

Name KEY Block \_\_\_\_\_ Date \_\_\_\_\_

**Data** Record your observations for each of the wells in a data table. Include the color or if it is colorless.  
 Clear = no reaction (N.R.) Cloudy = precipitate (ppt)

Column		1	2	3	4	5	6
		NaNO <sub>3</sub>	NaBr	Na <sub>2</sub> SO <sub>4</sub>	Na <sub>2</sub> CO <sub>3</sub>	Na <sub>2</sub> C <sub>2</sub> O <sub>4</sub>	Na <sub>3</sub> PO <sub>4</sub>
A	KCl	NR	NR	NR	NR	NR	NR
B	LiCl	NR	NR	NR	NR	NR	PPT Li <sub>3</sub> PO <sub>4</sub>
C	CaCl <sub>2</sub>	NR	NR	slightly PPT	PPT white CaCO <sub>3</sub>	PPT CaC <sub>2</sub> O <sub>4</sub>	PPT Ca <sub>3</sub> (PO <sub>4</sub> ) <sub>2</sub>
D	MgCl <sub>2</sub>	NR	NR	NR	PPT white	NR	PPT white
E	CoCl <sub>2</sub>	NR	NR	NR	PPT pink	PPT coral	PPT purple
F	FeCl <sub>3</sub>	NR	NR	NR	PPT orange	NR	PPT yellow

**Results** – What precipitates formed? Write the name and formula for the precipitate that formed in each well. If there was no precipitate, write N.R. (no reaction).

Anions		1	2	3	4	5	6
		(NO <sub>3</sub> ) <sup>-</sup> nitrate	Br <sup>-</sup> bromide	(SO <sub>4</sub> ) <sup>2-</sup> sulfate	(CO <sub>3</sub> ) <sup>2-</sup> carbonate	(C <sub>2</sub> O <sub>4</sub> ) <sup>2-</sup> oxalate	(PO <sub>4</sub> ) <sup>3-</sup> phosphate
A	K <sup>+</sup> potassium ion	NR	NR	NR	NR	NR	NR
B	Li <sup>+</sup> lithium ion	NR	NR	NR	NR	NR	Li <sub>3</sub> PO <sub>4</sub>
C	Ca <sup>2+</sup> calcium ion	NR	NR	CaSO <sub>4</sub>	CaCO <sub>3</sub>	CaC <sub>2</sub> O <sub>4</sub>	Ca <sub>3</sub> (PO <sub>4</sub> ) <sub>2</sub>
D	Mg <sup>2+</sup> magnesium ion	NR	NR	NR	MgCO <sub>3</sub>	NR	Mg <sub>3</sub> (PO <sub>4</sub> ) <sub>3</sub>
E	Co <sup>2+</sup> cobalt(II) ion	NR	NR	NR	CoCO <sub>3</sub>	CoC <sub>2</sub> O <sub>4</sub>	Co <sub>3</sub> (PO <sub>4</sub> ) <sub>2</sub>
F	Fe <sup>3+</sup> iron(III) ion	NR	NR	NR	Fe <sub>2</sub> (CO <sub>3</sub> ) <sub>3</sub>	NR	FePO <sub>4</sub>

### Post-activity Questions

- Analyze your data regarding the solubility of the following anions. Write a sentence that describes the solubility characteristics of each anion, following the example given in a.
  - nitrate: All nitrate compounds are soluble.
  - carbonate some carbonate compounds are soluble
  - sulfate almost all sulfate compounds are soluble
  - oxalate majority of oxalate compounds are soluble
- Analyze your data regarding the solubility of the following cations. Write a sentence that describes the solubility characteristics of each cation.
  - potassium ion all K<sup>+</sup> are soluble
  - calcium ion few Ca<sup>2+</sup> are soluble
  - cobalt(II) ion most Co<sup>2+</sup> are soluble
  - iron(III) ion most Fe<sup>3+</sup> are soluble
- Write a *complete chemical equation* for the reaction that occurred in each well in row C. If no reaction occurred, write "NR" instead of products.
  - C1 CaCl<sub>2</sub>(aq) + NaNO<sub>3</sub>(aq) → NR
  - C2 CaCl<sub>2</sub>(aq) + NaBr(aq) → NR
  - C3 CaCl<sub>2</sub>(aq) + Na<sub>2</sub>SO<sub>4</sub>(aq) → CaSO<sub>4</sub>(s) + 2NaCl(aq)
  - C4 CaCl<sub>2</sub>(aq) + Na<sub>2</sub>CO<sub>3</sub>(aq) → CaCO<sub>3</sub>(s) + 2NaCl(aq)
  - C5 CaCl<sub>2</sub>(aq) + Na<sub>2</sub>C<sub>2</sub>O<sub>4</sub>(aq) → CaC<sub>2</sub>O<sub>4</sub>(s) + 2NaCl(aq)
  - C6 3CaCl<sub>2</sub>(aq) + 2Na<sub>3</sub>PO<sub>4</sub>(aq) → Ca<sub>3</sub>(PO<sub>4</sub>)<sub>2</sub>(s) + 6NaCl(aq)
- Write a *net ionic equation* for the reactions that occurred in each the well of row C. If no reaction occurred, write "NR" instead of products.
  - C1 Ca<sup>2+</sup>(aq) + NO<sub>3</sub><sup>-</sup>(aq) → NR
  - C2 Ca<sup>2+</sup>(aq) + Br<sup>-</sup>(aq) → NR
  - C3 Ca<sup>2+</sup>(aq) + SO<sub>4</sub><sup>2-</sup>(aq) → CaSO<sub>4</sub>(s)
  - C4 Ca<sup>2+</sup>(aq) + CO<sub>3</sub><sup>2-</sup>(aq) → CaCO<sub>3</sub>(s)
  - C5 Ca<sup>2+</sup>(aq) + C<sub>2</sub>O<sub>4</sub><sup>2-</sup>(aq) → CaC<sub>2</sub>O<sub>4</sub>(s)
  - C6 3Ca<sup>2+</sup>(aq) + 2PO<sub>4</sub><sup>3-</sup>(aq) → Ca<sub>3</sub>(PO<sub>4</sub>)<sub>2</sub>(s)
- According to Coulomb's Law, the higher the charge, the stronger the force of attraction. This would mean that ions with higher charge are more likely to form precipitates.
  - Which cations reacted to produce the most precipitates? Co<sup>2+</sup>, Fe<sup>3+</sup>, Ca<sup>2+</sup>
  - Which anions reacted to produce the most precipitates? PO<sub>4</sub><sup>3-</sup>
  - How does the magnitude of the ionic charge relate to the formation of precipitates?  
\_\_\_\_\_
- List two sources of error that could impact your results? Briefly explain how each error source would impact your results.
  - \_\_\_\_\_
  - \_\_\_\_\_

### Conclusion

Write one sentence to describe the role ionic charges play in reactions that form precipitates.

\_\_\_\_\_