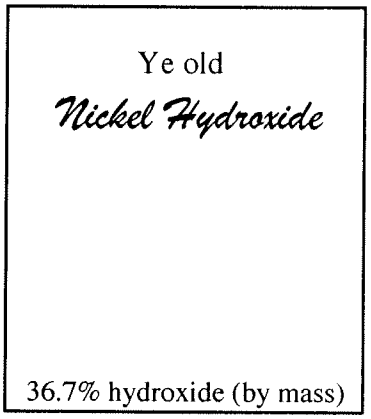
CHEMISTRY 121 MIDTERM 1

Sept. 28, 2007

Show all your reasoning/work/sig. figs. for full marks

(2) 1) Calculate the number of H atoms in 12.45 g of propanol ($CH_3CH_2CH_2OH$, MW = 60.1 g/mol).

(3) 2) An old bottle has the label shown at the lower right. This could mean a couple of things...lousy label. Using the label info., calculate the actual formula of the nickel hydroxide.



(2) 3) Write **ONE** correct name and **ONE** correct formula only. Your choice.

$P(NH_4)_3$ _____ Mn_3As_2 _____

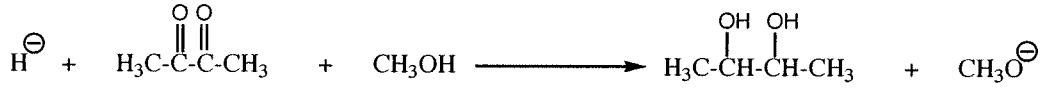
Nickel (II) hydroxide _____ Aluminum chromate _____

(3) 4) Silicon has three isotopes: $^{28.00}Si$, $^{29.00}Si$ and $^{30.00}Si$ in the ratio of 1000:50:23. Calculate silicon's atomic mass (g/mol).

(4) 5) An unknown metal (1.2 g) has chlorine gas (Cl_2) bubbled into it and they completely react to produce a MCl_3 solid which weighs 5.93 g. Identify the unknown metal. Fully explain.

6) The reaction of butan-2,3-dione with hydride forms the butan-2,3-diol and methoxide anion in a 57% yield.

(4) a) Calculate the limiting reagent.



Amount	0.112 g	5.0 g	3.2 mL, 30M		
FW (g/mol)	1.0	86.1	32.0	90.1	31

(3) b) Calculate the volume of the diol made using info. from the other page and that the density of the diol = 0.995 g/mL.

(3) 7) Glassware, water and 0.46 M KCl (aq) are made available to you. Make 250.0 mL of a 0.152 M KCl solution. Fully explain how to do this from start to finish.

(3) 8) Methylammonium chloride, NH_3CH_3Cl, can be made in a series of three steps. Write the **overall** balanced equation for the reaction sequence.

$$H_2(g) + N_2(g) \longrightarrow NH_3(g)$$

$$NH_3(g) + CH_3Cl \longrightarrow NH_2CH_3(g) + HCl(g)$$

$$NH_2CH_3(g) + HCl(g) \longrightarrow NH_3CH_3Cl(s)$$

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(5) 9) Hydrogen gas (MW = 2.0 g/mol) is reacted with oxygen gas (1.76 g, MW = 32.0 g/mol) to yield the products of water (MW = 18.0 g/mol) and hydrogen peroxide H_2O_2 (MW = 34.0 g/mol). This, dare I say, mixture of products has a mass of 1.9 g. Calculate the % (by mass) of the water in the original mixture. Follow the general procedure we talked about in class. It works.

(1) Bonus. What is the either the first or last name of the president of UBC?