Mock Exam 1

1. Which of the following is not a characteristic of living things?
    a. Populations of living things evolve
    b. They convert energy form one form to another
    c. All living things use DNA as their genetic material
    d. All living things require oxygen
    e. All living things contain complexity of order
2. Sodium and Lithium are two different elements yet they react very similarly. What is the best explanation for this?
    a. They have similar atomic numbers
    b. They have the same number of total electrons
    c. They have the same number of outer shell (valence) electrons
    d. They have the same number of electron shells
    e. They form isotopes with the same atomic mass
3. A fictional element normally has 7 protons, 12 neutrons, and 7 electrons. Which of the following could be an isotope of the element
    a. 7 protons, 12 neutrons, 7 electrons
    b. 8 protons, 12 neutrons, 8 electrons
    c. 8 protons, 12 neutrons, 7 electrons
    d. 7 protons, 15 neutrons, 7 electrons
4. An element has an atomic number of 14 and a mass of 20. What are the numbers of protons, neutrons, and electrons, respectively.
    a. 14, 6, 14
    b. 14, 14, 14
    c. 6, 14, 14
    d. 6, 6, 14
5. What roles do Van der Waals interactions play in biology?
    a. They are too weak to play an important role
    b. They are strong bonds that stabilize protein structure
    c. They involve the transfer of electrons from one atom to another
    d. They involve the sharing of electrons between two atoms of equal electronegativity
    e. They are weak bonds that help reinforce the structure of larger molecules
6. T/F: Ionic bonds do not involve the transfer of electrons
7. Water molecules are bound together by:
    a. The transfer of electrons between hydrogen and oxygen
    b. The sharing of electrons between hydrogen and oxygen
    c. A force of attraction between hydrogen and oxygen
    d. Van der Waals interactions
8. What causes the partial charges on the hydrogen and oxygen within a molecule of water?
    a. The high electronegativity of hydrogen
    b. The high electronegativity of oxygen
    c. The low electronegativity of oxygen
    d. Hydrogen bonding between oxygen and hydrogen

9. $3H_2 + N_2 \leftrightarrow 2NH_3$

Which of the following is true of the above reaction at equilibrium

   a. The concentrations of hydrogen and nitrogen are equal
   b. The concentrations of hydrogen and ammonia are equal
   c. The rates at which the ammonia is forming and breaking is equal
   d. None of the above are true

10. A hydrocarbon molecule is placed in water and you notice the solution does not mix. Why does this happen?
   a. The molecule is hydrophilic
   b. The hydrocarbon contains no internal charges
   c. The hydrocarbon is negatively charged
   d. Carbon and oxygen cannot bind together

11. Which phenomenon allows water to travel against gravity up through the xylem tissues in a plant?
   a. Adhesion
   b. Cohesion
   c. Hydrogen bonding
   d. Surface tension

12. How would you make a 2 M solution of sucrose? Sucrose molecular weight is 342 g/mol
   a. Dissolve 342 grams in water and raise the volume to 2 L
   b. Dissolve 342 grams in water and raise the volume to 1 L
   c. Dissolve 648 grams in water and raise the volume to 2 L
   d. Dissolve 648 grams in water and raise the volume to 1 L

13. A compound with a pH of 1 is how many times stronger than a compound with a pH of 5?
   a. 10,000
   b. 4
   c. 1,000
   d. 40,000
   e. 40

14. A molecule that contains a high number of carboxyl groups will be what in solution?
   a. Neutral
   b. Basic
   c. Increase the number of ionic bonds
   d. Acidic

15. The properties of a molecule are changed by:
   a. Changing valence electrons
   b. Moving functional groups
   c. Placing the molecule in solvent
   d. Heating the molecule up

16. Regarding straight chain carbon compounds, which combinations of atoms would require at least one carbon-carbon double bond?
   a. C2H6
   b. C7H16

c. C3H4
d. C3O2H8
e. None of the above

17. T/F: The reaction that BREAKS DOWN ATP is endergonic
18. You need to break a polypeptide chain into smaller pieces. How could you break the chain up?
    a. Adding water
    b. Adding ethanol
    c. Adding a non-polar solvent
    d. Any of the above would break the chain up
19. Which functional group is in all amino acids?
    a. Amino group
    b. Carbonyl group
    c. Carboxyl group
    d. Both A and B
    e. Both A and C
20. Which of the following functional groups will form a hydrogen bond with the oxygen atom of another functional group?
    a. Amino
    b. Carboxyl
    c. Sulfhydryl
    d. Hydroxyl
    e. All of the above
21. A compound rich in _____ will release a lot of energy.
    a. Methyl
    b. Phosphate
    c. Sulfhydryl
    d. Ketone Carbonyls
22. Animals store glucose as _____, plants store glucose as_____
    a. Starch & Cellulose
    b. Starch & Glycogen
    c. Cellulose & Glycogen
    d. Glycogen & Starch
    e. Cellulose & Starch
23. Triglycerides are rich in
    a. Peptide bonds
    b. Ionic bonds
    c. Phosphodiester bonds
    d. Ester linkages
24. Which of the following molecules is a monosaccharide?
    a. $C_{51}H_{98}O_6$
    b. $C_{25}H_{43}O_8$
    c. $C_6H_{12}O_6$
    d. $C_{22}H_{49}O_{10}N$
25. Lipids differ from other large biological molecules in that they_____
    a. Do not contain double bonds

b. Are not truly polymers
c. Do not contain nitrogen
d. Are much larger

26. The secondary structure of proteins does not include:
    a. The amino acid chain
    b. Hydrogen bonding between the carboxyl and amino groups
    c. Alpha helices and beta pleated sheets
    d. Hydrogen bonding between R groups
    e. An N-terminus and C-terminus
27. T/F: Double bonds in an unsaturated fat can be removed to create a saturated fat through a process called hydrolysis
28. What type of protein structure does hemoglobin exhibit?
    a. A linked series of amino acids
    b. Secondary
    c. Quaternary
    d. None of the above
29. Cell walls of plants are composed of lipopolysaccharides and proteins. What part of the cell produces these components?
    a. DNA and enzymes within the cytosol
    b. Free ribosomes and enzymes within the cytosol
    c. Rough endoplasmic reticulum and Golgi apparatus
    d. Smooth endoplasmic reticulum and Golgi apparatus
    e. The Golgi apparatus and ribosomes
30. T/F: A human egg is smaller than a bacteria
31. Consider two cells with the same volume but very different surface areas due to differences in their shape. The cell with the larger surface area is likely to:
    a. Have a very high metabolic rate
    b. Be a prokaryotic cell
    c. Be involved in the rapid uptake of compounds from the cell's environment
    d. Be buried deep in the interior of an organism
    e. Be nearly spherical in shape
32. Which of the following do prokaryotes and eukaryotes have in common?
    a. Ribosomes, plasma membranes, cytoplasm
    b. Nucleus, plasma membrane, cytoplasm
    c. Mitochondria, cytoplasm, plasma membrane
    d. Ribosomes, nucleus, plasma membrane
33. Which statement about the cytoskeleton is true?
    a. Microfilaments are more permanent structures in the cell compared to intermediate filaments and microtubules
    b. Microtubules are chains of proteins that resist stretching
    c. Intermediate filaments are hollow tubes of protein that provide structural support
    d. Plant cells lack a cytoskeleton because they have a rigid cell wall
    e. Components of the cytoskeleton often mediate the movement of organelles within the cytoplasm

34. Dye injected into a plant cell might be able to enter adjacent cells through:
    a. A cell wall
    b. A microtubule
    c. Plasmodesmata
    d. A tight junction
    e. A gap junction
35. OMIT THIS QUESITON
36. Your intestine is lined with individual cells. No fluids leak between these cells from the gut into your body. Why?
    a. Intestinal cells are bound together by an extracellular matrix
    b. Intestinal cells are bound together by gap junctions
    c. Intestinal cells are bound together by tight junctions
    d. The intestinal cells are bound together by Plasmodesmata
    e. The intestinal cells are fused into one great cell
37. Which cells would have the greatest number of mitochondria?
    a. Cells that carry out photosynthesis
    b. Muscle cells in the legs of a dog
    c. Bacteria cells growing on an agar plate
    d. Non-dividing cells in the skin of your skin
38. Which of the following nitrogenous bases is a purine?
    a. Adenine
    b. Uracil
    c. Thymine
    d. Kerosine
    e. Cytosine
39. What is the monomer of a nucleic acid?
    a. A nucleoside
    b. A nucleotide
    c. A 5-carbon sugar attached to a nitrogenous base
    d. An amino acid
40. T/F: The plasma membrane is amphipathic
41. The interior of the plasma membrane is studded with?
    a. Peripheral proteins
    b. Carbohydates
    c. Lipids only
    d. Integral proteins
42. What type of molecule would participate in simple diffusion?
    a. Large nonpolar molecules
    b. Small nonpolar molecules
    c. Water
    d. Large polar molecules
    e. Small polar molecules
43. Which of the following would be most likely to passively diffuse through the membrane?
    a. DNA
    b. Hemoglobin

c. Carbon dioxide
d. Glucose
e. Sodium Ion

44. Which of the following statements about diffusion is true?
    a. It is very rapid over long distances
    b. It requires expenditure of energy by the cell
    c. It occurs when molecules move from a region of low concentration to high concentration
    d. It always requires integral proteins of the plasma membrane
    e. It is a passive process
45. A selectively permeable membrane separates two solutions. The membrane is permeable to sodium ions but not to chloride ions. Side A has a Sodium concentration of 0.2 M and Chlorine concentration of 0.3 M. Side B has a Sodium concentration of 0.4 M and Chlorine concentration of 0.3 M. What will happen to the solution?
    a. Chlorine ions will from side A to B
    b. Sodium ions will move from side A to B
    c. Water will move from side B to A
    d. Sodium ions will move from side B to A
    e. Both A and C
46. Refer to question 45. Side A is _____ to Side B.
    a. Hypertonic
    b. Hypotonic
    c. Isotonic
    d. Neutral
47. If a membrane that is freely permeable to glucose and water molecules but impermeable to sucrose molecules is placed in a solution that is 0.03 M glucose and 0.04 M sucrose, what will occur if the fluid inside the membrane is composed of 0.03 M glucose and 0.02 M sucrose?
    a. Water will diffuse inside the membrane
    b. Water will diffuse out of the membrane
    c. Glucose will diffuse into the cell
    d. Sucrose will diffuse out of the cell
    e. Both C and D
48. Refer to question 47. The membrane is placed into a _____ solution
    a. Hypertonic
    b. Hypotonic
    c. Isotonic
    d. Neutral
49. What is true regarding electrogenic pumps?
    a. They all create a charge difference across the cell membrane
    b. They all pump positive ions out of the cell
    c. They all pump a variety of ions across the cell membrane
    d. None of them will pump hydrogen ions
    e. None of the above

50. When you ingest certain large molecules, the cells lining the digestive tract take them in. How are they most likely taken in?
    a. Exocytosis
    b. Endocytosis
    c. Osmosis
    d. Active transport
    e. Passive transport