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Name: Key
Blk: ____ Date: ____

Chemistry 12
The Common Ion Effect and Altering Solubility

1. The following table shows some compounds with low solubility in the left column. In column 2, a solution (reagent) is added. In column 3, indicate whether the solubility of the compound on the left will be increased, decreased or not affected. In column 4 give a brief explanation for your answer. You don't need to include equilibrium equations in your explanations in this case.

Low Solubility Compound	*Added Reagent*	*Effect on Solubility of Compound in Column 1*	*Explanation for Effect*
1. $SrSO_4$	$Ba(NO_3)_{2(aq)}$	increase	$SrSO_{4(s)} \rightleftharpoons Sr^{2+} + SO_4^{2-}$ (+ Ba^{2+}) ↓
2. Ag_2S	$AgNO_{3(aq)}$	decrease	$Ag_2S \rightleftharpoons 2Ag^+ + S^{2-}$ + NO_3^-
omit * $SrCO_3$	$HNO_{3(aq)}$ *(nitric acid)*	increase	$SrCO_{3(s)} \rightleftharpoons Sr^{2+} + CO_3^{2-}$ (CO_3^{2-} + H^+) ↓
3. $AgBr$	$Pb(NO_3)_{2(aq)}$	increase	$AgBr_{(s)} \rightleftharpoons Ag^+ + Br^-$ (Br^- + Pb^{2+}) ↓
4. $PbCl_2$	$KCl_{(aq)}$	decrease	$PbCl_{2(s)} \rightleftharpoons Pb^{2+} + 2Cl^-$
5. $Be(OH)_2$	$NaCl_{(aq)}$	no effect	$Be(OH)_{2(s)} \rightleftharpoons Be^{2+} + 2OH^-$
omit * $PbCO_3$	$HCl_{(aq)}$	increase	$PbCO_{3(s)} \rightleftharpoons Pb^{2+} + CO_3^{2-}$ (CO_3^{2-} + H^+) ↓
6. CuI	$CaI_{2(aq)}$	decrease	$CuI_{(s)} \rightleftharpoons Cu^{2+} + I^-$
7. Ag_2CO_3	$Na_2S_{(aq)}$	increase	$Ag_2CO_3 \rightleftharpoons 2Ag^+ + CO_3^{2-}$ (S^{2-}) ↓
8. $Ca_3(PO_4)_2$	$K_2SO_{4(aq)}$	increase	$Ca_3(PO_4)_{2(s)} \rightleftharpoons 3Ca^{2+} + 2PO_4^{3-}$ (SO_4^{2-}) ↓

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omit

2. Given that natural rainwater is slightly acidic, explain why rain will slowly dissolve limestone ($CaCO_{3(s)}$) over a period of time. Give a full explanation including relevant equilibrium equations.

$CaCO_3(s) \rightleftharpoons Ca^{2+} + [CO_3^{2-} + H^+] \downarrow$

(Unit IV)

3. Silver sulphate is a white precipitate with low solubility. When a solution of ammonium sulphide ($(NH_4)_2S_{(aq)}$) is added, the white precipitate slowly dissolves and a black precipitate forms on the bottom. Using **equilibrium equations** and clear explanations, indicate what happened here.

$Ag_2SO_4(s) \rightleftharpoons [2Ag^+ + S^{2-}] + SO_4^{2-}$
(white)

$\downarrow\downarrow$

$Ag_2S(s)$ (black)

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4. Name two compounds (not just ions) that can ***decrease*** the solubility of $BaSO_{4(s)}$ and explain **why** each one of them works

$BaSO_4(s) \rightleftharpoons Ba^{2+} + SO_4^{2-}$

a) $Ba(NO_3)_2 \rightarrow \uparrow [Ba^{2+}]$ ∴ shift to reactants.

b) $Na_2SO_4 \rightarrow \uparrow [SO_4^{2-}]$ ∴ shift to reactants.

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5. Name a substance (not just an ion) which could ***increase*** the solubility of $BeCO_{3(s)}$. Explain why this substance works.

$BeCO_3(s) \rightleftharpoons [Be^{2+} + OH^-] \downarrow + CO_3^{2-}$

a) NaOH

b) Na_3PO_4 or Na_2CO_3 or Na_2SO_3

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6. Briefly explain what is meant by the ***common ion effect***.

The addition of a particular ion to prevent a ~~pe~~ salt from dissolving (decreasing solubility).

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