CHEM 100   Name_____
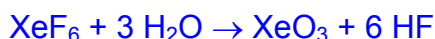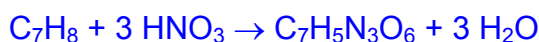
Quiz 3   **Summer 2011**

1. Balance the following reactions. (8 points)
    a. Xenon hexafluoride reacts with water to make xenon trioxide and hydrogen fluoride.

$$XeF_6 + 3\ H_2O \rightarrow XeO_3 + 6\ HF$$

  b. The reaction of toluene (C_7H_8) with nitric acid (HNO_3) to produce the explosive TNT ($C_7H_5N_3O_6$) and water.

$$C_7H_8 + 3\ HNO_3 \rightarrow C_7H_5N_3O_6 + 3\ H_2O$$

2. A truck carrying 31,000 kg of sulfuric acid (H_2SO_4) is involved in an accident, spilling its cargo. HAZMAT crews use sodium bicarbonate ($NaHCO_3$) to neutralize the acid by the reaction below. (9 points)

$$H_2SO_4\ (aq) + 2\ NaHCO_3\ (s) \rightarrow Na_2SO_4\ (s) + 2\ H_2O\ (\ell) + 2\ CO_2\ (g)$$

  a. How many moles of sodium bicarbonate are needed to neutralize all the sulfuric acid?

31,000 ~~kg H_2SO_4~~ x $\dfrac{1000\ \text{g}}{1\ \text{kg}}$ x $\dfrac{1\ \text{mol } H_2SO_4}{98.079\ \text{g } H_2SO_4}$ x $\dfrac{2\ \text{mol } NaHCO_3}{1\ \text{mol } H_2SO_4}$ = **6.32×10^5 mol $NaHCO_3$**

  b. If all of the H_2SO_4 is neutralized, how many kilograms of water will be produced?

31,000 ~~kg H_2SO_4~~ x $\dfrac{1000\ \text{g}}{1\ \text{kg}}$ x $\dfrac{1\ \text{mol } H_2SO_4}{98.079\ \text{g } H_2SO_4}$ = 316,071 mol H_2SO_4

316,071 ~~mol H_2SO_4~~ x $\dfrac{2\ \text{mol } H_2O}{1\ \text{mol } H_2SO_4}$ x $\dfrac{18.015\ \text{g } H_2O}{1\ \text{mol } H_2O}$ x $\dfrac{1\ \text{kg}}{1000\ \text{g}}$ = **11,400 kg H_2O**

3. The molarity of a solution is defined as the concentration of a solution in terms of *moles of solute per liter of solution* (*mol/L*). You have prepared a solution by dissolving 22.4 grams of potassium hydroxide in a total of 200 mL of solution. What is the molarity of the potassium hydroxide? (8 points)

22.4 ~~g KOH~~ x $\dfrac{1\ \text{mol KOH}}{56.106\ \text{g KOH}}$ = 0.3992 mol KOH

concentration = $\dfrac{0.3992\ \text{mol KOH}}{0.200\ \text{L}}$ = 1.996 M = 2.00 M KOH

PERIODIC CHART OF THE ELEMENTS

IA	IIA	IIIB	IVB	VB	VIB	VIIB	VIII	VIII	VIII	IB	IIB	IIIA	IVA	VA	VIA	VIIA	INERT GASES
1 H 1.00797																	2 He 4.0026
3 Li 6.939	4 Be 9.0122											5 B 10.811	6 C 12.0112	7 N 14.0067	8 O 15.9994	9 F 18.9984	10 Ne 20.183
11 Na 22.9898	12 Mg 24.312											13 Al 26.9815	14 Si 28.086	15 P 30.9738	16 S 32.064	17 Cl 35.453	18 Ar 39.948
19 K 39.102	20 Ca 40.08	21 Sc 44.956	22 Ti 47.90	23 V 50.942	24 Cr 51.996	25 Mn 54.9380	26 Fe 55.847	27 Co 58.9332	28 Ni 58.71	29 Cu 63.54	30 Zn 65.37	31 Ga 69.72	32 Ge 72.59	33 As 74.9216	34 Se 78.96	35 Br 79.909	36 Kr 83.80
37 Rb 85.47	38 Sr 87.62	39 Y 88.905	40 Zr 91.22	41 Nb 92.906	42 Mo 95.94	43 Tc (99)	44 Ru 101.07	45 Rh 102.905	46 Pd 106.4	47 Ag 107.870	48 Cd 112.40	49 In 114.82	50 Sn 118.69	51 Sb 121.75	52 Te 127.60	53 I 126.904	54 Xe 131.30
55 Cs 132.905	56 Ba 137.34	*57 La 138.91	72 Hf 178.49	73 Ta 180.948	74 W 183.85	75 Re 186.2	76 Os 190.2	77 Ir 192.2	78 Pt 195.09	79 Au 196.967	80 Hg 200.59	81 Tl 204.37	82 Pb 207.19	83 Bi 208.980	84 Po (210)	85 At (210)	86 Rn (222)
87 Fr (223)	88 Ra (226)	‡89 Ac (227)	104 Rf (261)	105 Db (262)	106 Sg (266)	107 Bh (262)	108 Hs (265)	109 Mt (266)	110 ? (271)	111 ? (272)	112 ? (277)						

Numbers in parenthesis are mass numbers of most stable or most common isotope.

Atomic weights corrected to conform to the 1963 values of the Commission on Atomic Weights.

The group designations used here are the former Chemical Abstract Service numbers.

* Lanthanide Series

58 Ce 140.12	59 Pr 140.907	60 Nd 144.24	61 Pm (147)	62 Sm 150.35	63 Eu 151.96	64 Gd 157.25	65 Tb 158.924	66 Dy 162.50	67 Ho 164.930	68 Er 167.26	69 Tm 168.934	70 Yb 173.04	71 Lu 174.97

‡ Actinide Series

90 Th 232.038	91 Pa (231)	92 U 238.03	93 Np (237)	94 Pu (242)	95 Am (243)	96 Cm (247)	97 Bk (247)	98 Cf (249)	99 Es (254)	100 Fm (253)	101 Md (256)	102 No (256)	103 Lr (257)