

This exam consists of 52 questions lovingly spread 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 C. Your score will be posted on the UIC Blackboard site as soon as they are in. Good Luck!

1. What is the difference between  $^{13}\text{C}$  and  $^{14}\text{C}$ ?
  - A.  $^{14}\text{C}$  has one more proton than  $^{13}\text{C}$
  - B.  $^{14}\text{C}$  has one more neutron than  $^{13}\text{C}$
  - C.  $^{14}\text{C}$  has one more electron than  $^{13}\text{C}$
  - D.  $^{14}\text{C}$  has one more proton and one more electron than  $^{13}\text{C}$
  - E. None of the above
2. How many covalent bonds would you expect Selenium (Atomic Number 34) to form?
  - A. One
  - B. Two
  - C. Three
  - D. Four
  - E. Heck if I know...
3. What type of ion is Rubidium (Rb, Atomic number 37) most likely to form?
  - A. A positive ion
  - B. A negative ion
  - C. A neutral ion
4. Which of the following molecules is the most polar?
  - A.  $\text{H}_2\text{O}$
  - B.  $\text{NH}_3$
  - C.  $\text{O}_2$
  - D.  $\text{C}_2\text{H}_6$
  - E.  $\text{N}_2$
5. Which of the statements below (A-D) about water is FALSE? If statements A-D are true, then choose E.
  - A. Water is the most common molecule comprising living organism
  - B. Water is a very polar molecule
  - C. Water has a very low heat of vaporization
  - D. Water is an excellent insulator
  - E. All of the above statements about water are TRUE
6. In which molecule is Carbon the most reduced?
  - A.  $\text{C}_2\text{H}_6$
  - B.  $\text{CO}_2$
  - C.  $\text{CO}$
  - D. Not enough information to tell
7. Which of the following is an example of a condensation reaction?
  - A. DNA degradation
  - B. Protein synthesis
  - C. The burning of paper
  - D. The creation of unsaturated bonds in a fatty acid
  - E. None of the above
8. The molecule below is an example of a (n):
  - A. Polysaccharide
  - B. Phospholipid
  - C. Steroid
  - D. Protein
  - E. Nucleic Acid

9. Which of the below molecules is the most amphipathic?  
 A. Polysaccharide                      B. Phospholipid                      C. Steroid  
 D. Protein                                  E. Nucleic Acid
10. A disulfide bridge is a covalent linkage between two non-adjacent cysteine amino acids in a protein. Disulfide bridges create very stable three-dimensional structures in proteins. A disulfide bridge is an example of a protein \_\_\_\_\_ structure.  
 A. Primary                      B. Secondary                      C. Tertiary                      D. Quaternary
11. Which of the nucleotides below is NOT a pyrimidine?  
 A. Adenine    B. Thymine    C. Cytosine    D. Uracil    E. A & C
12. Why are polymers so commonly seen structures of biological molecules?  
 A. They have a low energy cost to construct  
 B. A high diversity of molecules can be created from just a few different types of monomers  
 C. They are easy to construct because a common bond type can join all available monomers into a polymer  
 D. A & B  
 E. B & C
13. A peptide bond joins:  
 A. Two monoglycerides              B. A fatty acid to glycerol              C. Two amino acids  
 D. Two nucleotides                      E. None of the above
14. The joining of actin subunits to form a microfilament is an example of protein \_\_\_\_\_ structure  
 A. Primary                      B. Secondary                      C. Tertiary                      D. Quaternary
15. Which of the following is NOT a valid difference between DNA and RNA?  
 A. DNA has an -H bound to the 2' carbon while RNA has an -OH bound to the 2' carbon  
 B. DNA is more stable than RNA  
 C. DNA is composed of ATC & G while RNA is composed of ATU & G  
 D. Most of the genetic information is stored as DNA, not RNA  
 E. All of the above are valid differences between DNA and RNA
16. Peroxidase is an enzyme that is commonly found in most organisms. Below is a diagram illustrating the relationship between peroxidase activity and temperature for a gecko lizard, a fern, and a human. Match each curve to the appropriate organism.
- A. I human, II, fern, III gecko  
 B. I fern, II, gecko, III human  
 C. I gecko, II human, III fern  
 D. I gecko, II fern, III human  
 E. I human, II gecko, III fern

17. Which of the following statements (A-D) about ATP is FALSE? If statements A-D are true, then choose E.
- A. ATP is a modified nucleotide
  - B. ATP is commonly called the “universal energy currency of living organisms”
  - C. ATP contains unstable, high-energy phosphate bonds
  - D. ATP is most commonly broken down to AMP to release energy
  - E. All of the above statements about enzymes are TRUE
18. Which of the following statements (A-D) about enzymes is FALSE? If statements A-D are true, then choose E.
- A. Enzymes lower the activation energy of the forward and reverse reactions
  - B. Enzyme activities are sensitive to external environmental conditions like temperature and pH
  - C. The substrates bind to the allosteric site of an enzyme
  - D. Feedback inhibition is a common regulator of enzyme activity
  - E. All of the above statements about enzymes are TRUE
19. Which of the following is the best description of the induced fit model of enzyme-substrate binding?
- A. The active site is a nearly-perfect binding site for the substrates - they just slide right in
  - B. The substrates will easily bind to the active site, but some non-substrates can also bind if their concentration is high enough
  - C. Substrates cannot bind to the active site unless another molecule (the inducer) is bound to the allosteric site of the enzyme
  - D. The substrates have an imperfect fit to the active site. This contorts the substrates, weakening the substrate bonds that will be rearranged in the reaction
  - E. None of the above
20. The pH of your stomach is roughly 2.0. What would you predict the pH optimum of pepsin, an enzyme which digests proteins in your stomach, to be?
- A. 1.5      B. 2.0      C. 2.5      D. 7.0      E. 10.0
21. Which of the following graphs most accurately represents an enzyme’s activity as a function of external pH

A

B

C

D

22. Which of the following is NOT a part of the endomembrane system?
- A. Rough Endoplasmic Reticulum
  - B. Outer nuclear membrane
  - C. Golgi apparatus
  - D. Lysosome
  - E. Chloroplast

23. 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.
- This system is regulated by negative feedback
  - The enzyme threonine deaminase has both an active site and an allosteric site
  - The concentration of isoleucine can affect the activity of threonine deaminase
  - Both threonine and isoleucine can easily bind to the enzyme at the same time
  - All of the above statements about the enzyme system that converts threonine to isoleucine are TRUE
24. Plant cells contain mitochondria
- True
  - False
25. Which of the following is not a component of all cells?
- DNA
  - Ribosomes
  - Endomembrane system
  - Cytoplasm
  - All of the above are components of all cells
26. Which cellular structure is incorrectly matched with its function?
- Chloroplast - site of cellular respiration in plants
  - Rough ER - protein synthesis
  - Smooth ER - synthesis of lipids
  - Gogli apparatus - packaging and distribution of proteins
  - Central vacuole - storage and maintenance of turgor pressure
27. Which is not a function of the cytoskeleton?
- Contractile movement
  - Track for motor proteins
  - Maintenance of cell shape
  - Anchorage of enzymes and organelles
  - All of the above are functions of the cytoskeleton
28. A rose, an amoeba, a mushroom, and you are all examples of:
- Archaeans
  - Prokaryotes
  - Eukaryotes
29. How many of the structures are typically found in both plant and animal cells?
- |                 |                 |                       |
|-----------------|-----------------|-----------------------|
| Mitochondria    | Chloroplasts    | Endoplasmic Reticulum |
| Golgi Apparatus | Cell Wall       | Ribosomes             |
| Central Vacuole | Plasma Membrane | Nucleoli              |
- Four
  - Five
  - Six
  - Seven
  - Eight
30. How are proteins marked for packaging and distribution in the ER and Golgi bodies?
- Their terminal amino acid sequences mark their distribution
  - The pattern of alpha-helices and beta-pleated sheets in the proteins determine their distribution
  - Sugars are used to label the proteins with their distribution
  - Carrier enzymes can transport proteins to their destination
  - None of the above

31. Cilia and flagella contain a 9+2 arrangement of:  
 A. Microtubules                      B. Intermediate filaments                      C. Microfilaments
32. Dynein, kinesin, and myosin are:  
 A. Energy molecules similar to ATP                      B. Amino acids                      C. Motor proteins
33. 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.
34. Ribosomes are manufactured by the:  
 A. Rough Endoplasmic Reticulum                      B. Smooth Endoplasmic Reticulum  
 C. Nucleus                      D. Lysosome  
 E. None of the above
35. Where are damaged organelles and macromolecules sent for breakdown?  
 A. Lysosome                      B. Mitochondria                      C. Rough Endoplasmic Reticulum  
 D. Smooth Endoplasmic Reticulum                      E. Golgi Apparatus
36. What type of organisms would you expect to find in hot springs or exceptionally saline conditions?  
 A. Archaeans                      B. Prokaryotes                      C. Eukaryotes
37. Which of the following molecules is the primary constituent of a biological membrane?  
 A. Phospholipids                      B. Steroids                      C. Glycolipids                      D. Proteins  
 E. None of the above
38. Which of the following will increase membrane fluidity  
 A. Increasing the concentration of saturated fatty acids in the membrane lipids  
 B. Increasing the concentration of unsaturated fatty acids in the membrane lipids  
 C. Decreasing the concentration of cholesterol in the membrane  
 D. A & C  
 E. B & C
39. Increasing the tail length of the fatty acids will \_\_\_\_\_ membrane fluidity  
 A. Increase                      B. Decrease                      C. Not affect
40. The A, B, and O antigens found on blood cells are examples of different:  
 A. Glycoproteins                      B. Steroids                      C. Glycolipids  
 D. Proteins                      E. Phospholipids
41. Which type of movement is most typically seen in phospholipids of biological membranes?  
 A. Lateral movement                      B. Flip-flops                      C. Both are equally frequent

42. 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<sub>2</sub>H<sub>6</sub>      B. H<sub>2</sub>O      C. Na<sup>+</sup>      D. CO<sub>2</sub>      E. Cholesterol
46. Which of the following statements (A-D) about biological membranes is FALSE? If statements A-D are true, then choose E.  
 A. Biological membranes of the endomembrane system can bud off vesicles which can fuse to other membranes  
 B. Biological membranes have asymmetrical distribution of proteins  
 C. Enzymes are frequently bound to membranes by elements of the cytoskeleton  
 D. Membranes are frequently utilized to create electrochemical gradients  
 E. All of the above statements about biological membranes are TRUE
47. Mary has blood type A. Her baby is blood type O. Use the blood type information of the four potential fathers given below to determine who can be eliminated from consideration of who is the actual father.
- Billy - type O      Carlos - type A      Ahmed - type B      Kenshu - type AB
- A. Ahmed      B. Kenshu  
 C. Kenshu & Ahmed      D. Carlos, Ahmed and Kensu  
 E. We cannot eliminate any of the potential fathers from consideration
48. Mary has another child and this child is type A. If the same four men are still potential fathers, who can be eliminated from consideration?  
 A. Billy      B. Ahmed      C. Kenshu      D Billy & Ahmed  
 E. We cannot eliminate any of the potential fathers from consideration
49. Which of the following is NOT a component of the cell theory of life?  
 A. All organisms are composed of cells  
 B. The cell is the structural unit of life - units smaller than cells are not alive  
 C. Cells can arise by spontaneous generation  
 D. Cells can be cultured to produce more cells  
 E. All of the above are components of the cell theory of life.
50. In a reduction-oxidation reaction, a substance that loses electrons is:  
 A. oxidized      B. reduced
51. Which of the following statements about ribosomes is FALSE?  
 A. Ribosomes are the "factories" of the cell involved in protein synthesis  
 B. Ribosomes may either be free or bound to ER  
 C. Ribosomes are made up of two subunits, the large subunit and the small subunit  
 D. The ribosomes of prokaryotes and eukaryotes are identical

52. In his overly-long story, what was Mike's big concern after the Thanksgiving meal?
- A. I had eaten too much and would be sick
  - B. The turkey was bad and I would have problems later on
  - C. I had diabetes
  - D. I had cancer
  - E. The man I called "dad" wasn't really my biological father

For your viewing pleasure: A Periodic Table