Chunk #1 - spring final

(1) 1.485×10^{4}

(2) 3.87×10^{-4}

(3) 52800

(4) 0.00875

(5) K - Kilo

(6) c - centi

(7) KHDBdcm

29.4

294000

(8) KHDBdcm

3405.2

0.034052

(9) $\frac{4\text{ mi}}{1\text{ hr}} \left| \frac{1.609\text{ km}}{1\text{ mi}} \right| \frac{1000\text{ m}}{1\text{ km}} \left\| \frac{1\text{ hr}}{60\text{ min}} \right| \frac{1\text{ min}}{60\text{ sec}} = 1.79 \frac{\text{m}}{\text{sec.}}$

(10) $\frac{19.2\text{ mi}}{1\text{ min}} \left| \frac{1.609\text{ km}}{1\text{ mi}} \right| \frac{1000\text{ m}}{1\text{ km}} \left\| \frac{60\text{ min}}{1\text{ hr.}} \right. = 1853568 \frac{\text{m}}{\text{hr}}$

(11) $\frac{52\text{ m}}{1\text{ sec.}} \left| \frac{1\text{ km}}{1000\text{ m}} \right| \frac{1\text{ mi}}{1.609\text{ km}} \left\| \frac{60\text{ sec}}{1\text{ min}} \right| \frac{60\text{ min}}{1\text{ hr.}} = 116.3 \frac{\text{mi}}{\text{hr}}$

(12) no change to the components - same molecules when done

(13) change to the componets - new substance when done

(14) melting, bending, freezing, crushing, cutting

(15) burning, rotting, digesting, cooking

(16) protons plus neutrons

(17) number of protons

(18) Ag = 47p, 61n, 47e⁻

(19) Cl = 17p, 18n, 17e⁻
Ba = 56p, 81n, 56e⁻
C = 6p, 6n, 6e⁻
Ne = 10p, 10n, 10e⁻

(20) Mg

(21) 8n, 6p, 6e⁻
6n, 6p, 6e⁻

(22) an area an e⁻ is most likely to be found
a probability cloud
only 2 e⁻ per orbital

(23) 

(24) 2, 6, 10, 14

(25)

3p ↑↓ ↑ ↑	3p ↑↓ ↑↓ ↑
3s ↑↓	3s ↑↓
2p ↑↓ ↑↓ ↑↓	2p ↑↓ ↑↓ ↑↓
2s ↑↓	2s ↑↓
1s ↑↓	1s ↑↓
sulfur	chlorine

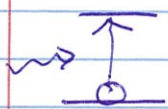
(26) Ge

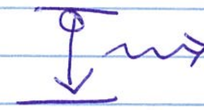
(27) K

(28) H = $1s^1$
He = $1s^2$
K = $1s^2 2s^2 2p^6 3s^2 3p^6 4s^1$
Ca = $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2$
Zn = $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10}$
I = $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^{10} 5p^5$
Kr = $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6$

Chunk #2 - Spring Final

(1) to get a full valence shell

(2) 
energy in,
e⁻ goes up a level
to "excited state"

(3) 
e⁻ falls back down
to "ground state" &
energy is released.

(4)

α	β	γ
+2	−1	∅
neg.	pos.	neither

(5) α^{4}_{2} OR He^{4}_{2} , β^{0}_{-1} or e^{0}_{-1} , γ^{0}_{0}

(6) alpha, gamma, beta

(7) $^{99}_{44}Ru$

(8) $^{4}_{2}He$ or $^{4}_{2}\alpha$

(9) $AE = As * 0.5^{t/h}$
$AE = 1.75 * 0.5^{(243.5/44.5)} = 3.94 * 10^{-2}\,g$

(10) $AE = 85 * 0.5^{(35/35)} = 42.5\,g$ 5 wks = 35 days

(11) yes, no

(12) they are on the outside

(13) the e⁻ in the last filled orbital

(14) 1, 1, 2, 7, 6, 6, 4, 3

(15) see your notebook!

Chunk #2

(16) Li, Ca
O, F
Si, Ge
Fe, Cu

(17) lose 2, gain 2, gain 1, gain 3

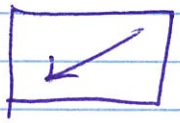
(18) +1, +2, -1, ∅

(19) 

(20) Fr, Ca, Na, Fe, S, F

(21) 

(22) Fr, Ca, Na, Fe, S, F

(23) 

(24) F, S, Fe, Na, Ca, Fr

(25) ionic, covalent, metallic

(26) ionic = m-nm
covalent = nm-nm
metallic = m-m

(27) ionic, covalent, metallic, ionic

(28) cation first then anion,
same name - change end to -ide
most transition metals need roman numerals

(29) use prefixes! except no mono for first element, and last element ends in -ide, careful w/ some double vowels

(30) copper (II) chloride
potassium sulfide
aluminum oxide
calcium oxide
sodium sulfate

(31) phosphorous pentachloride
dihydrogen monoxide
carbon tetrahydride
hexacarbon dodecahydrogen hexoxide

Spring Final - Chunk #3 KEY

(1) Ga_2O_3 $CaCl_2$ $NaNO_3$ $Ca_3(PO_3)_2$ FeF_3

(2) CCl_4 N_2H_5 PI_3

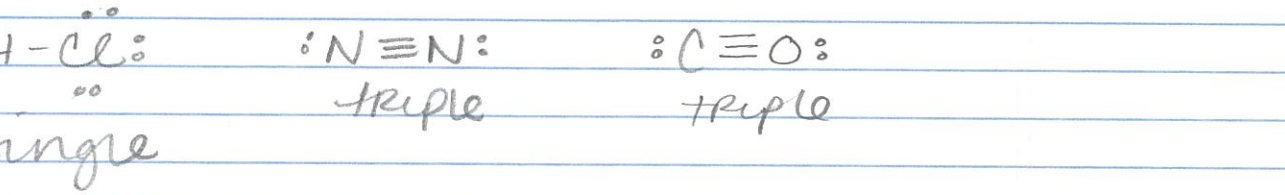
(3) most elements want 8 valence e^-

(4) H, B, P, S

(5) 

(6) single- H_2, H_2O, NH_3
double- CO_2, O_2
triple- N_2

lone pairs
$CO_2 = 4$
$N_2 = 2$
$O_2 = 4$
$H_2O = 2$
$NH_3 = 1$

(7) 

(8) London, dipole-dipole, hydrogen bonding

(9) CH_4, H_2 — london
HCl, CO — dipole
H_2O, NH_3 — hydrogen bond

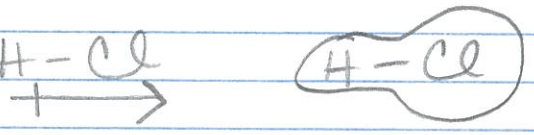
(10) DNA, proteins

(11) Hbond, London, HBond, HBond, dipole, london, dipole

(12) Hbond, dipole, london } inter
ionic, covalent } intra

Chunk #3

(13) unequal e⁻ distribution



(14) polar, polar, non, non, non, polar, non

(15) because it makes it polar if its bent

(16) $CH_4 < CH_3OCH_3 < CH_3OH$

(17) CH_3CH_2OH b/c Hbond vs. CH_3OCH_3 only dipole

(18) See your notebook!

(19) ionic lattice, metallic, network covalent

(20) very high

(21) diamond, graphite

(22) $C_3H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O$

(23) $2Al(OH)_3 \rightarrow Al_2O_3 + 3H_2O$

(24) double Repl. Synth. Single Repl. Combustion

(25) $Na_2O + Ca$

(26) $CO_2 + H_2O$

(27) Na_2S $CaSO_4$

(28) 174.3 g/mol 241.2 g/mol

(29) $\frac{5.9\,g \mid 1\,mol}{39.95\,g} = 0.148\,mol$

Chunk #3

(30) $\frac{12.65\,g}{18\,g} \left| \frac{1\,mol}{} \right. = 0.703\,mol$

(31) $2.7 \times 10^{41}\,atoms \left| \frac{1\,mol}{6.02 \times 10^{23}\,atoms} \right| \frac{58.69\,g}{1\,mol}$

$= 2.63 \times 10^{19}\,g$

(32) $50\,mL \left| \frac{1\,g}{1\,mL} \right| \frac{1\,mol}{18\,g} \left| \frac{6.02 \times 10^{23}\,molec.}{1\,mol} \right| \frac{3\,atoms}{1\,molec.}$

$= 5.02 \times 10^{24}\,atoms$

Spring Final - Chunk #4

① $\frac{3.8 \text{ mol } N_2}{} \left| \frac{2 \text{ mol } NH_3}{1 \text{ mol } N_2} \right. = 7.6 \text{ moles}$

② $C_3H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O$

$\frac{6 \text{ mol } O_2}{} \left| \frac{4 \text{ mol } H_2O}{5 \text{ mol } O_2} \right. = 4.8 \text{ moles}$

③ $\frac{60.4 \text{ g } H_2}{} \left| \frac{1 \text{ mol } H_2}{2.02 \text{ g } H_2} \right| \frac{2 \text{ mol } NH_3}{3 \text{ mol } H_2} \left| \frac{17.03 \text{ g } NH_3}{1 \text{ mol } NH_3} \right. = 339.5 \text{ g}$

④ $\frac{12.5 \text{ g } C_2H_4}{} \left| \frac{1 \text{ mol } C_2H_4}{28.05 \text{ g}} \right| \frac{2 \text{ mol } CO_2}{1 \text{ mol } C_2H_4} \left| \frac{44 \text{ g}}{1 \text{ mol } CO_2} \right. = 39.2 \text{ g}$

⑤ $\frac{9.6 \times 10^{31} \text{ molecules } Cl_2}{} \left| \frac{1 \text{ mol } Cl_2}{6.02 \times 10^{23} \text{ molecules } Cl_2} \right| \frac{1 \text{ mol } H_2}{1 \text{ mol } Cl_2} = 1.59 \times 10^{8} \text{ moles}$

⑥ exo ⑦ endo ⑧ exo

⑨ endo = melting, boiling
exo = freezing, burning

⑩ $Q = (4.3)(0.87)(39-20) = 71.08 \text{ J}$

⑪ $480 = (10)(0.18)(\Delta T) \quad \Delta T = 266.7^\circ$

⑫ $190 = (5)(C)(90-30) \quad C = 0.63 \text{ J/g}^\circ\text{C}$

⑬ $Q_1 = (20)(2.09)(0-30) = 1254 \text{ J}$
$Q_2 = (20)(333) = 6660 \text{ J}$
$Q_3 = (20)(4.18)(50-0) = 4180 \text{ J}$
$Q_T = Q_1 + Q_2 + Q_3 = 12094 \text{ J}$

Chunk #4 Cont

14. $Q_1 = 40g \times 334 \frac{J}{g} = 13360\ J$
$Q_2 = 40g \times 4.18 \frac{J}{g \cdot °C} \times 100°C = 16720\ J$
$Q_3 = 40g \times 2260 \frac{J}{g} = 90400\ J$
$Q_4 = 40g \times 1.87 \frac{J}{g \cdot °C} \times 30°C = 2244\ J$

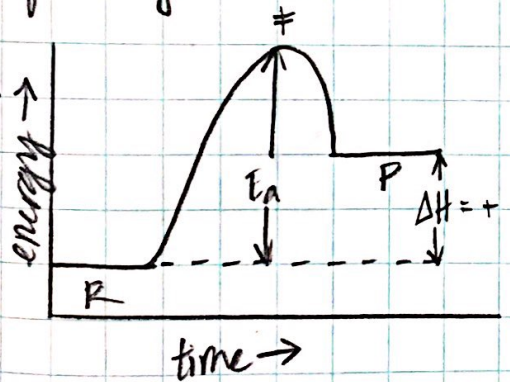
$\boxed{Q = 122724\ J}$

15. $Q_1 = 3g \times 2.09 \frac{J}{g \cdot °C} \times 15°C = 94.05\ J$
$Q_2 = 3g \times 334 \frac{J}{g} = 1002\ J$
$Q_3 = 3g \times 4.18 \frac{J}{g \cdot °C} \times 100°C = 1254\ J$
$Q_4 = 3g \times 2260 \frac{J}{g} = 6780\ J$
$Q_5 = 3g \times 1.87 \frac{J}{g \cdot °C} \times 50°C = 280.5\ J$

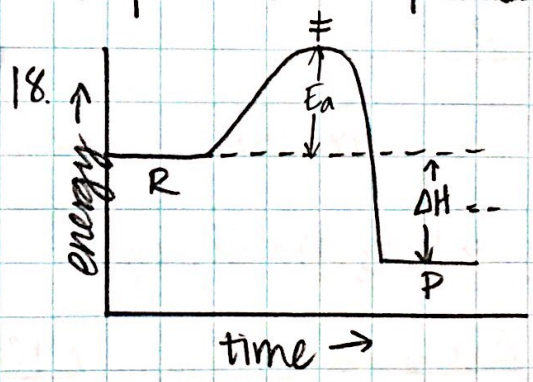
$\boxed{Q = 9410.55\ J}$

16. Thermo involves the study of reaction heat and the direction that the heat moves with regards to systems and surroundings. The energy in these reactions are studied to determine whether or not the reaction will take place. Kinetics studies the speed of the reaction and how quickly reactants are used while products are formed.

17.



18.



19. Factors that can speed up / slow down rxn:
- Temperature
- Concentration
- Surface Area
- Catalyst

20. $\frac{10\ g\ Na_2S}{200\ mL\ soln} \times \frac{1\ mol\ Na_2S}{78.05\ g\ Na_2S} \times \frac{1000\ mL}{1\ L} = \boxed{0.641\ M\ Na_2S}$

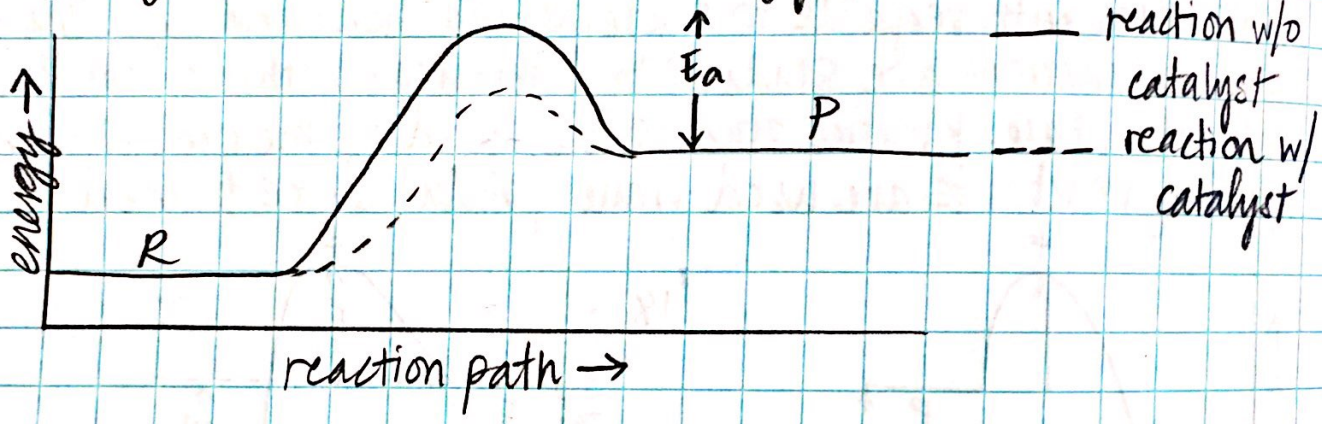
21. $\frac{30g\ K_2SO_4}{100\ mL\ soln} \times \frac{1\ mol\ K_2SO_4}{174.27\ g\ K_2SO_4} \times \frac{1000\ mL}{1\ L} = \boxed{1.72\ M\ K_2SO_4}$

22. $390\ mL \times \frac{1\ L}{1000\ mL} \times \frac{0.587\ mol\ CaCl_2}{1\ L} \times \frac{110.98\ g\ CaCl_2}{1\ mol\ CaCl_2} = \boxed{25.407\ g\ CaCl_2}$

23. Collision theory states that reactants must collide in order to react and must have "effective collisions." This means that the particles must be moving fast enough and have correct orientation.

24. When you change Temp and [conc], the particles change in speed and in the number of possible effective collisions. ↑ temp and ↑ [conc] will cause rates to also ↑, while ↓ temp and ↓ [conc] will cause rates to ↓.

25. Catalysts are chemicals added to a rxn that do not get used up during the rxn. They help orient molecules to reach transition state faster, so you don't need as much energy.



26. $PCl_5(g) \rightarrow PCl_3(g) + Cl_2(g)$

$$\text{Rate} = -\frac{\Delta[PCl_5]}{\Delta t} = \frac{\Delta[PCl_3]}{\Delta t} = \frac{\Delta[Cl_2]}{\Delta t}$$

$2\,HI(g) \rightarrow H_2(g) + I_2(g)$

$$\text{Rate} = -\frac{\Delta[HI]}{2\Delta t} = \frac{\Delta[H_2]}{\Delta t} = \frac{\Delta[I_2]}{\Delta t}$$

$2\,NO(g) + H_2(g) \rightarrow N_2O(g) + H_2O(g)$

$$\text{Rate} = -\frac{\Delta[NO]}{2\Delta t} = -\frac{\Delta[H_2]}{\Delta t} = \frac{\Delta[N_2O]}{\Delta t} = \frac{\Delta[H_2O]}{\Delta t}$$

27. $P_4(s) + 5O_2(g) \rightarrow P_4O_{10}(s)$ $\text{Rate} = -\frac{\Delta[P_4]}{\Delta t} = -\frac{\Delta[O_2]}{5\Delta t} = \frac{\Delta[P_4O_{10}]}{\Delta t}$

$$\text{Rate} = -\frac{\Delta[O_2]}{\Delta t} = -\frac{(0.000\ M - 0.400\ M)}{(20s)} = \boxed{0.02\ M/s}$$

28. $H_2(g) + Cl_2(g) \rightarrow 2HCl(g)$ $\text{Rate} = -\frac{\Delta[H_2]}{\Delta t} = -\frac{\Delta[Cl_2]}{\Delta t} = \frac{\Delta[HCl]}{2\Delta t}$

$$\text{Rate} = \frac{\Delta[HCl]}{\Delta t} = \frac{(1.500\ M - 0.000\ M)}{(5.42\ s)} = \boxed{0.277\ M/s}$$

Chunk #5

1. Equilibrium is the state at which the rate of the forward reaction and the rate of the backwards reaction are equal.

2. Rates are equal at equilibrium, but not necessarily concentrations.

3. Factors that can shift an equilibrium:
   - Temperature
   - Concentration (of gases and solutions) } excludes solids and liquids!
   - Pressure (of gases and solutions) }

4. ←

5. ←

6. increases

7. decreases

8. no change

9. decreases

10. increases