

Name _____ Block: _____ Date: _____

Chemistry 12

QUALITATIVE ANALYSIS

- 1) Identify a **cation** that could be added to an aqueous mixture containing SO_4^{2-} and S^{2-} to separate the ions by precipitating one of them.

- 2) Identify a **solution** that could be used to separate the cations Al^{3+} and Ba^{2+} from each other by precipitation.

- 3) Identify a **solution** that could be used to separate the anions SO_4^{2-} and CO_3^{2-} from each other by precipitation.

- 4) A solution is prepared containing both 0.2 M OH^- and 0.2 M PO_4^{3-} ions. An equal volume of a second solution is added in order to precipitate only one of these anions. Identify a cation that the second solution must contain.

- 5) Devise a scheme to individually precipitate and remove the cations from a solution containing Mg^{2+} , Sr^{2+} and Pb^{2+} . As a part of your scheme, provide the compounds added, the net ionic equations and the method of removal.

6) Devise a scheme to individually precipitate and remove the cations from a solution containing OH^- , S^{2-} and Br^- . As a part of your scheme, provide the compounds added, the net ionic equations and the method of removal.

7) A solution contains the cations Pb^{2+} , Ba^{2+} and Fe^{2+} . Devise a scheme to individually precipitate two of the cations and separate them from the solution. As part of your answer, provide the compounds added, the net ionic equations and the method of removal.

8) An experiment is conducted to identify an unknown cation that is present in each of four beakers.

Diagram illustrating the addition of reagents to four beakers:

- Beaker 1: Na_2CO_3 added, resulting in a precipitate.
- Beaker 2: MnSO_4 added, resulting in no precipitate.
- Beaker 3: $(\text{NH}_4)_2\text{S}$ added, resulting in a precipitate.
- Beaker 4: RbNO_3 added, resulting in no precipitate.

Which of the following could be the unknown cation?

Ag^+ , Ba^{2+} , Fe^{3+} or Be^{2+}

9) A reagent that may be used to separate Cl^- from S^{2-} by precipitation is:

- A. KNO_3 B. $\text{Pb}(\text{NO}_3)_2$ C. AgNO_3 D. $\text{Al}(\text{NO}_3)_3$

10) A solution contains both Ag^+ and Mg^{2+} ions. During selective precipitation, these ions are removed one at a time by adding:

- A. OH^- followed by S^{2-} C. SO_4^{2-} followed by Cl^-
 B. I^- followed by OH^- D. NO_3^- followed by PO_4^{3-}

11) A precipitate forms when a 0.20 M solution containing an unknown cation is added to SO_4^{2-} , but not when an equal volume is added to S^{2-} . What is the possible identity of the unknown cation?

Diagram illustrating the addition of 0.20 M unknown cation to two test tubes:

- Test tube 1: 0.20 M SO_4^{2-} solution, resulting in a precipitate.
- Test tube 2: 0.20 M S^{2-} solution, resulting in no precipitate.

12) A solution contains 0.2 M Zn^{2+} and 0.2 M Sr^{2+} . An equal volume of a second solution was added, forming a precipitate with Sr^{2+} but not with Zn^{2+} . What is present in the second solution?

13) A solution containing an unknown cation was added to three solutions and the following observations were recorded:

What is the identity of the unknown cation?)

SOLUTION	OBSERVATION
NaI	no precipitate
Na ₂ SO ₄	precipitate
NaOH	no precipitate

14) Consider the following experiment:

What **anion** could the unknown solution contain?

