BIOS 100 - Fall, 2005 **Name:**
Exam I, 14 September, 2005
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. Your score will be posted on the UIC Blackboard site as soon as they are in. Good Luck!

1. The Batman notices a series of crimes committed in Gotham City at Janus Financing, Old 2nd bank, and the Half and Half Bakery. Using what he knows about his rogues gallery of criminals, he determines that his old foe, Two-Face, is back at it. He then uses this information to predict where Two-Face will strike next. This is an example of:
   A. Inductive Reasoning B. Deductive Reasoning

2. Which of the following statements (A-D) about the process of science is FALSE. If statements A-D are true, then choose E.
   A. A good scientist is always trying to disprove their hypotheses
   B. Science is a dynamic process, with many ideas constantly changing in light of new ideas and data.
   C. Hypotheses may be disproved, but most theories are known to be true
   D. Science involves both inductive and deductive reasoning
   E. All of the above statements about science are TRUE

3. Which of the following statements about carbon is FALSE?
   A. Carbon can typically form four covalent bonds
   B. Carbon and hydrogen have about the same electronegativities
   C. Carbon has six protons in the nucleus
   D. A ^{14}C atom has more electrons than a ^{12}C atom.
   E. Carbon is one of the most common elements found in biological systems

4. Which of the following has the bond type arranged from strongest to weakest?
   A. Covalent, Ionic, Hydrogen B. Ionic, Covalent, Hydrogen
   C. Covalent, Hydrogen, Ionic D. Ionic, Hydrogen, Covalent
   E. None of the above

5. Covalent bonds are the result of:
   A. Oppositely charged particles attracting each other
   B. Electron sharing between two atoms
   C. Dipole-dipole interactions
   D. Overlapping nuclear energy signals

6. What type of bond is formed during protein synthesis?
   A. Hyrdophobic bond B. Peptide bond C. Phosphodiester bond
   D. Glycosidic bond E. None of the above

7. Which of the following statements (A-D) about water is FALSE? If statements A-D are true, then choose E.
   A. Water has higher heats of fusion and evaporation than typical for a molecule its size
   B. Liquid water is less dense than solid water
   C. Water has high surface tension
   D. It is much more difficult to heat up a gram of water than is typical for a molecule its size
   E. All of the above statements about water are TRUE

8. What is different when comparing two isotopes of the same element?
   A. The number of protons B. The number of neutrons C. The number of electrons

9. Which of the following molecules is not a polymer?
   A. DNA B. Proteins C. Steroids D. Polysaccharides E. All are polymers

10. Which of the following molecules are not found associated with the plasma membrane?
   A. DNA B. Proteins C. Cholesterol
   D. Phopholipids E. All of the above are associated with the plasma membrane

11. When starch is broken down during digestion, what type of reaction is taking place?
   A. Hydrolysis B. Condensation C. Glycosidic
   D. Degeneration E. None of the above

12. Which of the following is an ionic solid?
   A. Sucrose B. CO_2 C. H_2O D. NaCl

13. How many electrons does it take to fill the second electron shell?
   A. 2 B. 4 C. 6 D. 8 E. 10

14. Which of the following molecules is the most hyrdophobic?
   A. H_2O B. CO_2 C. NH_3 D. C_2H_6 E. Na+

15. Which of the following statements (A-D) about lipids is FALSE. If statements A-D are true, then choose E.
   A. Steroids are a type of lipid
   B. Phospholipids are amphipathic molecules
   C. Lipids have more energy per gram than proteins and polysaccharides
   D. Phospholipids will spontaneously form miclles and lipid bilayers
   E. All of the above statements about lipids are TRUE

16. Which of the following is an example of a protein tertiary structure?
   A. An alpha helix
   B. A disulfide bridge (sulfhydryl bond) between two amino acids
   C. The joining of the four subunits in hemoglobin
   D. The sequence of amino acids in one of the hemoglobin subunits
   E. None of the above.
17. Which of the following bonds is the most reduced?

A. H-O B. C-O C. C-H D. N-H E. None of the above

18. Which of the following is not a component of a nucleotide?
    A. An amino and a carboxyl end
    B. A phosphate group
    C. A ribose sugar
    D. A nitrogenous base
    E. All of the above are components of a nucleotide

19. What is the difference between DNA and RNA nucleotides
    A. The position of the phosphate group
    B. RNA possesses a hydroxyl (-OH) group on the 2' carbon
    C. DNA and RNA have some unique nitrogenous bases
    D. B & C
    E. A, B, & C

20. The molecule below is an example of a:

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

21. ATP and NADH most are most similar to a(n):
    A. Lipid B. Sugar C. Amino Acid D. Nucleotide

22. Which of the following statements (A-D) about enzymes is FALSE. If statements A-D are true, then choose E.
    A. Enzymes are consumed in a chemical reaction
    B. Enzymes are important for coupling endergonic and exergonic reactions
    C. Enzymes can be denatured by excessive temperature
    D. Enzymes may be allosterically controlled
    E. All of the above statements about enzymes are TRUE

23. Stomach acid is pH 3. Pepsin is an enzyme which is secreted into the stomach to digest proteins. What would you predict to be the pH optimum of pepsin?
    A. pH 1 B. pH 3 C. pH 5 D. pH 7 E. pH 9

24. Which of the following statements (A-D) about enzymes is FALSE. If statements A-D are true, then choose E.
    A. Enzymes are very sensitive to external environmental conditions
    B. Enzymes often have an induced fit when a substrate binds to the active site
    C. Enzymes and substrates form a temporary enzyme-substrate complex during the reaction
    D. An allosteric site is the site where the substrates bind
    E. All of the above statements about enzymes are TRUE

25. cAMP can bind to an allosteric site of an enzyme. When this binding occurs, the conformation of the enzyme changes and the active site can now bind to substrates. This is an example of:

A. Competitive inhibition
B. Allosteric inhibition
C. Competitive enhancement
D. Allosteric enhancement
E. None of the above

26. Which of the following statements about feedback inhibition is FALSE?
    A. Feedback inhibition often involves allosteric inhibition
    B. Feedback inhibition is a common mechanism utilized by cells
    C. During feedback inhibition, the products of a reaction sequence can inhibit the activity of an enzyme
    D. Isoleucine is an enhancer of the enzyme threonine deaminase

27. Which of the following characteristics would you expect to find only in a eukaryotic cell but not in a prokaryotic cell?
    A. DNA B. Ribosomes C. Nucleus D. Enzymes E. Membranes

For questions 28-30, match the organelle on the right with the function on the left. Answers may be used once, more than once, or not at all (but there is only one correct answer per question)

28. Responsible for lipid synthesis

29. Contains thylakoid membranes

30. Is responsible for maintaining turgor pressure in plant cells

A. Mitochondria
B. Chloroplast
C. Rough Endoplasmic Reticulum
D. Smooth Endoplasmic Reticulum
E. Central Vacuole

31. In the above matching questions, how many of the organelles listed in A-E are components of the endomembrane system?
    A. 1 B. 2 C. 3 D. 4 E. 5

32. 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 eukaryotic 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.

33. All of the organelles below are lacking in animal cells except:
    A. Cell Wall B. Lysosomes C. Chloroplast D. Central Vacuole
    E. All of the above are lacking in animal cells

34. 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 involved in movement of cells
    B. Both cilia and flagella have a 9+2 arrangement of microtubules
    C. Cilia and flagella are found in eukaryotic cells
    D. Cilia and flagella are the same thing, basically the only difference is that flagella are longer and less numerous
    E. All of the above statements about cilia and flagella are TRUE

35. Ribosomes are used in:
    A. Protein synthesis B. Lipid synthesis C. Membrane synthesis
    D. Endoplasmic reticulum stabilization E. None of the above

36. Which of the following is continuous with the endoplasmic reticulum?
    A. The inner nuclear membrane B. The outer nuclear membrane
    C. The Golgi bodies D. The lysosome membrane
    E. None of the above

37. Which of the following organelles is involved in packaging and distribution of proteins?
    A. Rough Endoplasmic Reticulum B. Smooth Endoplasmic Reticulum
    C. Golgi bodies D. Lysosome
    E. Plasma membrane

38. Proteins that enter the endoplasmic reticulum usually have what associated with them?
    A. A sugar B. A signal lipid
    C. A specific amino acid sequence D. RNA
    E. None of the above

39. Functional mitochondria are found in living plant cells
    A. True B. False

40. Which of the following is not a component of the Fluid Mosaic Model of the plasma membrane?
    A. The membrane is a lipid bilaryer composed primarily of phospholipids
    B. Cholesterol is associated with the lipid bilayer
    C. Proteins are asymmetrically associated with the plasma membrane
    D. Molecules in the plasma membrane have some lateral mobility
    E. All of the above are components of the Fluid Mosaic Model

41. Which of the following increase membrane fluidity?
    A. Saturated fatty acids B. Unsaturated fatty acids
    C. Cholesterol D. Longer fatty acid chains
    E. Colder temperatures

42. A type O woman has a type A baby. How many of the following men could you eliminate as the potential father?

Louie (type O) Gerry (type A) Biff (type B) Wayne (Type AB)

A. One B. Two C. Three D. Four

43. An integral protein will typically have which of the following?
    A. An alpha helix with many hydrophillic -R groups
    B. An alpha helix with many hydrophobic -R groups
    C. A beta pleated sheet with many hyrdophillic -R groups
    D. A beta pleated sheet with many hydrophobic -R groups
    E. None of the above

44. Which of the following molecules is a steroid?
    A. Phospholilpid B. Sphingolipids C. Cholesterol D. Ceramides

45. Which of the following molecules is least likely to cross a plama membrane?
    A. O_2 B. H_2O C. CO_2 D. Na+ E. C_2H_6

46. Which of the following statements (A-D) about diffusion is FALSE. If statements A-D are true, then choose E.
    A. Diffusion is a passive process
    B. The size of the molecule sill not affect diffusion rate
    C. Increasing system temperature will increase diffusion rate
    D. Objects diffuse from areas of greater concentration to areas of lesser concentration
    E. All of the above statements about diffusion are TRUE.

47. Which of the following statements (A-D) about osmosis is FALSE. If statements A-D are true, then choose E.
    A. Osmosis is the diffusion of water
    B. The type of osmotically active solute is not important - only the final concentration
    C. Osmosis produces a force
    D. Water will move from a hypertonic solution to a hypotonic solution
    E. All of the above statements about osmosis are TRUE

Use the key below to answer questions 48 and 49.

I. Diffusion II. Facilitated Diffusion III. Active Transport

48. Which of the following can move solutions from areas of greater concentration to areas of lesser concentration?
    A. I only B. I, II C. II, III D. I, III E. I, II, III

49. Which of the following require a carrier protein?
    A. I only B. I, II C. II, III D. I, III E. I, II, III

50. 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 is an antiport
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

51. In the H+ / Sucrose pump system, what *directly* drives the movement of sucrose into the cell?
    A. ATP synthesis
    B. ATP hydrolysis
    C. The concentration gradient of sucrose
    D. The concentration gradient of H+

52. Which of the following statements about glucose facilitated transporters is FALSE?
    A. The protein carrier is very specific and will only bind glucose
    B. The protein carrier is fully reversible
    C. The protein carrier will saturate (i.e. there is a maximum rate that they can transport glucose)
    D. The protein carrier can transport glucose against its concentration gradient
    E. The protein carrier has two conformations, one open to the outside and one open to the inside