

Test Bank for Biochemistry 9th Berg

Chapter 2

1. What is NOT a key property that enable proteins to participate in a wide range of functions?
- Proteins have a high molecular weight.
 - Proteins contain different functional groups.
 - Some proteins are quite rigid, whereas others display considerable flexibility.
 - Proteins are linear polymers built of different amino acids.
 - Proteins can interact with one another and with other biological macromolecules to form complex assemblies.

ANSWER: a

2. What does an α -amino acid consist of?
- carbonyl group, α carbon, amino group, oxygen atom, distinctive R group
 - carboxylic acid group, α carbon, amino group, hydrogen atom, distinctive R group
 - carboxylic acid group, ϵ carbon, nitro group, hydrogen atom
 - alcohol group, α carbon, amino group, nitrogen atom, distinctive R group, hydrogen atom
 - carboxylic acid group, δ carbon, imine radical, hydrogen atom, distinctive R group

ANSWER: b

3. What isomers of amino acids are found in proteins and what absolute configuration do they have?
- L isomer; R absolute configuration
 - D and L isomers; R absolute configuration
 - L isomer; S absolute configuration
 - D isomer; S absolute configuration
 - L and D isomers; S absolute configuration

ANSWER: c

4. In an acidic solution (pH = 1), what is the ionization state of an amino acid?
- The amino group is deprotonated; the carboxyl group is protonated.
 - The amino group is not dissociated; the carboxyl group is not dissociated.
 - The amino group is protonated; the carboxyl group is deprotonated.
 - The amino group is protonated; the carboxyl group is not dissociated.
 - The amino group is deprotonated; the carboxyl group is not dissociated.

ANSWER: d

5. Choose the correct groups for Thr, Lys, His, Met, respectively, on the basis of general chemical characteristics.
- polar but uncharged; negatively charged; positively charged; hydrophobic
 - polar but uncharged; positively charged; positively charged; hydrophobic
 - positively charged; hydrophobic; polar but not charged; positively charged
 - negatively charged; hydrophobic; positively charged; polar but not charged
 - positively charged; positively charged; polar but not charged; negatively charged

ANSWER: b

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6. Which amino acid has the one-letter abbreviation K?

- a. histidine
- b. asparagine
- c. alanine
- d. valine
- e. lysine

ANSWER: e

7. Choose the statement that does NOT reflect why a particular set of 20 amino acids becomes the building block of proteins.

- a. Other possible amino acids may have simply been too reactive.
- b. The rings in their cyclic forms are too big.
- c. They provide proteins with the versatility to assume many functional roles.
- d. Many of these amino acids were probably available from prebiotic reactions.
- e. As a set, they are diverse.

ANSWER: b

8. The amide bond is a linkage between the:

- a. β -amino group of one amino acid and the α -amino group of another amino acid.
- b. β -carboxyl group of one amino acid and the β -amino group of another amino acid.
- c. δ -carboxyl group of one amino acid and the α -carboxyl group of another amino acid.
- d. α -amino group of one amino acid and the ϵ -amino group of another amino acid.
- e. α -carboxyl group of one amino acid and the α -amino group of another amino acid.

ANSWER: e

9. What is the amino-terminal residue and what is the carboxyl-terminal residue in the sequence of amino acids Gly-Tyr-Gly-Phe-Leu?

- a. Leucine is N-terminal and glycine is C-terminal.
- b. Glycine is N-terminal and leucine is C-terminal.
- c. Tyrosine is N-terminal and leucine is C-terminal.
- d. Phenylalanine is N-terminal and leucine is C-terminal.
- e. There are no N-terminal and C-terminal residues in the sequences of amino acids.

ANSWER: b

10. Oligopeptide is a polypeptide chain made of:

- a. numerous amino acids.
- b. amino acids with a low molecular weight.
- c. positively charged amino acids.
- d. small numbers of amino acids.
- e. negatively charged amino acids.

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ANSWER: d

11. A protein with a molecular weight of $75\,550\text{ g mol}^{-1}$ has a mass of:

- a. 75,550 Da or 755.5 kDa.
- b. 7555 Da or 75.55 kDa.
- c. 75,550 Da or 75.55 kDa.
- d. 755,500 Da or 7.555 kDa.
- e. 7,555,000 Da or 75550 kDa.

ANSWER: c

12. Knowledge of the amino acid sequences is important for several reasons. What is NOT one of those reasons?

- a. Amino acid sequences determine the three-dimensional structures of proteins.
- b. The sequence of a protein reveals much about its evolutionary history.
- c. Knowledge of the sequence of a protein can help to prevent mutations.
- d. Changes in the amino acid sequence can lead to abnormal protein functioning and disease.
- e. The sequence of a protein is necessary to determine its function.

ANSWER: c

13. Choose atoms that lie in a plane in a pair of linked amino acids.

- a. $C_{\alpha 3}$, C, O, N, $C_{\alpha 2}$
- b. C_{α} , C, N, H, $C_{\alpha 2}$
- c. C_{α} , C, O, N, H, $C_{\alpha 3}$
- d. C_{α} , $C_{\alpha 2}$, $C_{\alpha 3}$, N, H, C
- e. C_{α} , C, O, N, H, $C_{\alpha 2}$

ANSWER: e

14. Which statement CORRECTLY describe a peptide bond?

- a. The C–N distance in a peptide bond is $1.49\text{ \AA}$; the peptide bond is positively charged.
- b. The C–N distance in a peptide bond is $1.27\text{ \AA}$; the bond resonates between a single bond and a double bond; the peptide bond is negatively charged.
- c. The C–N distance in a peptide bond is $1.32\text{ \AA}$; the bond resonates between a double bond and a triple bond; the peptide bond is a kind of dipole.
- d. The C–N distance in a peptide bond is $1.35\text{ \AA}$; the bond resonates between a single bond and a triple bond; the peptide bond is a kind of dipole.
- e. The C–N distance in a peptide bond is $1.30\text{ \AA}$; the bond resonates between a double bond and a triple bond; the peptide bond is positively charged.

ANSWER: c

15. What is the configuration of peptide bonds in proteins?

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- a. Almost all peptide bonds are in the *cis* configuration.
- b. Almost all peptide bonds are in the *trans* configuration.
- c. Half of all peptide bonds are in the *trans* configuration and the other half are in the *cis* configuration.
- d. Approximately one third are in the *trans* configuration and rest are in the *cis* configuration.
- e. Approximately one third are in the *cis* configuration and rest are in the *trans* configuration.

ANSWER: b

16. What is the name of the angle of rotation about the bond between the α carbon and the carbonyl carbon atoms?

- a. α
- b. δ
- c. ε
- d. ψ
- e. ϕ

ANSWER: d

17. An α helix is a coil stabilized by:

- a. intrachain hydrogen bonds between the carbonyl oxygen of a residue and the amide hydrogen of the fourth residue away.
- b. intrachain nitrogen bonds between the carbonyl nitrogen of a residue and the amide nitrogen of the second residue away.
- c. extrachain oxygen bonds between the carbonyl oxygen of a residue and the amide nitrogen of the fifth residue away.
- d. intrachain nitrogen bonds between the carbonyl nitrogen of a residue and the amide nitrogen of the sixth residue away.
- e. extrachain hydrogen bonds between the carbonyl hydrogen of a residue and the amide oxygen of the third residue away.

ANSWER: a

18. A β sheet is formed by linking two or more β strands lying next to one another through:

- a. nitrogen bonds.
- b. oxygen bonds.
- c. ionic bonds.
- d. disulfide bridges.
- e. hydrogen bonds.

ANSWER: e

19. What is the difference between β strands and loops?

- a. Loops do not have regular, periodic structures.
- b. Loops do not have hydrogen bonds.
- c. Loops have a greater molecular weight.

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- d. Loops do not have amino acid residues.
- e. Loops do not have a three-dimensional structure.

ANSWER: a

20. What describes the direction in which a helical structure rotates with respect to its axis?

- a. turn
- b. translation
- c. rise
- d. screw sense
- e. pitch

ANSWER: d

21. What muscle protein is composed of a single polypeptide chain of 153 amino acids and serves as the oxygen storage location?

- a. keratin
- b. hemoglobin
- c. myoglobin
- d. protoporphyrin
- e. heme

ANSWER: c

22. What is the secondary structure of myoglobin's main chain?

- a. about 70% β sheets and 30% turns and loops between helices
- b. about 70% eight α helices and 30% turns and loops between helices
- c. about 30% five α helices, 30% β sheets, and 40% turns and loops between helices
- d. about 50% five α helices, 20% β sheets, and 30% turns and loops between helices
- e. about 60% seven α helices and 40% turns and loops between helices

ANSWER: b

23. Why are all charged residues such as aspartate, glutamate, lysine, and arginine absent inside myoglobin?

- a. They help molecules to go through the cytoplasmic membrane.
- b. They play a critical role in regulatory activity.
- c. They play critical roles in signaling.
- d. They help to form the tertiary structure.
- e. They play critical roles in binding of iron and oxygen.

ANSWER: d

24. Why are porins considered to be "inside out" relative to proteins that function in aqueous solution?

- a. Porins are positively charged while usual proteins are negatively charged.
- b. Porins interact with the neighboring alkane chains while usual proteins interact with alkene chains.
- c. Porins function in outer membranes while usual proteins function in inner membranes.

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- d. Porins function only in bacteria while usual proteins function in all organisms.
- e. Porins have a reverse distribution of hydrophobic and hydrophilic amino acids.

ANSWER: e

25. What is the term for the combination helix-turn-helix?

- a. supersecondary structure
- b. supertertiary structure
- c. globular protein
- d. domain
- e. tertiary structure

ANSWER: a

26. How many domains does the extracellular part of CD4 comprise?

- a. five similar domains of approximately 150 amino acids each
- b. three different domains of approximately 150 amino acids each
- c. four similar domains of approximately 100 amino acids each
- d. two similar domains and two different domains of approximately 50 amino acids each
- e. five similar domains and four different domains of approximately 70 amino acids each

ANSWER: c

27. What are the interactions that associate the two helices in α -keratin?

- a. hydrogen bonds and electrostatic forces
- b. van der Waals forces and covalent interactions
- c. electrostatic forces and metallic bonds
- d. van der Waals forces and ionic interactions
- e. metallic bonds and van der Waals forces

ANSWER: d

28. Why are hair and wool flexible, unlike horns, claws, and hooves?

- a. Hair and wool have fewer ionic bonds than horns, claws, and hooves do.
- b. Hair and wool have fewer disulfide bond cross-links than horns, claws, and hooves do.
- c. Hair and wool have fewer metallic bonds than horns, claws, and hooves do.
- d. Hair and wool have fewer domains than horns, claws, and hooves do.
- e. Hair and wool have more loops than horns, claws, and hooves do.

ANSWER: b

29. What is the simplest sort of quaternary structure?

- a. a monomer
- b. a dimer consisting of two different subunits
- c. a dimer consisting of two identical subunits
- d. a trimer consisting of two identical subunits and one diverse subunit

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- e. a tetramer consisting of two identical subunits and diverse subunits

ANSWER: c

30. What is a structure of the hemoglobin molecule?

- a. α_2 dimer
- b. β_2 dimer
- c. $\alpha_2\beta_1$ trimer
- d. $\alpha_1\beta_2$ trimer
- e. $\alpha_2\beta_2$ tetramer

ANSWER: e

31. What is the structure of the coat of human rhinovirus?

- a. 50 copies of each of three subunits
- b. 55 copies of each of five subunits
- c. 70 copies of each of two subunits
- d. 60 copies of each of four subunits
- e. 100 copies of each of six subunits

ANSWER: d

32. What disrupts the noncovalent interactions in proteins?

- a. guanidinium sulfide
- b. β -mercaptoethanol
- c. uric acid
- d. urea
- e. ammonia

ANSWER: d

33. What statement about prions is FALSE?

- a. The infectious prions are aggregated forms of the PrP protein termed PrP^{SC}.
- b. Prions cause scrapie in sheep.
- c. Prions are proteins that can assume (after infection or by other causes) a new protein structure, which is self-propagating.
- d. Mammalian prion diseases are fatal.
- e. Prions are composed largely of a cellular protein called PrP, which is normally present in the liver.

ANSWER: e

34. The amino termini acetylation of proteins:

- a. makes these proteins negatively charged.
- b. makes these proteins more resistant to degradation.
- c. induces their conformation change.

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- d. makes these proteins hydrophobic.
- e. makes these proteins less exposed to mutations.

ANSWER: b

35. In the ribonuclease experiments performed by Anfinsen, β -mercaptoethanol reduced:
- a. all incorrectly paired bonds and stabilized the protein structure.
 - b. all bonds and destroyed the protein structure.
 - c. all charged residues, and the protein was unable to take part in signaling.
 - d. all bonds, and the unfolded protein molecules became tangled up with one another to form aggregates.
 - e. incorrectly paired disulfide bonds, allowing them to reform with the correct pairing until the most stable conformation of the protein had been obtained.

ANSWER: e

36. A protein has 400 residues. If each residue can assume four different conformations, the total number of different folded structures would be:
- a. 3^{400} .
 - b. 400^{100} .
 - c. 4^{400} .
 - d. 400.
 - e. 1200.

ANSWER: c

37. What is the term for a molecule that contains both positive and negative charges but overall has a neutral charge?
- a. enantiomer
 - b. amino acid
 - c. racemate
 - d. zwitterion
 - e. amphipath

ANSWER: d

38. Which amino acid forms disulfide bonds?
- a. histidine
 - b. methionine
 - c. proline
 - d. serine
 - e. cysteine

ANSWER: e

39. What amino acid has an ionizable R group with a pK_a near neutral pH?

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- a. histidine
- b. serine
- c. aspartic acid
- d. lysine
- e. tyrosine

ANSWER: a

40. What plot type allows one to investigate the likely ϕ and ψ angles of the peptide backbone?

- a. Hill
- b. Lineweaver–Burk
- c. Hanes–Woelf
- d. Ramachandran
- e. Michaelis–Menten

ANSWER: d

41. What level of protein structure is composed of α helices, β sheets, and turns?

- a. primary
- b. secondary
- c. tertiary
- d. quaternary
- e. supersecondary

ANSWER: b

42. The overall three-dimensional structure of a single polypeptide is referred to as _____ structure.

- a. primary
- b. secondary
- c. tertiary
- d. quaternary
- e. supersecondary

ANSWER: c

43. At a pH of 12, what is the charged groups present in glycine?

- a. $-\text{NH}_3^+$
- b. $-\text{COO}^-$
- c. $-\text{NH}_2^+$
- d. $-\text{NH}^+$
- e. $-\text{CO}^-$

ANSWER: b

44. The amino acids Tyr, Asn, and Thr:

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- a. have aromatic rings.
- b. are negatively charged at pH = 7.0.
- c. are positively charged at pH = 7.0.
- d. have double bonds in side chains.
- e. are polar.

ANSWER: e

45. Which individual won a Nobel Prize for his or her landmark work in sequencing the protein insulin?

- a. Pauling
- b. McClintock
- c. Gilbert
- d. Maxam
- e. Sanger

ANSWER: e

46. What structures did Pauling and Corey predict in 1951?

- a. α helix, α sheet, and β turn
- b. α helix and α sheet
- c. α helix, β sheet, and β turn
- d. α turn and β sheet
- e. α helix and β sheet

ANSWER: e

47. The term *quaternary* with respect to protein structure stands for:

- a. a repeating structure stabilized by intrachain hydrogen bonds.
- b. the ability to form all four kinds of noncovalent bonds.
- c. a multisubunit structure.
- d. a linear sequence of four amino acids.
- e. the only four amino acids that can form hydrogen bonds.

ANSWER: c

48. What pair of amino acids is positively charged at a neutral pH?

- a. Lys, Arg
- b. Tyr, Arg
- c. Cys, Met
- d. Leu, Pro
- e. Asp, Glu

ANSWER: a

49. What is NOT a modification acquired by proteins?

- a. cleavage and trimming of the protein

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- b. addition of carbohydrate groups
- c. phosphorylation of certain groups
- d. hydrolysis of all protein
- e. addition of acetyl groups

ANSWER: d

50. What amino acid residue would MOST likely be buried in the interior of a water-soluble globular protein?

- a. Asp
- b. Ser
- c. Phe
- d. Lys
- e. Gln

ANSWER: c