

Inorganic Chemistry Review 1

(a) Solution X contains **four** metal cations. The following tests were carried out to identify these cations.

	Test	Observation
①	Dilute HCl was added to a small portion of X.	No precipitate.
②	H ₂ S was bubbled through the solution from ① above.	A black precipitate (P₁)
③	P₁ was separated by filtration. The filtrate was boiled to remove the H ₂ S, cooled, and NH ₄ Cl/NH ₄ OH was added.	A green precipitate (P₂)
④	P₂ was separated by filtration and H ₂ S was bubbled through the filtrate.	A white precipitate (P₃)
⑤	P₃ was separated by filtration. The filtrate was boiled to remove the H ₂ S, cooled, and (NH ₄) ₂ CO ₃ was added.	A white precipitate (P₄)

The following tests were carried out on precipitates **P₁**, **P₂**, **P₃** and **P₄**.

Precipitate	Test	Observation
P₁	P₁ was dissolved in hot dil. HNO ₃ and conc. NH ₄ OH was added in excess.	A deep blue coloured solution (solution 1)
P₂	* Excess dil. NaOH was added to P₂ followed by H ₂ O ₂ . * Dilute H ₂ SO ₄ was added to solution 2 .	A yellow coloured solution (solution 2) An orange coloured solution (solution 3)
P₃	* P₃ was dissolved in dil. HCl and dil. NaOH was added gradually. * Addition of dil. NaOH was continued.	A white precipitate (P₅) P₅ dissolved to give a colourless solution (solution 4)
P₄	P₄ was dissolved in conc. HCl and subjected to the flame test.	A brick-red flame

- (i) Identify the **four** metal cations in solution X (**Reasons are not required.**)
- (ii) Identify the precipitates **P₁**, **P₂**, **P₃**, **P₄** and **P₅** and the chemical species responsible for the colours of **solutions 1, 2, 3** and **4**.
(**Note:** Write chemical formulae only.)