BIOS 100 - Exam 1- Summer, 2005 Name: _____
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The exam consists of 52 multiple guess questions each worth 2 pts apiece over seven pages. Please bubble in your name, last name first. Please be sure you use the name with which you are registered here at UIC and not a nickname. If you only learn one thing from college, please learn that whenever you fill out one of these forms, you should use a #2 pencil. Pen just won't work. Really, it won't. Good luck!

1. Which of the following statements about science is TRUE?
   A. If you perform an experiment and the data support the hypothesis, you may conclude that your hypothesis is true.
   B. In science, you can never prove something is true, only fail to prove that it is false
   C. A theory is the same thing as a hypothesis
   D. All science is impartial - the personality of the researcher never plays a role.
   E. All of the above statements about science are FALSE

2. Which of the following best describes the process by which scientific models are created?
   A. Inductive reasoning B. Deductive reasoning C. Conductive reasoning

Use the copy of the periodic table at the end of the exam to answer questions 3 - 7

3. How many covalent bonds would you expect Silicon (Si) to form?
   A. 0 B. 2 C. 3 **D. 4** E. 6

4. Rank the following elements from most electronegative to least electronegative
   A. C, N, O B. H, N, O **C. O, N, C** D. O, C, H, N E. None of the above

5. How many electrons does Carbon (C) have it its outermost valence electron shell?
   A. 2 B. 3 **C. 4** D. 6 E. None of the above

6. How many protons does Carbon (C) have in its nucleus?
   A. 2 B. 3 C. 4 D. 5 **E. 6**

7. How many neutrons does C^{14} have in its nucleus?
   A. 4 B. 6 C. 7 **D. 8** E. None of the above

8. Rank the bonds from weakest to strongest:
   A. Polar, Ionic, Covalent B. Polar, Covalent, Ionic
   C. Ionic, Polar, Covalent D. Covalent, Ionic, Polar
   E. None of the above

9. When you dissolve the salt NaCl in water, what is the orientation of the water molecules around the Cl- ion?
   A. The hydrogen end of the water molecule is most closely associated with the Cl- ion
   B. The oxygen end of the water molecule is most closely associated with the Cl- ion
   C. Not enough information to tell

10. Which of the following molecules is least polar?
    A. Water (H_2O) B. Ethanol (C_2H_5OH) C. Glucose ($C_6H_{12}O_6$)
    D. Octane (C_8H_{18}) E. Ammonia (NH_3)

11. Which of the following statements (A-D) about water is FALSE. If statements A-D are true, then select E.
    A. Water has a high surface tension
    B. Water has strong adhesive and cohesive properties
    C. Water has a low boiling point and a low freezing point relative to a molecule of its size
    D. Solid water is less dense than liquid water
    E. All of the above statements about water are TRUE

12. When I put a glass tube into a cup of water, the water will defy gravity and creep up the inside of the tube. This is known as: *Note - I accepted two answers for this one*
    A. Capillary action B. Surface tension **C. A meniscus**
    D. Siliconization E. None of the above

13. When you lower the pH of a solution:
    A. The solution becomes more acidic
    B. The concentration of H+ increases
    C. The concentration of OH- becomes greater
    D. A & B
    E. B & C

14. In which of the bonds below is carbon most oxidized?
    A. C--H **B. C--O** C. C--N D. C--Si E. A & B

15. Peptide bond formation is what type of a reaction?
    A. Hyrdolysis B. Hydrogenation C. Peptidolyization
    D. Condensation E. None of the above

16. The picture to the left is an example of what type of molecule?
    A. Polysaccharide
    B. Lipid
    C. Protein
    D. Nucleic Acid

17. Integral proteins frequently have which secondary structure associated with them?
    A. Alpha helix with mostly hydrophobic amino acids
    B. Alpha helix with mostly hydrophilic amino acids
    C. Beta pleated sheet with mostly hydrophobic amino acids
    D. Beta pleated sheet with mostly hydrophilic amino acids
    E. None of the above

18. ATP most closely resembles what monomeric unit?
A. Monosaccharide B. Steroid C. Amino Acid **D. Nucleotide**

19. Microtubules are constructed of thousands of tublin subunits. The manner in which these subunits are arranged is known as a _____ structure of the protein
A. primary B. secondary C. tertiary **D. quaternary**

20. Which of the following reactions are endergonic?
A. Protein synthesis B. ATP hydrolysis C. Fat digestion
D. B & C E. A, B, & C

21. Which of the following statements (A-D) about enzyme-catalyzed reactions is FALSE. If statements A-D are TRUE, then choose E.
A. Enzymes are not consumed in a reaction
B. Enzymes often form enzyme-substrate complexes
C. Enzymes lower the activation energy of both the forward and the reverse reactions
D. Enzymes often have allosteric sites - binding sites for non-substrate molecules
E. All of the above statements about enzymes are TRUE

22. All of the organisms below have a peroxidase enzyme to catalyze the breakdown of hydrogen peroxide. Which of enzymes has the greatest temperature optimum (T_{opt})?
A. Humans B. Crow C. Cat **D. Alligator** E. Gorilla

23. The pH of the blood is 7.3. What would you expect the pH optimum of carboxylic anhydrase, and enzyme found in the blood, to be?
A. 5.0 B. 7.0 **C. 7.3** D. 7.8 E. 9.0

24. The conversion of Threonine to Isoleucine is a five-step process involving five different eznymes. The activity of the first enzyme, Threonine Deaminase, is regulated by feedback inhibition. Which of the following statements about this system is FALSE?
A. The enzyme Threonine Deaminiase has two binding sites, an active site and an allosteric site
B. Isoleucine is a competitive inhibitor of the substrate Threonine
C. When Isoleucine is bound to the Threonine Deaminase, the enzyme is inactive
D. When the concentration of Isoleucine in the cell is low, Threonine Deaminase will be active
E. The enzyme Threonine Deaminase has two configurations, only one of which will bind to Threonine

25. Which of the following statements (A-D) about enzyme inhibitors is FALSE? If statements A-D are true, then choose E.
A. Competitive inhibitors can fit into the active site of an enzyme
B. Competitive inhibitors lower the activity of an enzyme
C. Non-competitive inhibitors alter the conformation of the active site
D. Non-competitive inhibitors are very rare in nature
E. All of the above statements about enzyme inhibitors are TRUE.

26. Why do you face serious health risks (and even death) if your fever gets too high?
    A. At high temperatures, your enzymes may denature
    B. At high temperatures, your blood becomes too acidic
    C. At high temperatures, the water in your body tissues starts to boil
    D. At high temperatures, oxygen transfer in the lungs in reduced
    E. None of the above

27. Which of the following cells structures is incorrectly matched with its function?
    A. Chloroplast - photosynthesis
    B. Mitochondria - cellular respiration
    C. Nucleus - store genetic information
    D. Ribosome - regulate cell division
    E. Golgi apparatus - sorting and packaging of proteins

28. Which of the following statements (A-D) about mitochondria is FALSE? If statements A-D are true, then choose E.
    A. Mitochondria are organelles which are not part of the endomembrane system
    B. Mitochondria have two membranes, an outer membrane and more convoluted inner membrane
    C. The space enclosed by the inner mitochondrial membrane is known as the stroma
    D. Mitochondria contain their own DNA and ribosomes
    E. All of the above statements about mitochondria are TRUE

29. Which of the following are not found in all cells?
    A. Ribosomes B. Plasma membrane C. DNA
    D. Cytoplasm **E. Nucleus**

30. Which of the following is not a difference between prokaryotes and eukaryotes
    A. Prokaryotes have naked DNA, eukaryotes have DNA arranged in chromosomes
    B. Prokaryote ribosomes are larger than eukaryote ribosomes
    C. Prokaryotes have a capsule and cell wall, eukaryotes lack the capsule and most lack a cell wall
    D. Prokaryotes are generally smaller and less morphologically distinct than eukaryotes
    E. All of the above are valid differences between prokaryotes and eukaryotes

31. Which of the following is NOT a function of the cytoskeleton?
    A. Maintain cell shape and support B. Intracellular transport
    C. Anchor organelles and nucleus D. Contractility and movement
    E. All of the above are functions of the cytoskeleton

32. Which of the following organelles / cell structures can have ribosomes associated with it?
    A. Endoplasmic Reticulum B. Lysosomes
    C. Nuclear envelope D. Golgi apparatus
    E. None of the above

33. Which of the following would you expect to be found in association with motor proteins and with cilia and flagella?
A. Microtubules B. Microfilaments C. Intermediate fibers

34. Which of the following organelles / cell structures is involved with ribosome synthesis?
A. Endoplasmic reticulum B. Golgi apparatus
C. Mitochondria **D. Nucleoli**
E. None of the above

35. Which of the following is NOT evidence used to support the endosymbiosis theory of mitochondrial and chloroplast origin? - *Bad question - I'm throwing it out*
A. Mitochondria and chloroplasts divide is process similar to binary fission
B. Mitochondria and chloroplasts contain DNA similar in structure to prokaryotes
C. The proteins in mitochondria and chloroplasts are more similar bacterial forms
D. Mitochondria and chloroplasts possess ribosomes that synthesize proteins and these ribosomes are more similar to prokaryotic ribosomes than eukaryotic ribosomes
E. All of the above support the endosymbiosis theory of mitochondrial and chloroplast origin

36. What cellular structures are involved in the creation and maintenance of turgor pressure in plant cells?
A. Cell wall B. Central vacuole C. Chloroplasts
D. A & B E. A, B, & C

37. Which of the following statements (A-D) about protein synthesis and transport is FALSE? If statements A-D are true, then choose E.
A. Proteins fated for secretion usually have a signal sequence of amino acids which allows the ribosome to bind to a receptor protein on the surface of the rough ER
B. Proteins destined for transport in the cell are frequently glycolated in the ER
C. Once a protein receives a polysaccharide label, this label cannot be modified
D. Within the Golgi apparatus, the polysaccharide labels bind to receptor proteins which cause versicle formation
E. Statements A-D are TRUE

38. Which of the following is not a component of the endomembrane system?
A. Central vacuole **B. Chloroplast** C. Endoplasmic Reticulum
D. Lysosome E. Plasma membrane

39. What is a primary function of the smooth ER?
A. Protein synthesis B. Ribosome synthesis C. Nucleic acid synthesis
D. Lipid synthesis E. None of the above

40. Which of the following has a 9+2 organization of microtubules?
A. Cilia B. Flagella C. Cytoskeleton
D. A & B E. A, B, & C

41. Which of the following reduce membrane fluidity

I. Saturated fatty acids II. Unsaturated fatty acids III. Cholesterol

A. I only B. II only C. I & II
D. I & III E. II & III

42. You have two cultures of *E. coli*, one grown at 10ºC (the cold culture) and one grown at 35ºC (the warm culture). How would the constitution of the cell membranes be different in these two cultures?

A. The cold culture would have more saturated fatty acids in the plasma membrane than the warm culture
B. The cold culture would have less saturated fatty acids in the plasma membrane than the warm culture
C. The cold culture and the warm culture would have identical fatty acid composition.

43. Which of the following statements (A-D) about biological membranes is FALSE? If statements A-D are true, then choose E.

A. Phospholipids and cholesterol are the primary lipids comprising biological membranes
B. Biological membranes are a lipid bi-layer
C. There is an asymmetrical distribution of proteins in most plasma membranes
D. Membranes are fluid - most lipids are free to move laterally
E. All of the above statements about biological membranes are TRUE

44. A type O mother has a type A baby. The father can not be which of the following blood types?

I. Type A II. Type B III. Type AB IV. Type O

A. II only B. II, III C. I, III **D. II, IV**
E. The father may be any of the above blood types

45. If a cell increased the length of the fatty acid chains in a membrane, the membrane would become:

A. More fluid **B. Less Fluid** C. Fluidity would remain the same

46. Lipid bilayer formation is spontaneous

A. True B. False

47. Which of the following is capable of moving a molecule against its concentration gradient?

A. Diffusion B. Facilitated diffusion **C. Active transport**
D. B & C E. A, B, & C

48. Which of the following utilize carrier proteins?

A. Diffusion B. Facilitated diffusion C. Active transport
D. B & C E. A, B, & C

49. A cell with a 0.8 mM concentration of osmotically active solutes is placed in a solution of 1.2 mM concentration of osmotically active solutes. Which way will water move?
    A. Into the cell **B. Out of the cell** C. There will be no net movement of water

50. Which of the following statements (A-D) about the Na+/K+ pump is FALSE? If statements A-D are true, then choose E.
    A. The Na+/K+ pump is an example of an active transport symport
    B. The Na+/K+ pump has two conformations, one with three Na+ binding sites and one with two K+ binding sites
    C. When the Na+/K+ pump is phosphorylated, it changes shape and opens to the outside
    D. The Na+/K+ pump moves three Na+ and two K+ across the membrane with each cycle
    E. All of the above statements about the Na+/K+ pump are TRUE.

51. Osmosis can produce a physical force
    A. True B. False

52. When you water a wilted (but still living) plant, what happens?
    A. The water will help reestablish turgor pressure
    B. The water will make the contents of the central vacuole isotonic to the surrounding medium
    C. The water will cause the cells to burst
    D. The water will strengthen the cell wall
    E. None of the above