Practice Midterm Exam #2 (MCDB 1150-Biofundamentals).
(think about why wrong choices are wrong, why your correct choice is correct)

1. Two molecules will be attracted to one another by van der Waals interactions as long as ....
- ❑ **A**. they are composed of different types of atoms
- ❑ **B**. they are composed of the same type of atoms
- ❑ **C**. they are further away from one another than their van der Waals radii
- ❑ **D**. they each contain bonds between atoms of different electronegativities.

2. If the electronegativities of H and O were equal what would happen to the boiling point of water?
- ❑ **A**. it would be unchanged
- ❑ **B**. it would increase
- ❑ **C**. it would decrease

3. You are given samples of two compounds with similar molecular weights. One compound (A332) is composed of atoms of very different electronegativities, while the other (G221) is composed of atoms with very similar electronegativities. You are asked to predict which compound is likely to be more soluble in water - you are most likely to be right if you say ....
- ❑ **A**. A332
- ❑ **B**. G221
- ❑ **C**. they will be equally water soluble

4. Lipids are characterized primarily by the fact that …
- ❑ **A**. they have a highly elongated shape
- ❑ **B**. they contain both hydrophilic and hydrophobic domains
- ❑ **C**. they are composed 5 to 10 repeating amphipathic units
- ❑ **D**. they are found only in living organisms

5. You are studying a cell in a solution of Na+ where the [Na^+] is higher on the outside than on the inside. You observe that glucose flows into the cell. You measure the glucose concentration and find that it is higher inside the cell than outside. What type of membrane molecule could be responsible for the observed movement of glucose.
- ❑ **A**. a glucose-Na+ symporter
- ❑ **B**. a glucose carrier
- ❑ **C**. a glucose-Na+ antiporter
- ❑ **D**. a glucose channel

6. How does a catalyst work?
- ❑ **A.** by increasing temperature
- ❑ **B**. by decreasing the free energy of the products
- ❑ **C**. by decreasing the free energy of the reaction intermediate
- ❑ **D.** by increasing the free energy of the products ❑ **no idea**

7. Increasing the temperature often increases the rate of a favorable reaction because ....
- ❑ **A**. the activation energy of the rate limiting step of the reaction is decreased
- ❑ **B**. more collisions transfer enough energy to make the rate limiting step likely
- ❑ **C**. the nature of the rate limiting step of the reaction is altered
- ❑ **D.** the free energy of the reactants is reduced, while the free energy of the products increases

8. A channel in a membrane is like a catalyst because it …

- ❏ **A**. alters lipid structure
- ❏ **B**. changes water structure
- ❏ **C**. increases the speed at which molecules collide with the membrane
- ❏ **D.** decreases the free energy needed to pass though the membrane

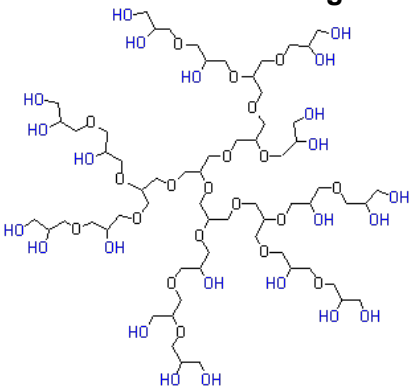
9. Plants are eukaryotes, and have within their cells endosymbiotically derived organelles. Based on this observation, we might well assume that the cell walls of plants and bacteria are

- ❏ **A**. homologous structures
- ❏ **B**. analogous structures
- ❏ **C**. unrelated in terms of origin or function.

. You find a species of plant without mitochondria, this could be possible if…

- ❏ **A**. its chloroplasts had retained all of their original respiratory functions
- ❏ **B**.its mitochondria never gained any non-respiratory functions
- ❏ **C**. both A and B would **<u>have</u>** to be true
- ❏ **D**. the ancestor of plants did not have mitochondria

11. Consider this strange compound. Based on its structure you might expect that it…



- ❏ **A**. dissolves in water
- ❏ **B**. forms micelles in water
- ❏ **C**. is insoluble in water
- ❏ **D**. would sit at the hydrophilic-hydrophobic interface of the membrane

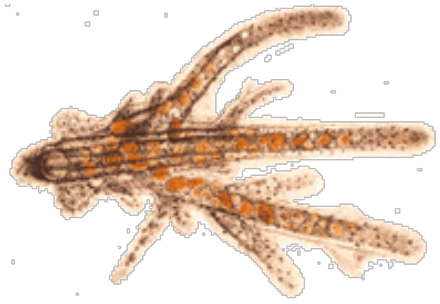
12. Assume that all of the Os in the molecule are replaced by Cs, then you would expect that the molecule would

- ❏ **A**. dissolve in water
- ❏ **B**. form micelles in water
- ❏ **C**. be insoluble in water
- ❏ **D**. would sit at the hydrophilic-hydrophobic interface of the membrane

13. Why are the oxidation of NADH, or other such molecules, and the hydrolysis of ATP similar?

- ❏ **A**. both are energetically unfavorable
- ❏ **B**. both can be used to drive thermodynamically unfavorable reactions
- ❏ **C**. both normally occur outside cell
- ❏ **D**. both occur only in the presence of light

14. Consider an animal cell (like an amoeba) living in a fresh water pond. The amoeba engulfs some bacteria; these bacteria make and secrete a toxin that acts as an efficient H+ ion channel and is able to enter all cellular membranes. The bacteria is immune to



the toxin because they also makes a specific inhibitor that blocks the ion channel's action within the bacteria. What happens to the amoeba ?

- ❑ **A**. Nothing
- ❑ **B**. its rate of ATP synthesis increases
- ❑ **C**. water is no longer pumped out, so the cell swells and dies.

15 . Consider the reactions (relax, read slowly, and take your time)

$$A + B + 3C \leftrightarrows 2D + G \quad \textbf{(reaction 1)}$$

$$G + H \leftrightarrows N \quad \textbf{(reaction 2)}$$

$$D \leftrightarrows 2F \quad \textbf{(reaction 3)}$$

Reactions 1 and 2 reach equilibrium very fast (in milliseconds), but are energetically highly unfavorable.

Reaction 3 does not occur to any significant extent, even though it is energetically very favorable (its equilibrium constant is 1000000).

You mix A + B + C + H and wait 10 minutes; then you add a catalyst that enables reaction 3 to reach equilibrium in 10 seconds. When you compare the concentration of H in the system before and after you added the catalyst, you will find that it has…

- ❑ **A**. increased
- ❑ **B**. decreased
- ❑ **C**. remains unaltered