

**EXAM I: Zoology 121, Human Physiology**

**70 Points Total; Please read each question carefully! Exam is double-sided (6 pages).**

Name: 2002 Exam Lab Section: T 8:30 T 11:30 T2:30 Th 11:30 Th 2:30

**Part I. Multiple Choice. 2 Points Each (20 Points Total). Only one choice is correct.**

- 1 Which of the following is NOT a basic function of all cells?
  - A Fat storage
  - B Elimination of wastes
  - C Production of energy
  - D Synthesis of protein
  
- 2 In this reaction,  $\text{H}_2\text{CO}_3 + \text{NaOH} \rightarrow \text{H}_2\text{O} + \text{NaHCO}_3$ , which is the ACID?
  - A NaOH
  - B NaHCO<sub>3</sub>
  - C H<sub>2</sub>O
  - D H<sub>2</sub>CO<sub>3</sub>
  
- 3 The chemical bonds in that link amino acids together in a protein are called:
  - A Ionic bonds
  - B Hydrogen bonds
  - C Double bonds
  - D Peptide bonds
  
- 4 Which one of the following reactions takes place in the peroxisome?
  - A  $\text{HCl} + \text{NaOH} \rightarrow \text{NaCl} + \text{H}_2\text{O}$
  - B  $\text{C}_6\text{H}_{12}\text{O}_6 + \text{O}_2 \rightarrow \text{CO}_2 + \text{H}_2\text{O} (+ 36 \text{ ATP})$
  - C  $\text{RH}_2 + \text{O}_2 \rightarrow \text{R}' + \text{H}_2\text{O}_2$
  - D  $\text{CO}_2 + \text{H}_2\text{O} = \text{H}_2\text{CO}_3$
  
- 5 Assuming that the concentration of glucose outside a cell is greater than the concentration inside the cell, which one of the following factors will NOT affect the rate of diffusion of glucose into that cell?
  - A Membrane permeability to glucose (# of glucose transporters on cell membrane)
  - B Surface area of membrane
  - C Magnitude of concentration gradient
  - D Presence of Na<sup>+</sup>/K<sup>+</sup> ATPase

- 6 Which of the following is NOT a lipid?
- A cholesterol
  - B glycerin
  - C prostaglandin
  - D lactose
- 7 Which one of the following is NOT a function of microtubules?
- A component of microvilli
  - B component of cilia
  - C internal transportation of vesicles
  - D maintain asymmetric cell shape
- 8 A lipid bilayer (no proteins present) is permeable to which ONE of the following?
- A Cl<sup>-</sup>
  - B glucose
  - C CO<sub>2</sub>
  - D starch
- 9 What is the membrane potential of a typical cell?
- A +60 mV
  - B -70 mV
  - C -90mV
  - D 0 mV
- 10 True or False: The yield of ATP (by aerobic catabolism) from one gram of fats is greater than the yield from one gram of carbohydrate
- A True
  - B False

**Part II. Short Answer. 3 Points Each (36 Points Total). Misspelled answers will lose ½ pt.**

- 11 Define homeostasis. \_\_\_\_\_
- 12 How do enzymes catalyze biological reactions? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

13 The molecular weight of the amino acid tryptophan is 204 grams/mole, and the molecular weight of the peptide hormone insulin is 5,734 grams/mole. Which will diffuse faster?  
\_\_\_\_\_.

14 A Where is DNA located within a cell? \_\_\_\_\_

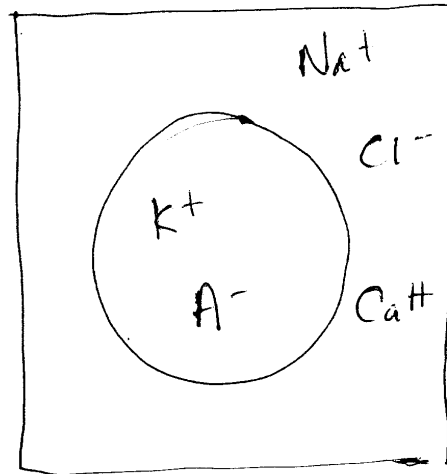
B What is the function of DNA? \_\_\_\_\_  
\_\_\_\_\_

15 The inside of a cell is 300 mOsm. If you put it in a solution that is 400 mOsm, that solution is \_\_\_\_\_ (isotonic/hypotonic/hypertonic). Will water move into or out of the cell? \_\_\_\_\_.

16 The cell at right is a normal cell with a high concentration of  $K^+$  inside, and high concentrations of  $Na^+$  and  $Ca^{++}$  outside. Suppose the cell were permeable to  $Ca^{++}$  but Not to  $K^+$  or  $Na^+$ .

A Which way would  $Ca^{++}$  flow (into or out of the cell)? \_\_\_\_\_.

B How would this change the membrane potential (would it be more positive or more negative)? \_\_\_\_\_.

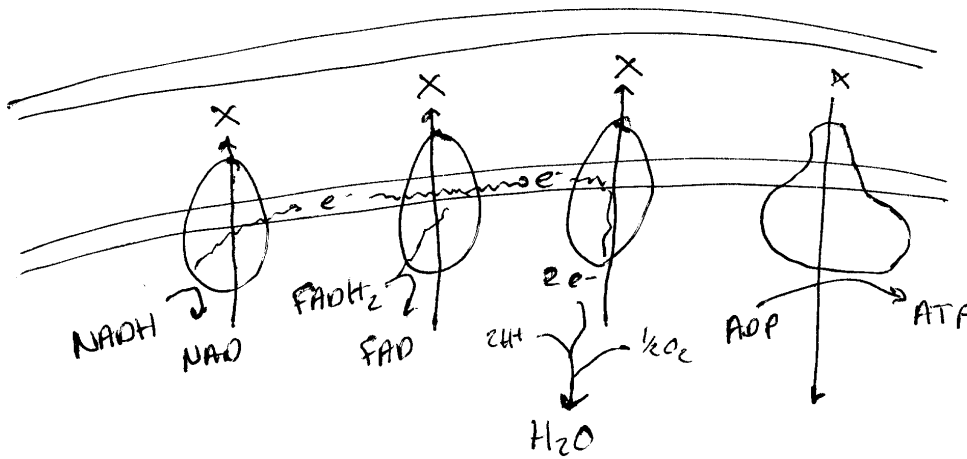


17 What normally maintains the concentration gradients of  $Na^+$  and  $K^+$  in every cell? \_\_\_\_\_.  
Please draw one on the diagram, and depict its function.

18 What type of transmembrane protein is the CFTR? \_\_\_\_\_  
In cystic fibrosis, where is the defective CFTR localized? \_\_\_\_\_

19 Compare and contrast passive diffusion and active transport \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

- 20 In the diagram (below) of the electron transport chain, which substances are intermediate electron acceptors? \_\_\_\_\_  
Which is a terminal electron acceptor? \_\_\_\_\_
- 21 On the diagram of the electron transport chain, please label ATP synthase. How many ATPs can it make when a single NADH enters the chain? \_\_\_\_\_
- 22 On the diagram of the electron transport chain, what is the substance labeled, "X"? \_\_\_\_\_  
Is its concentration greater in the intermembrane space or in the mitochondrial matrix? \_\_\_\_\_.



**Part III. Describe/Illustrate. 6-8 Points Each (14 Points Total).**

23 (8 points)

B Illustrate the citric acid cycle, beginning with pyruvic acid. On your diagram, please show the steps where decarboxylation takes place, where electrons are passed to NAD<sup>+</sup> or FAD<sup>+</sup>, and where GTP/ATP is generated. You may use # carbons to indicate each molecule, but please show where pyruvic acid, acetyl CoA, and citric acid are involved.

- 24 (6 points) Choose ONE of the following questions. Please circle your choice.
- A Draw a diagram of secondary active transport as a mechanism for getting glucose into a cell against its concentration gradient. List the steps involved.
  
  - B Draw a diagram of the negative feedback system that allows homeostatic regulation of body temperature. Assume that temperature has increased slightly and indicate the mechanisms that will bring it back to normal. Indicate on your diagram the sensor, integrator, and effector(s).