Year 11 Chemistry

Equations, Water and Energy Revision ***SOLUTIONS*** 2

1.

(a) $(NH_4)_2O$ (soluble)
(b) $FeBr_3$ (soluble)
(c) $Cu(OH)_2$ (insoluble)
(d) $NaHCO_3$ (soluble)
(e) K_2SO_4 (soluble)
(f) PbI_4 (insoluble)
(g) $BaCO_3$ (insoluble)
(h) Hg_3PO_4 (insoluble)
(i) AuF_2 (soluble)
(j) K_3P (soluble)
(k) $NiCl_2$ (soluble)
(l) MnS (insoluble)

2. Everything is soluble as nitrate, so that information is not helpful.
Insoluble as iodide, therefore must be silver, mercury or lead.
Insoluble as oxide, therefore must not be calcium or barium.
Insoluble as sulphate, therefore barium, strontium or lead.
The cation must be lead.

3.

(a) $SO_4^{2-}{}_{(aq)} + Pb^{2+}{}_{(aq)} \rightarrow PbSO_{4\,(s)}$
(b) $K_{(s)} + 2H_2O_{(l)} \rightarrow H_{2\,(g)} + K^+{}_{(aq)} + 2OH^-{}_{(aq)}$
(c) $Ag_2CO_{3\,(s)} + 2H^+{}_{(aq)} \rightarrow H_2O_{(l)} + CO_{2\,(g)} + 2Ag^+{}_{(aq)}$
(d) $C_5H_{12\,(g)} + 8O_{2\,(g)} \rightarrow 5CO_{2\,(g)} + 6H_2O_{\,(l)}$
(e) $I_{2\,(l)} + Ba_{(s)} \rightarrow BaI_{2\,(s)}$
(f) $H^+{}_{(aq)} + OH^-{}_{(aq)} \rightarrow H_2O_{(l)}$
(g) $6H^+{}_{(aq)} + 2PO_4^{3-}{}_{(aq)} + 3Ca_{(s)} \rightarrow 3H_{2\,(g)} + Ca_3(PO_4)_{2\,(s)}$
(h) $LiHCO_{3\,(s)} + H^+{}_{(aq)} \rightarrow H_2O_{(l)} + CO_{2\,(g)} + Li^+{}_{(aq)}$

4. Latent heat of fusion is absorbed/released during melting/freezing, whereas latent heat of vaporisation is absorbed/released during evaporation/condensation.

5.

(a) $\Delta H = mL = 2.69 \times 439 = 1181\ J$

(b) $\Delta H = mc_p\Delta T$

$$\Delta T = \frac{\Delta H}{mc_p} = \frac{4680}{783 \times 3.32} = 1.80\ ^\circ C$$

Absorbs energy so temperature increases. Final temperature is 27.8 + 1.80 = 29.6°C

6. (a) Soap works by attaching its polar end to the water and its non-polar end to the grease, allowing the grease to be washed away with the soap and water. The cations in hard water (Mg^{2+} and Ca^{2+}) form an insoluble scum with the soap molecules, preventing this.

(b) Permanent hardness involved SO_4^{2-} ions but temporary involves HCO_3^- ions.
Temporary hardness can be removed by boiling (decomposing the HCO_3^- into CO_3^{2-})

7. (a) The filters will not be able to filter as quickly and effectively (they will get clogged quickly)
(b) The distributed water will contain harmful micro-organisms

8. (a) Water has strong hydrogen bonds so the molecules are hard to break apart from each other.
(b) It is highly polar so it can break up and surround charged particles.
(c) As water freezes it spreads out into a 3D lattice structure, becoming less dense.