



7. Naturally occurring neon consists of two isotopes Ne-20 and Ne-22. The atomic mass of Ne is approximately 20.2. What are the reasonable estimates of the relative percentages of Ne-20 and Ne-22, respectively?

- a) 10, 90                                      b) 90, 10                                      c) 80, 20                                      d) 50, 50

8. How many electrons, protons, and neutrons are found in a  $^{208}\text{Pb}^{2+}$  ion?

- a) 82 electrons, 82 protons, 126 neutrons  
b) 80 electrons, 82 protons, 126 neutrons  
c) 84 electrons, 82 protons, 126 neutrons  
d) 80 electrons, 82 protons, 46 neutrons

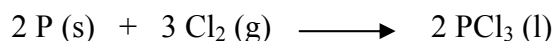
9. What is the number of moles of  $\text{Br}_2$  that contain  $6.022 \times 10^{21}$  molecules of  $\text{Br}_2$ ?

- a) 0.01    b)  $3.768 \times 10^{19}$   
c) 1.598    d) no answer was given

10. Calculate the percent of nitrogen by mass in ammonium nitrate.

- a) 35    b) 17.5  
c) 22    d) no answer was given

11. What mass of phosphorus trichloride,  $\text{PCl}_3$  in grams that can be made from 35.0 g  $\text{Cl}_2$  (g) according to the following equation?

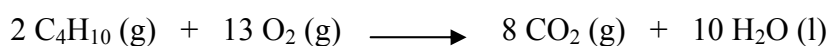


- a) 45.2  
b) 67.8  
c) 90.4  
d) 15.1

12. Which of the following could be a simplest formula?

- a)  $\text{N}_2\text{O}_4$     b)  $\text{N}_2$   
c)  $\text{C}_6\text{H}_5\text{Br}$     d)  $\text{C}_6\text{H}_3\text{F}_3$

13. **(Bonus: 4 pts)** When 0.225 mol butane,  $\text{C}_4\text{H}_{10}$ , is burned with excess oxygen how many molecules of oxygen are consumed?



- a) 1.46    b)  $8.87 \times 10^{23}$   
c)  $5.42 \times 10^{23}$                                       d) no answer was given

**Part II. Names, formulas and properties (28 pts: 14 @ 2 pts each) – NO Partial Credits**

1. (16 pts) Complete the following table with the formula or the name of the compound

Name	Formula
	Cu(NO <sub>3</sub> ) <sub>2</sub>
Chromium(III) oxide	
Magnesium nitride	
Phosphoric acid	
	Fe <sub>3</sub> (PO <sub>4</sub> ) <sub>2</sub>
	S <sub>2</sub> F <sub>4</sub>
Potassium chlorate	
	HBr (g)

2. (12 pts) Consider the following substances: SO<sub>3</sub>, XeOF<sub>4</sub>, N<sub>2</sub>, ScCl<sub>3</sub>, AsCl<sub>3</sub>, NiSO<sub>4</sub> and NO<sub>2</sub>.

- a) Which are diatomic? -----
- b) Which are ionic? -----
- c) Which are molecular (covalent)? -----
- d) Which compound is derived from a noble gas? -----
- e) Which compound(s) is derived from a transition metal? -----
- f) Which compound is derived from a metalloid element? -----

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**Part III. Calculations (24 pts): Show all work for full credit. Please express all answers with the proper units and correct number of significant figures.**

1. (8 pts) Copper (Cu), an excellent conductor of heat is composed of two isotopes. One of the isotopes has an atomic mass of 62.9208 amu and 69.09 % abundance. What is the atomic mass of the other isotope and what is its mass number?

Atomic mass:  
64.9278

Mass number:  
65

2. **(16 pts)** Caffeine is the compound that found in coffee, tea, and cola drinks and has a marked stimulatory effect on mammals. Chemical analysis of caffeine shows that it contains 49.38% C, 5.26% H, 28.76% N, and 16.60% O by mass, and its experimentally determined molar mass is 196 g/mol. Calculate:
- the simplest formula and
  - the molecular formula of caffeine

**a) Simplest formula**

**C<sub>4</sub>H<sub>5</sub>N<sub>2</sub>O**

**b) Molecular formula**

**C<sub>8</sub>H<sub>10</sub>N<sub>4</sub>O<sub>2</sub>**

# PREFERENCE SHEET FOR CHEM 107

## Exam 1 – Fall 2006

You will have **50 minutes** to complete this exam. The exam has **4 pages** plus the Periodic Table Reference page.

When you are told to do so, **tear off** the Periodic Table cover sheet and use as required during the exam.

### Useful Information:

$$T (^{\circ}\text{F}) = 1.8 T (^{\circ}\text{C}) + 32^{\circ}$$

$$d = m / V$$

$$\text{Avogadro's Number, } N_A = 6.022 \times 10^{23}$$

		<b>Periodic Table of the Elements</b>																
<b>1</b>	<b>H</b> 1.01															<b>He</b> 4.00		
<b>2</b>	<b>Li</b> 6.94	<b>Be</b> 9.01											<b>B</b> 10.81	<b>C</b> 12.01	<b>N</b> 14.01	<b>O</b> 16.00	<b>F</b> 19.00	<b>Ne</b> 20.18
<b>3</b>	<b>Na</b> 22.99	<b>Mg</b> 24.30											<b>Al</b> 26.98	<b>Si</b> 28.08	<b>P</b> 30.97	<b>S</b> 32.06	<b>Cl</b> 35.45	<b>Ar</b> 39.95
<b>4</b>	<b>K</b> 39.1	<b>Ca</b> 40.08	<b>Sc</b> 44.96	<b>Ti</b> 47.88	<b>V</b> 50.94	<b>Cr</b> 52.00	<b>Mn</b> 54.94	<b>Fe</b> 55.85	<b>Co</b> 58.93	<b>Ni</b> 58.69	<b>Cu</b> 63.55	<b>Zn</b> 65.38	<b>Ga</b> 69.72	<b>Ge</b> 72.59	<b>As</b> 74.92	<b>Se</b> 78.96	<b>Br</b> 79.90	<b>Kr</b> 83.80
<b>5</b>	<b>Rb</b> 85.47	<b>Sr</b> 87.62	<b>Y</b> 88.91	<b>Zr</b> 91.22	<b>Nb</b> 92.91	<b>Mo</b> 95.94	<b>Tc</b> (98)	<b>Ru</b> 101.1	<b>Rh</b> 102.9	<b>Pd</b> 106.4	<b>Ag</b> 107.9	<b>Cd</b> 112.4	<b>In</b> 114.8	<b>Sn</b> 118.7	<b>Sb</b> 121.8	<b>Te</b> 127.6	<b>I</b> 126.9	<b>Xe</b> 131.1
<b>6</b>	<b>Cs</b> 132.9	<b>Ba</b> 137.3	<b>La</b> 138.9	<b>Hf</b> 178.5	<b>Ta</b> 181.0	<b>W</b> 183.8	<b>Re</b> 186.2	<b>Os</b> 190.2	<b>Ir</b> 192.2	<b>Pt</b> 195.1	<b>Au</b> 197.0	<b>Hg</b> 200.6	<b>Tl</b> 204.4	<b>Pb</b> 207.2	<b>Bi</b> 209.0	<b>Po</b> (209)	<b>At</b> (210)	<b>Rn</b> (222)
<b>7</b>	<b>Fr</b> (223)	<b>Ra</b> 226.0	<b>Ac</b> 227.0	<b>Rf</b> (261)	<b>Db</b> (262)	<b>Sg</b> (263)	<b>Bh</b> (262)	<b>Hs</b> (265)	<b>Mt</b> (266)	<b>Uun</b> (269)	<b>Uuu</b> (272)	<b>Uub</b> (277)						

58 <b>Ce</b> 140.1	59 <b>Pr</b> 140.9	60 <b>Nd</b> 144.2	61 <b>Pm</b> (145)	62 <b>Sm</b> 150.4	63 <b>Eu</b> 152.0	64 <b>Gd</b> 157.2	65 <b>Tb</b> 158.9	66 <b>Dy</b> 162.5	67 <b>Ho</b> 164.9	68 <b>Er</b> 167.3	69 <b>Tm</b> 168.9	70 <b>Yb</b> 173.0	71 <b>Lu</b> 175.0
90 <b>Th</b> 232.0	91 <b>Pa</b> 231.0	92 <b>U</b> 238.0	93 <b>Np</b> 237.0	94 <b>Pu</b> (244)	95 <b>Am</b> (243)	96 <b>Cm</b> (247)	97 <b>Bk</b> (247)	98 <b>Cf</b> (251)	99 <b>Es</b> (252)	100 <b>Fm</b> (257)	101 <b>Md</b> (258)	102 <b>No</b> (259)	103 <b>Lr</b> (260)