Principles of Biochemistry, 5e **(Moran/Horton/Scrimgeour/Perry/Rawn)**
Chapter 3 Amino Acids and the Primary Structures of Proteins

1) Amino acids are named that because each one
A) is a unique carboxylic acid.
B) has a standard configuration.
C) is a carboxyl derivative of an amide acid.
D) is an amino derivative of a carboxylic acid.
Answer: D
Page Ref: Section 3-1

2) Amino acids found in meteorites and near stars are
A) D isomers only.
B) L isomers only.
C) Both D and L isomers.
D) not isomers.
Answer: C
Page Ref: Section 3-1

3) The last common ancestor of modern organisms must have used
A) D amino acids.
B) L amino acids.
C) both D and L amino acids.
D) either D or L amino acids.
Answer: B
Page Ref: Section 3-1

4) If the R group of an amino acid is -CH_3, then the name of this compound is
A) methyl amino acid.
B) 2-aminopropanoic acid.
C) alanine.
D) All of the above.
E) B and C.
Answer: E
Page Ref: Section 3-1

5) Amino acids with non-ionizable side chains are zwitterions when they are _____.
A) in any solution
B) at physiological pH, pH = 7.4
C) in acidic solutions only
D) in alkaline solutions only
E) All of the above
Answer: B
Page Ref: Section 3-1

6) Glycine is not a stereoisomer because
A) it has no chiral carbon.
B) it does not form enantiomers.
C) it does not exist in two non-superimposable mirror-image forms.
D) All of the above.
E) A and B only.
Answer: D
Page Ref: Section 3-1

7) An amino acid with two chiral carbon atoms
A) is unstable.
B) can exist in 4 forms, all of which are superimposable.
C) can form three possible stereoisomers.
D) can form four possible stereoisomers.
E) can form five possible stereoisomers.
Answer: D
Page Ref: Section 3-1

8) The number of commonly found amino acids with only one chiral carbon is
A) 17.
B) 18.
C) 19.
D) 20.
Answer: A
Page Ref: Section 3-1

9) At neutral pH, the net charge of serine is
A) positive.
B) negative.
C) zero.
D) None of the above.
Answer: C
Page Ref: Section 3-1

10) Fossil dating by amino acid racemization measured
A) the amount of a D-amino acid present.
B) the amount of an L-amino acid present.
C) the amounts of both D and L forms of an amino acid present.
D) the total of all amino acids present.
Answer: C
Page Ref: Section 3-1

11) The RS system of nomenclature describes
A) the relative sizes of molecules.
B) the way the amino acid side chains are arranged.
C) the absolute configuration about chiral carbon centers .
D) the strength of the chemical groups in amino acids.
Answer: C
Page Ref: Section 3-1

12) The R group of an amino acid determines if it is
A) hydrophilic or hydrophobic.
B) polar or nonpolar.
C) charged or uncharged.
D) an acid or a base.
E) All of the above.
Answer: E
Page Ref: Section 3-1

13) Proline is distinct among the 20 commonly found amino acids because
A) it is a ring compound.
B) it is hydrophilic and ionic.
C) the nitrogen of the amino group is in a ring.
D) the carbon of the carboxyl group is in a ring.
E) it has little effect on protein structure.
Answer: C
Page Ref: Section 3-2

14) Tyrosine and tryptophan are less hydrophobic than phenylalanine because
A) phenylalanine has an indole group.
B) phenylalanine has no polar group in the side chain.
C) phenylalanine is a phenol.
D) tyrosine and tryptophan have smaller R groups.
E) All of the above.
Answer: B
Page Ref: Section 3-2

15) Alanine, valine, leucine and isoleucine are important in three dimensional structure because they
A) are branched.
B) are highly hydrophobic.
C) are highly hydrophilic.
D) attract water molecules.
Answer: B
Page Ref: Section 3-2

16) Ultraviolet (UV) light can be used to estimate protein solution concentrations because
A) phenylalanine absorbs at 260 nm.
B) all the amino acids absorb UV light.
C) aromatic amino acids absorb at 280 nm.
D) tryptophan and tyrosine absorb at 280 nm.
E) All of the above.
Answer: D
Page Ref: Section 3-2

17) Concentrations of some proteins cannot be estimated by UV spectrophotometry because they are
A) low in glycine and valine.
B) low in tryptophan and tyrosine.
C) low in protein.
D) high in aromatic amino acids.
Answer: B
Page Ref: Section 3-2

18) The amino acids in polypeptide chains which contain sulfur (S) are
A) cysteine, cystine, and methionine.
B) cystine.
C) methionine only.
D) cysteine only.
E) cysteine and methionine.
Answer: E
Page Ref: Section 3-2

19) Disulfide bridges can form in proteins _____.
A) only between cysteine residues side-by-side in the protein sequence
B) between cysteine residues that are close in three-dimensional space, but not necessarily close in the primary structure
C) between two cystine residues in proteins
D) between any two methionines or cysteines
Answer: B
Page Ref: Section 3-2

20) The overall shape of a protein is greatly influenced by
A) amino acid R group properties.
B) charged amino acids.
C) hydrophobic amino acids.
D) pH.
E) hydrophilic amino acids.
Answer: A
Page Ref: Section 3-2

21) Although the hydroxyl groups in serine and threonine are uncharged, they can react within active sites of some enzymes _____.
A) precisely because they are uncharged
B) because the hydroxyl group is polar
C) because the hydroxyl group is small and fits into the site
D) All of the above
Answer: B
Page Ref: Section 3-2

22) Basic amino acids are _____ (positive, negative) at pH 7 and acidic R group amino acids are _____ (positive, negative) at pH 7.
A) negative; positive
B) negative; negative
C) positive; negative
D) positive; positive
Answer: C
Page Ref: Section 3-2

23) An amino acid named for a plant from which it was first isolated is
A) proline.
B) methionine.
C) threonine.
D) asparagine.
Answer: D
Page Ref: Section 3-2

24) Arginine is the most basic of the 20 amino acids because its side chain is _____ under most cell conditions.
A) very highly charged
B) hydrophobic
C) titrated
D) protonated
E) negatively charged
Answer: D
Page Ref: Section 3-2

25) Cystine is likely to be isolated from proteins that are
A) high in methionine.
B) in the cell nucleus.
C) intracellular.
D) extracellular.
Answer: D
Page Ref: Section 3-2

26) A protein that contains more isoleucine, phenylalanine and leucine than asparagine, lysine and arginine is most likely
A) hydrophilic.
B) hydrophobic.
C) neutral.
D) low on the hydropathy index scale.
Answer: B
Page Ref: Section 3-2

27) A sequence of amino acids with a relatively high hydropathy is very likely to function by
A) being at the active site of an enzyme.
B) being embedded in a cell membrane.
C) making a protein soluble.
D) being on the protein surface.
Answer: B
Page Ref: Section 3-2

28) Hydropathy is an important determination of protein-chain folding because
A) it predicts accurately where charged amino acids will appear in a protein.
B) it describes a specific type of folding.
C) it distinguishes enzymes from structural proteins.
D) hydrophobic R groups tend to cluster in the interior of proteins.
Answer: D
Page Ref: Section 3-2

29) A polypeptide chain may have abrupt changes in direction and restriction in geometry because of the presence of
A) arginine.
B) glycine.
C) proline.
D) leucine or isoleucine.
Answer: C
Page Ref: Section 3-2

30) Amino acids which are not incorporated into polypeptides are sometimes converted into
A) neurotransmitters.
B) methyl donors.
C) antibiotics.
D) blood flow controllers.
E) All of the above.
Answer: E
Page Ref: Section 3-3

31) When cystine is isolated after a protein is hydrolyzed, it is deduced that
A) 2 cysteine amino acids are present in the protein.
B) the protein is linked by a disulfide bridge.
C) 2 cysteine amino acids in the protein or proteins must be adjacent.
D) All of the above.
Answer: D
Page Ref: Section 3-3

32) Proteins can be modified by adding _____ to protein residues.
A) sugars and phosphate groups
B) hydroxyl and formyl groups
C) cystine
D) A and B
E) All of the above
Answer: D
Page Ref: Section 3-3

33) Selenocysteine, N-formylmethionine and pyrrolysine are found in many proteins. These amino acids are considered standard amino acids along with 20 common amino acids because they
A) are incorporated into proteins from specific codons.
B) are formed by post-translational modifications.
C) play key roles in metabolism.
D) are precursors of other important amino acids.
Answer: A
Page Ref: Section 3-3

34) At the isoelectric pH of an amino acid which has two pKa values the net charge is
A) 0.5.
B) 1.
C) 0.
D) -1.
Answer: C
Page Ref: Section 3-3

35) Histidine has pKa values of 1.8, 6.0 (R-group) and 9.3. At pH 8.0, the net charge on histidine is
A) positive.
B) negative.
C) neutral (uncharged).
D) Insufficient information to tell.
Answer: C
Page Ref: Section 3-3

36) Which amino acid is ideal for the transfer of protons within the catalytic site of enzymes due to the presence of significant amounts of both the protonated and deprotonated forms of its side chain at biological pH?
A) Lysine.
B) Asparagine.
C) Tyrosine.
D) Cysteine.
E) Histidine.
Answer: E
Page Ref: Section 3-3

37) The pKa's of arginine's α-Carboxyl group, α-Amino group and side chain are 1.8, 9.0 and 12.5, respectively. Calculate the isoelectric point.
A) 7.8
B) 7.2
C) 10.8
D) 5.4
Answer: C
Page Ref: Section 3-4

38) The pKa's of isoleucine's α-Carboxyl group and α-Amino group are 2.3 and 9.8, respectively. Calculate the isoelectric point.
A) 2.3
B) 6.0
C) 9.8
D) The isoelectric point cannot be calculated without the pKa value for the side chain.
Answer: B
Page Ref: Section 3-4

39) The pH inside cells is normally near pH 7. At pH 7 which statement is true about the charges (ionization state) of the α-Carboxyl and α-Amino groups of an amino acid?
A) The α-Carboxyl group is 1^- and the α-Amino group is 1^+.
B) The α-Carboxyl group is 1^+ and the α-Amino group is 1^-.
C) The α-Carboxyl group is 1^- and the α-Amino group is uncharged.
D) Both groups are uncharged (not ionized) at pH 7.
Answer: A
Page Ref: Section 3-4

40) Which structure below is appropriate for glycine at neutral pH?
A) H_2NCH_2COOH
B) $H_2NCH_2COO^-$
C) $+H_3NCH_2COO^-$
D) $+H_3NCH_2COOH$
Answer: C
Page Ref: Section 3-4

41) The pKa of a certain weak acid is 4.0. Calculate the ratio of proton acceptor to proton donor at pH 7.0.
A) 1000:1
B) 20:1
C) 3:1
D) 1:1
E) The ratio cannot be calculated without knowing the structure of the weak acid.
Answer: A
Page Ref: Section 3-4

42) The pKa's of the side chain group and the α-carboxyl group of glutamate are 4.1 and 2.1, respectively. Which statement accounts for this difference?
A) The side chain has more possible resonance structures.
B) The α-carboxyl group has less steric hindrance and is therefore ionized more easily.
C) The side chain is a different functional group than the α-carboxyl group.
D) The α-carboxyl group is closer to the α-amino group than the side chain is.
Answer: D
Page Ref: Section 3-4

43) How do the pKa values of an ionizable side chain compare when the amino acid is free versus when it is in a polypeptide chain?
A) The pKa of the side chain is independent of whether the amino acid is in a polypeptide chain or is free.
B) The pKa of the side chain is always lower for the free amino acid.
C) The pKa of the side chain may be lower or higher in a polypeptide chain due to weaker inductive effects and differences in their microenvironments.
D) The pKa of the side chain is usually higher in a polypeptide chain due to stabilization from nearby residues in the three-dimensional structure.
Answer: C
Page Ref: Section 3-4

44) The isoelectric point of alanine is pH = 6.15. It is mixed with proline (pHCOOH = 2.0; $pHNH_2$ = 10.6), and the mixture is placed in an electric field at pH 6.15. Which statement is true?
A) The two amino acids will be separated.
B) The two amino acids will not be separated.
C) Neither amino acid will move in the electric field.
D) Both amino acids will move from the origin and be separated.
Answer: A
Page Ref: Section 3-4

45) An enzyme works well at as a catalyst at a pH of 7.2. It is found that catalytic activity is significantly less at a pH of 8.4. Which could likely cause the decrease in activity?
A) The protein has been degraded into its amino acids at pH 8.4.
B) The protein has changed shape due to a change in charge.
C) The protonation state of amino acids involved in the catalytic mechanism has changed.
D) B and C above.
E) All of the above.
Answer: D
Page Ref: Section 3-4

46) According to the Henderson-Hasselbalch equation, when the concentrations of proton acceptor and proton donor are the same, then
A) the carboxylic acid is totally neutralized.
B) only salt forms are present.
C) pH = pKa.
D) pKa = log[proton acceptor]/[proton donor].
Answer: C
Page Ref: Section 3-4

47) For the amino acid lysine, the Henderson-Hasselbalch equation can be applied to _____ ionization group(s).
A) one
B) two
C) three
D) four
Answer: C
Page Ref: Section 3-4

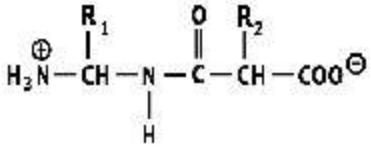
48) The primary structure of a protein specifically describes the _____.
A) location of disulfide bonds
B) linear sequence of amino acids
C) overall three-dimensional shape
D) Φ and Ψ angles for each amino acid
Answer: B
Page Ref: Section 3-5

49) The peptide bond is which of the following?
A) An amide bond.
B) An ester bond.
C) An ether bond.
D) An amine bond.
Answer: A
Page Ref: Section 3-5

50) Which amino acids are linked in phenylalanylglycine?
A) Phenyline, alanine and glycine.
B) Phenol, alanine and glycine.
C) Phenylalanine and glycine.
D) Phenol, adenine and glycine.
Answer: C
Page Ref: Section 3-5

51) Which shows a proper peptide bond?

A)



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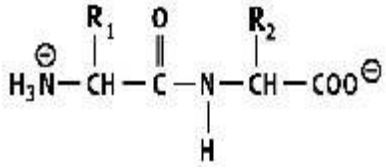
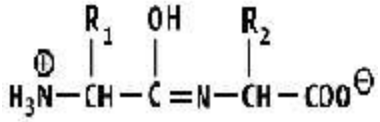
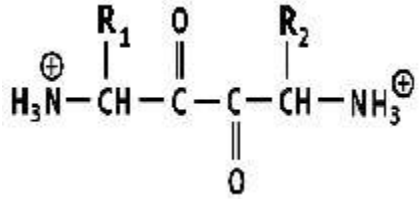


C)



D)



Answer: B
Page Ref: Section 3-5

52) What is the N-terminal for the pentapeptide Val-Ile-Glu-Arg-Tyr?
A) The NH_3^+ group on the side chain of Arg.
B) Valine.
C) Tyrosine.
D) Tryptophan.
Answer: B
Page Ref: Section 3-5

53) What is the net charge on the tripeptide Gly-Arg-Lys at pH 7? The table below gives the pKa's of the ionizable groups on the free amino acids.

Free amino acid	pKa of α-Carboxyl group	pKa of α-amino group	pKa of side chain
Glycine	2.4	9.8	---
Arginine	1.8	9.0	12.5
Lysine	2.2	9.1	10.5

A) -1
B) 0
C) +1
D) +2
Answer: D
Page Ref: Section 3-5

54) What is the net charge on the dipeptide Arg-Pro at pH 9.0? The table below gives the pKa's of the ionizable groups on the free amino acids.

Free amino acid	pKa of α-Carboxyl group	pKa of α-amino group	pKa of side chain
Arginine	1.8	9.0	12.5
Proline	2.0	10.6	---

A) -1
B) -0.5
C) 0
D) +0.5
E) +1
Answer: D
Page Ref: Section 3-5

55) The ionic charges associated with a protein molecule are _____.
A) mostly contributed by the side chains of constituent amino acids
B) determined by the contribution from the α-carboxyl group, α-amino group and side chain of every amino acid in the protein
C) contributed by only the N-terminal and C-terminal residues
D) independent of the amino acid composition and depend only on pH
Answer: A
Page Ref: Section 3-5

56) Which substance is used to fractionate proteins based on differences in their solubility as a function of salt concentration?
A) Cellophane.
B) Sodium dodecyl sulfate.
C) Phenylisothiocyanate.
D) Ammonium sulfate.
Answer: D
Page Ref: Section 3-6

57) Ammonium sulfate is often used as a first step in protein purification because it
A) buffers solutions and protects the protein.
B) precipitates many proteins.
C) precipitates all proteins.
D) hydrolyzes proteins into their constituent amino acids.
Answer: C
Page Ref: Section 3-6

58) Dialysis during protein purification is a process to
A) concentrate proteins.
B) remove high molecular weight substances.
C) dissolve insoluble proteins.
D) remove low molecular weight solutes such as salts.
Answer: D
Page Ref: Section 3-6

59) The first treatment of a crude protein extract usually involves
A) electroplating of unwanted proteins.
B) acidification followed by neutralization.
C) fractionation with varying salt concentrations and centrifugation.
D) treatment with a great number of proteases.
Answer: C
Page Ref: Section 3-6

60) In a biochemistry laboratory a student added ammonium sulfate to a tube containing a buffered protein solution. The student then centrifuged the solution. What was the student probably trying to do?
A) Change the pH of the buffer solution to solubilize all proteins.
B) Hydrolyze the proteins into their constituent amino acids to determine the percent composition.
C) Derivatize the N-terminal amino acid of all proteins.
D) Selectively precipitate and purify a certain protein.
Answer: D
Page Ref: Section 3-6

61) The liquid emerging from the bottom of a chromatography column is called the _____.
A) eluate
B) supernatant
C) solute
D) lysate
Answer: A
Page Ref: Section 3-6

62) Gel-filtration chromatography separates a mixture of proteins on the basis of _____.
A) charge
B) size
C) affinity for ligands in the column matrix
D) density
Answer: B
Page Ref: Section 3-6

63) A mixture of four proteins (X, Y, Z and N) is applied to a gel-filtration column. Given the information supplied, which will elute first?

Protein	Molecular Weight (g/mol)
X	35,000
Y	26,000
Z	146,000
N	26,000

A) Z.
B) Y and N elute together.
C) X.
D) Cannot answer without information about the isoelectric point.
Answer: A
Page Ref: Section 3-6

64) Which is used as the basis of separation of proteins by affinity chromatography?
A) The net charge and pI of the protein at the pH of the column.
B) The protein's molecular weight.
C) The protein's density.
D) The selective binding of the protein to a ligand on the column matrix.
Answer: D
Page Ref: Section 3-6

65) A mixture of two proteins with the same pI and molecular weights (MW) of 10,000 and 15,000 daltons, respectively, are applied to a gel filtration column. What happens during elution?
A) Both elute together.
B) The one with MW of 10,000 elutes first.
C) The one with MW of 15,000 elutes first.
D) More information is needed about the specificity of the column matrix to tell what happens.
Answer: C
Page Ref: Section 3-6

66) What is the purpose of SDS in SDS-PAGE?
A) To selectively bind the target protein.
B) To maintain buffer pH in the gel.
C) To cause the separation to be on the basis of molecular weight only.
D) To initiate polymerization of acrylamide to form a gel.
Answer: C
Page Ref: Section 3-6

67) Which technique is used less for protein purification and more for the determination of molecular weights?
A) Affinity chromatography.
B) SDS-PAGE.
C) Gel filtration.
D) Ion exchange chromatography.
Answer: B
Page Ref: Section 3-6

68) Even though mass spectrometry has been in use for over a hundred years, it had only limited use with proteins until the 1980s because
A) not many proteins had been discovered and purified before the 1980s.
B) it was not possible to disperse charged proteins into a gaseous stream of particles.
C) many proteins are difficult or impossible to crystallize.
D) proteins decompose too quickly into their component amino acids.
Answer: B
Page Ref: Section 3-7

69) In which technique is a protein solution pumped through a metal needle at high voltage to create tiny droplets that are analyzed for their mass/charge ratio?
A) Electrospray mass spectrometry.
B) MALDI-TOF.
C) Aerosol microscopy.
D) Millikan analysis.
E) SDS-PAGE.
Answer: A
Page Ref: Section 3-7

70) Which statement is true about SDS-PAGE of proteins?
A) The migration order for proteins in SDS-PAGE is the same as the order in gel filtration because both are sieving techniques.
B) Some proteins migrate toward the anode and others toward the cathode.
C) The rate of migration is inversely proportional to the logarithm of the protein's mass.
D) SDS-PAGE is purely an analytic technique and is not used to purify proteins.
Answer: C
Page Ref: Section 3-7

71) Which technique is most sensitive and accurate for the determination of a protein's molecular weight?
A) SDS-PAGE.
B) Gel filtration chromatography.
C) Mass spectrometry.
D) X-ray crystallography.
E) Osmotic pressure.
Answer: C
Page Ref: Section 3-7

72) Which is used to hydrolyze the peptide bonds of a protein to yield free amino acids?
A) PITC
B) SDS
C) CNBr
D) HCl
Answer: D
Page Ref: Section 3-8

73) Which will react with amino acids to yield derivatives that can be detected by monitoring the absorbance at 254 nm?
A) PITC
B) SDS
C) CNBr
D) HCl
Answer: A
Page Ref: Section 3-8

74) The distribution of amino acids in a protein often cannot be determined precisely by acid hydrolysis. Why?
A) The side chains of asparagine and glutamine are also hydrolyzed.
B) The amine groups on lysine and arginine neutralize much of the acid.
C) The side chain of phenylalanine is almost totally destroyed by acid hydrolysis.
D) All of the above.
Answer: A
Page Ref: Section 3-8

75) In the amino acid analysis the PTC-amino acid derivatives of a hydrolyzed protein are subjected to HPLC. How do you determine which amino acids are present?
A) From their elution time from the HPLC column
B) From the value of the absorbance at 254 nm
C) From the value of the absorbance at 254 nm
D) From conductivity of the separated derivatives
Answer: A
Page Ref: Section 3-8

76) What is the purpose of treating a protein with 2-mercaptoethanol?
A) To hydrolyze the protein into its amino acids.
B) To cleave the disulfide bonds.
C) To derivatize any free sulfhydryl groups to prevent them from reforming disulfide bonds.
D) To derivatize the N-terminal amino acid during the Edman degradation.
Answer: B
Page Ref: Section 3-9

77) Calculate the approximate relative molecular mass, Mr, for a protein with 527 amino acid residues.
A) 5.27×10^{6}
B) 5.8×10^{4}
C) 4.8
D) 1.7×10^{-5}
E) Cannot determine without knowing the exact sequence of amino acids.
Answer: B
Page Ref: Section 3-9

78) An octapeptide was determined to have the following amino acid composition:
Lys (2), Phe (2), Gly (1), His (1), Leu (1), Met (1). The native peptide was run through one cycle of the Edman degradation and the PTH-leucine derivative was identified by HPLC. When the native peptide was exposed to cyanogen bromide (BrCN), a heptapeptide and free glycine were recovered. Incubation of the native protein with trypsin gave a tetrapeptide, a tripeptide, and free lysine. The peptides were separated and each run through one cycle of the Edman degradation. The tetrapeptide yielded the PTH-leucine derivative, and the tripeptide yielded the PTH-phenylalanine derivative. Incubation of the native protein with pepsin produced a dipeptide and two tripeptides. The amino acid composition of the tripeptides (not the order) were determined to be (Phe, Gly, Met) and (Phe, Lys, Lys). What is the sequence of the octapeptide?

Specificities of Proteases

BrCN	cuts at the C-terminal side of Met
Trypsin	cuts at the C-terminal side of Lys or Arg
Pepsin	cuts at the N-terminal side of Phe, Trp or Tyr

A) Leu-His-Phe-Lys-Lys-Phe-Met-Gly
B) Gly-Met-Phe-Lys-Lys-Phe-His-Leu
C) Met-Leu-Phe-Lys-Phe-Gly-Lys-His
D) Leu-His-Lys-Lys-Phe-Phe-Gly-Met
E) His-Phe-Leu-Lys-Lys-Phe-Met-Gly
Answer: A
Page Ref: Section 3-10

79) How does one determine a tryptic fingerprint to identify a protein?
A) Enzymatic treatment followed by mass spectrometry.
B) Enzymatic treatment followed by gel electrophoresis.
C) Treatment with dithiothreitol followed by isoelectric focusing.
D) Treatment with PITC followed by mass spectrometry.
Answer: A
Page Ref: Section 3-10

80) What information can be gained by comparing the sequences of proteins that have the same or similar function in different species?
A) To determine evolutionary relationships and relatedness of species.
B) To determine sequences that are conserved among species since they are likely to be important to the function and stability of the proteins.
C) To locate highly variable residues which contribute little to the structure and function of the protein.
D) All of the above.
Answer: D
Page Ref: Section 3-11

81) If two proteins are determined to have descended from a common ancestor they are
A) heterogeneous.
B) amphipathic.
C) taxolinked.
D) homologous.
Answer: D
Page Ref: Section 3-11

82) All 20 common amino acids have an amino group and a carboxyl group bonded to the same carbon atom.
Answer: TRUE
Page Ref: Section 3-1

83) All 20 common amino acids exist in nature equally as both the D and L stereoisomers.
Answer: FALSE
Page Ref: Section 3-1

84) All amino acids have mirror-image pairs designated D and L.
Answer: FALSE
Page Ref: Section 3-1

85) Uncharged R groups of amino acids are not polar.
Answer: FALSE
Page Ref: Section 3-2

86) Ultraviolet (UV) light can be used to estimate concentrations of proteins in solutions because tryptophan and tyrosine absorb light at a wavelength of 280 nm.
Answer: TRUE
Page Ref: Section 3-2

87) Asparagine and glutamine are both amides of aspartic acid and because they have uncharged sidechains are often found on the interior of proteins.
Answer: FALSE
Page Ref: Section 3-2

88) The hydropathy of amino acids can help determine the folding of protein chains.
Answer: TRUE
Page Ref: Section 3-2

89) Amino acids and amino acid derivatives can be used to modify proteins.
Answer: FALSE
Page Ref: Section 3-3

90) The isoelectric point of amino acids is the average of the values pKCOOH + $pKNH_2$.
Answer: FALSE
Page Ref: Section 3-4

91) Amino acids are neutral at the isoelectric pH.
Answer: TRUE
Page Ref: Section 3-4

92) In gel electrophoresis the molecules with the highest molecular weight migrate the farthest from the starting wells.
Answer: FALSE
Page Ref: Section 3-6

93) Cation-exchange resins have negatively charged groups covalently attached to the column matrix.
Answer: TRUE
Page Ref: Section 3-6

94) Affinity chromatography can be used to save many purification steps compared to other techniques due to its high specificity for the target protein.
Answer: TRUE
Page Ref: Section 3-6

95) Most proteins contain an approximately equal amount of each of the standard amino acids.
Answer: FALSE
Page Ref: Section 3-6

96) Most purification procedures for proteins are carried out at room temperature.
Answer: FALSE
Page Ref: Section 3-6

97) The purpose of adding ammonium sulfate to a solution containing proteins is to cause fractionation by precipitating the less soluble proteins.
Answer: TRUE
Page Ref: Section 3-6

98) The liquid that emerges from the bottom of a chromatographic column is called the supernatant.
Answer: FALSE
Page Ref: Section 3-6

99) The twenty standard amino acids are the only amino acids found in living organisms.
Answer: FALSE
Page Ref: Section 3-7

100) Iodoacetate is used to acetylate sulfhydryl groups to prevent their oxidation to disulfides.
Answer: TRUE
Page Ref: Section 3-8

101) Proteins are treated with substances such as 2-mercaptoethanol to remove disulfide bonds before being sequenced because the disulfide bonds will interfere with the sequencing procedure.
Answer: TRUE
Page Ref: Section 3-9

Match the following to their functions.

A) N-formylmethionine
B) Histamine
C) S-adenosylmethionine
D) g-aminobutyrate
E) selenocysteine
F) epinephrine (adrenaline)

102) Regulates mammalian metabolism.
Page Ref: Section 3-3

103) Methyl donor in metabolism
Page Ref: Section 3-3

104) 21st amino acid in many species
Page Ref: Section 3-3

105) First amino acid in newly synthesized bacterial proteins
Page Ref: Section 3-3

106) Neurotransmitter
Page Ref: Section 3-3

107) Controls the constriction of certain blood vessels
Page Ref: Section 3-3

Answers: 102) F, 103) C, 104) E, 105) A, 106) D, 107) B