Stage 3 - Set 7 Answers: Reaction types

1. a) $CH_3COOH(\ell) + H_2O(\ell) \rightarrow CH_3COO^-(aq) + H_3O^+(aq)$

b) $NH_3(g) + H_2O(\ell) \rightarrow NH_4^+(aq) + H_3O^+(aq)$

c)

$NaHCO_3(s) \rightarrow Na^+(aq) + HCO_3^-(aq)$

$HCO_3^-(aq) + H_2O(\ell) \rightarrow H_2CO_3(aq) + OH^-(aq)$

$HCO_3^-(aq) + H_2O(\ell) \rightarrow CO_3^{2-}(aq) + H_3O^+(aq)$

d) $NaHSO_4(aq) \rightarrow Na^+(aq) + HSO_4^-(aq)$

$HSO_4^-(aq) + H_2O(\ell) \rightarrow SO_4^{2-}(aq) + H_3O^+(aq)$

e) $K_2CO_3(s) \rightarrow 2K^+(aq) + CO_3^{2-}(aq)$

$CO_3^{2-}(aq) + H_2O(\ell) \rightleftharpoons HCO_3^-(aq) + OH^-(aq)$

f) $NH_4CH_3COO(s) \rightarrow NH_4^+(aq) + CH_3COO^-(aq)$

$NH_4^+(aq) + H_2O(\ell) \rightleftharpoons NH_3(aq) + H_3O^+(aq)$

$CH_3COO^-(aq) + H_2O(\ell) \rightleftharpoons CH_3COOH(aq) + OH^-(aq)$

2. a) i) $H^+(aq) + OH^-(aq) \rightarrow H_2O(\ell)$

ii) Two colourless solutions are mixed together. No visible reaction; some heat evolved.

b) i) $Ba(OH)_2(s) + 2H^+(aq) \rightarrow Ba^{2+}(aq) + 2H_2O(\ell)$

ii) A white solid dissolves in a colourless solution.

c) i) $MgO(s) + 2H^+(aq) \rightarrow Mg^{2+}(aq) + H_2O(\ell)$

ii) A white solid dissolves in a colourless solution.

d) i) $CH_3COOH(aq) + NH_3(aq) \rightarrow NH_4^+(aq) + CH_3COO^-(aq)$

ii) Two colourless solutions are mixed. There are no visible reactions. There is a reduction in the vinegar smell.

e) i) $Zn(s) + 2H^+(aq) \rightarrow Zn^{2+}(aq) + H_2(g)$

ii) A silver solid dissolves in a colourless solution; colourless, odourless gas evolved

f) i) $2CH_3COOH(aq) + Mg(s) \rightarrow Mg^{2+}(aq) + 2CH_3COO^-(aq) + H_2(g)$

ii) A silver solid dissolves in a colourless solution; colourless, odourless gas evolved.

g) i) $Cu(s) + 4H^+(aq) + 2NO_3^-(aq) \rightarrow Cu^{2+}(aq) + 2NO_2(g) + 2H_2O(\ell)$

ii) A brown solid dissolves in a colourless solution to produce a brown, pungent gas evolved and a blue solution.

h) i) $Ni(s) + 2H^+(aq) \rightarrow Ni^{2+}(aq) + H_2(g)$

ii) A silver solid dissolves in a colourless solution to form a colourless, odourless gas evolved and green solution.

i) i) $Fe(s) + 2H^+(aq) \rightarrow Fe^{2+}(aq) + H_2(g)$

ii) A silver solid dissolves in a colourless solution to form a colourless, odourless gas evolved and a pale green solution.

3. a) i) $Br_2(\ell) + 2I^-(aq) \rightarrow 2Br^-(aq) + I_2(s)$

ii) A brown/orange liquid is added to a colourless solution. The brown/orange colour fades and a dark brown solid forms

b) i) $Mg(s) + Fe^{2+}(aq) \rightarrow Mg^{2+}(aq) + Fe(s)$

ii) A silver solid is added to a pale green solution. A black precipitate forms on silver solid; pale-green solution colour fades to colourless.

c) i) $Cu(s) + 2Ag^+(aq) \rightarrow Cu^{2+}(aq) + 2Ag(s)$

ii) A brown solid is added to a colourless solution. A black precipitate forms on brown solid; colourless solution turns blue.

d) i) $Zn(s) + Ni^{2+}(aq) \rightarrow Zn^{2+}(aq) + Ni(s)$

ii) A silver solid is added to a green solution. A black precipitate forms on silver solid; green solution colour fades to colourless.

e) i) $2Na(s) + 2H_2O(\ell) \rightarrow 2Na^+(aq) + 2OH^-(aq) + H_2(g)$

ii) A silver/white solid reacts vigorously with a colourless liquid to forma colourless, odourless gas.

f) i) $2K(s) + 2H_2O(\ell) \rightarrow 2K^+(aq) + 2OH^-(aq) + H_2(g)$

ii) A silver/white solid reacts vigorously with a colourless liquid to produce a colourless, odourless gas.

g) i) $C\ell_2(g) + 2Br^-(aq) \rightarrow 2C\ell^-(aq) + Br_2(aq)$

ii) A green pungent gas dissolves in a colourless solution to form a brown/orange solutions.

4. a) i) $Ag^+(aq) + C\ell^-(aq) \rightarrow AgC\ell(s)$

ii) Two colourless solutions are mixed to form a white precipitate.

b) i) $Ag^+(aq) + Br^-(aq) \rightarrow AgBr(s)$

ii) Two colourless solutions are mixed to form a cream/white solid.

c) i) $Pb^{2+}(aq) + 2\ I^-(aq) \rightarrow PbI_2(s)$

ii) Two colourless solutions are mixed to form a yellow precipitate.

d) i) $Ca^{2+}(aq) + SO_4^{2-}(aq) \rightarrow CaSO_4(s)$

ii) Two colourless solutions are mixed to form a white precipitate

e) i) $Ba^{2+}(aq) + OH^-(aq) + SO_4^{2-}(aq) + H^+(aq) \rightarrow BaSO_4(s) + H_2O(\ell)$

ii) Two colourless solutions are mixed to form a white precipitate.

f) i) $Fe^{2+}(aq) + CO_3^{2-}(aq) \rightarrow FeCO_3(s)$

ii) A pale green solution is mixed with a colourless solution to forma pale green precipitate. The green solution colour fades.

g) i) $3\ Zn^{2+}(aq) + 2\ PO_4^{3-}(aq) \rightarrow Zn_3(PO_4)_2(s)$

ii) Two colourless solutions are mixed together to form a white precipitate.

h) i) $Cu^{2+}(aq) + 2\ OH^-(aq) \rightarrow Cu(OH)_2(s)$

ii) A blue solution is mixed with a colourless solution to form a blue precipitate. The blue solution colour fades.

i) i) $2\ Cr^{3+}(aq) + 3\ CO_3^{2-}(aq) \rightarrow Cr_2(CO_3)_2(s)$

ii) A green solution is mixed with a colourless solution to form a green precipitate. The green solution colour fades.