AP Chem Quiz Ch 3 & 4, Version A

1. 1 $Al(OH)_{3(s)}$ + 3 $HClO_{4(aq)}$ → $Al(ClO_4)_{3(aq)}$ + $H_2O_{(l)}$

2. $2AgNO_{3(aq)}$ + 1 $Na_2SO_{4(aq)}$ → 1 $Ag_2SO_{4(s)}$ + 2 $NaNO_{3(aq)}$
   2 $Ag^+_{(aq)}$ + $SO_4^{2-}{}_{(aq)}$ → $Ag_2SO_{4(s)}$

3. % O = $\frac{4 * 16.00}{39.10 + 54.938 + 64.00} = \frac{64.00}{158.04} = 40.50\%$

4. $\frac{4.850 \text{ g butane}}{58.123 \text{ g}} = 0.08413$ mol butane
   $\frac{15.92 \text{ g } O_2}{32.00 \text{ g}} = 0.4975$ mol O_2
   O_2 is limiting reactant
   $\frac{0.4975 \text{ mol } O_2 * 8 \text{ mole } CO_2 * 6.022 \times 10^{23}}{13 \text{ mol } O_2 * 1 \text{ mol}} = 1.844 \times 10^{23}$ atoms CO_2

5. O_2 is the limiting reactant.
   $\frac{0.4975 \text{ mol } O_2 * 2 \text{ mol butane} * 58.123 \text{ g}}{13 \text{ mole } O_2 * 1 \text{ mol}} = 4.449$ g butane
   4.890 – 4.449 = 0 441 g excess butane

6. $\frac{0.8044 \text{ g } H_2O * 1 \text{ mol } H_2O * 2 * 1.0079 \text{ g}}{18.02 \text{ g} * 1 * 1 \text{ mol H}} = 0.08998$ g H
   $\frac{1.789 \text{ g} * 1 \text{ mol} * 1 * 12.011 \text{ g}}{44.01 \text{ g} * 1 * 1 \text{ mol}} = 0.4882$ g C
   $C_5H_{11}O_3$

7. $\frac{.350 \text{ L} * 1.20 \text{ mol } C_4Cl_2}{1 \text{ L}} = 1.420$ mol $CaCl_2$
   $\frac{1.420 \text{ mol } CaCl_2 * 1 \text{ L}}{1.70 \text{ mol}} = 0.247$ L sol'n add to beaker and dilute with 103 ml D.I.

8. Many answers. Strong electrolytes completely dissociate.

AP Chem Quiz Ch 3 & 4, Version B

1. $Sr(NO_3)_{2(aq)}$ + $Li_2SO_{4(aq)}$ → 2$LiNO_{3(aq)}$ + $SrSO_{4(s)}$
   $Sr^{2+}_{(aq)}$ + $SO_4^{2-}{}_{(aq)}$ → $SrSO_{4(s)}$

2. 3$PbBr_{2(s)}$ + 2$(NH_4)_3PO_{4(aq)}$ → $Pb_3(PO_4)_{2(s)}$ + 6$NH_4Br_{(aq)}$
   3$PbBr_{2(s)}$ + 2$PO_4^{3-}{}_{(aq)}$ → $Pb_3(PO_4)_{2(s)}$ + 6$Br^-_{(aq)}$

3. % O = $\frac{4 \times 16.00}{2 \times 22.99 + 52.00 + 4 \times 16.00} = \frac{64.00}{161.98} = 39.51\%$

4. $\frac{4.890 \text{ g of propane}}{44.096 \text{ g}} = 0.1109$ mol of propane

$\frac{20.05 \text{ g of } O_2}{32 \text{ g}} = 0.6266 \text{ mol of } O_2$

Therefore propane is the limiting reactant

$$\frac{0.1109 \text{ mol propane} * 4 \text{ mole } H_2O * 6.022 \times 10^{23}}{1 \text{ mol propane} * 1 \text{ mol } H_2O} = 2.671 \times 10^{23} \text{ atoms of } H_2O$$

5. Propane is the limiting reactant.
   20.05 g O2
   - 17.71 g reacted O2
   2.31 g O2 excess

6. 2.030 g PG – 0.2151 – 0.9612 = 0.8537 g O = 0.05336 mol O = 1

$$\frac{1.923 \text{ g } H_2O \times 1 \text{ mol of } H_2O \times 2 \times 1.0079 \text{ g}}{18.02 \text{ g of } H_2O} = 0.2151 \text{ g of H} = \frac{0.2134 \text{ mol of H}}{0.05336 \text{ mol O}} = 3.999$$

$$\frac{3.522 \text{ g } CO_2 \times 1 \text{ mol of } CO_2 \times 1 \times 12.011 \text{ g}}{44.01 \text{ g of } CO_2} = 0.9612 \text{ g of C} = \frac{0.08003 \text{ mol of C}}{0.05336 \text{ mol O}} = 1.505$$

$C_3H_3O_2$

7. $\frac{0.250 \text{ L} \times 0.200 \text{ mol}}{1\text{L}} = \frac{0.0500 \text{ mol} \times 1 \text{ L}}{2.60 \text{ mol}} = 0.0192$ L sol'n add to beaker and dilute with 231 ml D.I.

8. Many answers. Strong electrolytes completely dissociate.

AP Chem Answer Key, Quiz: Ch 3 & 4, Version E

1.

a)

% comp = (grams O) / (grams $C_6H_8O_6$)
= (6 X 16.00) / (6 X 16.00 + 6 X 12.011 + 8 X 1.0079)
= (96.00 / 176.1292) X 100
= 54.51 %

Ans = 54.51 % O

b)

$1\ C_6H_8O_6\ (s) + 5\ O_2\ (g) \rightarrow 6\ CO_2\ (g) + 4\ H_2O\ (g)$

c)

= (20.00g asc acid / 1) X (1 mol asc acid / 176.13g)
= (0.1136 mol asc acid / 1) X (6 mol O_2 / 1)
= 0.6813 mol O_2 required

= (3.00g O_2 / 1) X (1 mol / 32.00g)
= 0.0938 mol O_2

Ans = Oxygen is the limiting reactant

d)

= (0.0938 mol O_2 / 1) X (1 mol asc acid / 5 mol O_2)
= 0.0156 mol asc required

(0.1136 mol asc acid) – (0.0156 mol asc acid) = 0.0977 mol acid
=(0.0977 mol asc acid) X (176.13g / 1mol)
= 16.7g

Ans = 16.7g asc acid

e)

(0.0938 mol O_2 / 1) X (4 mol H_2O / 5 mol O_2) X (18.02g H_2O / 1 mol H_2O) X 0.900
= 1.22

Ans = 1.22g H_2O

2.

a)

$M_1V_1 = M_2V_2$
(0.100M)(0.4000L) = (2.50M)(V_2)
V_2 = 0.0160L

1) Add 16.0ml of 2.50M solution to a flask.
2) Dilute w/ distilled water to 400.0ml
3) Mix.

b) No. $Mg(OH)_2$ is negligibly soluble. No ions = non-electrolyte = no conductivity.

3.

a) ~~K^+~~ + S^{2-} + Ni^{2+} + ~~NO_3^-~~ → NiS
Ans: S^{2-} + Ni^{2+} → NiS

b) ~~Fe^{3+}~~ + SO_4^{2-} + Ca^{2+} + ~~Cl^-~~ → $CaSO_4$
Ans: SO_4^{2-} + Ca^{2+} → $CaSO_4$

c) ~~NH_4^+~~ + CrO_4^{2-} + Hg^{2+} + ~~I^-~~ → $HgCrO_4$
d) CrO_4^{2-} + Hg^{2+} → $HgCrO_4$

AP Chem Answer Key, Quiz: Ch 3 & 4, Version F

1.

a) % O = (grams O) / (grams $C_9H_8O_4$)
= (6 X 16.00) / (6 X 16.00 + 9 X 12.011 + 8 X 1.0079)
= (64.00 / 180.1622) X 100%

Ans = 35.52 % O

b) 1 $C_9H_8O_4$ (s) + 9 O_2 (g) -> 9 CO_2 (g) + 4 H_2O (g)

c) = (20.00g asc acid / 1) X (1 mol asc acid / 180.16 g)
= (0.1110 mol asc acid / 1) X (9 mol O_2 / 1 mol asc acid)
= 0.999 mol O_2 required

= (3.00g O_2 / 1) X (1 mol O_2 / 32.00 g O_2)
= 0.0937 mol O_2

Ans = oxygen

d) = (0.0937 mol O_2 / 1) X (1 mol asc acid / 9 mol O_2)
= 0.0104 mol asc required

(0.1110 mol asc acid) – (0.0104 mol asc acid) = 0.01006 mol acid
= (0.1006 mol asc acid excess) X (180.16g / 1 mol)
= 18.12 g

Ans = 18.12 g asc acid

e) (0.0937 mol O_2 / 1) X (9 mol CO_2 / 9 mol O_2) X (44.011 g CO_2 / 1 mol CO_2) X 0.60
= 2.48 g

Ans = 2.48 g H_2O

2.

a)

$M_1V_1 = M_2V_2$
$(0.200M)(0.3000L) = (2.00M)(V_2)$
$V_2 = 0.0300L$

1) Add 30.0ml of 2.00M solution to a flask.
2) Dilute to 400.0mL w/ distilled water.
3) Mix.

b) Slightly. H_3PO_4 is a weak acid = weak electrolyte since partially dissociated.

3.

a) ~~Li^+~~ + OH^- + Mn^{2+} ~~+ $C_2H_3O_2^-$~~ → $Mn(OH)_2$
Ans: OH^- + Mn^{2+} → $Mn(OH)_2$

b) Pb^{2+} ~~+ ClO_4^-~~ ~~+ NH_4^+~~ + $C_2O_4^{2-}$ → PbC_2O_4
Ans: Pb^{2+} + $C_2O_4^{2-}$ → PbC_2O_4

c) ~~K^+~~ + CO_3^{2-} + Ag^+ + ~~NO_3^-~~ → Ag_2CO_3
Ans: CO_3^{2-} + Ag^+ → Ag_2CO_3

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