Molar solubility obtainium, 3 cations & 1 anion. $K_{sp} = 0.0027$

$K_{sp} : 0.0027$     $[X^+][X^+][X^+][X^-]$

$X^4$

$\left( \dfrac{0.0027}{27} \right)^{.25} = 0.1 M$

$2.7 \times 10^{-7}$

1/31/13

Quiz 1. The $K_{sp}$ expresion for dissolution of ~~CB~~ $Cd_3 PO_3$ is:

$K_{sp} = 3Cd^{2+} \; 2PO_4^{3-}$

$[Cd^{2+}]^3 [PO_4^{3-}]^2$

2. The net ionic eqwation for following

$(NH_4)_2 CO_3 \, (aq) \; \cancel{+} \; CaCl_2 \, (aq) \rightarrow$

$NH_4 Cl + CaCO_3$
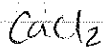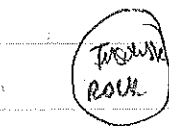
$CO_3^{2-} \, (aq) + Ca^{2+} \, (aq) + CaCl_2 \, (aq)$
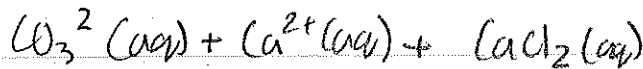
− Precipation insoluble solid that form and drops out of solution.

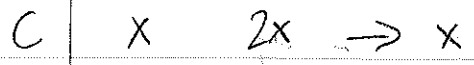− Spectator ion : ions that don't participate in the chemistry.

Group IA salts → soluble
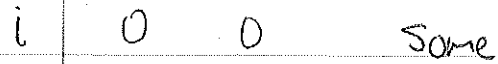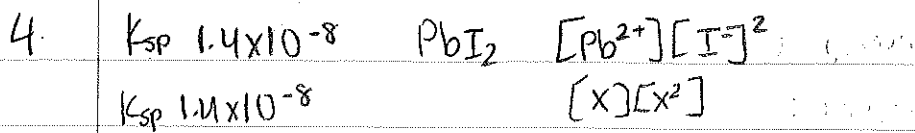
Ammonium salts → soluble

Nitrate salts → soluble

⊘ $CaCl_2$ dissolves completely into its ion which are surrounded by water molecules.

(through rour)    (Ca)   (Ca)    (Cl)    (Cl)

$CaCl_2$

$CaCl_2$

4   $K_{sp}$ $1.4 \times 10^{-8}$   $PbI_2$  $[Pb^{2+}][I^-]^2$

   $K_{sp}$ $1.4 \times 10^{-8}$        $[x][x^2]$

R  $Pb^{2+} + 2I^- \rightarrow PbI_2$

i   0    0     Some

C   X   2x $\rightarrow$ X

E   X   2x   Some — x

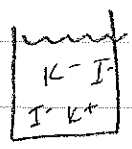$K_{sp} = (X)(2x)^2$

$\qquad 4x^3$

$Pb^{2+} = 1.5 \times 10^{-3}$  $[I^-] = 3.0 \times 10^{-3}$

The $\underset{molar}{Solubility} = 1.5 \times 10^{-3} = X$

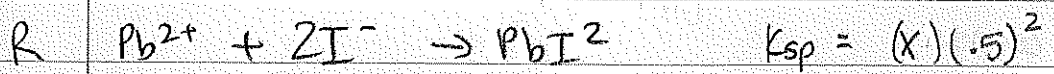$\dfrac{4x^3}{4} = \dfrac{1.4 \times 10^{-8}}{4}$

$X^3 = 1.5 \times 10^{-3}$

5)  $\boxed{(PbI_2)}$

0.5 M KI

what happens to solubility...

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

Poll  The $K_{sp}$ of $PbI_2$ is $1.4 \times 10^{-8}$ Predict $Pb^{2+}$ & $I^-$ in the solution described.

R  $Pb^{2+} + 2I^- \rightarrow PbI^2$     $K_{sp} = (x)(.5)^2$

I  0  2x+0.5 $\rightarrow$ $PbI^2$     $.25x$

C  X  2x+.5   very small    ignore x when attached

E  X  $(2x+.5)^2 = 1.4 \times 10^{-8}$   to big # or adding

$\boxed{[Pb^{2+}] \; 5.6 \times 10^{-8} \quad [I] = 0.5}$  it.

$Q > K$  precipate

$Q < K$    no precipate

Poll   AgCl    $K_{sp} = 1.8 \times 10^{-10}$    Will it precipitate?

$Q = 1.8 \times 10^{-6}$

$Q > K$  precipate will form.

8)  1L of 0.2M $Pb(NO_3)_2$ (aq)    0.2 moles of lead

1L of 0.2M  KI (aq)

$[Pb^{2+}]$ = 0.2 moles / 2 Liter  = $0.1M.$

$[I^-]$  = 0.2 moles / 2 Liter  = $0.1M$

Concentrations Pb =  0.1M

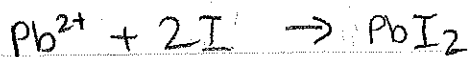concentration  I  =  0.1M.

4)    $Q_{sp}$  for $PbI^2$

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

$[0.1][0.1]^2$

$Q_{sp} = .001$    $1.0 \times 10^{-3}$

$K_{sp}$  $1.4 \times 10^{-8}$

.001 > $1.4 \times 10^{-8}$   so precipitate form.

10)  what is the mass of $PbI_2$ that was precipate?

$Pb^{2+} + 2I \rightarrow PbI_2$

assume
reaction goes to                        Limiting reactant.
100% completion.

0.2 moles    0.2 moles   →

(0.1M, 2L)  (0.1M, 2L)  →

$I^-$ (need twice as much)

Lead is left over:  0.1 mole  very little  $I^-$  will dissolve back.

Temperature Dependence on Solubility-
Solubility increases with $T$ for endothermic solution because $k_{sp}$ bigger.

Ksp is dependent on temp.
Solubility decreasing with increasing $T$ for exothermic solution because makes $k_{sp}$ smaller.