

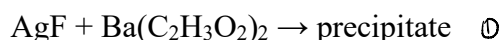
Grades		Grader/s
Pre-lab (100 pts)		

PRE-LAB EXERCISE (E5)

Please finish the following exercises before conducting the experiment and submit the electronic copy to canvas. These exercises consist of 5 questions and are worth a total of 100 points, counted as 3 points of the final grade. These pre-lab exercises cover contents of Experiment E5. Please study the corresponding lab manual and relevant references (e.g., your VC210 textbook) carefully before doing these exercises.

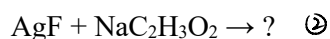
Question 1 (30 points)

When a solution of silver fluoride, 0.1M AgF, is mixed with a solution of barium acetate, 0.1M Ba(C₂H₃O₂)₂, a precipitate forms:



In order to identify the precipitating ions, you conduct some experimental tests.

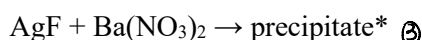
- 1) You substitute a solution of 0.1M sodium acetate, NaC₂H₃O₂, for the Ba(C₂H₃O₂)₂ solution and mix it with 0.1M AgF.



What is the purpose of this test?

To testify whether the Ag⁺ or Ba²⁺ is the precipitating ion. The precipitate of reaction ① can be AgC₂H₃O₂ or BaF₂. Since Na⁺ is highly soluble, if reaction ② has a precipitate, then it will be AgC₂H₃O₂ and Ag⁺ will be the precipitating ion. If reaction ② doesn't have a precipitate, then the precipitating ion will be Ba²⁺. But whether Ba²⁺ can form precipitate is unknown.

- 2) What do the test results below tell you about the AgF + Ba(C₂H₃O₂)₂ reaction?

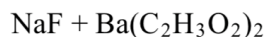


* The precipitate that forms is identical in properties to that formed in the AgF + Ba(C₂H₃O₂)₂ reaction.

in the AgF + Ba(C₂H₃O₂)₂ reaction
Ba²⁺ is the precipitating ion because AgNO₃ is soluble and the precipitate of reaction ② can only be BaF₂, which is identical in properties to that formed in AgF + Ba(C₂H₃O₂)₂ reaction.

- 3) Which reference blank test (indicated below) did you use to directly test the hypothesis that silver ions are critical to precipitate formation?

Circle the reference blank test reagent combination that could be used to directly verify if precipitate formation involves silver ions.



Question 2 (20 points)

Prepare a data table for Part 2.A (of the experimental) below.

CATION GROUP I 2drops	CATION GROUP II 2drops	REF 2drops	Cl ⁻ 2drops	CrO ₄ ²⁻ 2drops	I ⁻ 2drops	C ₂ O ₄ ²⁻ 2drops	S ²⁻ 2drops	SO ₄ ²⁻ 2drops	SPCTR GROUP I	SPCTR GROUP II
Na ⁺	K ⁺	clear								
Ba ²⁺	Mn ²⁺	clear								
Mg ²⁺	Ca ²⁺	clear								
Co ²⁺	Sr ²⁺	clear								
Ni ²⁺	Cr ³⁺	clear								
Cu ²⁺	Fe ³⁺	clear								
Al ³⁺	Zn ²⁺	clear								
Pb ²⁺	Ag ⁺	clear	White ppt↓	Brown ppt↓	Yellow ppt↓	White ppt↓	Black ppt↓	White ppt↓		

*precipitation reagents are 0.10 M sodium salts of the anion.

Question 3 (50 points)

Record a precise hypothesis and expected observations for Part 2a. Select one cation group, and record your hypothesis in the table you just prepared above.

On the next page

CATION GROUP I 2drops	CATION GROUP II 2drops	REF 2drops	Cl ⁻ 2drops	CrO ₄ ²⁻ 2drops	I ⁻ 2drops	C ₂ O ₄ ²⁻ 2drops	S ²⁻ 2drops	SO ₄ ²⁻ 2drops	SPCTR GROUP I	SPCTR GROUP II
Na ⁺	K ⁺	clear	clear	clear yellow	clear	clear	clear	clear	✓	
Ba ²⁺	Mn ²⁺	clear	clear	yellow ppt↓	clear	white ppt↓	clear	white ppt↓	✓	
Mg ²⁺	Ca ²⁺	clear	clear	clear orange	clear	white ppt↓	clear	clear	✓	
Co ²⁺	Sr ²⁺	clear	clear	yellow ppt↓	red clear	red ppt↓	red ppt↓	red clear	✓	
Ni ²⁺	Cr ³⁺	clear	clear	yellow ppt↓	green clear	green ppt↓	yellow ppt↓	green clear	✓	
Cu ²⁺	Fe ³⁺	clear	clear	clear brown	white ppt↓	blue ppt↓	black ppt↓	blue clear	✓	
Al ³⁺	Zn ²⁺	clear	clear	yellow ppt↓	clear	white ppt↓	white ppt↓	clear	✓	
Pb ²⁺	Ag ⁺	clear	White ppt↓	Brown ppt↓	Yellow ppt↓	White ppt↓	Black ppt↓	White ppt↓	✓	

*precipitation reagents are 0.10 M sodium salts of the anion.