

Place all answers on the attached answer sheet. Do not omit any questions unless specifically instructed to do so. On multiple choice questions: (a) select only one answer; (b) answer with the printed upper-case letter (= capital letter) that indicates the answer you are selecting. The answer to question eleven is three. On true/false questions, write out the entire word “true” or “false.”  
The atomic number of helium is two.

1. True or False All electrons contain energy.
2. True or False All electrons contain the same amount of energy.
3. How many centimeters are in 1 meter?
4. How many milliliters are in 1 liter?
5. How many millimeters in 1 centimeter?
6. Name one distinctive characteristic that will clearly distinguish living organisms from non-living material. A. ability to reproduce; B. ability to grow; C. ability to use energy; D. there is no such single characteristic
7. Which of the following best describes the term “evolution”?  
A. good; B. bad; C. evil; D. monkey; E. Darwin; F. change; G. eternal; H. illegal
8. Characteristics in which of the following species has been affected by artificial selection?  
A. horses; B. cows; C. soybeans; D. corn; E. all of these
9. What is the best size for rabbit ears?  
A. large; B. small; C. depends on the local climate; D. depends on the leg length in the rabbits
10. Biological success is best measured by:  
A. length of life; B. number of offspring produced; C. number of mates obtained; D. running speed; E. ear length
11. What is the length, in centimeters, of the right ear of a Minnesota rabbit after a cold winter?
12. What is the atomic number of carbon?
13. What is the atomic number of oxygen?
14. True or False Every hydrogen atom contains only one proton.
15. An atom contains 10 protons and 10 neutrons. What is the atomic number of this atom?

16. An atom contains 5 protons, 5 electrons, and 5 neutrons. What is the atomic mass (= atomic weight) of this atom?

17. An atom contains 17 electrons. How many of these electrons are in the first shell?

18. An atom contains 9 electrons. How many electrons are present in the second shell of this atom?

19. Neon has an atomic number of 10. Is neon likely to form ions?

A. yes, because it will lose an electron; B. yes, because it will gain an electron; C. no, because it is stable; D. no, because it will react too rapidly

20. Atom A has 6 electrons in its outer shell. Atom B has 7 electrons in its outer shell. Atom C has 8 electrons in its outer shell. Which of these atoms is least likely to react?

21. Which of the following explains stability in an atom?

A. the atom forms a covalent bond and fills its outer shell of electrons; B. the atom becomes an ion and fills its outer shell of electrons; C. before reacting, the atom contains eight electrons in its outer shell; D. any of these (A, B, or C) could be correct

22. What is the maximum number of electrons the first shell of an atom can hold?

23. Name the element with the smallest atoms on Planet Earth.

24. Name the smallest compound we have discussed in Biology 110.

25. Electrons in which of the following shells would have the least amount of energy?

A. shell 1; B. shell 2; C. shell 3; D. all of them contain the same amount of energy

26. Which is safer to use in a balloon?

A. hydrogen; B. helium; C. hydrogen and helium are equally safe

27. True or False A water molecule is an example of an ion.

28. Which of the following correctly describes an ion?

A. the number of protons is greater than the number of electrons; B. the number of protons is smaller than the number of electrons; C. the number of protons is equal to the number of neutrons; D. the number of electrons is equal to the number of protons; E. both answers A and B are correct.

29. How many hydrogen bonds can one molecule of water form with surrounding water molecules?
30. Which of the following is the strongest chemical bond we have studied in Biology 110?  
A. ionic; B. covalent; C. hydrogen; D. they are all of equal strength
31. Which of the following describes the attraction of one water molecule to another water molecule?  
A. adhesion; B. repulsion; C. cohesion; D. active sight
32. In the presence of cellulase, the carbohydrate cellulose will break down into glucose molecules. Name a reactant in this reaction.
33. Name a product in the reaction described in question 32.
34. True or False All enzymes are catalysts.
35. True or False All enzymes that we study in biology 110 are proteins.
36. Which of the following is a protein but not an enzyme?  
A. pepsin; B. amylase; C. hemoglobin; D. platinum
37. Which of the following would attach to an active site?  
A. substrate; B. enzyme; C. catalyst; D. hydrogen bond
38. Heat will kill an enzyme. The preceding statement is:  
A. true; B. false, because enzymes are not affected by heat; C. false, because enzymes are not alive; D. false, because enzymes need heat in order to react
39. A cell has 456 different kinds of chemical reactions occurring. How many different kinds of enzymes are probably present and being used in that cell?
40. Why can cows not manufacture cellulase?  
A. cows do not need cellulase; B. cows do not eat any plant material that contains cellulose;  
C. cows do not have genetic instructions on how to build cellulase; D. cows can manufacture cellulase but bacteria break it down
41. True or False Every isotope of carbon contains 6 protons.

42. Which of the following types of chemical bonds involves the sharing of electrons?  
A. covalent; B. hydrogen; C. ionic; D. none of these
43. How many covalent bonds are present in one water molecule?
44. How many electrons are involved in one covalent bond?
45. Compare the nuclei of oxygen and hydrogen: which has a stronger attraction for electrons?  
A. oxygen, because it contains 8 protons; B. hydrogen, because it contains 1 proton; C. they actually have equally strong attractions for electrons
46. True or False A covalent bond involves the sharing of electrons between two atoms, but the electrons are not always shared equally.
47. True or False Methane (CH<sub>4</sub>) is a non-polarized covalently bonded molecule.
48. The primary function of a cofactor is to:  
A. boost its enzyme; B. help give an enzyme the correct shape; C. lower the temperature of an enzyme; D. prevent antibiotics from affecting an enzyme
49. Which of the following is the strongest acid?  
A. pH = 8; B. pH = 7; C. pH = 5; D. pH = 3
50. Name a substance in which the liquid state is more dense than its solid state. (This is the same as asking: name a substance in which the solid state is less dense than its liquid state.)