Name _____ **Date** _____

AP BIOLOGY CHAPTER 2 WORKSHEET

MULTIPLE CHOICE. 25 pts.
Place the letter of the choice that best completes the statement or answers the question in the blank..

____ 1. About 25 of the 92 natural elements are known to be essential to life. Which four of these 25 elements make up approximately 96% of living matter?
   a. carbon, sodium, chlorine, nitrogen
   b. carbon, sulfur, phosphorus, hydrogen
   c. oxygen, hydrogen, calcium, sodium
   d. carbon, hydrogen, nitrogen, oxygen
   e. carbon, oxygen, sulfur, calcium

____ 2. Trace elements are those required by an organism in only minute quantities. Which of the following is a trace element that is required by humans and other vertebrates?
   a. nitrogen
   b. calcium
   c. iodine
   d. sodium
   e. phosphorus

____ 3. Which of the following statements is *false*?
   a. Atoms of the various elements differ in their number of subatomic particles.
   b. All atoms of a particular element have the same number of protons in their nuclei.
   c. The neutrons and protons present in the nucleus of an atom are almost identical in mass; each has a mass of about 1 dalton.
   d. An atom is the smallest unit of an element that still retains the properties of the element.
   e. Protons and electrons are electrically charged particles. Protons have one unit of negative charge, and electrons have one unit of positive charge.

____ 4. Each element is unique and different from other elements because of the number of protons in the nuclei of its atoms. Which of the following indicates the number of protons in an atom's nucleus?
   a. atomic mass
   b. atomic weight
   c. atomic number
   d. mass weight
   e. mass number

____ 5. Calcium has an atomic number of 20 and an atomic mass of 40. Therefore, a calcium atom must have
   a. 20 protons.
   b. 40 electrons.
   c. 40 neutrons.
   d. A and B only
   e. A, B, and C

____ 6. Different atomic forms of an element contain the same number of protons but a different number of neutrons. What are these different atomic forms called?
   a. ions
   b. isotopes
   c. neutronic atoms
   d. isomers
   e. radioactive atoms

____ 7. ^{3}H is a radioactive isotope of hydrogen. One difference between hydrogen-1 ($^{1}_{1}H$) and hydrogen-3 ($^{3}_{1}H$) is that hydrogen-3 has
   a. one more neutron and one more proton than hydrogen-1.
   b. one more proton and one more electron than hydrogen-1.
   c. one more electron and one more neutron than hydrogen-1.
   d. two more neutrons than hydrogen-1.
   e. two more protons than hydrogen-1.

____ 8. Radioactive isotopes can be used in studies of metabolic pathways because
   a. they are more reactive.
   b. the cell does not recognize the extra protons in the nucleus, so isotopes are readily used in metabolism.
   c. their half-life allows a researcher to time an experiment.
   d. their location or quantity can be experimentally determined because of their radioactivity.
   e. their extra neutrons produce different colors that can be traced throughout the body.

____ 9. Atoms whose outer electron shells contain eight electrons tend to
   a. form ionic bonds in aqueous solutions.
   b. form covalent bonds in aqueous solutions.
   c. be stable and chemically nonreactive, or inert.
   d. be unstable and chemically very reactive.
   e. be isotopes and very radioactive.

Use the information extracted from the periodic table in **Figure 1** *to answer* **Question 10**.

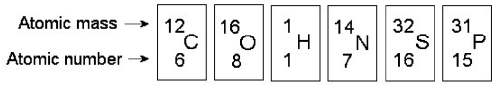

Figure 1

____ 10. Based on electron configuration, which of these elements would exhibit chemical behavior most like that of oxygen?
a. carbon
b. hydrogen
c. nitrogen
d. sulfur
e. phosphorus

____ 11. A covalent chemical bond is one in which
a. electrons are removed from one atom and transferred to another atom so that the two atoms become oppositely charged.
b. protons and neutrons are shared by two atoms so as to satisfy the requirements of both atoms.
c. outer-shell electrons of two atoms are shared so as to satisfactorily fill the outer electron shells of both atoms.
d. outer-shell electrons of one atom are transferred to the inner electron shells of another atom.
e. the inner-shell electrons of one atom are transferred to the outer shell of another atom.

____ 12. A molecule of carbon dioxide (CO_2) is formed when one atom of carbon (atomic number 6) is covalently bonded with two atoms of oxygen (atomic number 8). What is the total number of electrons that must be shared between the carbon atom and the oxygen atoms in order to complete the outer electron shell of all three atoms?
a. 1
b. 2
c. 3
d. 4
e. 5

____ 13. Nitrogen (N) is much more electronegative than hydrogen (H). Which of the following statements is *correct* about the atoms in ammonia (NH_3)?
a. Each hydrogen atom has a partial positive charge.
b. The nitrogen atom has a strong positive charge.
c. Each hydrogen atom has a slight negative charge.
d. The nitrogen atom has a partial positive charge.
e. There are covalent bonds between the hydrogen atoms.

____ 14. Which of the following molecules contains the strongest polar covalent bond?
a. H_2
b. O_2
c. CO_2
d. H_2O
e. CH_4

Question 15 *refers to* **Figure 2**.

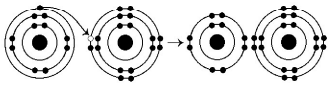

Figure 2

____ 15. What results from the chemical reaction illustrated in **Figure 2**?
a. a cation with a net charge of +1
b. a cation with a net charge of –1
c. an anion with a net charge of +1
d. an anion with a net charge of –1
e. A and D

____ 16. The atomic number of chlorine is 17. The atomic number of magnesium is 12. What is the formula for magnesium chloride?
a. MgCl
b. $MgCl_2$
c. Mg_2Cl
d. Mg_2Cl_2
e. $MgCl_3$

____ 17. Which of the following results from a transfer of electron(s) between atoms?
a. nonpolar covalent bond
b. polar covalent bond
c. ionic bond
d. hydrogen bond
e. hydrophobic interaction

____ 18. Which of the following explains most specifically the attraction of water molecules to one another?
a. nonpolar covalent bond
b. polar covalent bond
c. ionic bond
d. hydrogen bond
e. hydrophobic interaction

____ 19. A van der Waals interaction is the weak attraction between
a. the electrons of one molecule and the electrons of a nearby molecule.
b. the nucleus of one molecule and the electrons of a nearby molecule.
c. a polar molecule and a nearby nonpolar molecule.
d. a polar molecule and a nearby molecule that is also polar.
e. a nonpolar molecule and a nearby molecule that is also nonpolar.

____ 20. Sometimes atoms form molecules by sharing two pairs of valence electrons. When this occurs, the atoms are said to be joined by
a. a double covalent bond.
b. an electronegative bond.
c. a hydrogen bond.
d. a protonic bond.
e. a complex bond.

____ 21. Which of the following describes any reaction that has reached chemical equilibrium?
a. The concentration of the reactants equals the concentration of the products.
b. The rate of the forward reaction is equal to the rate of the reverse reaction.
c. All of the reactants have been converted to the products of the reaction.
d. All of the products have been converted to the reactants of the reaction.
e. Both the forward and the reverse reactions have stopped with no net effect on the concentration of the reactants and the products.

Please refer to **Figure 3** *to answer* **Questions 22-25**.

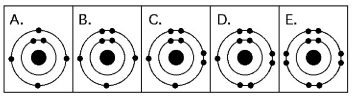

Figure 3

____ 22. Which drawing depicts the electron configuration of oxygen ($^{16}_{8}O$)?
a. A
b. B
c. C
d. D
e. E

____ 23. Which drawing depicts the electron configuration of nitrogen ($^{14}_{7}N$)?
a. A
b. B
c. C
d. D
e. E

____ 24. Which drawing depicts an atom that is inert or chemically unreactive?

a. A
b. B
c. C
d. D
e. E

____ 25. Which drawing depicts an atom with a valence of 2?

a. A
b. B
c. C
d. D
e. E

SHORT ANSWER. 7 pts. Answer the following questions in the space provided.

26. What is a cation?

_____

_____

_____

27. What is meant by the valence of an atom? How is valence related to the chemical behavior of an atom?

_____

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