

Question 20 (Answer: **D**)

- Ethanoic acid is a **weak** acid: only a small fraction of its molecules dissociate at any moment.
- It still behaves as an acid, so it does give carbon dioxide with a carbonate and hydrogen with magnesium.
- Only the -COOH hydrogen is acidic; the three on the CH_3 group are never released.

Question 22 (Answer: **D**)

- HBr gives its proton to the ammonia, which becomes NH_4^+ .
- A proton donor is an acid on the Brønsted–Lowry definition.
- It is used up in the reaction, so it cannot be a catalyst.

Question 21 (Answer: **A**)

- A base reacts with an ammonium salt to release ammonia gas.
- It is **acids** that give carbon dioxide from a carbonate and hydrogen from a metal.
- And copper is below hydrogen, so it gives no hydrogen with acid either.

Question 24 (Answer: **C**)

- The concentrations are equal, so any difference in rate must come from the **strength** of the acid.
- A strong acid is fully dissociated, so it has more H^+ and reacts faster.
- But the total volume of hydrogen is the same, because the moles of acid available are the same.

Question 34 (Answer: **B**)

- Ethanoic acid is an acid, so it gives carbon dioxide with a carbonate.
- With magnesium it gives **hydrogen**, not oxygen.
- Being acidic, it turns blue litmus red and methyl orange red – not the other way round.

4(a)(i)	H^+
4(a)(ii)	M1 complete (dissociation) M2 partial (dissociation)

4(a)(iii)	ethanoic (acid)
4(a)(iv)	colourless
4(a)(v)	M1 SO_4^{2-} M2 CH_3COO^-
4(a)(vi)	M1 hydrogen M2 oxygen
4(a)(vii)	calcium ethanoate
4(b)(i)	proton acceptor
4(b)(ii)	insoluble
4(b)(iii)	aluminium oxide
4(b)(iv)	M1 use of -18 or (9×-2) or $(3 \times 3 \times -2)$ M2 $+5$

Question 18 (Answer: **D**)

- What makes an acid strong or weak is the *fraction* that dissociates, not how much dissolves.
- Only 0.0048 of R's 0.10 mol dissociates, so R is a weak acid.
- Compare that fraction with S's to decide which solution has the lower pH.

Question 19 (Answer: **A**)

- Hydrochloric acid is strong, so it dissociates completely – a single forward arrow.
- Ethanoic acid is weak, so only some molecules dissociate – a reversible double arrow.
- It is the arrows, not the formulae, that distinguish strong from weak.

Question 22 (Answer: **A**)

- Nitric acid is strong, so it dissociates completely and gives a high H^+ concentration.
- Propanoic acid is weak: only partly dissociated, so even at four times the concentration its pH is higher.
- pH reflects the H^+ concentration, not the concentration of acid put in.