Long Quiz 1 | Chem 132 | February 1, 2013

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Name: Key SB#: 007

1. The K_{sp} for PbI_2 (lead iodide) is 8.5×10^{-9}. What is the molar solubility of PbI_2? ***(Show your set-up—including a balanced chemical equation—and your work.)***

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$PbI_2(s) \rightleftharpoons Pb^{2+} + 2\,I^-$ $\quad K_{sp} = [Pb^{2+}][I^-]^2$

at eq'm: $x \quad 2x$

$8.5 \times 10^{-9} = (x)(2x)^2 = 4x^3$

$x^3 = \frac{8.5 \times 10^{-9}}{4}$

$x = \sqrt[3]{\frac{8.5 \times 10^{-9}}{4}}$

$x = 1.3 \times 10^{-3}$

so, molar solubility of PbI_2 is $\boxed{1.3 \times 10^{-3} \text{ moles/liter}}$

2. Carbon tetrafluoride (CF_4) is synthesized from silicon carbide and fluorine according to this balanced equation:

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$$SiC(s) + 2\,F_2 \rightarrow CF_4(g) + Si(s)$$

When 100 g of SiC and 100 g of F_2 are combined, what is the maximum number of grams of CF_4 that can form? $\mathcal{M}(SiC) = 40.1$ g/mol; $\mathcal{M}(F_2) = 38.0$ g/mol; $\mathcal{M}(CF_4) = 88.0$ g/mol.

which is the limiting reagent?

$100\text{g SiC} \times \frac{1\text{mol SiC}}{40.1\text{g SiC}} = 2.4938\text{ mol SiC} \times \frac{1\text{mol } CF_4}{1\text{mol SiC}} = 2.4938\text{ mol } CF_4 \text{ possible}$

$100\text{g } F_2 \times \frac{1\text{mol } F_2}{38.0\text{g } F_2} = 2.6316\text{ mol } F_2 \times \frac{1\text{mol } CF_4}{2\text{mol } F_2} = 1.3158\text{ mol } CF_4 \text{ possible}$

so, F_2 is the limiting reagent.

$1.3158\text{ mol } CF_4 \times \frac{88\text{g } CF_4}{1\text{mol } CF_4} = \boxed{115.8\text{ g } CF_4}$

3. Complete the following tables:

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given:	write:
(example) permanganate	MnO_4^-
sulfate	SO_4^{2-}
carbonate	CO_3^{2-}
chlorate	ClO_3^-
ammonium	NH_4^+

given:	write:
phosphate	PO_4^{3-}
CN^-	cyanide
NO_2^-	nitrite
NO_3^-	nitrate
hydroxide	OH^-

4. Complete the following tables:

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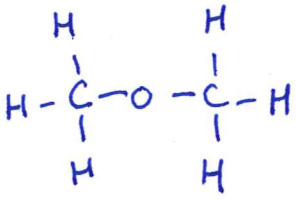
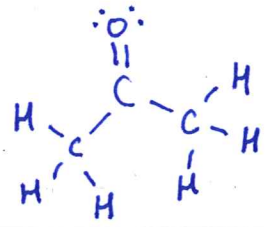
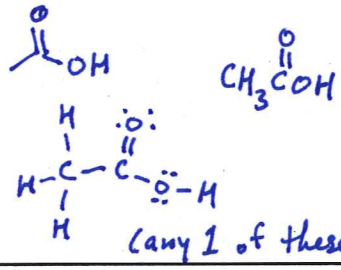
given:	write:
CH_3OCH_3	*(Lewis structure)* 
CH_3COCH_3	*(Lewis structure)* 

given:	write:
acetic acid (formula $C_2H_4O_2$)	*(any structural representation)*  (any 1 of these)
HCCH	*(Lewis structure)* 

5. A 0.040-L sample of 0.050 M NaCl has how many moles of Na^+? of Cl^-?

$$0.040\ L\ NaCl\ soln \times \frac{0.05\ mol\ NaCl}{1\ L\ soln} = 2.0 \times 10^{-3}\ mol\ NaCl$$

2.0×10^{-3} mol Na^+ $\quad$ 2.0×10^{-3} mol Cl^-

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6. Write the net ionic equation for a solution of sodium phosphate mixing with a solution of barium chloride to form a white precipitate. ***Put a BOX around your answer.***

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$$2\ Na_3PO_4(aq) + 3\ BaCl_2(aq) \longrightarrow 6\ NaCl(aq) + Ba_3(PO_4)_2(s)$$

$$6\ Na^+(aq) + 2\ PO_4^{3-}(aq) + 3\ Ba^{2+}(aq) + 6\ Cl^-(aq) \rightarrow 6\ Na^+(aq) + 6\ Cl^-(aq) + Ba_3(PO_4)_2(s)$$

$$\boxed{3\ Ba^{2+}(aq) + 2\ PO_4^{3-}(aq) \longrightarrow Ba_3(PO_4)_2(s)}$$

7. What is the empirical formula of the mineral called ***galena***? It is 13.4% sulfur (symbol S) and 86.6% lead (symbol Pb).

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assume 100 g galena

$$13.4\ g\ S \times \frac{1\ mol\ S}{32.066\ g\ S} = 0.4179\ mol\ S$$

$$86.6\ g\ Pb \times \frac{1\ mol\ Pb}{207.2\ g\ Pb} = 0.4179\ mol\ Pb$$

} 1:1 ratio

$$\boxed{\text{empirical formula is } PbS}$$