

Net ionic equations, titration and redox

AP Chemistry · Test answers (mark scheme)

Marking points follow each answer. Give method marks for correct working even if the final value has a rounding slip, and accept equivalent wording in explanations. Equations need correct species, states and balance to earn full marks.

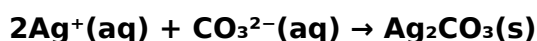
Level: AP Chemistry · **Curriculum:** AP Chem Unit 4

Question 1 Oxidation numbers (2 marks)

K is +1 and O is -2: Mn = +7. H is +1 and O is -2: $2(+1) + x + 3(-2) = 0$, so S = **+4**.
Answers: **+7 and +4**.

Marking: 1 each.

Question 2 Net ionic equation (3 marks)



Marking: 1 species, 1 states, 1 balanced atoms and charge.

Question 3 Predict precipitates (2 marks)

(a) **Yes, PbCl_2** . (b) **No**: all combinations are soluble.

Marking: 1 each.

Question 4 Titration calculation (3 marks)

$n(\text{HCl}) = 0.01560 \times 0.1200 = 1.872 \times 10^{-3} \text{ mol} = n(\text{KOH})$; $c = 1.872 \times 10^{-3} / 0.02000 =$
0.0936 mol/L.

Marking: 1 moles, 1 ratio, 1 answer.

Question 5 Limiting reagent (3 marks)

$n(\text{Ba}^{2+}) = 5.00 \times 10^{-3} \text{ mol}$; $n(\text{SO}_4^{2-}) = 3.00 \times 10^{-3} \text{ mol}$. **Na_2SO_4 is limiting**.
 $m = 3.00 \times 10^{-3} \times 233.39 =$ **0.700 g**.

Marking: 1 amounts, 1 limiting reagent, 1 mass.

Question 6 Redox agents (2 marks)

Cu²⁺ is the oxidising agent (reduced); **Al** is the reducing agent (oxidised).

Marking: 1 each.

Question 7 Titration curve (3 marks)

a. About **25 mL and pH 7**.

b. $n(\text{NaOH}) = 0.0250 \times 0.100 = 2.50 \times 10^{-3} \text{ mol} = n(\text{HCl})$; $c = 2.50 \times 10^{-3} / 0.0250 = \mathbf{0.100 \text{ mol/L}}$.

Marking: 1 + 2.

Question 8 Spectator ions (2 marks)

A spectator ion is present on both sides of the equation and takes no part in the reaction.
Here **Na⁺ and Cl⁻** are spectators; the net change is $\text{H}^+ + \text{OH}^- \rightarrow \text{H}_2\text{O}$.

Marking: 1 definition, 1 ions.