CHEM 12 DEMO: Competing solubility equilibria

*All concentrations are 0.1 M unless otherwise indicated.  
All reactants are added dropwise to the same test tube until a change is observed*

*Ask students to predict what will happen if the following is added:*

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| ADDED | Observation | Explanation |
| 2mL AgNO3 | Clear | Base solution – no reaction |
| Na2CO3 (0.1M) | Ppt forms | AgNO3 + Na2CO3 <---> Ag2CO3  + NaNO3  Ksp = 8.5 x 10-12 |
| HNO3 1.0M | Clear  Ppt dissolves | Ag2CO3 + HNO3 < --> AgNO3 + H2O + CO2  Students expect no change (2 spectators), but the reaction is driven forward by escaping CO2 .  (Le Chatelier!) No carbonate remains to form a ppt |
| NaOH 0.1M | Ppt forms | AgNO3 + NaOH <---> AgOH + NaNO3  Ksp = 2.0 x 10-8 |
| NaCl 0.1M | Ppt changes colour | AgOH + NaCl <---> AgCl + NaOH  Ksp = 1.8 x 10-10 |
| NH3 (6M) | Clear  Ppt dissolves | Ag+ + 2NH3 <---> [Ag(NH3)2]+ (aq)  *(Ag+ remains from minor dissolving of AgCl)*    Keq = 1.6x 107  At a [ ] of 6.0M, this forces it far to the product side.  This complex ion does not dissociate well, but it IS soluble |
| NaBr 0.1M | Ppt | Ag+ + NaBr <---> AgBr + Na+  Ksp = 5.4 x 10-13 |
| Na2S2O3 0.1M | Clear | Ag+ + 2S2O3-2 <---> [Ag2S2O3]-3 (aq)    Keq = 2 x 1013 |
| NaI 0.1M | Yellow ppt | Ag+ + NaI <---> AgI + Na+  Ksp = 8.5 x 10-17 |
| Na2S 0.1M (fresh) | Brown/grey ppt | AgI + Na2S <---> NaI + Ag2S  Ksp = 6 x 10-51 |

You can also add items from higher up the list. No change should occur.