

Chemistry 123 : Exam 1A

The 66 pts exam consists of 6 questions and students have the whole class period to complete the exam. Answers must be written in the box provided or else no credit is provided. Use the empty space provided to do your work. A periodic table is provided at the end. Fill in your name along with your student ID number.

Problem 1 : Significant Figures and Unit Conversion Convert the following units and perform the following calculations reporting the correct significant figures.(12 pts)

(a) 58.58 ms to μs

(b) 8.16 dag/L to dg/mL

(c) 1 L to m^3 (Hint : 1 mL = 1 cm^3)

(d) 4.2 GJ to nJ

(e)

$$\frac{67.12 + 52.013}{45.1} =$$

(f)

$$5.192 \times 10^2 - 1.024 \times 10 =$$

Problem 2 : Nomenclature Provide either the chemical formula or compound name for the following. (12 pts)

(a) Vanadium(V) acetate

(b) $\text{Sr}(\text{C}_2\text{H}_3\text{O}_2)_2$

(c) HClO_3

(d) $(\text{NH}_4)_2\text{SO}_4$

(e) Carbonic acid

(f) Sodium bicarbonate

(g) AuP

(h) SF_6

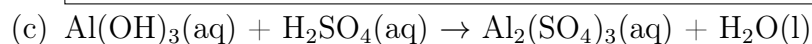
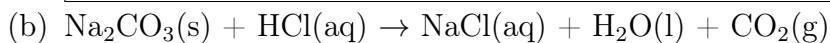
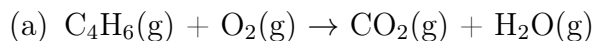
(i) Potassium cyanide

(j) Diphosphorus pentoxide

(k) SO_2

(l) $\text{Bi}(\text{NO}_3)_3$

Problem 3 : Balancing Chemical Equations Balance the following chemical equations. (6 pts)



Problem 4 : Relative Atomic Mass and Molar Mass Boron has only two naturally occurring isotopes (Boron-10 and Boron-11). The mass of Boron-10 is 10.01294 amu and the mass of Boron-11 is 11.00931 amu. (10 pts)

(a) Calculate the relative abundance of each isotope. *Hint* : There are two equations required.

(b) Taking the amu of boron from the periodic table, show conversion from amu to molar mass (g/mol). ($1 \text{ amu} = 1.661 \times 10^{-27} \text{ kg}$)

Problem 5 : Precipitation and REDOX Reactions

Precipitation reaction : Answer the following questions when mixing NaOH(aq) and $\text{CuSO}_4\text{(aq)}$. (8 pts)

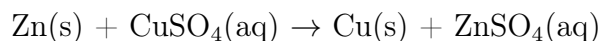
- (i) Write the balanced chemical equation when mixing NaOH(aq) and $\text{CuSO}_4\text{(aq)}$. Include the states.

- (ii) Write the complete ionic equation.

- (iii) What are the spectator ions?

- (iv) Write the net ionic equation.

REDOX reaction : Answer the following questions given the balanced chemical equation. (10 pts)



- (i) What are the oxidation states for each atom on the reactant side?

- (ii) What are the oxidationg states for each atom on the product side?

- (iii) What is the oxidizing agent?

- (iv) What is the reducing agent?

- (v) From which atom to which atom, is the electron being transferred?

Problem 6 : Empirical and Molecular Formulas Caffeine, a stimulant in coffee and tea, has a molar mass of 194.19 g/mol and a mass percentage composition of 49.48% C, 5.19% H, 28.85% N, and 16.48% O. (8 pts)

- (a) Determine the empirical formula

- (b) What is the molecular formula of caffeine?

Chemistry 123 : Apppendix 2 - Formulas and Constants

$$N_A = 6.022 \times 10^{23} \text{particles/mol}$$

$$\text{weighted average} = A_1 I_1 + A_2 I_2 + \dots$$

$$A_1 + A_2 + \dots = 1$$

1 H Hydrogen 1.008																		2 He Helium 4.003																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
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37 Rb Rubidium 85.468		38 Sr Strontium 87.62		39 Y Yttrium 88.906		40 Zr Zirconium 91.224		41 Nb Niobium 92.906		42 Mo Molybdenum 95.95		43 Tc Technetium [97]		44 Ru Ruthenium 101.07		45 Rh Rhodium 102.906		46 Pd Palladium 106.42		47 Ag Silver 107.868		48 Cd Cadmium 112.414		49 In Indium 114.818		50 Sn Tin 118.710		51 Sb Antimony 121.760		52 Te Tellurium 127.60		53 I Iodine 126.904		54 Xe Xenon 131.293																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
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