Unless otherwise specified, each question is worth 5 points.

4. Use the values of ΔH_f° given to calculate ΔH° for the following reaction:

$$Ca_3(PO_4)_2(s) + 3H_2SO_4(liq) \rightarrow 3CaSO_4(s) + 2H_3PO_4(liq)$$

COMPOUND	ΔH_f° (kJ/mol)
$Ca_3(PO_4)_2(s)$	-4126
$CaSO_4(s)$	-1433
$H_3PO_4(liq)$	-1267
$H_2SO_4(liq)$	-814

$\Delta H = \Sigma \Delta H_f$ (PRODUCTS) $- \Delta H_f$ (REACTANTS)

$= \left(3(-1433) + 2(-1267)\right) - \left(-4126 + 3(-814)\right)$

$= -4299 - 2534 + 4126 + 2442$

$\Delta H = \boxed{-265\ kJ}$

***Abbreviated* Periodic Table of the Elements**

1 1A												13 3A	14 4A	15 5A	16 6A	17 7A	18 8A
1 H 1.008	2 2A																2 He 4.00
3 Li 6.94	4 Be 9.01											5 B 10.81	6 C 12.01	7 N 14.01	8 O 16.00	9 F 19.00	10 Ne 20.18
11 Na 22.99	12 Mg 24.31	3 3B	4 4B	5 5B	6 6B	7 7B	8 8B	9 8B	10 8B	11 1B	12 2B	13 Al 26.98	14 Si 28.09	15 P 30.97	16 S 32.07	17 Cl 35.45	18 Ar 39.95
19 K 39.10	20 Ca 40.08	21 Sc 44.96	22 Ti 47.88	23 V 50.94	24 Cr 52.00	25 Mn 54.94	26 Fe 55.85	27 Co 58.93	28 Ni 58.69	29 Cu 63.55	30 Zn 65.38	31 Ga 69.72	32 Ge 72.59	33 As 74.92	34 Se 78.96	35 Br 79.90	36 Kr 83.80
37 Rb 85.47	38 Sr 87.62	39 Y 88.91	40 Zr 91.22	41 Nb 92.91	42 Mo 95.94	43 Tc (98)	44 Ru 101.1	45 Rh 102.9	46 Pd 106.4	47 Ag 107.9	48 Cd 112.4	49 In 114.8	50 Sn 118.7	51 Sb 121.8	52 Te 127.6	53 I 126.9	54 Xe 131.3
55 Cs 132.9	56 Ba 137.3	57 La* 138.9	72 Hf 178.5	73 Ta 180.9	74 W 183.9	75 Re 186.2	76 Os 190.2	77 Ir 192.2	78 Pt 195.1	79 Au 197.0	80 Hg 200.6	81 Tl 204.4	82 Pb 207.2	83 Bi 209.0	84 Po (209)	85 At (210)	86 Rn (222)
87 Fr (223)	88 Ra 226	89 Ac** (227)	104 Rf	105 Db	106 Sg	107 Bh	108 Hs	109 Mt	110 Uun	111 Uuu	112 Uub						

NAME:_____

Lab Section: __1(TuTh@3) __2(TuTh@9) __3(MW@1)

CHM 101
20 points, 30 mins.

Basic Competency Quiz #7
Chemistry, 7th ed., Zumdahl & Zumdahl, sections 6.1-6.4

Fall 2007
week 11

Wallace

revised 11/26/2007

Unless otherwise specified, each question is worth 5 points.

1. When a reactive alkali metal, such as sodium, is dropped into water, a highly exothermic reaction occurs: $2Na(s) + H_2O(liq) \rightarrow 2NaOH(aq) + H_2(g)$; $\Delta H = -654$ kJ

   How much heat is given off when 1.00g of Na is dropped into a liter of water?

$$1.00\,g\,Na \times \frac{1\,mol\,Na}{22.99\,g} \times \frac{(-654\,kJ)}{2\,mol\,Na} = \boxed{14.2\,kJ}$$

2. To make one cup of coffee, 0.180 kg of water must be heated from 19°C to the ideal brewing temperature of 96°C. How much heat (in joules) is required for this? The specific heat of water is 4.18 [J/g•°C].

$$q = S \times m \times \Delta T = 4.18\left(\frac{J}{g \cdot ^\circ C}\right) \times 180.\,g \times (96 - 19\,^\circ C)$$

$$= 4.18 \times 180. \times 77 = 57{,}935\,J$$

$$\boxed{58{,}000\,J \text{ or } 58\,kJ}$$

3. Use the following data: $S(s) + O_2(g) \rightarrow SO_2(g)$; $\Delta H = -297$ kJ
   $2SO_3(g) \rightarrow 2SO_2(g) + O_2(g)$; $\Delta H = 198$ kJ

   to find the enthalpy change (ΔH) for the following reaction: $2S(s) + 3O_2(g) \rightarrow 2SO_3(g)$

$$2 \times (S + O_2 \rightarrow SO_2) = 2 \times (-297)\,kJ$$

$$2S(s) + 2O_2(g) \rightarrow 2SO_2(g)$$

$$2SO_2(g) + O_2(g) \leftarrow 2SO_3(g) \qquad -(198)\,kJ$$

$$2S(s) + 2O_2(g) + 2SO_2(g) + O_2(g) \rightarrow 2SO_2(g) + 2SO_3(g)$$

$$\boxed{\Delta H = -792\,kJ}$$