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### Pre-Lab Assignment for Qualitative Analysis of Cations in Solution

1. Match the following terms to their definitions: Aqueous solution, cation, centrifuge, decant, flame test, precipitate, qualitative analysis, supernate

Definition	Term
a. an ion with a positive charge	Cation
b. the systematic separation and identification of the chemical components in an unknown sample	Qualitative analysis
c. a solution of one (or more) substances dissolved in water	aqueous solution
d. an insoluble solid formed when two solutions are mixed	precipitate
e. an instrument that spins test tubes to separate solids from liquids	centrifuge
f. the liquid above a solid after a mixture has been centrifuged	supernate.
g. the process of pouring a liquid from one container to another without transferring the solid at the bottom of the container	decanting
h. a method for identifying an ion using the color the ion emits when placed in a flame	flame test.

2. What are the three cations you will study in this experiment?

$Ba^{2+}$ ,  $Ca^{2+}$ ,  $Mg^{2+}$

3. If you put a drop of basic solution on red litmus paper, what will be the color of the wet spot?

Blue spot

4. Where should you place the looped end of the wire during a flame test?

The edge of a bunsen burner flame.

5. Read the procedure carefully to answer the following questions.

- a. Which cation is confirmed in test tube #1 by a green flame test? Ba<sup>2+</sup>
- b. Which cation is confirmed in test tube #2 by a brick-red flame test? Ca<sup>2+</sup>
- c. Which cation is confirmed in test tube #3 by a blue gel precipitate? Mg<sup>2+</sup>

6. Why is it necessary to wash all test tube with soap and water and rinse with deionized (DI) water before using them in this experiment?

to remove any traces of tap water.

7. Use the following observations and refer to the steps 6 through 9 of the procedure to determine which cations (Ba<sup>2+</sup>, Ca<sup>2+</sup>, Mg<sup>2+</sup>) are present and absent in an unknown solution.

- a. The unknown solution in test tube #1 plus (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub> gives a white precipitate. Ba<sup>2+</sup>
- b. The supernate in test tube #1 is poured into test tube #2.
- c. The flame test of the white precipitate remaining in test tube #1 produces a green flame.
- d. The solution in test tube #2 plus (NH<sub>4</sub>)<sub>2</sub>C<sub>2</sub>O<sub>4</sub> gives a white precipitate.
- e. The supernate in test tube #2 is poured into test tube #3.
- f. The flame test of the white precipitate remaining in test tube #2 produces a brick red flame.
- g. The solution in test tube #3 plus Na<sub>2</sub>HPO<sub>4</sub> and NaOH gives a white precipitate.
- h. The white precipitate in test tube #3 dissolves in HCl; magnesium indicator and NaOH is added until the solution tests basic. A blue gel is observed at the bottom of the test tube after centrifuging.

Cation(s) present Ba<sup>2+</sup>, Ca<sup>2+</sup> Cation(s) absent Mg<sup>2+</sup>

8. Use the following observations and refer to the steps 6 through 9 of the procedure to determine which cations (Ba<sup>2+</sup>, Ca<sup>2+</sup>, Mg<sup>2+</sup>) are present and absent in an unknown solution.

- The unknown solution in test tube #1 plus (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub> gives no reaction.
- The solution in test tube #1 is poured into test tube #2.
- The solution in test tube #2 plus (NH<sub>4</sub>)<sub>2</sub>C<sub>2</sub>O<sub>4</sub> gives no reaction.
- The solution in test tube #2 is poured into test tube #3.
- The solution in test tube #3 plus Na<sub>2</sub>HPO<sub>4</sub> and NaOH gives a white precipitate.
- The white precipitate in test tube #3 dissolves in HCl; magnesium indicator and NaOH is added until the solution tests basic. A blue gel is observed at the bottom of the test tube after centrifuging.

Cation(s) present Mg<sup>2+</sup> Cation(s) absent Ba<sup>2+</sup>, Ca<sup>2+</sup>

9. What safety precautions should be taken while performing this experiment?

- wear google at all times.
- Avoid contact w/ solutions.
- Always load the centrifuge evenly.
- Wait for centrifuge to stop spinning on its own