experiments would you perform to verify the existence of the endoplasmic reticulum in a strain of bacteria?

a. determine whether the bacterium can synthesize ATP in the presence of fuel molecules and O_2
b. determine whether the bacterium can synthesize proteins
c. determine whether the bacterium generates CO_2 in the presence of fuel molecules
d. determine whether the bacterium has an internal membrane-enclosed compartment
e. determine whether lipids can form a bilayer structure in the bacterial cell

ANSWER: d

48. What is/are the rigid material(s) that provide(s) structural support to a plant cell?

a. plant cytoskeleton
b. plasma membrane
c. cell wall
d. outer membrane
e. microfilaments and microtubules

ANSWER: c

49. Filaments and microtubules are components of a network called the:

a. chloroplast.
b. cytoplasm.
c. cytoskeleton.
d. cell wall.
e. mitochondrion.

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ANSWER: c

50. Translation takes place on/in the:
    a. ribosomes.
    b. smooth endoplasmic reticulum.
    c. nucleus.
    d. DNA polymerases.
    e. DNA parent strand.

ANSWER: a

51. Which three elements make up the majority of organisms, listed in descending order of abundance (as a percentage) in humans?
    a. carbon, oxygen, hydrogen
    b. hydrogen, oxygen, carbon
    c. hydrogen, carbon, nitrogen
    d. nitrogen, hydrogen, oxygen
    e. hydrogen, oxygen, nitrogen

ANSWER: b

52. The abundance of which element makes living organisms unique?
    a. hydrogen
    b. oxygen
    c. phosphorous
    d. nitrogen
    e. carbon

ANSWER: e

53. When comparing carbon–carbon and silicon–silicon bonds, which is FALSE?
    a. Carbon–carbon bonds are stronger than silicon–silicon bonds and provide greater stability to large molecules.
    b. Carbon–carbon bonds release more energy when undergoing combustion, compared to silicon–silicon bonds.
    c. Molecules with carbon–carbon bonds are better construction materials compared to molecules with silicon–silicon bonds
    d. Carbon–carbon bonding leads to greater solubility in water compared to silicon bonding.
    e. Carbon-based molecules are better fuel sources than silicon-based molecules.

ANSWER: d

54. The linear structure of proteins is constructed by linking ____ with _____ bonds.
    a. nucleotides; covalent
    b. amino acids; peptide

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c. amino acids; phosphodiester
d. polypeptides; hydrogen
e. amino acids; hydrogen

ANSWER: b

55. Which is NOT a functional role of proteins?
a. catalysis
b. signal transduction
c. cell-cell recognition
d. cell mobility
e. storage of genetic information

ANSWER: e

56. Which three components make up the monomers that are put together to form DNA?
a. ribose sugar, nitrogenous base, and three hydroxyl groups
b. ribose sugar, nitrogenous base, and three phosphoryl groups
c. deoxyribose sugar, nitrogenous base, and three phosphoryl groups
d. deoxyribose sugar, nitrogenous base, and three amino groups
e. deoxyribose sugar, nitrogenous base, and three hydroxyl groups

ANSWER: c

57. Which statement regarding DNA and RNA is FALSE?
a. DNA and RNA both contain pentose sugar backbones.
b. DNA and RNA both consist of nucleotides connected by phosphodiester linkages.
c. DNA and RNA both consist of four unique nucleotides, differing only in the nitrogenous base.
d. DNA and RNA are both directional molecules.
e. DNA and RNA are both helical structures composed of strands connected by hydrogen bonding.

ANSWER: e

58. Which is a result of the hydrophobic and hydrophilic dual chemical nature of lipids?
a. the ability to perform enzymatic functions and speed up biochemical reactions
b. the ability to form barriers that delineate an “inside” and “outside” at a biochemical level
c. the ability to act as signal molecules
d. the ability to combust to provide large amounts of cellular energy
e. the ability to store and transfer genetic information

ANSWER: b

59. A particular mutation renders DNA polymerase nonfunctional. Which is MOST LIKELY to be affected by this mutation?
a. replication of DNA
b. transcription of DNA molecules to functional RNAs

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c. transcription of DNA molecules to mRNA
d. translation of mRNA molecules to proteins
e. folding of functional RNAs

ANSWER: a

60. Liver cells and heart cells contain the exact same genetic information. What is responsible for liver and heart cells having drastic structural and functional differences?
a. DNA replication
b. mutations
c. protein sorting
d. selective gene expression
e. ribosomes

ANSWER: d

61. An unusual accumulation of mRNA molecules is observed in the cytoplasm of a cell with low levels of protein. Which enzyme or cell structure is likely malfunctioning in this cell?
a. DNA polymerase
b. plasma membrane
c. ribosomes
d. RNA polymerase
e. secretory granule

ANSWER: c

62. You are a researcher studying the function of a protein called mastermind. This protein functions in neuronal cells to assist in the transmission of electrical signals. In one of your experiments, you notice that mastermind is present in the neuronal cells, but not functioning properly. Other cellular functions appear normal. Select the likely explanation for your observations.
a. A mutation in the *mastermind* mRNA has occurred.
b. Ribosomes are not functioning properly.
c. RNA polymerase is not functioning properly.
d. The *mastermind* gene is missing from the genome.
e. DNA polymerase is not functioning properly.

ANSWER: a

63. A nonfunctional RNA polymerase would MOST directly affect which biological process?
a. folding of polypeptides into functional proteins
b. conversion of mRNA into protein
c. transfer of genetic information from DNA to RNA
d. replication of genetic information
e. exportation of mRNA from the nucleus to the cytoplasm

ANSWER: c

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64. What is meant when scientists say DNA replication is semi-conservative?
    a. Half of an offspring's genetic content comes from one parent and the other half comes from the other parent.
    b. DNA replication consumes energy to synthesize the first strand and synthesizes the second strand without expending additional energy.
    c. Each strand of a parent DNA molecule acts as a template strand to make two new daughter DNA molecules.
    d. DNA polymerase is only needed to synthesize one of the strands.
    e. Each strand of DNA is synthesized without a template.

ANSWER: c

65. Which is an example of the selective permeability of cell membranes?
    a. oxygen diffusing freely across the plasma membrane
    b. proteins embedded in the plasma membrane facilitating entry of glucose
    c. free movement of water across a cell membrane
    d. phospholipids containing hydrophobic and hydrophilic regions.
    e. proteins associated with the plasma membrane transducing information

ANSWER: b

66. Which of the following is NOT a biochemical process that occurs in the cytoplasm?
    a. mRNA synthesis
    b. glucose metabolism
    c. fatty acid synthesis
    d. protein synthesis
    e. endosome-lysosome fusion

ANSWER: a

67. Which biological process occurs on rough endoplasmic reticulum (ER) but not on smooth ER?
    a. processing of exogenous chemicals
    b. transcription
    c. translation
    d. phagocytosis
    e. DNA replication

ANSWER: c

68. What is a consequence of mutations in chaperone proteins in the lumen of the ER?
    a. improperly sorted proteins
    b. misfolded proteins
    c. untranslated proteins
    d. hyperactive proteins
    e. unmodified proteins

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ANSWER: b

69. The primary function of lysosomes is to:
    a. bring sorted proteins to the correct organelle or plasma membrane.
    b. engulf foreign microorganisms or exogenous agents.
    c. fuse with secretory granules to dump cargo into the extracellular environment.
    d. fuse with endosomes to digest extracellular material and damaged intracellular organelles.
    e. store water, ions, and various nutrients.

ANSWER: d

70. Which is TRUE of both familial hypercholesterolemia and Tay–Sachs disease?
    a. Both diseases are the result of improper gene expression.
    b. Both diseases are the result of disruptions in the microbiome.
    c. Both diseases are the result of improper combustion of fuels.
    d. Both diseases are the result of malfunctions in specific cellular organelles.
    e. Both diseases are the result of an inability to store glucose molecules as glycogen.

ANSWER: d

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