Solutions

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

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

2.1

- strong acid: pH 1 (or 0–2), red
- neutral: pH 7, green

2.2

- zinc sulfate
- water

2.3

- bubble the gas through limewater
- it turns milky (cloudy)

2.4

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

3.1

- moles $H_2SO_4 = 0.050 \times 20.0 \div 1000 = 0.0010$
- moles $NaOH = 0.0020$
- $0.0020 \div 0.0250 = \mathbf{0.080}$ mol/dm^3

3.2

- add sodium hydroxide solution and warm
- test the gas with damp red litmus paper
- it turns blue (ammonia is given off)

3.3

(a) $CuO(s) + H_2SO_4(aq) \rightarrow CuSO_4(aq) + H_2O(l)$

(b) excess makes sure all the acid has reacted, so the solution contains only the salt and water, with no acid left; the excess solid is removed by filtration, leaving the solution as the filtrate

(c) moles CuO $4.0 \div 80 = 0.050$; moles $CuSO_4 = 0.050$; $0.050 \times 160 = \mathbf{8.0}$ g

(d) points to include:

- pour the filtrate into an evaporating basin (K)
- heat gently to evaporate some water until the solution is saturated (crystals form on a cold glass rod) (K)
- leave the solution to cool slowly, so crystals form (K)
- filter off the crystals (K)
- wash them with a small amount of cold distilled water (App)
- dry them between filter papers or in a warm place; do not heat strongly, as the water of crystallisation would be lost (An)

Levels: **5–6** a full, logical answer with correct chemistry and correct terms; **3–4** several correct points, partly linked; **1–2** one or two relevant points.

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