

Useful Information for Chemistry 202 Final Exam

Always assume ideal behavior for gases (unless explicitly told otherwise).

$$PV = nRT$$

$$R = 0.08206 \text{ Latm/molK} = 8.314 \text{ J/Kmol}$$

$$K = ^\circ\text{C} + 273.0$$

$$N_A = 6.022 \times 10^{23}$$

$$v_{\text{rms}} = \sqrt{\frac{3RT}{M}}$$

$$\lambda = \frac{1}{\sqrt{2}(N/V)(\pi d^2)}$$

$$Z_A = A \frac{N}{V} \sqrt{\frac{RT}{2\pi M}}$$

$$Z = 4 \frac{N}{V} d^2 \sqrt{\frac{\pi RT}{M}}$$

Solubility Rules:

1. Most nitrate salts are soluble.
2. Most salts of sodium, potassium, and ammonium cations are soluble.
3. Most chloride salts are soluble. Exceptions: silver, lead(II), and mercury(I) chloride.
4. Most sulfate salts are soluble. Exceptions: calcium, barium, and lead (II) sulfate.
5. Most hydroxide salts can be considered insoluble. Soluble ones: sodium, potassium, and calcium hydroxide.
6. Consider sulfide, carbonate, and phosphate salts to be insoluble.

$$\Delta E = q + w$$

$$H = E + PV$$

$$\Delta S = q_{\text{rev}}/T$$

$$G = H - TS$$

Here are some of the formulas we used/derived in studying thermodynamics. An individual formula may or may not apply to a specific problem. This is for you to decide!

$$\Delta S = nR \ln(V_2/V_1)$$

$$\Delta S = \Delta H/T$$

$$C_v = (3/2)R$$

$$C_p = (5/2)R$$

$$\Delta S = nC \ln(T_2/T_1)$$

$$\Delta G = \Delta G^\circ + RT \ln(Q)$$

$$\Delta S_{\text{surr}} = -q/T$$

$$w = -P\Delta V$$

$$q_{\text{rev}} = nRT \ln(V_2/V_1)$$

$$q = nC\Delta T$$

$$\ln(K) = -\frac{\Delta H^\circ}{R} \left(\frac{1}{T} \right) + \frac{\Delta S^\circ}{R}$$

$$\ln\left(\frac{K_2}{K_1}\right) = -\frac{\Delta H^\circ}{R} \left(\frac{1}{T_2} - \frac{1}{T_1} \right)$$

$$k = A e^{-E_a/RT}$$

$$\ln\left(\frac{k_2}{k_1}\right) = \frac{E_a}{R} \left(\frac{1}{T_1} - \frac{1}{T_2} \right)$$

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Table 15.6

Summary of the Kinetics for Reactions of the Type $aA \longrightarrow$ Products That Are Zero, First, or Second Order in $[A]$

	Order		
	Zero	First	Second
Rate law	Rate = k	Rate = $k[A]$	Rate = $k[A]^2$
Integrated rate law	$[A] = -kt + [A]_0$	$\ln[A] = -kt + \ln[A]_0$	$\frac{1}{[A]} = kt + \frac{1}{[A]_0}$
Plot needed to give a straight line	$[A]$ versus t	$\ln[A]$ versus t	$\frac{1}{[A]}$ versus t
Relationship of rate constant to the slope of the straight line	Slope = $-k$	Slope = $-k$	Slope = k
Half-life	$t_{1/2} = \frac{[A]_0}{2k}$	$t_{1/2} = \frac{0.693}{k}$	$t_{1/2} = \frac{1}{k[A]_0}$

PERIODIC TABLE OF THE ELEMENTS

1A		atomic number → 26 Fe 55.85 ← atomic mass																8A						
1 H 1.008	2A																		5 B 10.81	6 C 12.01	7 N 14.01	8 O 16.00	9 F 19.00	10 Ne 20.18
3 Li 6.941	4 Be 9.012																	13 Al 26.98	14 Si 28.09	15 P 30.97	16 S 32.07	17 Cl 35.45	18 Ar 39.96	
11 Na 22.99	12 Mg 24.31	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 Unq	105 Unp	106 Unh	107 Uns	108 Uno	109 Une																
lanthanides*			58 Ce 140.1	59 Pr 140.9	60 Nd 144.2	61 Pm (145)	62 Sm 150.4	63 Eu 152.0	64 Gd 157.3	65 Tb 158.9	66 Dy 162.5	67 Ho 164.9	68 Er 167.3	69 Tm 168.9	70 Yb 173.0	71 Lu 175.0								
actinides†			90 Th 232.0	91 Pa (231)	92 U 238.0	93 Np (237)	94 Pu (244)	95 Am (243)	96 Cm (247)	97 Bk (247)	98 Cf (251)	99 Es (252)	100 Fm (257)	101 Md (258)	102 No (259)	103 Lr (260)								