

BIOS 100 - Summer, 2006
Exam I, 14 June, 2006 (Happy Flag Day!)
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Name:
TA:

This exam consists of 54 questions over 7 pages. Please check to see that all the pages are present before you begin. Use a #2 pencil and bubble in all answers. The answer to question 32 is C. Your score will be posted on the UIC Blackboard site as soon as they are in. Good Luck!

1. Which of the following is NOT a part of the process of science?
 - A. Asking questions about the natural world around us
 - B. Developing hypotheses to test these questions
 - C. Designing experiments to test hypotheses
 - D. Proving hypotheses to be true
 - E. Developing models and theories to explain the natural world
2. Which of the following is not a part of a well-planned experiment:
 - A. A high degree of precision - the more precise the data collection, the more accurate it is
 - B. Complexity - the more complex, the better
 - C. Absence of systematic error
 - D. Calculation of a degree of uncertainty - nothing is perfect, so a good understanding of the limitations is essential
 - E. All of the above are components of a well-planned experiment
3. Which of the following statements (A - D) about molecular bonds is FALSE - if statements A-D are true, then choose E.
 - A. Everything else being equal, covalent bonds are stronger than ionic bonds
 - B. Covalent bonds involve sharing of electrons between atoms
 - C. Ionic bonds will dissolve in a non-polar solvent
 - D. Polar (hydrogen) bonds are weak interactions between molecules with a dipole
 - E. All of the above statements about chemical bonds are TRUE
4. Carbon has six protons in the nucleus - if an atom of carbon gained a proton (giving it seven), what would happen?
 - A. Nothing
 - B. It would become an ion
 - C. It would become an isotope
 - D. It would become Nitrogen
 - E. It would explode
5. Which of the following statements (A-D) about water is FALSE? If statements A-D are true, then choose E..
 - A. Your body is approximately 75% water
 - B. Water has a very high boiling point and freezing point when compared to other similar sized molecules
 - C. Water has strong adhesive and cohesive properties
 - D. Water can act as both an acid and a base
 - E. All of the above statements about water are TRUE

6. O^{16} and O^{18} differ in the number of _____ in the atom
A. Electrons B. Protons C. Neutrons D. Bosons

Use the portion of the periodic table below to answer questions 7 - 10

7. Which of the elements listed below would you expect to be the most electronegative (row 3)?
A. Si B. P C. S D. Cl E. Ar
8. Which of the elements below can typically form four covalent bonds?
A. Si B. P C. S D. Cl E. Ar
9. Which of the elements below would you expect to form a 2+ ion
A. Na B. Mg C. Al D. Si E. P
- 10 Which element has almost identical electronegative as Carbon?
A. H B. N C. O D. Si E. F
11. In which of the bonds below is carbon the most oxidized?
A. C-C B. C-H C. C-O D. C-N E. None of the above
12. The molecule listed below is an example of a:

- A. Polysaccharide B. Lipid C. Protein D. Nucleic Acid

13. Sickle-cell anemia is caused by a change in the seventh amino acid from Glu to Val. This is a change in the _____ structure of a protein
 A. Primary B. Secondary C. Tertiary D. Quaternary
14. Of the nucleotide pairs below, which pair contains two purines?
 A. A & G B. A & T C. C & G D. C & T
15. An alpha helix is an example of a protein _____ structure.
 A. Primary B. Secondary C. Tertiary D. Quaternary
16. ATP has a structure very similar to a(n)
 A. Monosaccharide B. Amino acid C. Phospholipid
 D. Nucleotide E. None of the above
17. Which of the following statements (A-D) about enzymes is FALSE. If statements A-D are true, then choose E.
 A. Enzymes are not consumed in a reaction
 B. Enzymes temporarily bind to the substrates, forming an enzyme-substrate complex
 C. Enzymes only catalyze the forward reaction
 D. Enzymes function by lowering the activation energy of a reaction
 E. All of the above statements about enzymes are TRUE
18. The enzyme peroxidase is found in all sorts of organisms. Which of the following organisms would you expect to have a version of peroxidase with the highest Temperature optimum (T_{opt})?
 A. A bird B. A Human C. An oak tree D. A lizard
19. What is the induced fit model of enzyme-substrate binding?
 A. The enzyme has an active site that perfectly fits the substrates
 B. The enzyme has an active site that can perfectly fit substrates, but competitive inhibitors have an imperfect fit
 C. The enzyme has an active site that the substrates do not perfectly fit into - a small conformation change takes place that strains the bonds of the substrate
 D. The enzyme has an active site that requires ATP energy expenditure in order to bind to the substrate
 E. None of the above
20. Which of the graphs below represents enzyme activity as a function of temperature:

A

B.

C.

21. The pH of the blood is 7.4. What would you expect to be the pH optimum of carboxylic anhydrase, an enzyme found in red blood cells?
 A. 5.0 B. 7.0 C. 7.4 D. 8.0 E. None of the above
22. Which of the following statements (A-D) about the enzyme system that converts threonine to isoleucine is FALSE? If statements A-D are true, then choose E.
 A. This system is an example of positive feedback
 B. Threonine deaminase has both an active site and an allosteric site
 C. The concentration of isoleucine can affect the activity of threonine deaminase
 D. The enzyme threonine deaminase has two conformations, only one of which will bind to the substrate, threonine
 E. All of the above statements about the enzyme system that converts threonine to isoleucine are TRUE
23. CO₂ is the proper substrate for the enzyme RuBisCo. However, O₂ will also fit into the active site. O₂ is an example of a(n)
 A. Competitive inhibitor B. Non-Competitive inhibitor
 C. Allosteric inhibitor D. Allosteric enhancer
 E. None of the above

Matching - use the key below to answer questions 24 - 27

I. Prokaryotic cells II. Eukaryotic cells III. Achaeans

24. These cells do not contain organelles
 A. I only B. II only C. III only D. I, III E. I, II
25. These cells contain structures which evolved from endosymbiosis
 A. I only B. II only C. III only D. I, III E. II, III
26. These cells commonly live in extreme environments
 A. I only B. II only C. III only D. I, III E. I, II
27. These cells are small, typically only 5 - 10 um
 A. I only B. II only C. III only D. I, III E. I, II
28. What is the function of the bacterial cell wall?
 A. Cell to cell communication
 B. The cell wall prevents the bacteria from exploding
 C. It is sticky and allows bacteria to stick to each other
 D. It causes disease
 E. None of the above
29. All of the following are motor proteins except:
 A. Dynein B. Myosin C. Kinesin D. Actin

30. What structures would you expect to find the 9 + 2 microtubule configuration?
 A. Cilia and flagella B. Cytoskeleton C. Ribosomes
 D. A & B E. A, B, and C
31. What is the function of the nucleolus?
 A. Histone synthesis B. Protein synthesis C. Ribosome synthesis
 D. Lipid synthesis E. Storage of genetic information
32. Which of the following statements (A-D) about the nuclear envelope is FALSE? If statements A-D are true, then choose E
 A. The nuclear envelope is a double membrane system
 B. The outermost membrane of the nuclear envelope is continuous with the endoplasmic reticulum
 C. The nuclear envelope contains pores
 D. The nuclear envelope surrounds and encloses the nucleoplasm
 E. All of the above statements about the nuclear envelope are TRUE
33. What is the primary function of the rough endoplasmic reticulum?
 A. Protein synthesis B. Lipid synthesis
 C. Packaging and distribution of proteins D. Ribosome synthesis
 E. None of the above
34. Why are proteins that enter into the ER usually glycosylated?
 A. Glycosylation stabilizes the protein
 B. Glycosylation serves as a chemical signal for packaging and distribution
 C. Glycosylation helps to bind the protein to the plasma membrane
 D. Glycosylated proteins are protected from destruction by the lysosomes
 E. None of the above
35. Which of the following cellular structures is NOT part of the endomembrane system?
 A. Nuclear envelope B. Golgi Apparatus C. Lysosome
 D. Plasma membrane E. Chloroplast
36. Which of the following statements (A-D) about the mitochondria is FALSE? If statements A-D are true, then choose E
 A. Mitochondria contain functional DNA and ribosomes
 B. Mitochondria divide in a process similar to binary fission
 C. Mitochondria are responsible for aerobic respiration
 D. The innermost membrane of the mitochondria is called the thylakoid membrane
 E. All of the above statements about the mitochondria are TRUE
37. Ribosomes:
 A. Contain two subunits, a small subunit and a large subunit
 B. May be free or associated with the endoplasmic reticulum
 C. Are involved in protein synthesis
 D. Are found in all cells
 E. All of the above are true

38. Which of the following is NOT evidence in support of the endosymbiosis theory of the origin of the mitochondria and chloroplast?
- Chloroplasts and mitochondria are approximately the size of a prokaryotic cell
 - Chloroplasts and mitochondria have naked DNA
 - Chloroplasts and mitochondria have eukaryotic ribosomes
 - Chloroplasts and mitochondria divide in a process very similar to binary fission
 - All of the above are evidence in support of the endosymbiosis theory of the origin of the mitochondria and chloroplasts.
39. Which type of molecule comprises the majority of the plasma membrane?
- Phospholipids
 - Cholesterol
 - Integral proteins
 - Peripheral proteins
 - Glycolipids
40. Increasing the concentration of _____ will increase membrane fluidity.
- Saturated fats
 - Unsaturated fats
 - Cholesterol
41. Mary is blood type A. Her baby is blood type O. Based on their blood type, which of the following potential fathers cannot be the father of her baby?
- Juan (Type A)
 - Dirk (Type B)
 - Siddhartha (Type AB)
 - Joe (Type O)
- I only
 - II only
 - III only
 - II & III
 - I, II, III
42. What feature to most integral proteins possess?
- They are amphipathic
 - A complex quaternary structure
 - Alpha helices containing largely hydrophobic R-groups
 - Ion associations
 - None of the above
43. Which of the following molecules would be least likely to diffuse across a plasma membrane?
- O₂
 - H₂O
 - Glucose
 - C₈H₁₈
 - H⁺

Matching: use the key below to answer questions 44 - 47

- Diffusion
- Facilitated diffusion
- Active transport

44. This/these utilize carrier proteins
- II only
 - III only
 - II, III
 - I, II
 - I, II, III
45. This/these can carry a substance down its concentration gradient
- II only
 - III only
 - II, III
 - I, II
 - I, II, III
46. This/these can carry a substance against its concentration gradient
- II only
 - III only
 - II, III
 - I, II
 - I, II, III
47. This/these require ATP to function
- II only
 - III only
 - II, III
 - I, II
 - I, II, III

48. Which of the following statements (A-D) about osmosis is FALSE? If statements A-D are true, then choose E
- Osmosis produces a physical force
 - A cell placed in a hypotonic solution will expand and possibly burst
 - A substance that cannot cross a semi-permeable membrane is known as an osmotically active solute
 - Water will flow from a hypertonic solution to a hypotonic solution
 - All of the above statements about osmosis are TRUE
49. What is responsible for osmoregulation in humans?
- Nothing
 - Contractile vacuole
 - Your kidneys
 - Your heart
50. Which of the following statements (A-D) about the Na⁺/K⁺ pump is FALSE. If statements A-D are true, then choose E.
- The Na⁺/K⁺ pump is an example of active transport
 - The Na⁺/K⁺ pump found in many cells in humans
 - The Na⁺/K⁺ pump transports three Na⁺ out of the cell and two K⁺ into the cell
 - The Na⁺/K⁺ pump is an example of an integral protein
 - All of the above statements about the Na⁺/K⁺ pump are TRUE
51. Which of the following statements about glucose facilitated transporters is FALSE?
- The protein carrier is very specific and will only bind glucose
 - The protein carrier is fully reversible
 - The protein carrier will saturate (i.e. there is a maximum rate that they can transport glucose)
 - The protein carrier can transport glucose against its concentration gradient
 - The protein carrier has two conformations, one open to the outside and one open to the inside
52. Solution A contains 0.2 M glucose and solution B is 0.2 M NaCl. Both are separated by a semi-permeable membrane. Which way will water flow?
- From A to B
 - From B to A
 - There will be no net flow of water
53. How do plant leaves defy gravity and stick out?
- Turgor pressure
 - An internal “skeleton” of cellulose
 - The bark supports the leaves
 - Fibers and sclerids
 - None of the above
54. What are the characteristics of an amphipathic molecule?
- They are ions
 - They are large, hydrophobic molecules
 - They are molecules with a polar end and a non-polar end
 - They are molecules with a positive charge on one end and a negative charge on the other end
 - None of the above