

# Rowley CHEM 1220 Midterm 4

## Formulas

$$S = k_B \ln W$$

$$\Delta S_{universe} = \Delta S_{sys} + \Delta S_{surr}$$

$$\Delta G = \Delta H - T\Delta S$$

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

$$E^\circ_{cell} = E^\circ_{cathode} - E^\circ_{anode}$$

$$\Delta G^\circ = -nFE^\circ$$

$$E^\circ = \frac{RT}{nF} \ln K$$

$$\frac{N}{N_0} = \left(\frac{1}{2}\right)^{\frac{t}{t_{1/2}}}$$

$$\Delta S^\circ_{rxn} = \sum_{i, products} \nu_i S^\circ_i - \sum_{j, reactants} \nu_j S^\circ_j$$

$$\Delta S_{surr} = \frac{-q_{sys}}{T}$$

$$\Delta G^\circ = \Delta H^\circ - T\Delta S^\circ$$

$$\Delta G^\circ = -RT \ln K$$

$$\frac{C_1 V_1}{n_1} = \frac{C_2 V_2}{n_2}$$

$$\Delta G = -nFE$$

$$E = E^\circ - \frac{RT}{nF} \ln Q$$

$$E = mc^2$$

## Constants

$$R = 8.314 \frac{J}{mol K}$$

$$R = 0.08206 \frac{L atm}{mol K}$$

$$k_B = 1.380649 \times 10^{-23} \frac{J}{K}$$

$$N_A = 6.022 \times 10^{23} mol^{-1}$$

$$F = 96,485 \frac{C}{mol}$$

$$c = 2.998 \times 10^8 \frac{m}{s}$$



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1 1A	2 2A	3 3B	4 4B	5 5B	6 6B	7 7B	8	9	10	11 1B	12 2B	13 3A	14 4A	15 5A	16 6A	17 7A	18 8A
1 <b>H</b> Hydrogen 1.008	2 <b>He</b> Helium 4.003	3 <b>Li</b> Lithium 6.941	4 <b>Be</b> Beryllium 9.012	5 <b>B</b> Boron 10.811	6 <b>C</b> Carbon 12.011	7 <b>N</b> Nitrogen 14.007	8 <b>O</b> Oxygen 15.999	9 <b>F</b> Fluorine 18.998	10 <b>Ne</b> Neon 20.180	11 <b>Na</b> Sodium 22.990	12 <b>Mg</b> Magnesium 24.305	13 <b>Al</b> Aluminum 26.982	14 <b>Si</b> Silicon 28.086	15 <b>P</b> Phosphorus 30.974	16 <b>S</b> Sulfur 32.066	17 <b>Cl</b> Chlorine 35.453	18 <b>Ar</b> Argon 39.948
19 <b>K</b> Potassium 39.098	20 <b>Ca</b> Calcium 40.078	21 <b>Sc</b> Scandium 44.956	22 <b>Ti</b> Titanium 47.867	23 <b>V</b> Vanadium 50.942	24 <b>Cr</b> Chromium 51.996	25 <b>Mn</b> Manganese 54.938	26 <b>Fe</b> Iron 55.845	27 <b>Co</b> Cobalt 58.933	28 <b>Ni</b> Nickel 58.693	29 <b>Cu</b> Copper 63.546	30 <b>Zn</b> Zinc 65.38	31 <b>Ga</b> Gallium 69.723	32 <b>Ge</b> Germanium 72.631	33 <b>As</b> Arsenic 74.922	34 <b>Se</b> Selenium 78.971	35 <b>Br</b> Bromine 79.904	36 <b>Kr</b> Krypton 83.798
37 <b>Rb</b> Rubidium 85.468	38 <b>Sr</b> Strontium 87.62	39 <b>Y</b> Yttrium 88.906	40 <b>Zr</b> Zirconium 91.224	41 <b>Nb</b> Niobium 92.906	42 <b>Mo</b> Molybdenum 95.95	43 <b>Tc</b> Technetium 98.907	44 <b>Ru</b> Ruthenium 101.07	45 <b>Rh</b> Rhodium 102.906	46 <b>Pd</b> Palladium 106.42	47 <b>Ag</b> Silver 107.868	48 <b>Cd</b> Cadmium 112.414	49 <b>In</b> Indium 114.818	50 <b>Sn</b> Tin 118.711	51 <b>Sb</b> Antimony 121.760	52 <b>Te</b> Tellurium 127.6	53 <b>I</b> Iodine 126.904	54 <b>Xe</b> Xenon 131.294
55 <b>Cs</b> Cesium 132.905	56 <b>Ba</b> Barium 137.328	57 <b>La</b> Lanthanum 138.905	72 <b>Hf</b> Hafnium 178.49	73 <b>Ta</b> Tantalum 180.948	74 <b>W</b> Tungsten 183.84	75 <b>Re</b> Rhenium 186.207	76 <b>Os</b> Osmium 190.23	77 <b>Ir</b> Iridium 192.217	78 <b>Pt</b> Platinum 195.085	79 <b>Au</b> Gold 196.967	80 <b>Hg</b> Mercury 200.592	81 <b>Tl</b> Thallium 204.383	82 <b>Pb</b> Lead 207.2	83 <b>Bi</b> Bismuth 208.980	84 <b>Po</b> Polonium [208.982]	85 <b>At</b> Astatine 209.987	86 <b>Rn</b> Radon 222.018
87 <b>Fr</b> Francium 223.020	88 <b>Ra</b> Radium 226.025	89 <b>Ac</b> Actinium 227.028	104 <b>Rf</b> Rutherfordium [261]	105 <b>Db</b> Dubnium [262]	106 <b>Sg</b> Seaborgium [266]	107 <b>Bh</b> Bohrium [264]	108 <b>Hs</b> Hassium [269]	109 <b>Mt</b> Meitnerium [278]	110 <b>Ds</b> Darmstadtium [281]	111 <b>Rg</b> Roentgenium [280]	112 <b>Cn</b> Copernicium [285]	113 <b>Nh</b> Nihonium [286]	114 <b>Fl</b> Flerovium [289]	115 <b>Mc</b> Moscovium [289]	116 <b>Lv</b> Livermorium [293]	117 <b>Ts</b> Tennessine [294]	118 <b>Og</b> Oganesson [294]

Lanthanide Series

58

Ce

Cerium  
140.116

59

Pr

Praseodymium  
140.908

60

Nd

Neodymium  
144.243

61

Pm

Promethium  
144.913

62

Sm

Samarium  
150.36

63

Eu

Europium  
151.964

64

Gd

Gadolinium  
157.25

65

Tb

Terbium  
158.925

66

Dy

Dysprosium  
162.500

67

Ho

Holmium  
164.930

68

Er

Erbium  
167.259

69

Tm

Thulium  
168.934

70

Yb

Ytterbium  
173.055

71

Lu

Lutetium  
174.967

Actinide Series

90

Th

Thorium  
232.038

91

Pa

Protactinium  
231.036

92

U

Uranium  
238.029

93

Np

Neptunium  
237.048

94

Pu

Plutonium  
244.064

95

Am

Americium  
243.061

96

Cm

Curium  
247.070

97

Bk

Berkelium  
247.070

98

Cf

Californium  
251.080

99

Es

Einsteinium  
[254]

100

Fm

Fermium  
257.095

101

Md

Mendelevium  
258.1

102

No

Nobelium  
259.101

103

Lr

Lawrencium  
[262]