

Final Fall 2011

Name _____

Please show all work.

(1) Chromium(III) oxide can be made from the reaction of sodium dichromate and ammonium chloride (reaction directly below). What is the volume of Nitrogen gas, in liters, at 300K and 2 ATM, that can be produced from the complete reaction of 248.3 g of sodium dichromate, $\text{Na}_2\text{Cr}_2\text{O}_7$, with 99.6 g of ammonium chloride? The other products are sodium chloride, chromium(III) oxide, and water. (25 pts)



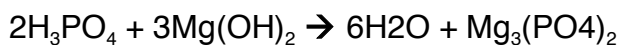
(2) My unpredictable friend throws a can of 'Aquanet' into our campfire. Aerosol cans have warnings about exposure to high temperatures. A typical aerosol can will explode if pressure exceeds 12 atmospheres. If a 200-mL aerosol can contains 0.060 moles of ozone depleting gas, at what temperature would the gas pressure reach 12 atm of pressure and explode? (15 pts)

In the reaction: $\text{SiO}_{2(s)} + 2\text{C}_{(s)} \rightarrow \text{Si}_{(l)} + 2\text{CO}_{(g)}$

(3) If you have 20.00 grams of silicon dioxide to react with 14.51 grams of carbon, what would be the theoretical yield of **silicon** in grams? (15 pts)

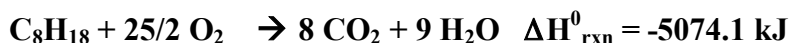
(4) If the actual yield of **Silicon**_(s) is 5.00 grams, what is the percent yield? (10 pts)

A 15.18 mL solution of 0.439 M phosphoric acid, H_3PO_4 is titrated with 14.89 mL of an unknown concentration of $\text{Mg}(\text{OH})_2$ solution.



(5) What is the concentration of $\text{Mg}(\text{OH})_2$ in the above titration? (15 pts)

Octane, the major component of gasoline burns according to the following equation:



(6) How much heat is given off by 7 kilograms of gasoline? (15 pts)

(7) The heat energy in you calculated in (9) is used to heat my swimming pool, with 500 Liters of water (500,000 grams or 5.00×10^5). How many degrees Celsius does the temperature change? Assume the water is at 10 degrees Celsius prior to heating. (15 pts)

(8) I am making a solution of Calcium Phosphate to dissolve my DNA sample into. What is the formula of calcium phosphate ? (10 pts)

(9) I take 100 grams of calcium phosphate and dissolve it into 200 mL. What is the concentration of the solution? (10 pts)

(10) What is the name of HNO₃? (10pts)

(11) I have a stock solution of 15M HNO₃. I take 10 mL of this solution and dilute it to a final volume of 5 liters. What is the new concentration of the diluted solution? (10 pts)

(12) I have a reaction of a solution of aluminum chloride, with a solution of sodium hydroxide. This double replacement reaction forms a precipitate. Group I metals are always soluble. Can you write a balanced chemical equation including the states of chemicals? (10pts)

(13) From the balanced equation in (15), can you write the Net Ionic Equation? (5pts)

(14) I have a 0.00435 M Solution of HCl, a strong acid. What is the pH of the solution? (15pts)

(15) I have a 2.57 pH solution of HClO₄, a strong mono-protic acid. What is the concentration of perchloric acid? (15 pts)

(16) Draw Lewis structure and state the shape of the interior atom(s).

(a) CH_3OH , methanol

(b) CO_3^{2-}

(c) CO carbon monoxide

(d) C_2H_4

(e) N_2H_4