Solutions

Marking: **M1** a correct method, **A1** the correct answer, **B1** an independent mark.

Each answer shows the steps, then the **result**.

2.1

H_2O; OH^-

2.2

(a) **2.30**; (b) $[H^+] = \dfrac{1.0 \times 10^{-14}}{0.010} = 1.0 \times 10^{-12}$; pH = **12.00**

2.3

HCl ionizes completely, ethanoic acid only partly; so ethanoic acid has a lower $[H^+]$; ethanoic acid conducts electricity less well / reacts more slowly with Mg (fewer bubbles)

2.4

it can donate a proton; and it can accept a proton; $HCO_3^- + H_2O \rightleftharpoons CO_3^{2-} + H_3O^+$

3.1

(a) $H^+(aq) + OH^-(aq) \rightarrow H_2O(l)$

(b) $n(NaOH) = 0.100 \times 0.02150 = 2.150 \times 10^{-3}$ mol; $n(HCl) = 2.150 \times 10^{-3}$ mol; $c = \dfrac{2.150 \times 10^{-3}}{0.0250} = \mathbf{0.0860\ mol\ dm^{-3}}$

(c) $-\log 0.0860 = \mathbf{1.07}$

(d) 7

3.2

(a) $K_w = [H^+][OH^-]$

(b) $[H^+] = \sqrt{5.5 \times 10^{-14}} = 2.3 \times 10^{-7}$; pH = **6.63**

(c) $[H^+] = [OH^-]$

(d) endothermic; K_w increases with temperature, so the equilibrium shifts right when heated

(e) 100

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