

Preliminary MFM Quiz

1. The major carrier of chemical energy in all cells is:
A) adenosine monophosphate
B) adenosine diphosphate
C) adenosine trisphosphate
D) guanosine trisphosphate
E) carbamoyl phosphate

2. Enzymes are biological catalysts that enhance the rate of a reaction by:
A) increasing the amount of free energy released
B) decreasing the amount of free energy released
C) increasing the energy of the transition state
D) increasing the activation energy
E) decreasing the activation energy

3. When a region of DNA must be repaired by removing and replacing some of the nucleotides, what ensures that the new nucleotides are in the correct sequence?
A) The newly incorporated nucleotides must be complementary to those on the other (template) strand
B) Specific enzymes bind the correct nucleotides
C) The three-dimensional structure determines the order of nucleotides
D) The repair enzyme recognizes the nucleotide being removed and brings in an identical one to replace it.
E) DNA cannot be repaired and this explains why mutations occur

4. The three-dimensional structure of a protein is determined primarily by:
A) non-covalent interactions with lipids, which provide a folding framework
B) non-covalent interactions with nucleic acids
C) the number of amino acids in the protein
D) the sequence (order) of amino acids in the protein
E) non-covalent interactions with ribosomes

5. The three-dimensional structure of macromolecules is maintained primarily through non-covalent interactions. Which of the following are not considered non-covalent interactions?
A) hydrogen bonds
B) van der Waals interactions
C) amide bonds
D) ionic interactions
E) hydrophobic interactions

6. A major change that occurred in the evolution of eukaryotic cells from prokaryotic cells was the development of:
A) DNA
B) photosynthetic capability
C) a cell membrane

D) nuclear membranes

E) ribosomes

7. The endoplasmic reticulum is:

A) a highly convoluted, three-dimensional network of membrane-enclosed spaces.

B) a collections of ribosomes

C) a spherical vesicle bounded by a single membrane

D) the cellular recycling center

E) the power plant of the cell

8. Cristae is the name given to the:

A) foldings of the inner membrane of chloroplasts

B) foldings of the outer membrane of chloroplasts

C) foldings of the nuclear membrane.

D) foldings of the inner membrane of mitochondria

E) foldings of the outer membrane of mitochondria

9. A protein that is *not* involved in the transport of organelles throughout the cytoplasm is:

A) myosin

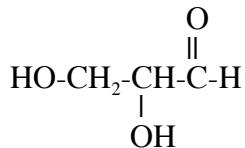
B) actin

C) histone

D) tubulin

E) kinesin

10. What functional groups are present on this molecule?



A) hydroxyl and carboxylic acid

B) hydroxyl and aldehyde

C) hydroxyl and ketone

D) ether and aldehyde

E) hydroxyl and ester

11. All of the amino acids that are found in proteins (except proline) contain a(n):

A) carbonyl group

B) carboxyl group

C) ester group

D) thiol group

E) amino group

12. Which of the following has the cellular components arranged in order of increasing size?

- A) Amino acid < ribosome < protein < endoplasmic reticulum
- B) Protein < ribosome < endoplasmic reticulum < amino acid
- C) Amino acid < protein < ribosome < endoplasmic reticulum
- D) Protein < amino acid < endoplasmic reticulum < ribosome
- E) Amino acid < protein < endoplasmic reticulum < ribosome

13. The pH of a sample of blood is 7.4. The pH of a sample of gastric juice is 1.4. The blood sample has:

- A) 5.29 times lower $[H^+]$ than the gastric juice.
- B) 6 times lower $[H^+]$ than the gastric juice
- C) 6,000 times lower $[H^+]$ than the gastric juice
- D) a million times lower $[H^+]$ than the gastric juice
- E) 0.189 times the $[H^+]$ as the gastric juice

14. The chirality of an amino acid results from the fact that its alpha carbon:

- A) is a carboxylic acid
- B) is bonded to four different chemical groups
- C) is symmetric
- D) is in the L absolute configuration in naturally occurring proteins
- E) has no net charge

15. Of the 20 standard amino acids, only _____ is not optically active. The reason is that its side chain _____.

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

16. The side chains of nonpolar amino acids are best categorized as:

- A) hydrophobic
- B) positively charged
- C) negatively charged
- D) uncharged
- E) hydrophilic

17. Titration of valine by a strong base, for example NaOH, results in two pK's. The titration reaction occurring at pK_2 ($pK_2 = 9.62$) is:

- A) $-COOH + OH^- \rightarrow -COO^- + H_2O$
- B) $-COOH + -NH_2 \rightarrow -COO^- + NH_2^+$
- C) $-COO^- + -NH_2 \rightarrow COOH + -NH_2$
- D) $-NH_3^+ + OH^- \rightarrow -NH_2 + H_2O$
- E) $-NH_2 + OH^- \rightarrow -NH^- + H_2O$

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

- A) NH₂-CH₂-COOH
- B) NH₃⁺-CH₂-COOH
- C) NH₂-CH₂-COO⁻
- D) NH₃⁺-CH₂-COO⁻
- E) NH₂-CH₃⁺-COO⁻

19. For amino acids with neutral (non-ionizing) R groups, at any pH below the pI of the amino acid, the population of amino acids in solution will:

- A) have no charged groups
- B) have no net charge
- C) have a net positive charge
- D) have positive and negative charges in equal concentration.
- E) have a net negative charge

20. Three amino acids that are positively charged at neutral pH are:

- A) K, R, H
- B) H, R, C
- C) C, R, M
- D) K, R, P
- E) R, E, H

21. The peptide alanylglutamylglycylalanylleucine has:

- A) four peptide bonds
- B) two free amino groups
- C) a disulfide bridge
- D) no free carboxyl group
- E) five peptide bonds

22. Which of the following is correct with respect to the amino acid composition of proteins?

- A) Proteins with the same molecular weight have the same amino acid composition
- B) Proteins contain at least one each of the twenty different standard amino acids
- C) Larger proteins have a more uniform distribution of amino acids than smaller proteins
- D) Proteins with different functions usually differ significantly in their amino acid composition
- E) The average molecular weight of an amino acid in a protein increases with the size of the protein

23. A major component of RNA but not of DNA is:

- A) adenine
- B) guanine
- C) cytosine
- D) uracil
- E) thymine

24. By definition, the 5' end of a DNA or RNA strand:

- A) has no phosphate attached to the 5' hydroxyl of the nucleotide

- B) is always represented as the right end of the polymer
C) has no nucleotide attached to the 5' hydroxyl
D) has no nucleotide attached to the 3' hydroxyl
25. Which of the following statements about membrane lipids is true?
A) phosphatidylcholine is a sphingolipid
B) glycerophospholipids contain fatty acids linked to glycerol through amide bonds
C) some sphingolipids include oligosaccharides in their structure
D) Glycerophospholipids are found only in the membranes of plant cells
26. An example of a glycerophospholipids that is involved in cell signaling is:
A) phosphatidylinositol
B) ceramide
C) arachidonic acid
D) testosterone
E) vitamin A (retinol)
27. Which of these statements about the composition of membranes is generally true?
A) The lipid composition of all membranes of eukaryotic cells is essentially the same
B) All biological membranes contain cholesterol
C) Free fatty acids are major components of all membranes
D) The inner and outer membranes of mitochondria have different protein compositions
28. Which of these is a general feature of the lipid bilayer in all biological membranes?
A) Polar, but uncharged, compounds readily diffuse across the bilayer.
B) Individual lipid molecules are free to diffuse laterally in the surface of the bilayer
C) Individual lipid molecules in one face (monolayer) of the bilayer readily diffuse (flip-flop) to the other monolayer
D) The bilayer is stabilized by covalent bonds between neighboring phospholipid molecules
29. Protein kinase A (PKA) is:
A) Competitively inhibited by cAMP
B) Noncompetitively inhibited by cAMP
C) Activated by covalent binding of cAMP
D) Allosterically activated by cAMP
E) Affected by cAMP only under unusual circumstances
30. The main function of the glycolytic pathway is to provide:
A) Reducing equivalents
B) Chemical energy
C) Fatty acids
D) Amino acids
E) Riboses