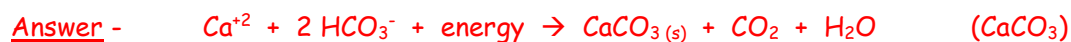


Common Ion Effect

- 1.) A new kettle was used to make tea using "temporarily hard" water. After a few weeks there was a thin layer of white scale on the inside of the kettle. Suggest the chemical formula for the kettle scale.



(temporary differs from permanent only in the fact that HCO₃⁻ is also dissolved in the water with the Ca⁺²).

- 2.) Is it possible to distinguish between temporarily hard and permanently hard water by adding washing soda and seeing if a precipitate forms?

Answer - No. adding Na₂CO₃ (washing soda) will precipitate the Mg⁺² and the Ca⁺² whether there is HCO₃⁻ or not. If HCO₃⁻ is present (as in the question above) then only heat is required to precipitate the Ca⁺² and Mg⁺².

- 3.) Cities whose water supply has temporarily hard water often have problems with the hot water pipes in homes becoming clogged and having decreased water flow. Why might this be?

Answer - as some of the water evaporates or is heated the Ca⁺² (and to a lesser extent Mg⁺²) are precipitating out and clogging the pipes up over time.

- 4.) The solubility of Sr(OH)₂ is about 0.5 M at 25°C. What are two ways you could increase the solubility and decreasing the solubility in water.

Answer -

Increase

Decrease

1.) - increase temperature

- decrease temperature

2.) - add CaS. The S⁻² will precipitate out Sr⁺² and shift equilibrium right.

- add NaOH. The increased OH⁻ will drive the equilibrium to the reactants.

(Common ion effect)

(Common ion effect)

- 5.) A metal plate had an unwanted coating of CaCO₃ (s). How might you dissolve this coating?

Answer - increase solubility of CaCO₃. Add a chemical like Na₃PO₄ to dissolve the Ca⁺².

- 6.) In which solution would SrCl₂ (s) be the most soluble? In which would it be least soluble? Explain.

a. 1 M NaNO₃

b. 1 M Na₂SO₄

c. 1 M Sr(NO₃)₂

d. 1 MgCl₂

Answer - Most soluble in Na₂SO₄ as the sulphate will precipitate with the strontium, driving the reaction to the products (more soluble).

- Least soluble in MgCl₂ as the chloride is a common ion and so drives the reaction back to the reactant (solid SrCl₂). The Sr(NO₃)₂ is also a common ion like the Cl⁻ BUT the Cl⁻ is trice as concentrated from the MgCl₂ driving the reaction to the reactants more!