

1. A major component of RNA but not of DNA is:
- adenine.
  - cytosine.
  - guanine.
  - thymine.
  - uracil.
2. The phosphodiester bonds that link adjacent nucleotides in both RNA and DNA:
- always link A with T and G with C.
  - are susceptible to alkaline hydrolysis.
  - are uncharged at neutral pH.
  - form between the planar rings of adjacent bases.
  - join the 3' hydroxyl of one nucleotide to the 5' hydroxyl of the next.
3. For the oligoribonucleotide ACGUAC:
- the nucleotide at the 3' end has a phosphate at its 3' hydroxyl.
  - the nucleotide at the 3' end is a purine.
  - the nucleotide at the 5' end has a 5' hydroxyl.
  - the nucleotide at the 5' end has a phosphate on its 5' hydroxyl.
  - the nucleotide at the 5' end is a pyrimidine.
4. In a double-stranded nucleic acid, cytosine typically base-pairs with:
- adenosine.
  - guanine.
  - inosine.
  - thymine.
  - uracil.
5. Double-stranded regions of RNA:
- are less stable than double-stranded regions of DNA.
  - can be observed in the laboratory, but probably have no biological relevance.
  - can form between two self-complementary regions of the same single strand of RNA.
  - do not occur.
  - have the two strands arranged in parallel (unlike those of DNA, which are antiparallel).
6. Restriction enzymes:
- act at the membrane to restrict the passage of certain molecules into the cell.
  - are highly specialized ribonucleases that degrade mRNA soon after its synthesis.
  - are sequence-specific DNA endonucleases.
  - are very specific proteases that cleave peptides at only certain sequences.
  - catalyze the addition of a certain amino acid to a specific tRNA.
7. A convenient cloning vector with which to introduce foreign DNA into *E. coli* is a(n):
- E. coli* chromosome.
  - messenger RNA.
  - plasmid.
  - yeast "ARS" sequence.
  - yeast transposable element.

8. The PCR reaction mixture does *not* include:

- A. all four deoxynucleoside triphosphates.
- B. DNA containing the sequence to be amplified.
- C. DNA ligase.
- D. heat-stable DNA polymerase.
- E. oligonucleotide primer(s).

9. Of the 20 standard amino acids, only \_\_\_\_\_ is not optically active. The reason is that its side chain \_\_\_\_\_.

- A. alanine; is a simple methyl group
- B. glycine; is a hydrogen atom
- C. glycine; is unbranched
- D. lysine; contains only nitrogen
- E. proline; forms a covalent bond with the amino group

10. Two amino acids of the standard 20 contain sulfur atoms. They are:

- A. cysteine and serine
- B. cysteine and threonine
- C. methionine and cysteine
- D. methionine and serine
- E. threonine and serine

11. In a highly basic solution, pH = 13, the dominant form of glycine is:

- A.  $\text{NH}_2\text{—CH}_2\text{—COOH}$
- B.  $\text{NH}_2\text{—CH}_2\text{—COO}^-$
- C.  $\text{NH}_2\text{—CH}_3^+\text{—COO}^-$
- D.  $\text{NH}_3^+\text{—CH}_2\text{—COOH}$
- E.  $\text{NH}_3^+\text{—CH}_2\text{—COO}^-$

12. An octapeptide composed of four repeating glycylalanyl units has:

- A. one free amino group on an alanyl residue
- B. one free amino group on an alanyl residue and one free carboxyl group on a glycyl residue
- C. one free amino group on a glycyl residue and one free carboxyl group on an alanyl residue
- D. two free amino and two free carboxyl groups
- E. two free carboxyl groups, both on glycyl residues

13. In a mixture of the five proteins listed below, which should elute second in size-exclusion (gel- filtration) chromatography?

- |                     |                       |
|---------------------|-----------------------|
| A. cytochrome c     | <i>m.w.</i> = 13,000  |
| B. immunoglobulin G | <i>m.w.</i> = 145,000 |
| C. ribonuclease A   | <i>m.w.</i> = 13,700  |
| D. RNA polymerase   | <i>m.w.</i> = 450,000 |
| E. serum albumin    | <i>m.w.</i> = 68,500  |

14. Which of the following refers to particularly stable arrangements of amino acid residues in a protein that give rise to recurring patterns?

- A. Primary structure
- B. Secondary structure
- C. Tertiary structure
- D. Quaternary structure
- E. None of the above

15. All of the following are considered “weak” interactions in proteins, *except*:

- A. hydrogen bonds
- B. hydrophobic interactions
- C. ionic bonds
- D. peptide bonds
- E. van der Waals forces

16. A D-amino acid would interrupt an  $\alpha$  helix made of L-amino acids. Another naturally occurring hindrance to the formation of an  $\alpha$  helix is the presence of:

- A. a negatively charged Arg residue
- B. a nonpolar residue near the carboxyl terminus
- C. a positively charged Lys residue
- D. a Pro residue
- E. two Ala residues side by side

17. The amino acid substitution of Val for Glu in Hemoglobin in sickle cell anemia (Hemoglobin S) results in aggregation of the protein because of \_\_\_\_\_ interactions between molecules.

- A. covalent
- B. disulfide
- C. hydrogen bonding
- D. hydrophobic
- E. ionic

18. The interactions of ligands with proteins:

- A. are relatively nonspecific.
- B. are relatively rare in biological systems.
- C. are usually irreversible.
- D. are usually transient.
- E. usually result in the inactivation of the proteins.

19. An allosteric interaction between a ligand and a protein is one in which:

- A. binding of a molecule to a binding site affects binding of additional molecules to the same site.
- B. binding of a molecule to a binding site affects binding properties of another site on the protein.
- C. binding of the ligand to the protein is covalent.
- D. multiple molecules of the same ligand can bind to the same binding site.
- E. two different ligands can bind to the same binding site.

20. Carbon monoxide (CO) is toxic to humans because:

- A. it binds to myoglobin and causes it to denature.
- B. it is rapidly converted to toxic CO<sub>2</sub>.
- C. it binds to the globin portion of hemoglobin and prevents the binding of O<sub>2</sub>.
- D. it binds to the Fe in hemoglobin and prevents the binding of O<sub>2</sub>.
- E. it binds to the heme portion of hemoglobin and causes heme to unbind from hemoglobin.