MIDTERM REVIEW GUIDE – HONORS CHEMISTRY

MULTIPLE CHOICE: Choose the best answer for each question.

1. In which pair is the members classified as pure substances?
   A. Mixtures and solutions
   B. Compounds and solutions
   C. Elements and mixtures
   D. Compounds and elements

2. Which of the following substances is an element?
   A. Table sugar ($C_{12}H_{22}O_{11}$)
   B. Potassium chlorate ($KClO_3$)
   C. Water (H_2O)
   D. Copper (Cu)

3. An example of a heterogeneous mixture is
   A. Soil B. Sugar C. Carbon monoxide D. Carbon dioxide

4. Which of the following is a chemical change?
   A. Cutting a bar of Sodium metal into pieces with a knife.
   B. Ice when heated changes to liquid.
   C. A freshly cut apple turns brown.
   D. Water disappears from a beaker in a few days at room temperature.

5. Which of the following properties can be used to distinguish between Fe (Iron) and S (sulfur)?
   A. Ductility B. Malleability C. Heat conductance D. All of them.

6. Which of the following is an extensive property?
   A. Color B. Density C. Volume D. Melting point.

7. Which of the following is the correct sequence to separate a mixture made of salt, sand and Iron?
   A. Dissolve in water, magnetize and filtrate, then evaporate
   B. Magnetize, dissolve in water, filtrate and evaporate.
   C. Melt, dissolve in water, filtrate and magnetize.
   D. None of the above.

8. The mass of an object
   A. Always remains the same.
   B. Varies with gravity.
   C. Varies with altitude.
   D. Is directly proportional to air pressure.

9. An atom is the smallest part of a (an)
   A. Compound
   B. Element that still has the properties of that element.
   C. Molecule.
   D. Solution.

10. The *SI* for the measurement of mass is the _____
    A. ounce B. Kilogram C. Meter D. Liter

11. _____ is the SI prefix meaning one-thousandth.
    A. Centi B. Milli C. Kilo D. Nano

12. Which of the following combines the Base Units of *time* and *length*?
A. Speed B. Area C. Density D. Mass

13. The correct value of the length of a metal rod is 22.6 cm. Which of the following sets of measurements of this rod could be considered *precise but not accurate*?
A. 22.5 cm, 22.7 cm, 22.6 cm
B. 12.6 cm, 22.6 cm, 32.6 cm
C. 20.4 cm, 20.3 cm, 20.4 cm
D. 24.6 cm, 23.7 cm, 25.9 cm

14. A gold piece has a volume of 2.31 cm^3 and a mass of 44.58 grams. What is its density?
A. 0.0518 g/cm^3 B. 19.2987013 g/cm^3 C. 19.3 g/cm^3 D. 19.30 g/cm^3

15. Which of the following measurement is given with one significant figure?
A. 899 lbs B. 0.5269 g C. 800 km D. 0.006850 kg

16. Convert 100. mL into liter (using sig. figs).
A. 1 L B. 0.1 L C. 0.100 L D. none of the above

17. If three figures are significant, how should the measurements 0.0022256 and 12345 g be reported, respectively?
A. 0.00222 and 1234 g
B. 0.00223 and 1234 g
C. 0.002 and 123 g
D. 0.00222 and 12300 g

18. Which of the following is a derived unit?
A. K B. mole C. m^3 D. m

19. How many protons, electrons and neutrons, respectively, are in an atom of Bromine-80?
A. 35, 35, 35 B. 80, 80, 80 C. 35, 35, 80 D. 35, 35, 45

20. What is the isotopic notation for the element contains 15 electrons and 15 neutrons?
A. Phosphorus-15 B. Phosphorus-30 C. Sulfur-30 D. Sulfur-15

21. The isotope $^{16}_{8}O$ has
A. 8p, 8e and 8n B. 8p, 16e and 16 n C. 16p, 16e and 16n D. 8p, 8e and 16n

22. Naturally occurring Copper, Cu consists of Copper-63 and Copper-65. Based on the following table, calculate the average mass of each Cu atom.

Isotope	% Abundance	Amu
Cu-63	69.17	62.9296
Cu-65	30.83	64.9278

A. 66.17 amu B. 63.55 amu C. 69.02 amu D. 65.14 amu

23. Which of the following pair does not fit to isotope definition?
A. $^{16}_{8}O$ and $^{17}_{8}O$ B. $^{16}_{8}O$ and $^{18}_{8}O$ C. $^{16}_{7}N$ and $^{16}_{8}O$ D. $^{31}_{15}P$ and $^{32}_{15}P$

24. Isotopes
    A. are atoms of the same element with same number of protons and different number of neutrons
    B. have same atomic numbers but different atomic masses
    C. have same number of neutrons and same number of electrons
    D. A and B

25. Which of the following pair illustrates the Law of Multiple Proportions?
    A. N_2O_4 and N_2H_4 B. HCl and KCl C. $FeCl_2$ and $FeCl_3$ D. K_2O and Li_2O

26. Calculate the molecular weight of $CrSO_4$? Cr = 52; S = 32; O =16
    A. 100 g/mol B. 244 g/mol C. 400 g/mol D. 148 g/mol

27. What is the number of total atoms in a molecule of $Fe_3(PO_4)_2$?
    A. 3 B. 5 C. 13 D. 12

28. The mass of 0.10 mol of H_2O H = 1; O = 16
    A. 18 g B. 180 g C. 1.8 g D. none of the above

29. How many mole(s) are in 300 g of $CaCO_3$? Ca = 40; C = 12; O = 16.
    A. 3 B. 300 C. 9 D. 900

30. Which of the following is NOT a Dalton's Atomic Model postulate?
    A. Atoms can not be divided
    B. In chemical reactions, atoms are combined, separated, or rearranged
    C. All matter is composed extremely small particles called atoms.
    D. Neutrons are heavier than electrons.

31. The mole is
    A. 1,000 grams.
    B. The number of C-atoms in 12.0 g of Carbon
    C. The SI unit for the amount of substance in Chemistry
    D. B and C

32. Which of the following element is diatomic?
    A. Iodine B. Copper C. Silicon D. Potassium

33. Which of the following is a *p*-block element?
    A. Cu B. In C. Ba D. Na

34. What is the <u>total</u> number of orbitals on the $n = 4$?
    A. 14 B. 16 C. 32 D. 4

35. Theoretically, what is the maximum number of electrons that can occupy principal energy level $n = 4$?
    A. 8 B. 14 C. 16 D. 32

36. The electron configuration $1s^2\ 2s^2\ 2p^2$ belongs to _____ atoms
    A. Li B. P C. C D. F

37. What is the total number of valence electrons in the oxalate ion, $C_2O_4^{2-}$?
    A. 31 B. 32 C. 33 D. 34

38. Choose the correct electron configuration for an element that is in row 4 and column 2?
    A. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^1$
    B. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2$
    C. $1s^2 2s^2 2p^6 3s^2$
    D. $1s^2 2s^2$

39. An atom with electron configuration $1s^2 2s^2 2p^6 3s^2 3p^6 4s^1$:
    A. has a maximum of 19 electrons
    B. can be found in the 4^{th} row and 1^{st} column
    C. is an alkali metal
    D. All of the above

40. Which of the following visible light has the highest frequency?
    A. Red B. Yellow C. Green D. Blue

41. A positively charged ion
    A. is called an anion
    B. is called an anode
    C. is called a cation
    D. is called a cathode

42 What is the electron configuration of Al^{3+}?
    A. $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6$
    B. $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4d^2$
    C. $1s^2\ 2s^2\ 2p^6\ 3s^2$
    D. $1s^2\ 2s^2\ 2p^6$

43. Which is NOT isoelectronic to P^{3-} ?
    A. Cl^- B. Ca^{2+} C. Ar D. Sr^{2+}

44. Write the short hand notation for the Sr atom:
    A. [Ar] $4s^2$ B. [Kr] $4p^6\ 5s^2$ C. [Ar] $5s^2$ D. [Kr] $5s^2$

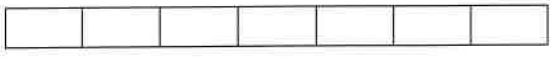
45. Which one of the following elements is the most electronegative?
    A. N B. F C. P D. He

46. Which of the following configurations is permitted for ten electrons in an *f* subshell?

    A. 

    B. 

    C. 

    D. 

47. Which of the following has a linear shape?
    A. CH_4 B. BCl_4^- C. CO_2 D. All of these

48. If chlorine has an electronegativity of 3.0, what type of bond is formed in Cl_2?
    A. ionic B. polar covalent C. nonpolar covalent D. Metallic

49. The concept used in writing the electron-dot structures of certain molecules that oscillate between two or more possible structures is called:
A. hybridization
B. electrostatic repulsion
C. resonance
D. electronegativity

50. Which of the following compounds violates the octet rule?
A. NF_3 B. CCl_4 C. $SbCl_5$ D. Cl_2

51. Which of the following is the most polar bond? $E_B = 2.0$; $E_C = 2.5$; $E_O = 3.5$; $E_S = 2.5$
A. B-C B. S-O C. C-O D. B-O

52. A chemical bond in which electrons are transferred from one atom to another one is called:
A. a covalent bond
B. an ionic bond
C. an electrostatic bond
D. a networking bond

53. The VSEPR Theory basically:
A. explains why bonds form
B. helps predict the shape of the molecules
C. has to do with why hybrid orbitals form
D. allows scientist to calculate the bond energies

54. A triple bond is made of sharing of _____ electrons between two atoms.
A. 2 B. 4 C. 6 D. 3

OPEN ENDED PROBLEMS (*Complete on a separate sheet of paper*)

1. What contributions were made by each of the following scientists in the development of the current atomic model?

a. Democritus	d. Bohr	g. Schroedinger
b. Dalton	e. Planck	h. Rutherford
c. Thomson	f. Einstein	i. Heisenberg

2. If the wavelength is equal to 6.25×10^{-7} m, what is the energy of this wave?
($C = 3.00 \times 10^{8}$ m/s ; $h = 6.63 \times 10^{-34}$ J·s)

3. Hund's Rule, the Aufbau Principle, and the Pauli Exclusion Principle should be followed when writing electron configurations. For the following elements, write their electron configuration, explain which rule is most important, and why.
a. Cr b. N c. He

4. Write, balance, and classify the following reactions.
a. lithium + barium chloride → _____
b. calcium chlorate → _____
c. water + dinitrogen trioxide → _____
d. nitric acid + magnesium hydroxide → _____
e. octane (C_8H_{18}) + oxygen → _____

5. A compound is found to be 40.00% carbon, 6.67% hydrogen, and 53.33% oxygen. Its molar mass is 210.0 g/mol. What is the molecular formula of this compound?

6. Name the following:
   a. P_2O_5
   b. $Ca(ClO_3)_2$
   c. NH_4F
   d. AlN
   e. $Fe(NO_2)_3$
   f. SnO_2
   g. H_2SO_3
   h. H_3P

Write formulas for the following:
a. lead (IV) sulfide
b. hydrosulfuric acid
c. dinitrogen trioxide
d. chromium (III) hydroxide
e. chromic acid
f. sodium carbonate
g. zinc oxalate
h. sulfur hexafluoride

7. Fill in the following chart

Formula	Lewis Structure	Geometry	Bond Angles	Hybridization	Molecular Polarity
PH_3					
H_2S					
CCl_4					
CO_2					
CH_2O					
AsI_5					
$SeBr_6$					

8. Which has a larger radius, P or As?
   Which is more electronegative, F or Ne?
   Which has the higher ionization energy, P or S?
   Which is larger, F or F^{-1}?
   Which is larger, Ca or Ca^{+2}?

9. Element 'X' on a Martian Planet was found to have a density of 3.35 conks/soble. Convert this density to dribbles/flish. (1 conk = 1.65 dribbles ; 1 flish = 0.0175 sobles)