HONORS CHEMISTRY PRACTICE FINAL (semester one):

1. What are the three subatomic particles, their charges, and their mass?
2. What is atomic number and where do you find it? What is mass number and where do you find it?
3. How many protons, electrons, and neutrons are in the following atoms/ions?
   - Chlorine
   - Nickel
   - Cs^{+1}
   - P^{-3}
4. Use the following notation to answer the questions: $^{138}_{56}Ba$
   - How many protons?
   - How many neutrons?
   - What is the mass number?
   - What is the atomic number?
5. What is an isotope?
6. How does Carbon-12 and Carbon-14 differ?
7. What defines an element?
8. Write the orbital notation for the following:
   - Vanadium
   - Sulfur
   - Neon
9. Write the electron configuration for the following:
   - Phosphorous
   - Bromine
   - Neon
   - O^{-2}
   - Na^{+1}
10. Write the noble gas configuration for the following:
    - Calcium
    - Cesium
    - Boron
11. What element with electron configuration $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^1$?
12. What is ground state? What is excited state? Which one required absorption of energy as an electron moves to it? Which one releases energy as an electron moves to it? What is created as an electron moves from one energy level to an orbit closer to the nucleus?
13. Circle the pairs that are isoelectronic.
    - Kr and Br^{-1}
    - Br^{-1} and Rb^{+1}
    - Ca^{+2} and Kr
    - Ca^{+2} and Ar
14. What is the octet rule? What elements on the periodic table have a full octet? What are valence electrons? What happens to valence electrons as you move down a group on the periodic table?
15. What is the difference between a group and a period on the periodic table?
16. What is periodic law?

17. Where is the location of the following?
    - Alkali metals
    - Alkaline earth metals
    - Transition Metals
    - Metalloids
    - Halogens
    - Noble Gases
    - Lanthanides
    - Actinides
18. What is electron shielding? What is effective nuclear charge?
19. Define the following trends:
    - Atomic Radius
    - Ionic Radius
    - Ionization Energy
    - Electron Affinity
    - Electronegativity
    - Reactivity
20. As you move across a period, what happens to the following trends:
    - atomic radii
    - ionization energy
    - electron affinity
    - electronegativity
    - reactivity
    - effective nuclear charge
    - electron shielding
21. As you move down a group, what happens to the following trends:
    - atomic radii
    - ionization energy
    - electron affinity
    - electronegativity
    - reactivity
    - effective nuclear charge
    - electron shielding
22. Do halogens have high or low ionization energies? Do they have high or low electron affinities?
23. Out of the following elements, which has the largest atomic radii? Which is the most reactive? Which shares properties with Cesium, Cs? Which as a valence electron configuration of s^2? Which has the lowest electronegativity?
    - Sodium, Na
    - Potassium, K
    - Magnesium, Mg
    - Calcium, Ca
24. List the first 3 ionization energies for Be (Look in your book). Where do you notice a large increase in ionization energy? Why? Draw a graph illustrating this large jump.
25. Which element lies in the same period as the element with the electron configuration of $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^6$?

26. Which electrons are used to form chemical bonds? What is the difference between ionic and covalent bonds? What does electronegativity have to do with the types of bonds formed?

27. What is the electronegativity difference for the following elements and what type of bonds would they form?

Ca and S
Al and Cl
~~1.~~ Mg and N
Br and Cl
H and Cl
O and O

28. Name the following compounds:

PF_5
ICl_3
P_4O_{10}
Ag_2O
$Ca(OH)_2$
~~$KClO_3$~~
SnI_4

29. Write the formula for the following:

Potassium Nitride
Aluminum Bromide
Sodium Fluoride
Vanadium (III) Bromide
Iron (III) Sulfide
Copper (II) Sulfate
Calcium Carbonate
Potassium Sulfate
Dinitrogen Pentoxide
Sulfur Hexafluoride
Disulfur Dichloride

30. Which is stronger? Intermolecular Forces or Intramolecular Forces?

31. List the following types of bonds from weakest to strongest: Ionic, Nonpolar Covalent, Polar Covalent

32. What has more atoms, 50g of Al or 50g of Au?

33. What diatomic molecule has a mass of 25.09g in a 0.157mol sample?

34. Balance the following equations:

___Al + ___Fe_2O_3 → ___Al_2O_3 + ___Fe

___Na + ___H_2SO_4 → ___Na_2SO_4 + ___H_2

~~1)~~ ___SO_3 + ___H_2O → ___H_2SO_4

~~2)~~

4) 36. A chemical reaction involving substances A and B stops when A is B is the (excess/limiting) reactant?

5) 37. For the reactions below, identify the reaction types and balance the reactions:

~~2Li~~ ___ $Li_{(s)}$ + ~~$2H_2O$~~ ___ $H_2O_{(l)}$ → ~~2LiOH~~ ___ $LiOH_{(aq)}$ + ___ $H_{2(g)}$

___ ~~2~~$NaI_{(aq)}$ + ___ $Cu(NO_3)_{2(aq)}$ →___ $CuI_{2(s)}$ + ___ ~~2~~$NaNO_{3(aq)}$

___ ~~2~~$Ca_{(s)}$ + ___ $O_{2(g)}$ → ___ ~~2~~$CaO_{(s)}$

___ ~~2~~$HgO_{(s)}$ → ___ ~~2~~$Hg_{(l)}$ +___ $O_{2(g)}$

Use the following activity series for question ~~14~~38.

METALS Activity Series
Lithium
Potassium
Magnesium
Iron
Lead

6) 38. What metals would replace Mg in a chemical reaction?

39. What is the percent of oxygen in $CaSO_4$?

40. Which pair of compounds has the same empirical and molecular formula?

$CaCO_3$ and $Ca(HCO_3)_2$

$C_6H_{12}O_6$ and $C_{12}H_{24}O_{12}$

CO_2 and CO

7) 41. What is the empirical formula for a compound that is 56.4% phosphorus and 43.6% oxygen?

42. Given the following data, find the molecular formula:

27.05% Na, 16.48% N, 56.47% O and a molar mass of 207 g/mol

43. Given the formula $Ca(NO_3)_2$, which of the following is incorrect?

The mole ratio is 1 mol of Ca to 2 mol of N to 6 mol of O

The ratio is 1 atom of Ca to 2 atoms of N to 6 atoms of O

The ratio is 1g of Ca to 2g of N to 6g of O

The ratio of cations to anions is 1 to 2.

44. For the reaction $PbCl_2 + K_2SO_4 \rightarrow 2KCl + PbSO_4$, if you have 12 moles of KCl, how many moles of $PbCl_2$ did you start with?

8) 45. For the reaction $2Na + 2H_2O \rightarrow 2NaOH + H_2$, if 52.g of sodium and 120.g of water are available, which is the limiting reactant? Excess reactant? How many grams of hydrogen is produced?

46. For the reaction $SO_3 + H_2O \rightarrow H_2SO_4$, how many grams of sulfur trioxide are required to produce 4.00 mol of sulfuric acid?

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~~9)~~ 47. What mass in grams of 1-chloropropane (C_3H_7Cl) is produced if 200. g of react with excess chlorine gas according to the equation $C_3H_8 + Cl_2 \rightarrow C_3H_7Cl + HCl$?

~~10)~~ 48. How many moles of Ag can be produced when reacting with 100. g of Cu to the equation $Cu(s) + 2AgNO_3(aq) \rightarrow 2Ag(s) + Cu(NO_3)_2(aq)$?

~~11)~~ 49. For the reaction $Mg + 2HCl \rightarrow H_2 + MgCl_2$, calculate the percent yield of magnesium chloride if 50.g of magnesium react with excess hydrochloric acid to yield 60.g of magnesium chloride.

50. When mixing baking soda and 6 M hydrochloric acid, the following reaction occurred, $NaHCO_3 + HCl \rightarrow NaCl + CO_2 + H_2O$

Given the following sample data, what is the **PERCENTAGE YIELD** of NaCl for this reaction?

Baking Soda = 1.65 grams
Dish = 40 grams
Cover = 10 grams
Final weight of dish, cover, & NaCl = 51.0g

~~12)~~ 51. Given the following table, what is the volume of the acid necessary to titration?

	Acid	Base
Formula	HCl	$Ca(OH)_2$
Volume	?	22.7 mL
Molarity	0.0375	0.0200

52. Identify the type of reaction, predict the products and balance the reaction:

____SiI_4 + ____Mg →

____Mg + ____I_2 →

____$CuCl_2$ + ____KOH →

____NH_3 →

____CH_4 + ____O_2 →