

Vining

1. Consider an ion of the isotope  $^{23}\text{Mg}$  with a charge of 2+. How many protons, neutrons, and electrons does it have?

\_\_\_\_\_ protons, \_\_\_\_\_ neutrons, \_\_\_\_\_ electrons

2. Describe the location of the subatomic particles in an atom:

Protons are found \_\_\_\_\_.

Electrons are found \_\_\_\_\_.

Neutrons are found \_\_\_\_\_.

What force holds electrons in an atom? \_\_\_\_\_

3. You make some tea using a tea bag. Some tea dissolves, but some of the little leaves leak out and are floating around in the liquid. The result is a:

- a) pure compound                      b) pure element  
c) homogeneous mixture              d) heterogeneous mixture

4. The atomic number of Si is:

- a) 28                      b) 14                      c) 42                      d) 58                      e) none of these

5. What is the molar mass of  $\text{Mg}(\text{NO}_3)_2$ ? \_\_\_\_\_ g/mol

6. A) How many elements are in the 4<sup>th</sup> period of the periodic table? \_\_\_\_\_

B) What is the group letter designation for: (enter an answer like 4A)

Alkaline earth metals \_\_\_\_\_

Halogens \_\_\_\_\_

7. Give formulas for the following:

calcium chloride: \_\_\_\_\_

Calcium nitrate: \_\_\_\_\_

Dinitrogen pentoxide \_\_\_\_\_

Ammonium carbonate: \_\_\_\_\_

8. Which of the following types of compounds do you expect each pair of elements to form?

Mg and Cl: covalent or ionic

C and Se: covalent or ionic

9. Name the following:

MgCl<sub>2</sub> \_\_\_\_\_

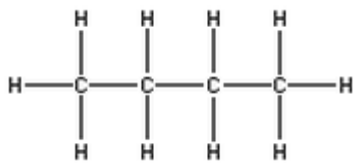
N<sub>2</sub>Cl<sub>4</sub> \_\_\_\_\_

Cr(OH)<sub>3</sub> \_\_\_\_\_

H<sub>2</sub>SO<sub>4</sub> \_\_\_\_\_

SiO<sub>2</sub> \_\_\_\_\_

10. What are the molecular and empirical formulas of the pictured molecule?



Molecular: \_\_\_\_\_ Empirical: \_\_\_\_\_

11. What is the formula of the ionic compound formed between  $\text{Ti}^{4+}$  and  $\text{O}^{2-}$  ions?

What is the formula of the ionic compound formed between  $\text{Al}^{3+}$  and  $\text{SiO}_4^{4-}$  ions?

12. Give the charge on ions of the following elements:

Al \_\_\_\_\_ Li \_\_\_\_\_ S \_\_\_\_\_ Br \_\_\_\_\_

13. The molecules  $\text{O}_2$  and  $\text{O}_3$  represent: \_\_\_\_\_

The atoms  $^{16}\text{O}$  and  $^{18}\text{O}$  represent: \_\_\_\_\_

14. A compound has the empirical formula  $\text{CH}_2\text{O}$  and a molar mass of 120.10 g/mol. What is the molecular formula?

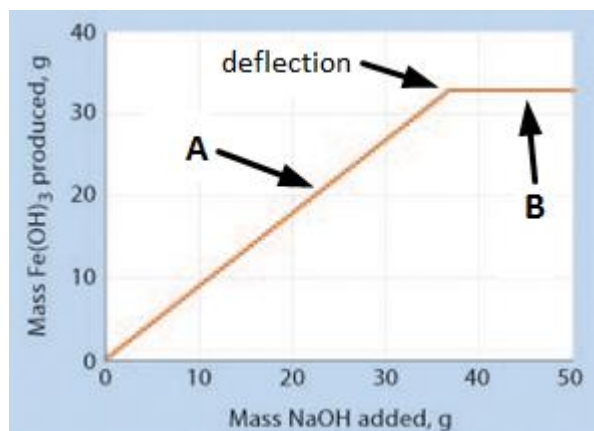
a)  $\text{PCl}_2\text{F}$     b)  $\text{C}_3\text{H}_6\text{O}_3$     c)  $\text{C}_4\text{H}_8\text{O}_4$     d)  $\text{CH}_2\text{O}$     e) none of these

15. Consider the reaction,  $\text{P}_4 + 6 \text{Cl}_2 \rightarrow 4 \text{PCl}_3$

If 3.5 mol of  $\text{P}_4$  react, how many moles of  $\text{PCl}_3$  can be formed?

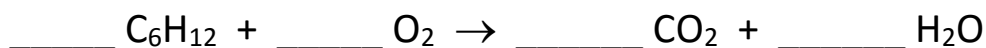
a) 4    b) 3.5    c) 14    d) 6    e) 11

16. An experiment is performed where NaOH is slowly added to 50.0 g FeCl<sub>3</sub>. The reaction that occurs produces Fe(OH)<sub>3</sub>. The plot below shows the mass of Fe(OH)<sub>3</sub> produced as a function of the mass of NaOH added. Choose **two** correct statements.



- a) at point A, FeCl<sub>3</sub> is the limiting reactant
- b) at point A, NaOH is the limiting reactant
- c) adding more FeCl<sub>3</sub> will move the deflection point to the right
- d) adding more NaOH will move the deflection point to the right

17. Balance the following reaction: (if a species has a coefficient of "1" then **do write in the 1**)



### Calculation Questions: You must show your work.

18. Calculate the atomic weight for **iridium**. It has two naturally occurring isotopes,

**iridium-191** (190.961 u, 37.40% abundant)

**iridium-193** (192.963 u, 62.60% abundant)

atomic weight = \_\_\_\_\_

19. The density of gold (Au) is 19.32 g/mL. How many atoms of gold are present in 2.68 mL of gold?

\_\_\_\_\_ atoms

20. What is the percent composition of Cu in  $\text{Cu}_2\text{SO}_4$ ?

% Cu = \_\_\_\_\_

21. Determine the empirical formula of a compound of P and O has the following percent composition values:

43.64 % P      and      56.35 % O

Formula: \_\_\_\_\_

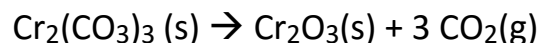
22. A 25.4-g sample of ethanol burns in excess oxygen. What mass of CO<sub>2</sub> can be formed?



Grams CO<sub>2</sub> = \_\_\_\_\_

23. Chemical Analysis: You have a 10.56-gram sample that is a solid mixture of Cr<sub>2</sub>(CO<sub>3</sub>)<sub>3</sub> and Fe<sub>2</sub>O<sub>3</sub>.

You heat it and the Cr<sub>2</sub>(CO<sub>3</sub>)<sub>3</sub> reacts according to the equation below:



Molar masses: CO <sub>2</sub> = 44.01 g/mol Cr <sub>2</sub> O <sub>3</sub> = 151.99 g/mol Cr <sub>2</sub> (CO <sub>3</sub> ) <sub>3</sub> = 284.01 g/mol
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*KEY: When the reaction occurs, the CO<sub>2</sub> is lost.*

*No reaction* occurs to the Fe<sub>2</sub>O<sub>3</sub>. After heating, the mass of the new mixture is 8.46 g. What is the mass percent of Cr<sub>2</sub>(CO<sub>3</sub>)<sub>3</sub> in the original mixture?

%Cr<sub>2</sub>(CO<sub>3</sub>)<sub>3</sub> = \_\_\_\_\_

24. Consider the reaction,  $4 \text{Cr} + 3 \text{O}_2 \rightarrow 2 \text{Cr}_2\text{O}_3$

If 75.0 g of Cr are mixed with 25.0 g  $\text{O}_2$ , which reactant is the limiting reactant?

Molar masses: Cr = 52.00 g/mol $\text{O}_2$ = 32.00 g/mol $\text{Cr}_2\text{O}_3$ = 151.99 g/mol
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limiting reactant = \_\_\_\_\_

What mass of  $\text{Cr}_2\text{O}_3$  can be formed?

g  $\text{Cr}_2\text{O}_3$  = \_\_\_\_\_

Avogadro's number:  $6.022 \times 10^{23}$

1	Hydrogen 1 H 1.008																	8A (18) Helium 2 He 4.0026
2	1A (1) Lithium 3 Li 6.94	2A (2) Beryllium 4 Be 9.0122											3A (13) Boron 5 B 10.81	4A (14) Carbon 6 C 12.011	5A (15) Nitrogen 7 N 14.007	6A (16) Oxygen 8 O 15.999	7A (17) Fluorine 9 F 18.9984	Neon 10 Ne 20.1797
3	Sodium 11 Na 22.9898	Magnesium 12 Mg 24.3050	3B (3)	4B (4)	5B (5)	6B (6)	7B (7)	8B (8) (9) (10)			1B (11)	2B (12)	Aluminum 13 Al 26.9815	Silicon 14 Si 28.085	Phosphorus 15 P 30.9738	Sulfur 16 S 32.06	Chlorine 17 Cl 35.45	Argon 18 Ar 39.948
4	Potassium 19 K 39.0983	Calcium 20 Ca 40.078	Scandium 21 Sc 44.9559	Titanium 22 Ti 47.867	Vanadium 23 V 50.9415	Chromium 24 Cr 51.9961	Manganese 25 Mn 54.9380	Iron 26 Fe 55.845	Cobalt 27 Co 58.9332	Nickel 28 Ni 58.6934	Copper 29 Cu 63.546	Zinc 30 Zn 65.38	Gallium 31 Ga 69.723	Germanium 32 Ge 72.64	Arsenic 33 As 74.9216	Selenium 34 Se 78.96	Bromine 35 Br 79.904	Krypton 36 Kr 83.798
5	Rubidium 37 Rb 85.4678	Strontium 38 Sr 87.62	Yttrium 39 Y 88.9059	Zirconium 40 Zr 91.224	Niobium 41 Nb 92.9064	Molybdenum 42 Mo 95.96	Technetium 43 Tc (97.9072)	Ruthenium 44 Ru 101.07	Rhodium 45 Rh 102.9055	Palladium 46 Pd 106.42	Silver 47 Ag 107.8682	Cadmium 48 Cd 112.411	Indium 49 In 114.818	Tin 50 Sn 118.710	Antimony 51 Sb 121.760	Tellurium 52 Te 127.60	Iodine 53 I 126.9045	Xenon 54 Xe 131.293
6	Cesium 55 Cs 132.9055	Barium 56 Ba 137.327	Lanthanum 57 La 138.9055	Hafnium 72 Hf 178.49	Tantalum 73 Ta 180.9479	Tungsten 74 W 183.84	Rhenium 75 Re 186.207	Osmium 76 Os 190.23	Iridium 77 Ir 192.217	Platinum 78 Pt 195.084	Gold 79 Au 196.9666	Mercury 80 Hg 200.59	Thallium 81 Tl 204.38	Lead 82 Pb 207.2	Bismuth 83 Bi 208.9804	Polonium 84 Po (208.9824)	Astatine 85 At (209.9871)	Radon 86 Rn (222.0176)
7	Francium 87 Fr (223.0197)	Radium 88 Ra (226.0254)	Actinium 89 Ac (227.0278)	Rutherfordium 104 Rf (265.1167)	Dubnium 105 Db (268.125)	Seaborgium 106 Sg (271.133)	Bohrium 107 Bh (272)	Hassium 108 Hs (277.150)	Meitnerium 109 Mt (276.151)	Darmstadtium 110 Ds (281.162)	Roentgenium 111 Rg (280.164)	Copernicium 112 Cn (285.174)	Ununtrium 113 Uut (284.178)	Flerovium 114 Fl (289.189)	Ununpentium 115 Uup (288.192)	Livermorium 116 Lv (293)	Ununseptium 117 Uus (294)	Ununoctium 118 Uuo (294)

Uranium 92	----- Atomic number
U	----- Symbol
238.0289	----- Atomic weight

- MAIN GROUP METALS
- TRANSITION METALS
- METALLOIDS
- NONMETALS



Note: Atomic masses are 2009 IUPAC values (up to four decimal places). Numbers in parentheses are atomic masses or mass numbers of the most stable isotope of an element.

Cerium 58 Ce 140.116	Praseodymium 59 Pr 140.9077	Neodymium 60 Nd 144.242	Promethium 61 Pm (144.9127)	Samarium 62 Sm 150.36	Europium 63 Eu 151.964	Gadolinium 64 Gd 157.25	Terbium 65 Tb 158.9254	Dysprosium 66 Dy 162.500	Holmium 67 Ho 164.9303	Erbium 68 Er 167.259	Thulium 69 Tm 168.9342	Ytterbium 70 Yb 173.054	Lutetium 71 Lu 174.9668
Thorium 90 Th 232.0381	Protactinium 91 Pa 231.0359	Uranium 92 U 238.0289	Neptunium 93 Np (237.0482)	Plutonium 94 Pu (244.0642)	Americium 95 Am (243.0614)	Curium 96 Cm (247.0704)	Berkelium 97 Bk (247.0703)	Californium 98 Cf (251.0796)	Einsteinium 99 Es (252.0830)	Fermium 100 Fm (257.0951)	Mendelevium 101 Md (258.0984)	Nobelium 102 No (259.1010)	Lawrencium 103 Lr (262.1096)