

This exam consists of 41 questions spreading like the plague over six pages (I got lazy, OK - each question is worth 2.5 points). 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. Your score will be posted on the UIC Blackboard site as soon as they are in. Good Luck!

1. Batman and Robin are called to a crime scene. There they find a two-headed coin with one side defaced. From this clue, they determine that the criminal was Two-Face. Batman has used \_\_\_\_\_ reasoning to come to this conclusion.  
A. inductive                      B. deductive
2. Which of the following statement (A-D) about the process of science is FALSE? If statements A-D are true, then choose E  
A. Science is an evolving field - the state of our knowledge is constantly changing  
B. Scientific hypothesis are based upon previous knowledge  
C. A scientist is considered successful if their hypothesis is proven to be true  
D. Theories and models are compilations of linked hypotheses used to explain larger-scale phenomena  
E. All of the above statements about the process of science are TRUE
3. You hypothesized that ATP synthase was inhibited by high levels of urea. You exposed cells to high levels of urea and ATP production was greatly reduced. What conclusions could you draw from these data?  
A. Your hypothesis was correct and no further research is necessary  
B. Your hypothesis is supported, further research is not necessary  
C. Your data appear to support your hypothesis, but there are many other reasons why the high level of urea could have affected the cell that you can draw no conclusion  
D. Your hypothesis is not supported and urea has no effect on ATP synthase  
E. None of the above
4. How many covalent bonds would you expect silicon (Si, atomic number 14) to typically form?  
A. 2                      B. 4                      C. 6                      D. 8                      E. 14
5. You strike a Sodium atom (Na, atomic number 11) with an electron, turning one of its protons into a neutron. What has happened to the atom?  
A. It is now an isotope of the original sodium  
B. It is now Na<sup>+</sup>  
C. It is now Na<sup>-</sup>  
D. It is now Neon (Ne)  
E. Not enough information to tell
6. Which element on the second row of the periodic table is the most electronegative?  
A. C                      B. N                      C. O                      D. F                      E. Ne

7. Which of the following assumptions about a hydrophilic molecule is incorrect?
- It will readily dissolve in water
  - It is capable of forming polar bonds
  - It probably would not dissolve in an oil
  - It is a salt
  - All of the above assumptions about a hydrophilic molecule are true
8. Which of the below molecules is the most amphipathic?
- |                   |                 |            |
|-------------------|-----------------|------------|
| A. Water          | E. Phospholipid | C. Steroid |
| A. Polysaccharide | B. A & B        |            |
9. What type of molecule is pictured below?
- |               |                   |                 |
|---------------|-------------------|-----------------|
| A. Amino acid | B. Polysaccharide | C. Phospholipid |
| D. Purine     | E. Pyrimidine     |                 |
10. An alpha helix is an example of a protein \_\_\_\_\_ structure
- |            |              |             |               |
|------------|--------------|-------------|---------------|
| A. Primary | B. Secondary | C. Tertiary | D. Quaternary |
|------------|--------------|-------------|---------------|
11. Which of the following statements (A-D) about DNA and RNA is FALSE? If statements A-D are true, then choose E.
- DNA and RNA nucleotides both possess a phosphate group, pentose sugar, and nitrogenous bases
  - The DNA nucleotides are G A T C while the RNA nucleotides are G A U C
  - DNA can base-pair with RNA
  - DNA lacks an -OH functional group on the 2' carbon
  - All of the above statements about DNA and RNA nucleotides are TRUE
12. In which of the following structures is the carbon most reduced?
- |                  |  |                           |                           |
|------------------|--|---------------------------|---------------------------|
| A. $\text{CO}_2$ | B. $\text{C}_6\text{H}_{12}\text{O}_6$ | C. $\text{C}_2\text{H}_8$ | D. $\text{CH}_2\text{OH}$ |
|------------------|--|---------------------------|---------------------------|
13. Which of the following statements (A-D) about phospholipids is FALSE? If statements A-D are true, then choose E
- Phospholipids are a form a glyceride lipid
  - Phospholipids will dissolve in both water and oils
  - Phospholipids will spontaneously form a lipid bilayer when placed in water
  - Phospholipids are the primary component of a biological membrane
  - All of the above statements about phospholipids are TRUE.
14. The amino acids in proteins are held together by \_\_\_\_\_ bonds.
- |            |                |          |                   |
|------------|----------------|----------|-------------------|
| A. Peptide | B. Proteaceous | C. Polar | D. Phosphodiester |
|------------|----------------|----------|-------------------|



21. 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, both 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
22. Allosteric inhibition utilizes:
- A. Competitive inhibitors
  - B. Non-competitive inhibitors
23. When a substrate binds to an enzyme:
- A. It is a perfect fit
  - B. It is an induced fit
  - C. It must be guided into the active site by allosteric ligands
  - D. It requires ATP hydrolysis
  - E. None of the above
24. Plant cells contain functional mitochondria
- A. True
  - B. False
25. 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.
26. Increasing the concentration of \_\_\_\_\_ will make a membrane less fluid.
- A. Saturated fatty acids
  - B. Unsaturated fatty acids
  - C. Cholesterol
  - D. A & C
  - E. B & C
27. Which of the following cell structures is NOT part of the endomembrane system of a plant cell?
- A. Plasma membrane
  - B. Golgi apparatus
  - C. Central vacuole
  - D. Endoplasmic reticulum
  - E. Cell Wall
28. Which of the following structures typically has ribosomes associated with it?
- A. Outer nuclear membrane
  - B. Rough endoplasmic reticulum
  - C. Smooth endoplasmic reticulum
  - D. Golgi apparatus
  - E. Plasma membrane

29. Which of the following is NOT found in all cells?  
 A. DNA                      B. Ribosomes                      C. Cytoplasm                      D. Enzymes  
 E. Endoplasmic reticulum
30. The concentration of osmotically active solutes in a cell is 0.8 M. It is placed in sea water with a concentration of osmotically active solutes at 0.6 M. The sea water is \_\_\_\_\_ to the cytoplasm  
 A. Hypertonic                      B. Hypotonic                      C. Isotonic
31. The above cell will \_\_\_\_\_ in the above sea water.  
 A. expand                      B. shrink                      C. remain the same size
32. What cell structures are responsible for the creation and maintenance of turgor pressure in plant cells?  
 A. Plasma membrane                      B. Cell Wall                      C. Central vacuole  
 D. B & C                      E. A, B, and C
33. Which of the following statements (A-D) about the  $\text{Na}^+/\text{K}^+$  pump is FALSE. If statements A-D are true, then choose E.  
 A. The  $\text{Na}^+/\text{K}^+$  pump requires the hydrolysis of ATP to operate  
 B. The  $\text{Na}^+/\text{K}^+$  pump has two configurations, one which can bind to  $\text{Na}^+$  and the other which can bind to  $\text{K}^+$   
 C. The  $\text{Na}^+/\text{K}^+$  produces an unequal charge distribution across the membrane  
 D. The  $\text{Na}^+/\text{K}^+$  pump is an example of an integral protein  
 E. All of the above statements about the  $\text{Na}^+/\text{K}^+$  pump are TRUE

Use the key below to answer questions 34 - 36.

- I. Simple diffusion                      II. Osmosis                      III. Ion Channels  
 IV. Facilitated diffusion                      V. Active transport

34. Which of the above processes do not involve carrier proteins?  
 A. I only                      B. II only                      C. I, II                      D. I, II, III                      E. II, III
35. Which of the above can transport molecules down their concentration gradient?  
 A. I, II                      B. I, II, III                      C. I, II, III, IV  
 D. I, II, III, IV, V                      E. V only
36. Which of the above requires energy to function?  
 A. I, II                      B. V only                      C. IV, V                      D. III, IV, V                      E. III, IV
37. If you phosphorylate glucose when it enters the cell via a facilitated diffusion carrier protein, glucose can be transported against its concentration gradient  
 A. True                      B. False

38. 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.
39. NADP<sup>+</sup> can accept two electrons and H<sup>+</sup> to become NADPH. This is known as:
- A. Oxidation
  - B. Reduction
40. Which of the following molecules would be least likely to diffuse across a plasma membrane?
- A. a triglyceride
  - B. CO<sub>2</sub>
  - C. Na<sup>+</sup>
  - D. H<sub>2</sub>O
  - E. Cholesterol
41. The Na<sup>+</sup>/K<sup>+</sup> pump is a/an
- A. Antiport
  - B. Symport