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Name: Key
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Chemistry 12
SOLUBILITY LESSON # 9
Removing Pollution and Hardness from Water by PRECIPITATION

Before attempting this assignment please read pgs 102-105 in HEBDEN

1. Under certain conditions biological systems can tolerate certain metallic ions. Give the conditions and examples of ions that are toxic to biological systems.

/2 Heavy metal ions such as Cu^{2+}, Hg^{2+} & Pb^{2+} interfere w biochemical rxns & are toxic to organisms that ingest them. The greater the concentration of the heavy metal ion, the greater their toxicity

2. Explain the technique used by industrial mining operations to remove undesired metal ions from their "waste water".

/2 "waste water" containing $[Cd^{2+}]$ has to be lowered before the waste water can be discharged into the water system. The mines use sufficient $[OH^-]$ to form the ppt $Cd(OH)_2$ ∴ decreasing the $[Cd^{2+}]$ through precipitation

3. Explain, in detail, where "hardness in water' comes from.(Use equations to support your answer)

/4 The term "hardness" comes from the presence of Ca^{2+} and/or Mg^{2+} in water.

- Ca^{2+} is present in water as a result of acid action on limestone: $CaCO_{3(s)} + H^+ \rightleftharpoons Ca^{2+} + CO_{2(g)}$
- atmospheric CO_2 also combines w $CaCO_3 + H_2O$ + Heat to form HCO_3^- : $CaCO_{3(s)} + CO_{2(g)} + H_2O \rightleftharpoons Ca^{2+} + HCO_3^-$ + heat

→ Mg^{2+} is also present (to a smaller extent) in $MgCO_3$

4. List the THREE effects that "hardness in water" has on water.

1. Bitter taste b/c of the presence of Ca^{2+} / Mg^{2+}

3/3 2. deposits of $CaCO_3$ / $MgCO_3$ left in pipes/kettles interfere c steam (mes + function of kettles

3. inhibits the cleaning action of soap (it won't lather)

5. Explain the most common method used to "soften water".

The addition of washing soda ($Na_2CO_3 \cdot 10H_2O$)

1/1 ∴ ppts of $CaCO_3$ + $MgCO_3$ eliminates the Ca^{2+} and Mg^{2+} ions

6. Explain the difference between the terms "Temporarily Hard Water" and "Permanently Hard Water".

Water that contains Mg^{2+} / Ca^{2+} + HCO_3^- is said to be "Temporarily hard" b/c the heating of it will remove the "hardness"

1/2 Water c Mg^{2+} + Ca^{2+} but NOT HCO_3^- is said to be "permanently hard"

Seatwork/Homework: Exercises 76- 80
PLO's: H7