26. $c = \lambda \cdot \nu$

$c = 3.00 \times 10^{8}\ m/s$ $\nu = ?$

$\lambda = 400\ nm \left(\frac{1\ m}{1 \times 10^{9}\ nm}\right) = 4.00 \times 10^{-7}\ m$

$$\frac{3.00 \times 10^{8}\ m/s}{4.00 \times 10^{-7}\ m} = \frac{(4.00 \times 10^{-7}\ m) \cdot \nu}{4.00 \times 10^{-7}\ m}$$

$7.50 \times 10^{14}\ 1/s = \nu$

$E = h \cdot \nu$

$E = ?$

$h = 6.626 \times 10^{-34}\ J \cdot s$

$\nu = 7.50 \times 10^{14}\ 1/s$

$E = (6.626 \times 10^{-34}\ J \cdot s)(7.50 \times 10^{14}\ 1/s)$

$E = 4.970 \times 10^{-19}\ J$

27. $c = \lambda \cdot \nu$

$c = 3.00 \times 10^{8}\ m/s$

$\lambda = 1.00 \times 10^{1}\ m$

$\nu = ?$

$$\frac{3.00 \times 10^{8}\ m/s}{1.00 \times 10^{1}\ m} = \frac{(1.00 \times 10^{1}\ m) \cdot \nu}{1.00 \times 10^{1}\ m}$$

$3.00 \times 10^{7}\ 1/s = \nu$

$E = h \cdot \nu$

$E = ?$

$h = 6.626 \times 10^{-34}\ J \cdot s$

$\nu = 3.00 \times 10^{7}\ 1/s$

$E = (6.626 \times 10^{-34}\ J s) \cdot (3.00 \times 10^{7}\ 1/s)$

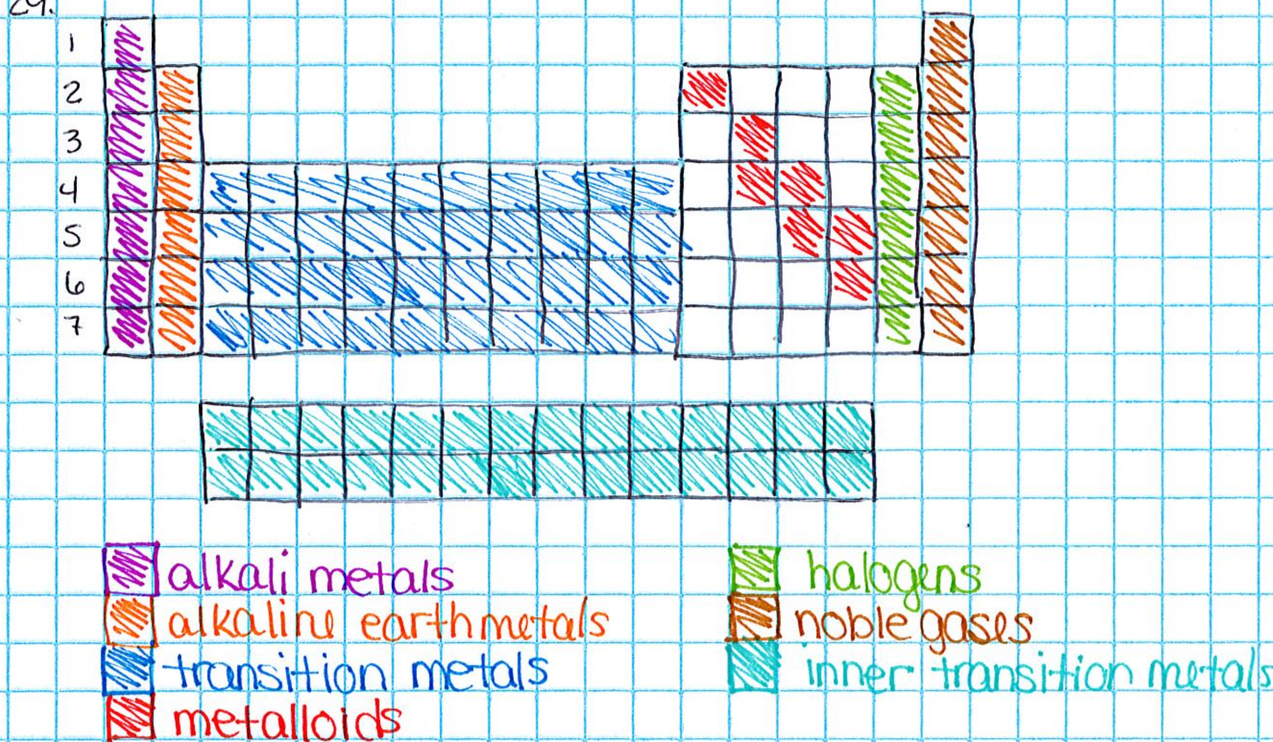
$E = 2.00 \times 10^{-26}\ J$

Chemical Bonds

28 a) CO_2 covalent (2 nonmetals)
b) FeF_2 ionic (metal + nonmetal)
c) NH_3 covalent (2 nonmetals)
d) $CaBr_2$ ionic (metal + nonmetal
e) $MgSO_4$ both (metal - Mg, & 2 nonmetals - S & O)
f) $KC_2H_3O_2$ both (metal - K, & 3 nonmetals - C, H, & O

Periodic Table and Periodic Trends

29.



30. Groups are vertical columns of elements, there are 18

31. Periods are horizontal rows of elements, there are 7

32. a) $Br < Ni < Sc$
b) $Sc > Ni > Br$
c) $Sc < Ni < Br$
d) $Br > Ni > Sc$

33. a) $F < Se < Pb$
b) $Pb > Se > F$
c) $Pb < Se < F$
d) $F > Se > Pb$

Reaction Rates and Collision Theory

34 a). the rate would increase
b) the rate would increase
c) the rate would decrease
d) the rate would increase, the catalyst lowers the amount of activation energy needed for the reaction to occur.

Heat

35 a) hot chocolate → exothermic
b) your hands → endothermic

36. exothermic

37 endothermic

38 $q = mC\Delta T$

$q = +1086.75J$
$m = 15.75g$
$C = ?$
$\Delta T = 175°C - 25°C$
$= 150°C$

$1086.75J = (15.75g) \times C \times (150°C)$

$\frac{1086.75J}{2362.50g°C} = \frac{(2362.50g°C)C}{2362.50g°C}$

$.46 J/g°C = C$

39. $q = mC\Delta T$

$q = ?$
$m = 2300.g$
$C = .90 J/g°C$
$\Delta T = 16°C - 2°C = 14°C$

$q = (2300.g)(.90 J/g°C)(14°C)$

$q = 28,980.00J$

40. $q = mC\Delta T$

$q = ?$
$m = 454g$
$C = .386 J/g°C$
$\Delta T = 28.0°C - 96.0°C$
$= -68.0°C$

$q = (454g)(.386 J/g°C)(-68.0°C)$

$q = -11,916.59 J$

Solutions

-Factors that affect the rate a solute dissolves
- agitation (stirring) - moves the solute and solvent into contact more often
- increase concentration - more reactants available to react
- increase surface area - more reactant available to react
- increase temperature (liquids & solids) - solute moves faster
- decrease temperature (gases) - keeps solute in solution, moves slower

41. $M = \frac{n}{V}$

$M = ?$

$n = 15.0\,g\ Mg(OH)_2 \left(\frac{1\,mol}{58.33\,g}\right) = .257157551\,mol$

$V = 400\,mL \Rightarrow .400\,L$

$M = \frac{.257157551\,mol}{.400\,L} = .64\,M$

42. $M = n/V$

$M = .76\,mol/L$

$n = 5.00\,g\ HCl \left(\frac{1\,mol}{36.46\,g}\right) = .137136588\,mol$

$V = ?$

$V \cdot \left(.76\,\frac{mol}{L}\right) = \frac{(.137136588\,mol)}{V} \cdot V$

$\frac{V \cdot \left(.76\,\frac{mol}{L}\right)}{.76\,\frac{mol}{L}} = \frac{(.137136588\,mol)}{.76\,\frac{mol}{L}}$

$V = .18\,L$

43. $M = \frac{n}{V}$

$M = 1.23\,mol/L$

$n = ?$

$V = 1.00\,L$

$\frac{1.23\,\frac{mol}{L}}{1.00\,L} = \frac{n \cdot (1.00\,L)}{1.00\,L}$

$1.23\,mol = n$

$1.23\,mol\ NH_3 \left(\frac{17.04\,g}{1\,mol}\right) = 20.96\,g$

Colligative Properties

- Boiling point elevation ... because the solute particles block the solvent particles from escaping as a gas. Therefore, higher temperatures are needed to give the solvent particles enough energy to force their way past the solute particles and escape.
- Freezing point depression ... because the solute particles interfere with the solvent forming a solid crystal. Therefore, even lower temperatures are needed to force the solvent to crystallize

44. a) It will increase
    b) It will decrease

45. $\Delta T_f = i \cdot K_f \cdot m$

$\Delta T_f = ?$
$i = 3$ $(1\,Fe^{2+} \,\&\, 2\,NO_3^-)$
$K_f = 1.86\ {}^\circ C/m$
$m = 1.18\,m$

$\Delta T_f = (3) \cdot (1.86\ \frac{^\circ C}{m})(1.18\,m)$

$\Delta T_f = 6.58^\circ C$

46. $\Delta T_b = i \cdot K_b \cdot m$

$\Delta T_b = ?$
$i = 3$
$K_b = .512\ {}^\circ C/m$
$m = 1.18\,m$

$\Delta T_b = (3) \cdot (.512\ {}^\circ C/m) \cdot (1.18\,m)$

$\Delta T_b = 1.81^\circ C$

Acids and Bases

47. Arrhenius acid - gives off H^+ in solution
    Arrhenius base - gives off OH^- in solution

48. Bronsted-Lowry acid - donates H^+
    Bronsted-Lowry base - accepts H^+
    conjugate acid - the base becomes this after getting H^+
    conjugate base - what

49. a) H_2O + H_2SO_4 → H_3O^+ + HSO_4^-
Base | Acid | conj. Acid | conj. Base

b) H_2O + NH_3 → OH^- + NH_4^+
Acid | Base | conj. Base | conj. Acid

50. Strong acid/base - breaks apart/dissociates 100% into ions in solution
Weak acid/base - breaks apart/dissociates ≤5% into ions in solution

7 strong acids		8 strong bases	
HCl	$HClO_3$	LiOH	CsOH
HBr	HNO_3	NaOH	$Ca(OH)_2$
HI	H_2SO_4	KOH	$Sr(OH)_2$
$HClO_4$		RbOH	$Ba(OH)_2$

51. i) $pH = -\log[4.04 \times 10^{-5}] = 4.39$

ii) $pOH = -\log[8.88 \times 10^{-8}] = 7.05$ $pH = 14.00 - 7.05 = 6.95$

iii) $M = n/V$

$n = 45.0\,g\ HNO_3 \left(\frac{1\,mol}{63.02\,g}\right) = .714\,mol$

$V = 500\,mL = .500\,L$

$M = \frac{.714\,mol}{.500\,L} = 1.43$

$pH = -\log[1.43] = -.16$

iv) $M\ n/V$

$n = 45.0\,g\ NaOH \left(\frac{1\,mol}{40.00\,g}\right) = 1.13\,mol$

$V = .500\,L$

$M = \frac{1.13\,mol}{.500\,L} = 2.26$

$pOH = -\log[2.26] = -.35$

$pH = 14.00 - -.35 = 14.35$

52 i) $[H^+] = 10^{-pH} = 10^{-3.24} = 5.75 \times 10^{-4}\ M$

$pOH = 14.00 - 3.24 = 10.76$

$[OH^-] = 10^{-pOH} = 10^{-10.76} = 1.74 \times 10^{-11}\ M$

ii) $[OH^-] = 10^{-pOH} = 10^{-4.78} = 1.66 \times 10^{-5}\ M$

$pH = 14.00 - 4.78 = 9.22$

$[H^+] = 10^{-pH} = 10^{-9.22} = 6.03 \times 10^{-10}\ M$

iii) $[H^+] = 10^{-pH} = 10^{-12.36} = 4.37 \times 10^{-13}\ M$

$pOH = 14.00 - 12.36 = 1.64$

$[OH^-] = 10^{-pOH} = 10^{-1.64} = 2.29 \times 10^{-2}\ M$

53 $M_A V_A = M_B V_B$

$M_A = .85M$
$V_A = .0250L$
$M_B = .75M$
$V_B = ?$

$$\frac{(.85M)(.0250L)}{.75M} = \frac{(.75M)V_B}{(.75M)}$$

$.028\ L = V_B$