**Chemistry 112 Practice Midterm 2017**

**Multiple Choice (33 Points) -** *Identify the choice that best completes the statement or answers the question.*

\_\_\_\_ 1. Which of the following is NOT an example of matter?

|  |  |  |  |
| --- | --- | --- | --- |
| a. | air | c. | smoke |
| b. | heat | d. | water vapor |

\_\_\_\_ 2. Which state of matter is characterized by having an indefinite shape, but a definite volume?

|  |  |  |  |
| --- | --- | --- | --- |
| a. | gas | c. | solid |
| b. | liquid | d. | none of the above |

\_\_\_\_ 3. Which of the following is a physical change?

|  |  |  |  |
| --- | --- | --- | --- |
| a. | corrosion | c. | evaporation |
| b. | explosion | d. | rotting of food |

\_\_\_\_ 4. Which of the following CANNOT be classified as a substance?

|  |  |  |  |
| --- | --- | --- | --- |
| a. | table salt | c. | nitrogen |
| b. | air | d. | gold |

\_\_\_\_ 5. An example of a homogeneous mixture is \_\_\_\_.

|  |  |  |  |
| --- | --- | --- | --- |
| a. | Fizzy water | c. | noodle soup |
| b. | stainless steel | d. | oxygen |

\_\_\_\_ 6. Which of the following is a chemical property of water at 4C?

|  |  |
| --- | --- |
| a. | its color |
| b. | its state |
| c. | its temperature |
| d. | its ability to decompose into hydrogen and oxygen |

\_\_\_\_ 7. Which of the following is true for all chemical reactions?

|  |  |
| --- | --- |
| a. | The total mass of the reactants increases. |
| b. | The total mass of the products is greater than the total mass of the reactants. |
| c. | The total mass of the products is less than the total mass of the reactants. |
| d. | The total mass of the reactants equals the total mass of the products. |

\_\_\_\_ 8. Dalton's atomic theory included which idea?

|  |  |
| --- | --- |
| a. | All atoms of all elements are the same size. |
| b. | Atoms of different elements always combine in one-to-one ratios. |
| c. | Atoms of the same element are always identical. |
| d. | Individual atoms can be seen with a microscope. |

\_\_\_\_ 9. The atomic number of an element is the total number of which particles in the nucleus?

|  |  |  |  |
| --- | --- | --- | --- |
| a. | neutrons | c. | electrons |
| b. | protons | d. | protons and electrons |

\_\_\_\_ 10. Using the periodic table, determine the number of neutrons in O.

|  |  |  |  |
| --- | --- | --- | --- |
| a. | 4 | c. | 16 |
| b. | 8 | d. | 24 |

\_\_\_\_ 11. How many protons, electrons, and neutrons does an atom with atomic number 50 and mass number 125 contain?

|  |  |  |  |
| --- | --- | --- | --- |
| a. | 50 protons, 50 electrons, 75 neutrons | c. | 120 neutrons, 50 protons, 75 electrons |
| b. | 75 electrons, 50 protons, 50 neutrons | d. | 70 neutrons, 75 protons, 50 electrons |

\_\_\_\_ 12. What is the maximum number of shapes orbitals in the *p* sublevel?

|  |  |  |  |
| --- | --- | --- | --- |
| a. | 2 | c. | 4 |
| b. | 3 | d. | 5 |

\_\_\_\_ 13. When an electron moves from a lower to a higher energy level, the electron \_\_\_\_.

|  |  |
| --- | --- |
| a. | always doubles its energy |
| b. | absorbs a continuously variable amount of energy |
| c. | absorbs a quantum of energy |
| d. | moves closer to the nucleus |

\_\_\_\_ 14. What types of atomic orbitals are in the third principal energy level?

|  |  |  |  |
| --- | --- | --- | --- |
| a. | *s* and *p* only | c. | *s, p,* and *d* only |
| b. | *p* and *d* only | d. | *s, p, d,* and *f* |

\_\_\_\_ 15. If three electrons are available to fill three empty 2*p* atomic orbitals, how will the electrons be distributed in the three orbitals?

|  |  |
| --- | --- |
| a. | one electron in each orbital |
| b. | two electrons in one orbital, one in another, none in the third |
| c. | three in one orbital, none in the other two |
| d. | Three electrons cannot fill three empty 2*p* atomic orbitals. |

\_\_\_\_ 16. The quantum mechanical model of the atom \_\_\_\_.

|  |  |
| --- | --- |
| a. | defines the exact path of an electron around the nucleus |
| b. | was proposed by Niels Bohr |
| c. | involves the probability of finding an electron in a certain position |
| d. | has many analogies in the visible world |

\_\_\_\_ 17. Which subatomic particle plays the greatest part in determining the properties of an element?

|  |  |  |  |
| --- | --- | --- | --- |
| a. | proton | c. | neutron |
| b. | electron | d. | none of the above |

\_\_\_\_ 18. What are the Group 1A and Group 7A elements examples of?

|  |  |  |  |
| --- | --- | --- | --- |
| a. | representative elements | c. | noble gases |
| b. | transition elements | d. | nonmetallic elements |

\_\_\_\_ 19. How many electrons does nitrogen gain in order to achieve a noble-gas electron configuration?

|  |  |  |  |
| --- | --- | --- | --- |
| a. | 1 | c. | 3 |
| b. | 2 | d. | 4 |

\_\_\_\_ 20. What is the electron configuration of the iodide ion?

|  |  |
| --- | --- |
| a. | 1*s*2*s*2*p*3*s*3*p*3*d*4*s*4*p*4*d*5*s*5*p* |
| b. | 1*s*2*s*2*p*3*s*3*p*3*d*4*s*4*p*4*d* |
| c. | 1*s*2*s*2*p*3*s*3*p*3*d*4*s*4*p*4*d*5*s* |
| d. | 1*s*2*s*2*p*3*s*3*p*3*d*4*s*4*p* |

\_\_\_\_ 21. How many valence electrons are transferred from the nitrogen atom to potassium in the formation of the compound potassium nitride?

|  |  |  |  |
| --- | --- | --- | --- |
| a. | 0 | c. | 2 |
| b. | 1 | d. | 3 |

\_\_\_\_ 22. Ionic compounds are normally in which physical state at room temperature?

|  |  |  |  |
| --- | --- | --- | --- |
| a. | solid | c. | gas |
| b. | liquid | d. | plasma |

\_\_\_\_ 23. What characteristic of metals makes them good electrical conductors?

|  |  |
| --- | --- |
| a. | They have mobile valence electrons. |
| b. | They have mobile protons. |
| c. | They have mobile cations. |
| d. | Their crystal structures can be rearranged easily. |

\_\_\_\_ 24. Which is a typical characteristic of an ionic compound?

|  |  |
| --- | --- |
| a. | Electron pairs are shared among atoms. |
| b. | The ionic compound has a low solubility in water. |
| c. | The ionic compound is described as a molecule. |
| d. | The ionic compound has a high melting point. |

\_\_\_\_ 25. Which of these elements does not exist as a diatomic molecule?

|  |  |  |  |
| --- | --- | --- | --- |
| a. | Ne | c. | H |
| b. | F | d. | I |

\_\_\_\_ 26. Why do atoms share electrons in covalent bonds?

|  |  |
| --- | --- |
| a. | to become ions and attract each other |
| b. | to attain a noble-gas electron configuration |
| c. | to become more polar |
| d. | to increase their atomic numbers |

\_\_\_\_ 27. A molecule with a single covalent bond is \_\_\_\_.

|  |  |  |  |
| --- | --- | --- | --- |
| a. | CO | c. | CO |
| b. | Cl | d. | N |

\_\_\_\_ 28. What is another name for the representative elements?

|  |  |  |  |
| --- | --- | --- | --- |
| a. | Group A elements | c. | Group C elements |
| b. | Group B elements | d. | transition elements |

\_\_\_\_ 29. What is another name for the transition metals?

|  |  |  |  |
| --- | --- | --- | --- |
| a. | noble gases | c. | Group B elements |
| b. | Group A elements | d. | Group C elements |

\_\_\_\_ 30. What is shown by the structural formula of a molecule or polyatomic ion?

|  |  |  |  |
| --- | --- | --- | --- |
| a. | the arrangement of bonded atoms | c. | the number of metallic bonds |
| b. | the number of ionic bonds | d. | the shapes of molecular orbitals |

\_\_\_\_ 31. How do atoms achieve noble-gas electron configurations in single covalent bonds?

|  |  |
| --- | --- |
| a. | One atom completely loses two electrons to the other atom in the bond. |
| b. | Two atoms share two pairs of electrons. |
| c. | Two atoms share two electrons. |
| d. | Two atoms share one electron. |

\_\_\_\_ 32. Which of the following diatomic molecules is joined by a double covalent bond?

|  |  |  |  |
| --- | --- | --- | --- |
| a. |  | c. |  |
| b. |  | d. |  |

**Short Answer (4 Points)**

34. Give the electron configuration for a neutral atom of selenium.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

35. Which group in the periodic table is known as the noble gases? \_\_\_\_\_\_\_\_\_\_\_\_\_\_

36. From which orbital in a strontium atom is an electron transferred to form Sr2? \_\_\_\_\_\_\_\_\_\_\_

37. Give the electron configuration for aluminum the ion. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**True/False (7 Points) Indicate** *whether the statement is true or false.*

\_\_\_\_ 38. The modern periodic table is arranged by increasing atomic mass of the elements.

\_\_\_\_ 39. In a neutral atom, the number of protons is equal to the number of neutrons.

\_\_\_\_ 40. Isotopes are forms of an element that have the same number of protons but a different number of electrons.

\_\_\_\_ 41. The mass of a neutron is approximately equal to the mass of a proton.

\_\_\_\_ 42. The modern periodic table is arranged from right to left in order of increasing atomic mass.

\_\_\_\_ 43. In the notation , 107 represents the atomic number and 47 represents the atomic mass of silver.

\_\_\_\_ 44. A proton is a subatomic particle carrying a charge equal to but opposite that of an electron.

**Numeric Response (6 Points)**

45. Use the periodic table to determine the number of electrons in a neutral atom of carbon. \_\_\_\_\_\_

46. Determine the number of electrons in an atom of zinc. \_\_\_\_\_\_

47. How many electrons are in the highest occupied energy level of a neutral chlorine atom? \_\_\_\_\_\_

48. How many electrons are in a rubidium ion (Rb)? \_\_\_\_\_\_

49. How many electrons does a gallium atom give up when it becomes an ion? \_\_\_\_\_\_\_

50. How many valence electrons does an iodine atom have? \_\_\_\_\_\_\_

51. How many electrons are shared in a triple covalent bond? \_\_\_\_\_\_\_\_

52. How many electrons are shared in a double covalent bond? \_\_\_\_\_\_\_\_\_\_

**Problem**

53. For each of the following molecules, draw the Lewis structure, determine the number of valence electrons associated with each (8)

a. formaldehyde, H2CO b. hydrogen peroxide, H2O2

c. F2O d. NH41+

**Open Response (17 Points)**

54. What does the chemical formula of a compound indicate? Use an example to illustrate your points. (3)

55. Explain the difference between chemical properties and physical properties. Give an example of each using a sample of copper in your example. (4)

56. What is the quantum mechanical model? (2)

57. Explain the octet rule and give an example of how it is used. (3)

58. Outline the differences between an ionic and molecular compound. (5)