Station 1:

It is found that 1.892 x 10^{-13} grams of the compound cadmium (II) sulphide will dissolve in 350.0 mL of water to form a saturated solution. Using this data, calculate the value for the K_{sp} of CdS

$$CdS_{(s)} \rightleftharpoons Cd^{2+}_{(s)} + S^{2-}_{(s)} \qquad \text{(one source)}$$

$$S = \frac{1.892 \times 10^{-13}\ g}{0.3500\ L} \times \frac{1\ mol}{144.5\ g} = 3.741 \times 10^{-15}\ M$$

$$K_{sp} = [Cd^{2+}][S^{2-}] = S^2$$

$$= (3.741 \times 10^{-15})^2$$

$$= \boxed{1.399 \times 10^{-29}}$$

How did you do?

"I don't get it yet, but I'm trying."	*"I'm starting to get it."*	*"I get it."*	*"I really get it and can teach others how to do it."*

Station 2:

Up to 15.0g of barium chloride can be dissolved in 2.5L of $Al_2(SO_4)_3$ solution without forming a precipitate. Find the mass of aluminum in the solution.

$3BaCl_2 + Al_2(SO_4)_3 \rightleftharpoons 3BaSO_4(s) + 2AlCl_3$

$K_{sp} = 1.1 \times 10^{-10}$

$\frac{15.0\,g}{2.5\,L} \times \frac{1\,mol}{208.3\,g} = 0.0288\,M = [BaCl_2] = [Ba^{2+}]$

$K_{sp} = [Ba^{2+}][SO_4^{2-}]$

$[SO_4^{2-}] = \frac{1.1 \times 10^{-10}}{0.0288} = 3.8 \times 10^{-9}\,M$

$Al_2(SO_4)_3 \rightleftharpoons 2Al^{3+} + 3SO_4^{2-}$

$2.6 \times 10^{-9}\,M \quad 3.8 \times 10^{-9}\,M \times \frac{2}{3}$

$?\,g\,Al^{3+} = 2.5\,L \times \frac{2.6 \times 10^{-9}\,mol}{1\,L} \times \frac{27.0\,g}{1\,mol} = \boxed{1.7 \times 10^{-7}\,g}$

How did you do?

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Station 3:

Calculate the mass of Na_2CO_3 that must be added to 2.50 L of 0.00085 M $MgCl_2$ in order to just start precipitation

$Na_2CO_3 + MgCl_2 \rightleftharpoons 2NaCl + MgCO_{3(s)}$

$[MgCl_2] = [Mg^{2+}] = 0.00085$

$K_{sp} = [Mg^{2+}][CO_3^{2-}] = 6.8 \times 10^{-6}$

$[CO_3^{2-}] = \frac{6.8 \times 10^{-6}}{0.00085} = 0.0080\ M$

$Na_2CO_3 \rightleftharpoons 2Na^+ + CO_3^{2-}$

$0.0080\ M \qquad 0.0080\ M$

$?\ g\ Na_2CO_3 = 2.50\ L \times \frac{0.0080\ mol}{1\ L} \times \frac{106.0\ g}{1\ mol} = 2.12\ g$

How did you do?

"I don't get it yet, but I'm trying."	*"I'm starting to get it."*	*"I get it."*	*"I really get it and can teach others how to do it."*

Station 4:

A sample of a saturated solution of MgF_2 was evaporated and the following data table was constructed:

Mass of empty evaporating dish: 78.5418 g Mass of evaporating dish and MgF_2 residue after evaporation: 78.5434 g Volume of saturated MgF_2: 100.00 mL = 0.10000 L Temperature: 25.0 °C

Use this data to calculate the value of K_{sp} for MgF_2 at 25°C

MgF_2 residue = 78.5434 g − 78.5418 g = 0.0016 g

$$\frac{0.0016\ g}{0.10000\ L} \times \frac{1\ mol}{62.3\ g} = 2.6 \times 10^{-4}\ M = s$$

$$MgF_2 \rightleftharpoons Mg^{2+} + 2F^-$$
$$s \qquad 2s$$

$$K_{sp} = 4s^3 = 4(2.6 \times 10^{-4})^3 = 6.8 \times 10^{-11}$$

How did you do?

"I don't get it yet, but I'm trying."	*"I'm starting to get it."*	*"I get it."*	*"I really get it and can teach others how to do it."*

Station 5:

What is the maximum mass of copper (II) chloride you can add 100.0L of a 0.025M solution of sodium iodate without causing precipitation?

$CuCl_2 + 2\,NaIO_3 \rightleftharpoons Cu(IO_3)_{2\,(s)} + 2\,NaCl$

$[NaIO_3] =$

$[IO_3^-] = 0.025M \rightarrow$ $K_{sp} = [Cu^{2+}][IO_3^-]^2 = 6.9 \times 10^{-8}$

$[Cu^{2+}] = \frac{6.9 \times 10^{-8}}{(0.025)^2} = 1.1 \times 10^{-4} M$

$CuCl_2 \rightleftharpoons Cu^{2+} + 2Cl^-$

$1.1 \times 10^{-4} \quad 1.1 \times 10^{-4}$

$?\,g\,Cu^{2+} = 100.0\,L \times \frac{1.1 \times 10^{-4}\,mol}{1\,L} \times \frac{134.5\,g}{1\,mol}$

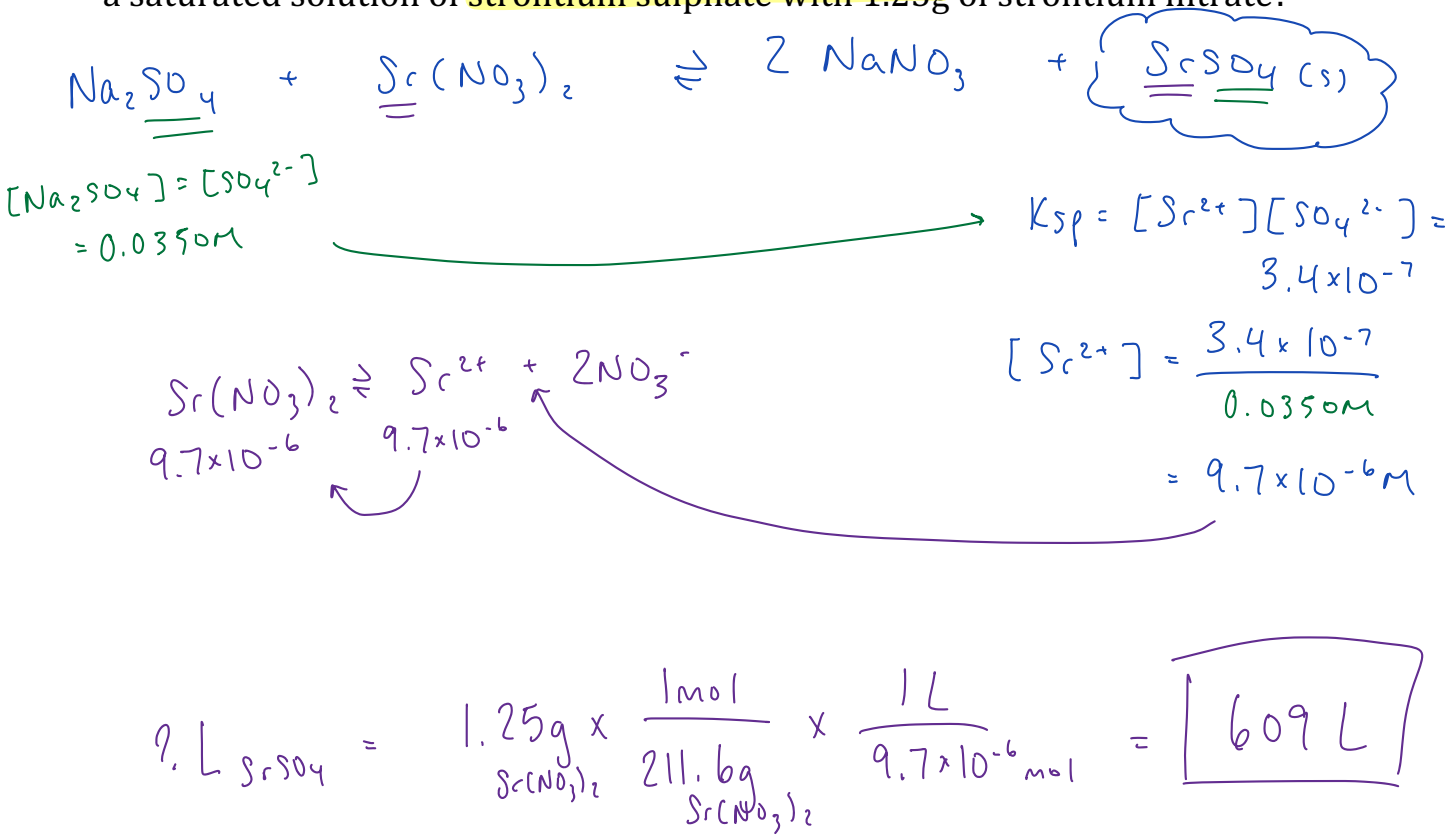
$= \boxed{1.48\,g}$

How did you do?

"I don't get it yet, but I'm trying."	*"I'm starting to get it."*	*"I get it."*	*"I really get it and can teach others how to do it."*

Station 6:

What is the maximum volume of 0.0350M sodium sulphate solution required to obtain a saturated solution of strontium sulphate with 1.25g of strontium nitrate?



$$?\,L_{SrSO_4} = 1.25\,g_{Sr(NO_3)_2} \times \frac{1\,mol}{211.6\,g_{Sr(NO_3)_2}} \times \frac{1\,L}{9.7\times10^{-6}\,mol} = \boxed{609\,L}$$

How did you do?

"I don't get it yet, but I'm trying."	*"I'm starting to get it."*	*"I get it."*	*"I really get it and can teach others how to do it."*

Station 7:

Calculate the $[Ag^+]$ required to just start precipitation of Ag_2CO_3 in a 0.0030 M solution of $(NH_4)_2CO_3$

$(NH_4)_2CO_3 + Ag^+ \rightleftharpoons Ag_2CO_{3(s)} + 2NH_4^+$

$[(NH_4)_2CO_3] = [CO_3^{2-}] = 0.0030M$

$K_{sp} = [Ag^+]^2[CO_3^{2-}] = 8.5 \times 10^{-12}$

$[Ag^+] = \sqrt{\frac{8.5 \times 10^{-12}}{0.0030M}}$

$= 5.3 \times 10^{-5} M$

How did you do?

"I don't get it yet, but I'm trying."	*"I'm starting to get it."*	*"I get it."*	*"I really get it and can teach others how to do it."*

Station 8:

If 250.0 mL of 3.40 x 10^{-4} M $Cu(NO_3)_2$ is mixed with 350.0 mL of 3.12 x 10^{-4} M KIO_3, will a precipitate form?

$Cu(NO_3)_2 + KIO_3 \rightleftharpoons Cu(IO_3)_{2(s)} + KNO_3$

$C_2 = \frac{(3.40 \times 10^{-4})(250.0)}{(600.0)}$

$= 1.42 \times 10^{-4} = [Cu^{2+}]$

$C_2 = \frac{(3.12 \times 10^{-4})(350.0)}{(600.0)}$

$= 1.82 \times 10^{-4} = [IO_3^-]$

Trial $K_{sp} = [Cu^{2+}][IO_3^-]^2$

$= (1.42 \times 10^{-4})(1.82 \times 10^{-4})^2$

$= 4.70 \times 10^{-12}$

$<$

Actual $K_{sp} = 6.9 \times 10^{-8}$

∴ No ppt will form

How did you do?

"I don't get it yet, but I'm trying."	*"I'm starting to get it."*	*"I get it."*	*"I really get it and can teach others how to do it."*