BIOLOGY 311C - Brand Spring 2009

NAME (printed very legibly) ______ KEY _____ UT-EID _____

EXAMINATION 2

Before beginning, check to be sure that this exam contains 7 pages (including front and back) numbered consecutively, and that you have been provided with a clean Answer Sheet. Then immediately print your name and UT-EID legibly at the top of this page. Also print and bubble in your name and your UT-EID (not your social security number) on the front of the Answer Sheet in the spaces provided. The first 37 questions are "multiple choice", with only one correct answer. Mark the letter corresponding to the correct answer to each of these questions in the appropriate location on the Answer Sheet, using a No. 2 pencil. Write answers to Questions 38 - 41 directly on this exam, in the spaces provided with the questions. Print neatly if your handwriting is likely to be difficult to read. Turn in both this exam and the Answer Sheet after checking to be sure that your name is clearly written in both places and all questions have been answered in the appropriate locations. You must turn in your exam on or before 9:55 a.m.

- 1. Which one of the following functional groups would be expected to carry a net positive charge in the cytoplasmic matrix of a cell?
 - a. An alcohol
 - b. A phosphate
 - c. An aldehyde
 - <u>d.</u> An amine
- 2. In cell biology the appreviation "P_i" stands for:
 - a. a denatured protein.
 - b. a proton bound to an inorganic atom.
 - **<u>c.</u>** inorganic phosphate.
 - d. a phospholipid.
- 3. A cell compartment with a H_3O^+ concentration of 1 X 10^{-9} :
 - a. has a pH of 5.
 - **<u>b.</u>** is alkaline.
 - c. would be buffered by carboxylic acid functional groups.
 - d. would have a higher $[H_3O^+]$ than $[OH^-]$.
- 4. Which one of the following functional groups would be capable of forming an electrovalent bond with an amine functional group a pH 7?
 - a. Alcohol
 - b. Ketone
 - <u>c.</u> Phosphate
 - d. Methyl
- 5. Which one of the following ions occurs at lowest concentration in the cytoplasmic matrix of living cells?
 - a. Phosphate
 - b. K⁺
 - c. Mg^{2+}
 - <u>**d.</u> Na⁺</u>**

- 6. The organic content of living cells is typically approximately:
 - a. 1% of the dry weight.
 - **b.** 99% of the dry weight.
 - c. 1% of the wet weight.
 - d. 99% of the wet weight.
- 7. According to abbreviations used in this course, a C₇ molecule:
 - **a.** contains 7 carbon atoms.
 - b. has a pK value of 7.
 - c. is a heptose.
 - d. is an oligomer that contains 7 monomers.
- 8. Which one of the following functional groups is not a typical component of simple sugars?
 - a. Alcohol
 - b. Aldehyde
 - c. Sulfhydryl
 - d. Ketone

The following two questions pertain to the molecule whose structure is shown at right.

- 9. How many asymmetric carbon atoms does this molecule contain?
 - a. 0
 - <u>b.</u> 1
 - c. 2
 - d. 3
- 10. This molecule is a(n):
 - a. aldose.
 - b. amino acid.
 - **<u>c.</u>** simple sugar.
 - d. polar lipid.
- 11. Which one of the following is least polar (most non-polar)?
 - a. Triglyceride
 - b. Phospholipid
 - c. Fatty acid
 - d. Monoglyceride
- 12. The molecule whose structure is shown at right is a:
 - a. cyclic nucleotide.
 - b. ring form of a modified sugar.
 - **<u>c.</u>** steroid.
 - d. tetrapeptide.



- a. Fatty acid
- b. Phosphate
- c. Glycerol
- <u>**d.</u> Fe^{2+}</u>**



- 14. The kind of reaction that converts two amino acids into a dipeptide is called a:
 - **<u>a.</u>** dehydration.
 - b. hydrolysis.
 - c. protonation.
 - d. deprotonation.
- 15. Which one of the following polysaccharides is not a food or energy source for humans and other animals?
 - a. Starch
 - b. Glycogen
 - <u>c.</u> Cellulose
 - d. Amylopectin
- 16. Which one is a major component biological membranes, ribosomes and chromatin?
 - a. Lipid
 - b. Carbohydrate
 - c. Nucleic acid
 - <u>d.</u> Protein
- 17. An unsaturated fatty acid is a fatty acid that:
 - a. is present in a very low concentration in an aqueous solution.
 - **<u>b.</u>** has one or more double bonds.
 - c. occurs only in trace amounts in biological membranes.
 - d. is not bonded to glycerol.
- 18. A glyceride bond is a kind of:
 - **<u>a.</u>** ester bond.
 - b. phosphodiester bond.
 - c. acid anhydride bond.
 - d. peptide bond.
- 19. Isoprene units are:
 - a. composed of long-chain fatty acids.
 - **b.** composed of hydrocarbon.
 - c. monomers of oligonucleotides.
 - d. steroids
- 20. Which one of the following is not typical of free amino acids?
 - a. An asymmetric carbon atom
 - **b.** a peptide bond
 - c. An amino functional group
 - d. A carboxylic acid functional group
- 21. The level of organization of a polypeptide chain stabilized by hydrogen bonds between peptide groups is its:
 - a. quaternary structure.
 - b. tertiary structure.
 - **<u>c.</u>** secondary structure.
 - d. primary structure.

22. The three-dimensional conformation of a globular oligomeric protein is called its:

- **<u>a.</u>** quaternary structure.
- b. tertiary structure.
- c. secondary structure.
- d. primary structure.

The following 5 questions refer to the conjugated molecule whose structure is illustrated at right.

- 23. The ring structure designated by " X " is a:
 - a. peptide.
 - b. purine.
 - **<u>c.</u>** pyrimidine.
 - d. pentose.
- 24. The component of this molecule designated by " γ " is a:
 - a. nucleoside.
 - b. nucleotide.
 - **<u>c.</u>** simple sugar.
 - d. modified sugar.
- 25. The component of this molecule designated by "Z" is a:
 - a. nucleoside.
 - b. nucleotide.
 - **<u>c.</u>** simple sugar.
 - d. modified sugar.
- 26. The bonding arrangement shown by \frown is a:
 - a. phosphate ester bond.
 - b. phosphodiester bond.
 - c. inorganic phosphate.
 - **<u>d.</u>** acid anhydride bond.
- 27. The atoms indicated by the arrow 🛩 emphasize that a component of this conjugated molecule is:
 - a. a polar lípid instead of a nonpolar lipid.
 - **<u>b.</u>** a ribonucleotide instead of a deoyribonucleotide.
 - c. ATP instead of GTP.
 - d. glycerol instead of an isoprenoid.
- 28. How many phosphates are present in the molecule whose name is abbreviated "GDP"?
 - a. 0
 - b. 1
 - <u>c.</u> 2
 - d. 3
- 29. The thickness of a typical biological membrane is:
 - <u>a.</u> 8 nm.
 - b. 20 nm.
 - c. 0.2 µm.
 - d. 80 µm.
- 30. Hydrophobic bonding is:
 - a. a kind of van der Waals force.
 - b. a kind of covalent bond between two nonpolar functional groups.
 - **<u>c.</u>** the conformation of a hydrophobic molecule when it is exposed to water.
 - d. a typical bonding arrangement of oligosaccharides and polysaccharides.
- 31. Which one of the following can penetrate <u>rapidly</u> through a lipid bilayer such as a liposome immersed in water?



- a. Simple sugars
- b. H₂O
- c. Inorganic ions
- **<u>d.</u>** Dissolved gases
- 32. A component of the lumen surface of membrane-bounded organelles and the external surface of the plasma membranes, but <u>not</u> the other surfaces of these membranes, is:
 - a. nucleoprotein.
 - b. peripheral membrane protein.
 - c. microfilaments.
 - d. oligosaccharide.
- 33. Plant cells avoid blowing up and breaking due to osmosis because:
 - **<u>a.</u>** they contain a rigid cell wall.
 - b. they are bathed in an isotonic solution.
 - c. they contain contractile vacuoles.
 - d. water can only flow slowly through their plasma membrane.
- 34. A process that allows a specific kind of molecule or ion to pass through a biological membrane, one at a time without expending any energy, is called:
 - a. non-specific transport.
 - **b.** facilitated diffusion.
 - c. active transport.
 - d. bulk transport.
- 35. Endocytosis is an example of:
 - a. non-specific transport.
 - b. facilitated diffusion.
 - c. active transport.
 - **<u>d.</u>** bulk transport.
- The following two questions pertain to the two molecules shown at right.
- 36. Molecule A is:
 - a. a hexose.
 - **<u>b.</u>** an alpha (α) form of a sugar.
 - c. a tetrasaccharide.
 - d. a modified sugar.
- 37. If Molecule A is D-ribose, then molecule B is:
 - a. L-ribose.
 - b. 2-deoxy-D-ribose.
 - c. a modified sugar.
 - d. a ketopentose.



- 38. Show a complete structural formula of a covalently bonded molecule, starting with and adding to the skeleton shown below. Each atom must demonstrate the covalency that it would have in a biological molecule. In addition, the molecule must conform to the instructions listed below (read carefully).
 - All atoms and all covalent bonds should be shown.





- The molecule should contain exactly two additional carbon atoms.
- The molecule should have a branched chain.
- The molecule should have exactly one carbon-carbon double bond.
- The molecule should contain exactly one carboxylic acid functional group.
- All functional groups should be in the charged form that would be present if the molecule occurred in the cytoplasmic matrxix of a living cell.

For example:



39. Show an alcohol functional group hydrogen bonded to an amine functional group. Show all atoms and bonds in each functional group. Designate the remainder of the alcohol-containing molecule as " R_1 " and the remainder of the amine-containing molecule as R_2 . Use a dotted line to show the hydrogen bond. Show the correct bond angle of the hydrogen bond.



40. The following statements refer to the molecule whose structure is shown at right. Write a correct response in each provided space.



- a. <u>tripeptide or oligopeptide</u> A name of this molecule.
- b. <u>amino acids</u> The name of the monomers that occur in this molecule.
- c. <u>peptide bonds</u> The name of the bond (bonding arrangement) that joins the monomers together.
- 41. For each item below, select the item from the kinds of molecule listed at right that best fits its description, and write the corresponding letter in the space provided.

A Carbohydrate

- **B** Nucleic acid
- C Protein
- D Lipid BIO 311c Brand

- i. _A_Cellulose
- ii. __C_Hemoglobin
- iii. **__D_**Cholesterol
- iv. __A_ Lactose
- v. **___B_** RNA
- vi. **___B_** Always contains phosphodiester bonds
- vii. **__B_**, **__C_** Information molecule (two answers)
- viii.__A_Glycosidic bonds
- ix. **__D**_Diglyceride
- x. ______ Peptide bonds