BIOS 100 - Summer, 2007 **Name:**
Exam I, 13 June, 2006
Michael Muller, Instructor **TA:**

This exam consists of 52 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. There is a copy of the periodic table at the end of the exam. The answer to question 32 is D. 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. Developing models and theories to explain the natural world
   D. Disproving your hypothesis
   E. All of the above are part of the process of science

2. Two atoms differ in their number of protons. These two atoms are:
   A. Isotopes of the same element B. Ions
   C. Different elements D. Identical to each other
   E. Not enough information to determine

3. Which of the following statements (A-D) about water is FALSE? If statements A-D are true, then choose E..
   A. Water has strong adhesive and cohesive properties
   B. Water has a very high boiling point and freezing point when compared to other similar sized molecules
   C. Water is a good insulator because it resists changes in temperature
   D. Water is a very polar molecule
   E. All of the above statements about water are TRUE

4. Water cohering to other water molecules is an example of _____ bonds.
   A. covalent B. ionic **C. polar (hydrogen)**

5. The structure of a NaCl crystal is maintained by _____ bonds.
   A. covalent **B. ionic** C. polar (hydrogen)

6. In which of the following bonds is the hydrogen the most oxidized?
   A. C-H B. H-H **C. O-H** D. N-H E. A & B

7. An acid:
   A. Donates a proton B. Accepts a proton

8. Which element in the list below is least electronegative?
   A. H **B. Be** C. C D. O E. Cl

9. Which of the following questions about biological polymers is FALSE? If statements A-D are true, then choose E.
   A. Biological polymers are typically formed via condensation reactions and are broken apart via hydrolysis
   B. Most biological polymers have the monomers joined together by a common bond type, thus requiring few enzymes to create many different molecules
   C. The synthesis and break down of biological polymers are both exergonic
   D. Biological polymers include polysaccharides, proteins, and nucleic acids
   E. All of the above statements about biological polymers are TRUE.

10. The molecule illustrated below is a(n):

   A. Monsaccharide
   B. Glyceride
   C. Amino Acid
   D. Nucleotide

11. A portion of a protein is stabilized by many hydrophobic interactions between many nearby amino acids. This is an example of protein _____ structure.
   A. Primary B. Secondary **C. Tertiary** D. Quaternary

12. The manner in which the actin subunits are joined together to make a microfilament is and example of protein _____ structure.
   A. Primary B. Secondary C. Tertiary **D. Quaternary**

13. Which biomolecule is most common in cells?
   A. Polysaccharides **B. Proteins** C. Lipids D. Nucleic Acids

14. How are amino acids joined together?
   A. Peptide bonds B. Phosphodiester bonds C. Amino linkages
   D. Proteinaceous bonds E. None of the above

15. A steroid is an example of a:
   A. Polysaccharide B. Protein **C. Lipid** D. Nucleic Acid

16. Which of the pairs below are both pyrimidines
   A. A & G B. A & T **C. C & T** D. G & T E. C & A

17. Which of the following statements (A-D) about enzymes is FALSE. If statements A-D are true, then choose E.
   A. Enzymes function by lowering the activation energy of a reaction
   B. Enzymes temporarily bind to the substrates, forming an enzyme-substrate complex
   C. Enzymes catalyze the forward and reverse reactions
   D. The substrate does not perfectly bind to the active site - this is known as an induced fit
   E. All of the above statements about enzymes are TRUE

18. Which of the following statements (A-D) about ATP is FALSE. If statements A-D are true, then choose E.
    A. ATP is basically a modified nucleotide with three phosphate groups
    B. ATP is the universal energy molecule of all life on earth
    C. The phosphate bonds in ATP are very stable bonds
    D. ATP can be broken down to form ADP and energy. ADP can be further broken down to form AMP and still more energy
    E. All of the above statements about ATP are TRUE

19. Carbonic anhydrase is an enzyme found in your blood. What would you propose is the best estimate of its temperature optimum?
    A. 85ºF (29.5ºC) B. 98.6ºF (37ºC) **C. 106ºF (41ºC)** D. 120ºF (50ºC)

20. The pH of blood is 7.4. What would you propose is the best estimate of the pH optimum of carbonic anhydrase?
    A. 6 B. 7 **C. 7.4** D. 7.9 E. 10

21. Which of the graphs below represents enzyme activity as a function of temperature:

    A B. **C.**

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 negative 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. Peroxidase is an enzyme found in both plants and animals. Which of the following organisms would you expect to have a form of peroxidase with the greatest Topt?
    A. A rat **B. A pine tree** C. A snake D. An owl

24. Plant cells contain mitochondria
    A. True B. False

25. Which of the following is NOT a part of the endomembrane system?
    A. Plasma membrane B. Outer nuclear membrane C. Golgi apparatus
    D. Chloroplast E. Plant central vacuole

26. Which organelle is incorrectly matched with its function?
    A. Mitochondria - site of cellular respiration
    B. Rough ER - synthesis of ribosomes
    C. Central vacuole - storage and maintenance of turgor pressure
    D. Smooth ER - synthesis of lipids
    E. Gogli apparatus - packaging and distribution of proteins

27. Which is not a function of the cytoskeleton?
    A. Contractile movement
    B. Establishment and maintenance of turgor pressure
    C. Maintaining cell shape
    D. Anchorage of enzymes and organelles
    E. All of the above are functions of the cytoskeleton

28. What is the function of the nucleolis?
    A. Regulation of cell division B. Protein synthesis
    C. Protection of the DNA **D. Synthesis of ribosomes**
    E. Synthesis of the nuclear envelope

29. How are proteins segregated for different distribution locations by the Golgi apparatus?
    A. The proteins are usually glycolated which can bind to receptors on the membranes of the Golgi apparatus
    B. The destination is encoded in the first few amino acids of the protein
    C. The proteins contain lipid labels which mark their ultimate destination
    D. The method of segregation in the Golgi is not completely understood
    E. None of the above

Matching - use the key below for questions 30 to 33.
    A. Archaeans B. Prokaryotes C. Eukaryotes

30. These cells contain organelles
    A. A only B. B only **C. C only** D. A & B E. B & C

31. These cells typically live in extreme environments
    A. A only B. B only C. C only D. A & B E. B & C

32. These cells contain naked DNA
    A. A only B. B only C. C only **D. A & B** E. B & C

33. You are this type of organism.
    A. A only B. B only **C. C only** D. A & B E. B & C

34. 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 contains pores
    B. The nuclear envelope is a double membrane system
    C. The outermost membrane of the nuclear envelope in continuous with the endoplasmic reticulum
    D. The nuclear envelope surrounds and encloses the nucleoplasm
    E. All of the above statements about the nuclear envelope are TRUE

35. What is the function of the bacterial capsule?
    A. It prevents the bacterium from exploding
    B. It maintains the bacteria's shape
    C. It allows the bacterium to stick to surfaces
    D. It is involved in binary fission
    E. None of the above

36. Which of the following is NOT evidence in support of the endosymbiosis theory of the origin of the mitochondria and chloroplast?
    A. Chloroplasts and mitochondria are approximately the size of a prokaryotic cell
    B. Chloroplasts and mitochondria have naked DNA
    C. Chloroplasts and mitochondria have prokaryotic ribosomes
    D. Chloroplasts and mitochondria divide in a process very similar to binary fission
    E. All of the above are evidence in support of the endosymbiosis theory of the origin of the mitochondria and chloroplasts.

37. Dynein, kinesin, and myosin are:
    A. Hormones
    B. Motor proteins
    C. Energy molecules similar to ATP
    D. Components of microtubules
    E. Enzymes

38. Which of the following statements (A-D) about cilia and flagella is FALSE? If statements A-D are true, then choose E
    A. Cilia and flagella are basically the same thing, cilia are just shorter and more numerous
    B. Cilia and flagella are involved in cellular movement
    C. Cilia and flagella both contain a 9+2 arrangement of microtubules
    D. Movement of cilia and flagella is facilitated by the interaction of dynein and tubulin
    E. All of the above statements about cilia and flagella are TRUE

39. What is the function of ribosomes?
    A. Protein synthesis
    B. Nuclear replication
    C. Lipid synthesis
    D. Cellular movement
    E. None of the above

40. What molecule is the primary constituent of a biological membrane?
    A. Phosopholipid
    B. Triglyceride
    C. Amphipatic steroid
    D. Cholesterol
    E. Proteins

41. Increasing the concentration of _____ will make biological membranes less fluid.
A. Saturated fats B. Unsaturated fats C. Cholesterol
D. A & C E. B & C

42. Joe is blood type AB. What blood type of baby can he not possibly have?
A. Type A B. Type B C. Type AB **D. Type O**

43. The ABO blood system is determined by _____ on the surface of blood cells.
A. DNA B. Enzymes **C. Glycolipids** D. None of the above

44. Integral proteins usually contain many of these structures:
A. Polar amino acids **B. Alpha helices** C. Beta pleated sheets
D. Sulfide bridges E. Subunits

45. Which of the following molecules would be least likely to diffuse across a plasma membrane?
A. C_6H_{14} B. Glucose C. H_2O **D. H+** E. O_2

Matching: use the key below to answer questions 46 - 47
I. Diffusion II. Facilitated diffusion III. Active transport

46. This/these can carry a substance against its concentration gradient
A. II only **B. III only** C. II, III D. I, II E. I, II, III

47. This/these can become saturated
A. II only B. III only **C. II, III** D. I, II E. I, II, III

48. Which of the following statements (A-D) about the Na+/K+ pump is FALSE. If statements A-D are true, then choose E.
A. The Na+/K+ pump is an example of active transport
B. The Na+/K+ pump found in many cells in humans
C. The Na+/K+ pump transports three Na+ out of the cell and two K+ into the cell
D. The Na+/K+ pump is an example of an integral protein
E. All of the above statements about the Na+/K+ pump are TRUE

49. Which of the following statements (A-D) about osmosis is FALSE? If statements A-D are true, then choose E
A. Osmosis produces a physical force
B. A cell placed in a hypertonic solution will expand and possibly burst
C. A substance that cannot cross a semi-permeable membrane is known as an osmotically active solute
D. Water will flow from a hypotonic solution to a hypertonic solution
E. All of the above statements about osmosis are TRUE

50. How do plant leaves defy gravity and stick out?
    A. Turgor pressure
    B. An internal "skeleton" of cellulose
    C. The bark supports the leaves
    D. Fibers and sclerids
    E. None of the above

51. How can the facilitated diffusion carrier protein in the H+/Sucrose transport system carry sucrose against its concentration gradient?
    A. It can't, it is a facilitated diffusion carrier protein
    B. It utilizes ATP energy
    C. It is a symport so the total gradient of the H+ and sucrose is greater outside the cell, sucrose can be carried against its gradient.
    D. None of the above

52. What are the characteristics of an amphipathic molecule?
    A. They are molecules with a polar end and a non-polar end
    B. They are molecules with a positive charge on one end and a negative charge on the other end
    C. They are ions
    D. They are large, hydrophobic molecules
    E. None of the above