## Multiple Choice

***Identify the choice that best completes the statement or answers the question.***

_____ 1. The isotope Sodium-24 has 11 protons. Therefore, it has _____ neutrons.
a. 24.
b. 11.
c. 12.
d. 13

_____ 2. The nuclear symbol for Cobalt-60 should be written as
a. Co-60.
b. $^{60}_{27}$ Co
c. $^{60}_{33}$ Co
d. Co.

_____3. How many moles of magnesium exist in 100.0 g of magnesium?
a. 3.706 mol
b. 4.11 mol
c. 4.9 g
d. 6.9 g.

_____ 4. How many different orientations are there for f orbitals?
a. 1
b. 3
c. 5
d. 7

_____ 5. How many electrons can a p sublevel contain?
a. 10
b. 6
c. 8
d. 16

_____ 6. The ground-state electron configuration of Aluminum is $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^1$. In this arrangement, how many of Aluminum's p orbitals are completely filled?
a. 7
b. 1
c. 3
d. 4

_____ 7. A ground-state atom of which element has two electrons in its sixth and outermost main energy level
a. Ba
b. Mg
c. B
d. Ra

_____ 8. The diagram  represents two electrons with the same spin state, this violate ___
a. Aufbau principle
b. Pauli exclusion principle
c. Hund's rule.
d. Heisenberg uncertainty principle

_____ 9. Which of these does the principal quantum number indicate?
a. the shape of an orbital
b. the main energy level of an electron
c. the orientation of an orbital around the nucleus
d. the spin state of an electron in an orbital

_____ 10. What is the correct electron configuration for a ground-state atom with 9 electrons?
a. $1s^2\ 2s^2\ 2p^3$
b. $1s^2\ 2s^2\ 2p^2\ 3s^1$
c. $1s^2\ 2s^2\ 2p^5$
d. $1s^2\ 2s^5$

_____11. What is the correct noble-gas notation for the electron configuration of an atom of Calcium?
a. [Ar]$3s^1$
b. [Ne]$3s^2$
c. [Ar]$4s^2$
d. [Ne]$4s^2$

_____12. What are the possible values for the spin quantum number?
a. 2, -2
b. 1/2, -1/2
c. 1/2, 1/2
d. -1/2, -1/2

_____13. Which element is least likely to be a metalloid?
a. silicon
b. Arsenic
c. sulfur
d. boron

_____14. Elements are considered to be Lanthanides when their atomic number is _____
a. from 58 to 71
b. from 90 to 301
c. from 21 to 30
d. from 39 to 48

_____15. The electron configurations of main-group elements end in
a. d and f orbitals.
b. s and p orbitals
c. s and d orbitals
d. p and d orbitals.

_____16. Which of the following elements has the greatest atomic radius?
a. Al
b. Ga
c. In
d. Tl

_____17. Which of the following elements has the lowest electronegativity?
a. C
b. F
c. Li
d. O

_____18. In which period is an element that has the electron configuration $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^{10}\ 4s^2\ 4p^6\ 5s^2$ when it is in its ground state?
a. Period 2
b. Period 3
c. Period 4
d. Period 5

_____19. An element that has the electron configuration [Ne]$3s^2\ 3p^4$ is in Group
a. 4
b. 2
c. 6
d. 16

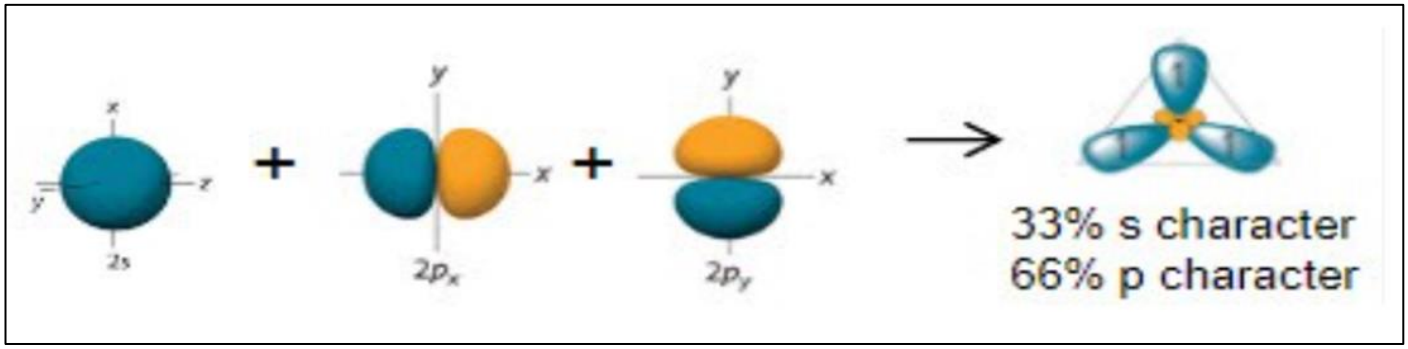
_____20. The VSEPR formula for a molecule of type ($AB_2E$) tells you that the molecule is made up of
a. a central atom A, with two B atoms and one E atoms bonded to it.
b. a central atom A, with two B atoms bonded to it and two unshared electron pairs.
c. a central atom A, with two B atoms bonded to it and one unshared electron pairs.
d. two central atoms B, with an atom A and two atoms E bonded to it.

_____21. According to VSEPR theory, what is the shape of a molecule of ($AB_4$)
a. linear.
b. bent
c. trigonal-planar.
d. tetrahedral

_____22. It is the mixing of two or more atomic orbitals of similar energies on the same atom to produce new hybrid atomic orbitals of equal energies.

a. Hybrid Orbitals Theory
b. Atomic Orbitals Theory
c. Valence Orbitals Theory
d. Electrons Orbitals Theory

_____23. Diagram shows




a. formation of atomic orbitals.
b. atomic orbitals overlap to from one sp hybrid orbital.
c. atomic orbitals overlap to from three $sp^2$ hybrid orbital.
d. atomic orbitals overlap to from three $sp^3$ hybrid orbital.

_____ 24. Which of the following molecules is polar?

a. Ethane
b. Water
c. Boron trifluoride
d. Carbon dioxide

_____ 25.Which are the intermolecular forces that can act between non-polar molecules?

a. covalent bonds
b. hybridization
c. hydrogen bonds
d. London dispersion forces

_____ 26. The intermolecular force that stronger than hydrogen bonding is _____

a. Ion-ion attraction
b. London dispersion forces
c. Dipole-dipole attraction
d. All of them.

_____ 27. How many grams are in 3.62 mol of dicarbon tetroxide, $C_2O_4$?

a. 88 g.
b. 318.56 g.
c. 3.62 g.
d. 294 g.

_____ 28. What is the percentage of Sodium in Sodium Chloride, NaCl?

a. 39.34%
b. 35.43%
c. 22.99%
d. 58.44%

_____ 29. What is the empirical formula for ($Pb_5Cr_5O_{20}$)?

a. $Pb_2Cr_2O_{10}$
b. $Pb_9Cr_4O_2$
c. $PbCr_2O_7$
d. $PbCrO_4$

_____ 30. You are given the following percentages: 40.05% S and 59.95% O. Find the empirical formula for these elements.

a. SO
b. $SO_3$
c. $SO_2$
d. $SO_4$

_____ 31. What form do you need in order to determine the molecular formula from the empirical formula of a compound?

a. X = molecular formula mass / empirical formula mass.
b. X = molecular formula mass x empirical formula mass.
c. X = empirical formula mass / molecular formula mass.
d. X = empirical formula mass x molecular formula mass.

Use the activity series to the right to answer questions 32 and 34.

***Activity Series of Metals***

| **Activity of metals** | **Reactions** |
|---|---|
| K | react with cold water and acids, replacing hydrogen; react with oxygen, forming oxides |
| Sr | |
| Ca | |
| Na | |
| Mg | react with steam (but not cold water) and acids, replacing hydrogen; react with oxygen, forming oxides |
| Al | |
| Zn | |
| Cr | |
| Fe | |
| Cd | |
| Co | do not react with water; react with acids, replacing hydrogen |
| Ni | |
| Sn | |

_____32.Based on the activity series, will this reaction occur?

$$Ni\ (s) + H_2O\ (l) \rightarrow$$

a. Yes.
b. No.

_____ 33. A mixture contains Cobalt metal and Tin metal. This mixture is mixed with nickel nitrate. Which metals, if any, will react?

a. Cobalt metal only.
b. Tin metal only.
c. both of them.
d. none of them.

_____34.Using the activity series, predict of the following reactions can occur.

a. $2Cr(s) + SnCl_4(aq) \rightarrow$
b. $Na(s) + KBr(aq) \rightarrow$
c. $2Na(s) + CdCl_2 \rightarrow$
d. Both (a) and (c)

_____35. In the chemical reaction described by the equation

$$4Fe(s) + 3O_2(g) \rightarrow 2Fe_2O_3(s),$$

the mole ratio of iron (III) oxide to iron is

a. 1:1
b. 1:2
c. 2:3
d. 4:1.

_____36. A balanced chemical equation allows one to determine the

a. mole ratio of any two substances in the reaction.
b. energy released in the reaction.
c. electron configuration of all elements in the reaction.
d. mechanism involved in the reaction

_____37. The following equation represents a laboratory preparation for oxygen gas:

$$2KClO_3(s) \rightarrow 2KCl(s) + 3O_2(g)$$

How many moles of $O_2$ form if 3.0 mol of $KClO_3$ are totally consumed?

a. 5.0 mol of $O_2$
b. 4.5 mol of $O_2$
c. 5.0 g. of $O_2$
d. 4.5 g. of $O_2$

## True/False

***Indicate whether the statement is true or false.***

_____ 38. Some diatomic molecules are linear.

_____ 39. In $sp^3$ hybridization, one (s) orbital and three (p) orbitals combine to form four hybridized orbitals of equal energy**.**

_____ 40. A molecule in which there is an unequal distribution of electrical charges is called a nonpolar molecule.

_____ 41. The dipole for each bonded pair can be represented by an arrow with a head pointed toward the less electronegative atom and a crossed tail situated at the more electronegative atom.

_____42. In general, the boiling point of a polar liquid is likely to be higher than the boiling point of a nonpolar liquid of about the same mass.

_____43. If the formula mass of one molecule is x u, the molar mass is 3x g/mol.

_____44. If metal A is placed in an ionic solution containing metal B ions and no reaction occurs, then metal B is most likely higher on the activity series.

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