1) a i $PbI_{2(s)} \rightleftharpoons Pb^{2+} + 2I^-$

$1.3\times10^{-3}M \quad 2(1.3\times10^{-3})$

$K_{sp} = [Pb^{2+}][I^-]^2$

ii $[I^-] = 2(1.3\times10^{-3}) = 2.6\times10^{-3}$

iii $K_{sp} = (1.3\times10^{-3})(2.6\times10^{-3})^2$

$= 8.8\times10^{-9}$

b) $[Pb^{2+}] = 1.3\times10^{-3}$

$[I^-] = 2.6\times10^{-3}$

The concentration of the cation and anion are the same weather the volume is 1L or 2L. The Ksp value for the solubility of PbI_2 is related to temperature not volume.

c) The concentration of the Pb^{2+} ion will decrease. A common ion will suppress the solubility of an Ionic solid.

d) i $[Ba^{2+}] = 500\,mL \times \frac{8.2\times10^{-6}\,mol}{1\,mL} \times \frac{1}{1000}$

$= 4.1\times10^{-6}\ \frac{mol}{L}$

$[CrO_4^{2-}] = 500\,mL \times \frac{8.2\times10^{-6}\,mol}{1\,mL} \times \frac{1}{1000\,mL}$

$= 4.1\times10^{-6}\ \frac{mol}{L}$

ii $Q = [Ba^{2+}][CrO_4^{2-}] = (4.1\times10^{-6})^2$

$= 1.7\times10^{-11}$ $\quad Q < 1.2\times10^{-10}$

the concentration of the cation and the anion are not high enough for the solution to be considered saturated.

2a)

		ΔH°
	$CO \rightarrow \cancel{\frac{1}{2}}O_2 + \cancel{C}$	$+110.5\ kJ$
$+$	$\cancel{C} + O_2 \rightarrow CO_2$	$-393.5\ kJ$
	$CO + \frac{1}{2}O_2 \rightarrow CO_2$	$-283.0\ kJ$

26) $\Delta S^\circ_{rxn} = 213.7 \frac{J}{mol\,k} - \left(197.7 \frac{J}{mol\,k} + \right.$

$\left. \frac{1}{2}(205.1\ J/mol\,k)\right)$

$= -86.5 \frac{J}{mol\,k}$

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

$\Delta G^\circ = -283.0 \frac{kJ}{mol} - (298k)\left(-0.0865 \frac{kJ}{mol\,k}\right)$

$= -257.2\ kJ/mol$

D Yes. A loss of free energy (ΔG) implys a spontaneous reaction.

E $\Delta G^\circ = -RT\ln k$

$\ln k = \frac{-259.2\ kJ/mol}{\left(0.008314 \frac{kJ}{mol\,k}\right)(298\,k)}$ $k = 1.28 \times 10^{45}$

3a) i $2.241\,g\,CO_2 \times \frac{12.011\,g\,C}{44.01\,g\,CO_2} = 0.6116\,g\,C$

ii $1.2359\,g \times 0.2884 = 0.3564\,g\,N$

iii $1.2359\,g - (0.0648\,g + 0.6116\,g + 0.3564\,g)$

$= 0.2031\,g\,O$

b $0.0648\,g\,H \times \frac{mol}{1.0078\,g} = \frac{0.06428\,mol\,H}{0.01269}$

$0.6116\,g\,C \times \frac{mol}{12.011\,g} = \frac{0.05092\,mol\,C}{0.01269}$

$0.2031\,g\,O \times \frac{mol}{16.00\,g} = \frac{0.01269\,mol\,O}{0.01269}$

$0.3564\,g\,N \times \frac{mol}{14.007\,g} = \frac{0.02544\,mol\,N}{.01269}$

$C_4H_5N_2O$

B) i CH_2Br

$$n = \frac{(0.983\ atm)(1.00L)}{\left(0.0821 \frac{L\ atm}{mol\ K}\right)(375\ K)} = 0.0319\ mo$$

$$\frac{6.00g}{0.0319\ mol} = 188\ g/mol$$

ii $\frac{188}{93.9}$ = factor of 2

$C_2H_4Br_2$

4) a $KClO_3 \rightarrow KCl + O_2$

b $AgCl + Cl^- \rightarrow AgCl_2^-$

c $CH_3COOH + OH^- \rightarrow H_2O + CH_3COO^-$

D $NH_3 + HF \rightarrow NH_4^+ + F^-$

E $Zn + Cu^{2+} \rightarrow Cu + Zn^{2+}$

F $PH_3 + BCl_3 \rightarrow PH_3 - BCl_3$

G $Ni^{2+} + OH^- \rightarrow Ni(OH)_2(s)$

H $C_6H_{14} + O_2 \rightarrow CO_2 + H_2O$

5) a Na_2CO_3

KCl

$MgSO_4$

b $Mg(OH)_2$

c CO_3^{2-} is the conjugate base of a weak acid HCO_3^-. so it has hydrolytic value.

$$H_2O + CO_3^{2-} \rightleftharpoons HCO_3^- + OH^-$$

D $M_1V_1 = M_2V_2$

$$\left(3.0 \frac{mol}{L}\right)(V_1) = \left(1.0 \frac{mol}{L}\right)(.1L)$$

$V_1 = .033L$ or 33 ml

step 1) use the buret to transfer 33ml of 3.0 M NaOH into a 100ml volumetric flask.

step2) Add distilled water to just below the etched mark on the flask.

5d continued

step 3 use the dropper to the bottom of the miniscus to sit on the ecked mark.

e) $Na_2CO_{3(s)}$ will dissolve in water. $CaCO_{3(s)}$ is insoluble

6) a Glucose is capable of H-Bonding and induced dipole induced dipole attractions. Cyclohexane is only capable of induced dipole-induced dipole attractions.

b. Because Glusose is capable of H-Bonding it will soluble in H_2O (like dissolves like).
The intermolecular attractions between Cyclohexane and water are weak. (Induced dipole - dipole). Therefore H_2O excludes Cyclohexane.

6) c) i $H_2O\ l \rightarrow H_2O(g)$

H-Bonds between the H_2O molecule have to be broken when vaporizing H_2O.

$$H_2O(l) \rightarrow H_2(g) + \tfrac{1}{2} O_2(g)$$

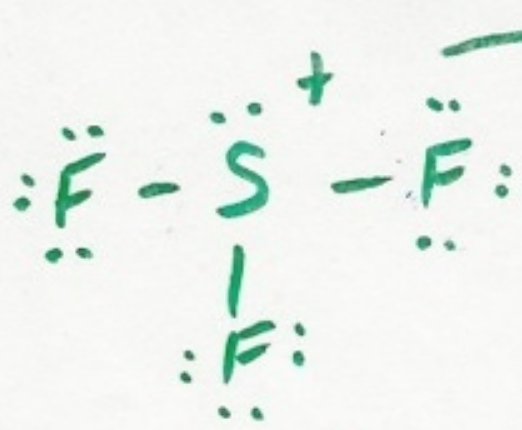
Covalent bonds between Hydrogen and Oxygen have to be broken. Then H-H and O-O bonds have to be formed.

ii False. H-Bonds are Broken between H_2O molecules in order to get H_2O molecules into the gas phase.

D) i. 

Diagram 1 represents the catalyzed path
Diagram 2 represents the uncatalyzed path

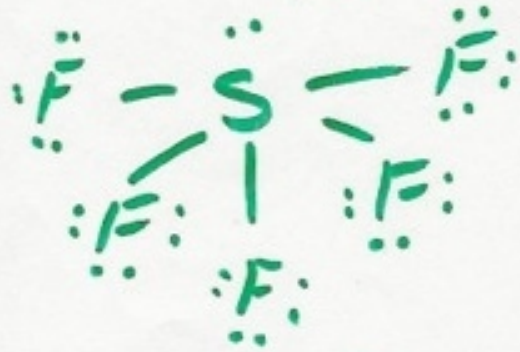
ii False. A catalyst speeds up a reaction by changing the mechanism for the reaction. ie lowering the activation energy.

7) a) i 

ii sp^3

iii Trigonal pyramidal

iiii The bond angle will be closer to 107°. lone pairs are more repulsive than bonded pairs.

b) i 

ii sp^3d^2

iii square pyramidal

iiii +4

8a $8s^1$

b) Element Q would be an alkali metal because it has one shielded electron in its outer level.

c) Q would have largest radius in group 1A.

d) +1

e) $2Q + 2H_2O \rightarrow 2Q^+ + 2OH^- + H_2$

f) Q_2CO_3