

BIOS 100 - Fall, 2010
Exam I, 17 Sept, 2010
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Name:
TA:

This exam consists of 40 questions over 8 pages (the last page also has a periodic table). Each question is worth 4 points apiece (so, yes, you can earn 160 points) Please check to see that all the pages are present before you begin. There are some useful diagrams on the last page - check them out before you start taking the exam. Use a #2 pencil and bubble in all answers. Your score will be posted on the UIC Blackboard site as soon as they are in. Choose the BEST answer for each question. Good Luck!

1. Which of the following statement (A-D) about the process of science is FALSE? If statements A-D are true, then choose E
 - A. A hypothesis which is not falsifiable is not a valid scientific hypothesis
 - B. Science is an evolving field - the state of our knowledge is constantly changing
 - C. You can never prove a hypothesis to be true, you can only continually support it with observational and experimental data
 - D. Scientific theories and models are compilations of linked hypotheses used to explain larger scale phenomena and they can be used to predict outcomes for situations that have not been observed or data collected.
 - E. All of the above statements about the process of science are TRUE**

2. A non-science major took this BIOS 100 course three years ago to fulfil their GenEd requirement and have since not taken another science course. They gave a group presentation using Power Point on the history and treatment of people with HIV. I gave this student a copy of the final exam and interspersed questions about the treatment of HIV. They did acceptable on the general biology questions, but did exceptionally well on the HIV questions. What is the best scientific explanation for these results?
 - A. HIV is a topically relevant subject and they have been exposed to this information in the media
 - B. It is possible that they have a relative or close friend who has HIV and retaining this information has comforted them
 - C. Teaching others about a subject is the most effective way to promote long-term learning of the topic**
 - D. The use of AV material and Power Point have been demonstrated to improve learning and retention of material
 - E. None of the above

3. Which of the reasons given below was NOT given by the judge in the Kitzmiller v Dover court case for why Intelligent Design (ID) is not science?
 - A. All of ID's claims have not been scientifically demonstrated**
 - B. ID's negative attacks on evolution have been refuted by the scientific community
 - C. The argument of irreducible complexity, central to ID, employs the same flawed and illogical contrived dualism that doomed creation science
 - D. ID violated the centuries-old ground rules of science by invoking and permitting supernatural causation for natural phenomena
 - E. All of the above reasons were cited by the judge in the Kitzmiller v Dover case

4. Which of the following statements could not be supported or rejected by a scientific experiment?
- The first living cells came from outer space**
 - Production of melanin, a pigment in the skin, is affected by vitamin C intake
 - Wearing seatbelts helps reduce major injury and/or death in auto accidents
 - College students prefer low-cost textbooks to high-cost textbooks
 - All of the above statements could be supported or rejected by scientific experiments.
5. What was one of the main points of the Zheng et al. article *Application of Bloom's Taxonomy Debunks the "MCAT Myth"*?
- The common belief that the MCAT is a good indicator of success in medical school is not supported by performance data and job placement
 - The common belief that the MCAT is mostly a collection of factual recall questions is not supported by the study performed by Zheng et al.**
 - The common belief that exams given during the first year of medical school consist primarily of lower-order knowledge questions was not supported
 - Introductory level biology courses (such as BIOS 100) need to have more of a basis in factual information as these are the tools necessary for success on the MCAT and medical school
 - None of the above
6. Which of the following levels of learning is considered by Bloom's Taxonomy to be the lowest level of learning?
- Analyzing
 - Evaluating
 - Understanding
 - Remembering**
 - Creating
7. What level of learning was required by you to answer the above question on Bloom's Taxonomy?
- Analyzing
 - Evaluating
 - Understanding
 - Remembering**
 - Creating
8. Experiments performed in the medical field testing the effectiveness of drugs frequently employ what is called a double blind experimental design. What is the function of a double blind experimental design?
- It controls for the placebo effect
 - It removes potential bias from the patients' description of the effectiveness of the drug
 - It removes potential bias from the doctors' and nurses' data collection since they do not know which patients have received the active drug**
 - It removes potential bias from the drug company since they have a great financial stake in the results
 - None of the above
9. Based on information presented in the periodic table, which of the following chemicals is the most stable (i.e. follows the simple covalent bonding rules)?
- SH₂**
 - H₂Cl
 - CO₄
 - H₂NC
 - CN₃

10. Which of the following molecules would you expect to have the strongest dipole?
A. CH_4 B. NH_3 C. **H_2O** D. CH_3OH E. None of the above
11. You developed a drug to reduce the negative effects of seasonal allergies on patients. You gathered up a group of people who suffer from the same seasonal allergies and created three groups. The first group you gave nothing. The second group you gave a sugar pill but told them it was a drug and the third group you gave your drug. You measured effectiveness of the drug by antibody counts in their blood - the lower the antibody count, the more effective the treatment is in reducing allergies. You obtained the following results illustrated by the graph below. What conclusions could you draw from your data?
- A. There is no effect from either the drug or the placebo in treating these seasonal allergies
B. The drug is no more effective than a placebo in treating seasonal allergies.
C. **The drug is significantly better than a placebo in treating seasonal allergies**
D. You cannot draw any conclusions based on your data
12. Which of the following molecules would have the least solubility in water?
A. HCl B. NaCl C. $\text{C}_6\text{H}_{12}\text{O}_6$ D. **C_2H_6** E. CH_3OH
13. You have two identical water-gliding insects, the only difference is one has waxy residues on its feet and one has chitin (a polysaccharide) on its feet. Which insect will float and glide better?
A. **The insect with waxy feet** B. The insect with chitinous feet
C. Both will float and glide equally as well D. None of the above
14. In which molecule is the indicated carbon molecule the most reduced?
A. B.

C. D.

E. **A & C**
15. Which of the molecules below is not a monomer?
A. Glucose B. Proline (an amino acid) C. Adenine (a nucleotide)
D. **A phospholipid** E. All of the above are monomers

16. Which of the following statements (A-D) about what happens at a campfire is false? If statements A-D are true, then choose E. (Note A & B are both false...)
- A. **When you burn wood, you are reducing the carbon in the wood**
 - B. The electrons are more evenly shared in the carbon found in the carbon dioxide molecules than in the carbon found in the wood molecules
 - C. The carbon in the carbon dioxide is more oxidized than the carbon in the wood
 - D. The oxygen in the water produced is more reduced than in the wood
 - E. All of the above statements about what happens at a campfire are TRUE
17. Why are most biologically important molecules polymers?
- A. Polymers are simple molecules
 - B. The monomers are energetically cheap to produce
 - C. Polymers are very unstable, which makes them highly reactive
 - D. **Each polymer has a common bond type joining each monomer. This makes it easy to mix and match to create a large number of different molecules**
 - E. None of the above
18. When your digestive system breaks down the proteins you eat into amino acids:
- A. Water is formed from the chemical breakdown of proteins
 - B. **Water is needed to perform the chemical breakdown of proteins**
 - C. Water is neither formed nor needed in the chemical breakdown of proteins
19. The molecule pictured below is a(n):
- A. **Amino acid**
 - B. Steroid
 - C. Glyceride
 - D. Polysaccharide
 - E. None of the above
20. Which of the below statements describes a difference between an RNA nucleotide and a DNA nucleotide?
- A. RNA nucleotides are more acidic than DNA nucleotides
 - B. RNA nucleotides are more reactive than DNA nucleotides
 - C. There are nitrogenous bases found in some RNA nucleotides which are different from the nitrogenous bases found in some DNA nucleotides
 - D. **B & C**
 - E. A, B, & C
21. How could a slight change in pH affect the shape of a protein?
- A. The change in pH could destroy the amino acids if the environment became too basic
 - B. The change in pH could cause the peptide bonds to become weak and break
 - C. **The change in pH could cause changes in the nature of the acidic and basic amino acids, which could affect the tertiary structure**
 - D. The change in pH could alter the primary structure of a protein
 - E. Proteins are largely immune to changes in pH

22. Which of the below nucleotides is not a pyrimidine?
A. **Adenine (A)** B. Uracil (U) C. Cytosine (C) D. ~~Tyrosine~~
——— E. ~~All of the above are pyrimidines~~
23. ATP is a modified form of what type of molecule?
A. Amino acid B. Sugar C. **Nucleotide** D. Triglyceride
24. A person afflicted with sickle cell anemia has a mutation in which the sixth amino acid in one of their hemoglobin molecules is changed from a Glutamine to a Valine. This is a change in the _____ structure of the protein
A. **Primary** B. Secondary C. Tertiary D. Quaternary
25. Which of the following graphs represents the relationship between enzyme activity as a function of ambient pH in an enzyme-catalyzed reaction?

A

B

C

D

26. The graph below shows the relationship between the concentration of substrate and reaction rate with a fixed amount of enzyme. What would happen to the curve if you added more enzyme to the system?

- A. Nothing,
B. The curve would have the same general shape, but it would level off at a lower reaction rate
C. **The curve would have the same general shape, but it would level off at a higher reaction rate**
D. The curve would not level off but would instead crash to almost zero after an optimal concentration was reached.

27. Which of the following statements (A-D) about enzymes is FALSE? If statements A-D are true, then choose E.
- A. Substrates bind to the enzyme forming a temporary enzyme-substrate complex
 - B. Enzymes lower the activation energy of both the forward and the reverse reactions
 - C. An exergonic reaction catalyzed by an enzyme will release less energy than the same exergonic reaction not catalyzed by an enzyme**
 - D. Enzyme activity is typically sensitive to changes in temperature and pH
 - E. All of the above statements about enzymes are TRUE
28. Why is the lock-and-key model of enzyme function not the best model to illustrate enzyme activity?
- A. There are frequently multiple substrates, and this doesn't correlate well with a concept of a key and a lock
 - B. The substrates don't fit perfectly with the active site like you'd expect with a lock and key mechanism**
 - C. The enzyme-substrate transition state created during catalysis doesn't correlate well with the concept of a key and lock
 - D. The lock-and-key model is a fully functional model to illustrate enzyme activity
29. 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 feedback inhibition
 - B. Threonine deaminase has both an active site and an allosteric site
 - C. An increase in the concentration of isoleucine will increase the activity of threonine deaminase**
 - D. The enzyme threonine deaminase has two conformations, but only one will bind to the substrate, threonine
 - E. All of the above statements about the enzyme system that converts threonine to isoleucine are TRUE
30. O-Methylthreonine is an isoleucine analog that will permanently bind to the allosteric site of threonine deaminase. What will happen to a cell when O-Methylthreonine is introduced to the system?
- A. The levels of threonine will be greatly reduced
 - B. The levels of isoleucine will be greatly reduced**
 - C. The levels of both threonine and isoleucine will be greatly reduced
 - D. Isoleucine production will greatly increase
 - E. None of the above
31. Which type of cell is generally considered to be the most primitive cell type?
- A. Prokaryotes** B. Archaeans C. Eukaryotes D. This is still unknown
32. Plant cells involved in photosynthesis typically lack functional mitochondria
- A. True **B. False**

33. Which of the following statements (A-D) about prokaryotes is FALSE? If statements A-D are true, then choose E.
- A. Prokaryotes possess a plasma membrane, cytoplasm, nuclear material, and ribosomes
 - B. Prokaryotes typically possess a cell wall to help maintain cell shape and resist osmotic stress
 - C. Prokaryotes may possess membrane invaginations called mesosomes to aid in compartmentalization
 - D. Prokaryotes possess ribosomes which is structurally different from those of an Archaeon
 - E. All of the above statements about prokaryotes are true**
34. Grb2 is a protein which is exclusively found in the cytoplasm. What would happen if a Nuclear Localization Signal (NLS) that could bind to an importin were grafted to this protein?
- A. Nothing, the Grb2 would remain in the cytoplasm
 - B. The Grb2 molecule would be able to cross through a nuclear pore and enter the nucleus**
 - C. The Grb2 molecule would not be able to enter into the nucleus, but if it were placed into the nucleus, it could cross through the nuclear pore and reenter the cytoplasm
 - D. The NLS on the Grb2 would cause it to become permanently bound to the nuclear membrane
 - E. None of the above
35. Pepsinogen is a digestive enzyme that will be produced and secreted into the stomach by a stomach cell. Tubulin is a protein produced by the stomach cell used in formation of the cytoskeleton. Which of the following statements about the production of these two proteins in a stomach cell is TRUE?
- A. Both the tubulin and the pepsinogen proteins will be glycosylated when first produced
 - B. Both the tubulin and the pepsinogen proteins will be produced in ribosomes floating free in the cytoplasm and not on ribosomes bound to the ER
 - C. Both tubulin and pepsinogen will be sorted in the Golgi Apparatus
 - D. Only the pepsinogen will be glycosylated when it is produced, the tubulin will not**
 - E. None of the above are TRUE.
36. Which cellular structure is incorrectly matched with one of its functions:
- A. Cytoskeleton - maintenance of cell shape
 - B. Ribosome - protein synthesis
 - C. Nucleolus - ribosome synthesis
 - D. Rough ER - lipid synthesis**
 - E. Golgi apparatus - protein packaging & distribution
37. Which of the following lines of evidence are NOT used to support the endosymbiosis theory of the origin of the mitochondria and chloroplast?
- A. Mitochondria and chloroplasts have naked DNA
 - B. Mitochondria and chloroplasts are approximately the size of a prokaryotic cell
 - C. Mitochondria and chloroplasts contain ribosomes very similar to prokaryotes
 - D. Mitochondria and chloroplasts 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.**

38. Which of the following cell structures is NOT part of the endomembrane system of a plant cell?
- A. Outer nuclear membrane B. Golgi apparatus C. Lysosome
D. Mitochondria E. Smooth Endoplasmic reticulum
39. 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
40. You have just discovered species of bacteria that lives in hot springs where the water can be almost 95°C. Which of the following would you predict to be true about the phospholipids in its membranes, compared to phospholipids in the membranes of bacteria that live in cooler environments?
- A. The membrane phospholipids of the hot spring bacteria will have much shorter hydrocarbon tails than those found in bacteria that live in cooler environments.
B. The membrane phospholipids of the hot spring bacteria will have more saturated hydrocarbon tails than those found in bacteria that live in cooler environments.
C. The membrane phospholipids of the hot spring bacteria will have more unsaturated hydrocarbon tails than those found in bacteria that live in cooler environments.
D. A & B
E. A & C
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Periodic Table of the Elements