

Chem 111 2:30p section Final Exam

This exam is composed of 50 questions, 14 of which require mathematics that require a calculator. Go initially through the exam and answer the questions you can answer *quickly*. Then go back and try the ones that are more challenging to you and/or that require calculations.

As discussed in the course syllabus, honesty and integrity are absolute essentials for this class. In fairness to others, dishonest behavior will be dealt with to the full extent of University regulations.

I hereby state that all answers on this exam are my own and that I have neither gained unfairly from others nor have I assisted others in obtaining an unfair advantage on this exam.

Signature

$PV = nRT$	$N_o = 6.022 \times 10^{23} \text{ mol}^{-1}$	$1 \text{ mL} = 1 \text{ cm}^3$	$h = 6.626 \times 10^{-34} \text{ J s}$
$E = h\nu = \frac{hc}{\lambda}$	$\bar{u}^2 = \frac{3RT}{M}$	$1 \text{ atm} = 760 \text{ mm Hg}$	$c = 2.998 \times 10^8 \text{ m s}^{-1}$
$E_n^{H-atom} = -\frac{R_H hc}{n^2}$	$R_H hc = 1312 \text{ kJ mol}^{-1}$	$\Delta H_{\text{vap}}(H_2O) = 40.65 \text{ kJ mol}^{-1}$	$R = 0.0820 \text{ L atm K}^{-1} \text{ mol}^{-1}$
$R_H = 1.0974 \times 10^7 \text{ m}^{-1}$		$\Delta H_{\text{fus}}(H_2O) = 6.00 \text{ kJ mol}^{-1}$	$R = 8.314 \text{ J K}^{-1} \text{ mol}^{-1}$
		$\Delta E = q + w = \Delta H - P\Delta V$	$J = \text{kg m}^2 \text{ s}^{-2}$

PERIODIC TABLE OF THE ELEMENTS

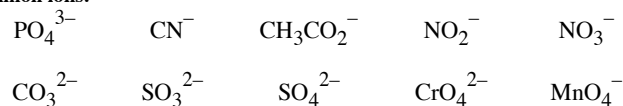
1A	2A	3B	4B	5B	6B	7B	8B	8B	8B	1B	2B	3A	4A	5A	6A	7A	8A
1 H 1.008																	2 He 4.003
3 Li 6.939	4 Be 9.012							5 B 10.81	6 C 12.01	7 N 14.01	8 O 16.00	9 F 19.00	10 Ne 20.18				
11 Na 22.99	12 Mg 24.31							13 Al 26.98	14 Si 28.09	15 P 30.97	16 S 32.07	17 Cl 35.45	18 Ar 39.95				
19 K 39.10	20 Ca 40.08	21 Sc 44.96	22 Ti 47.90	23 V 50.94	24 Cr 52.00	25 Mn 54.94	26 Fe 55.85	27 Co 58.93	28 Ni 58.71	29 Cu 63.55	30 Zn 65.39	31 Ga 69.72	32 Ge 72.61	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 (99)	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 181.0	74 W 183.8	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 226.0	89 Ac 227.0	Unq (261)	Unp (262)	Unh (263)	Uns (262)	Uno (265)	Une (266)									

Solubility Rules for some ionic compounds in water**Soluble Ionic Compounds**

- All sodium (Na^+), potassium (K^+), and ammonium (NH_4^+) salts are SOLUBLE.
- All nitrate (NO_3^-), acetate (CH_3CO_2^-), chlorate (ClO_3^-), and perchlorate (ClO_4^-) salts are SOLUBLE.
- All chloride (Cl^-), bromide (Br^-), and iodide (I^-) salts are SOLUBLE -- EXCEPT those also containing: lead, silver, or mercury (I) (Pb^{2+} , Ag^+ , Hg_2^{2+}) which are NOT soluble.
- All sulfate (SO_4^{2-}) salts are SOLUBLE -- EXCEPT those also containing: calcium, silver, mercury (I), strontium, barium, or lead (Ca^{2+} , Ag^+ , Hg_2^{2+} , Sr^{2+} , Ba^{2+} , Pb^{2+}) which are NOT soluble.

Not Soluble Ionic Compounds

- Hydroxide (OH^-) and oxide (O^{2-}) compounds are NOT SOLUBLE -- EXCEPT those also containing: sodium, potassium, or barium (Na^+ , K^+ , Ba^{2+}) which are soluble.
- Sulfide (S^{2-}) salts are NOT SOLUBLE -- EXCEPT those also containing: sodium, potassium, ammonium, or barium (Na^+ , K^+ , NH_4^+ , Ba^{2+}) which are soluble.
- Carbonate (CO_3^{2-}) and phosphate (PO_4^{3-}) salts are NOT SOLUBLE -- EXCEPT those also containing: sodium, potassium, or ammonium (Na^+ , K^+ , NH_4^+), which are soluble.

Some common ions:**Bond Dissociation Energies (kJ mol^{-1}) (gas phase)**

Bond	D	Bond	D	Bond	D
H-H	436	C-C	346	N-N	163
C-H	413	C=C	610	N=N	418
C \equiv O	1046	C \equiv N	887	N \equiv N	945
N-H	391	O-O	146	C-O	358
O-H	463	O=O	498	C=O	745
C-F	485	F-F	155	N-F	283
C-Cl	339	Cl-Cl	242	N-Cl	192
C-I	213	I-I	151	N-I	169