Na⁺ Sodium	Ca ²⁺		
Na⁺ Sodium	Calcium	Al³⁺ Aluminum	Fe³⁺ Iron(III)
Na⁺ Sodium	Ca²⁺		
NH₄⁺ Ammonium	Calcium		Mg ²⁺
NH₄⁺ Ammonium	Ca²+	Al ³⁺ Aluminum	Magnesium
NH₄⁺ Ammonium	Calcium		Mg ²⁺
K⁺ Potassium	Fe ²⁺		Magnesium
K⁺ Potassium	Iron(II)	Fe³⁺ Iron(III)	Mg ²⁺
Fe ²⁺	Fe ²⁺		Magnesium
Iron(II)	Iron(II)	K⁺ Potassium	Cations - Positive Oxidation Numbers; comes first in name and formula

Dr ⁻			
Bromide			
Bronnido	S ²⁻		
Br ⁻	Sulfide		N ³⁻
Bromide		Phosphate	Nitride
Br -			
Bromide			
	S ²⁻		
Cl ⁻	Sulfide		
Chloride			
			O ²⁻
CL ⁻		PO. ³⁻	Oxide
Chloride		Phosphate	•
	S ²⁻		
	Sulfide		
Chloride	Sunde		
			O ²⁻
NO ₂ -			Oxide
Nitrate			
	SO4 ²⁻		
NO ²	Sulfate	N ³⁻	
Nitrate		Nitride	
			O ²⁻
			Oxide
SO ₄ ²⁻	SO ₄ ²⁻		
Sulfate	Sulfate	NO ₃ ⁻	Anions - Negative
		Nitrate	Oxidation Numbers;
			comes last in name

SYMBOL AND FORMULA MANIA

OBJECTIVES

- 1. Use models of ions to assemble formulas
- 2. Write formulas of chemical compounds
- 3. Name chemical compounds

INTRODUCTION

Oxidation numbers (the charges) of ions give the information needed to write the formulas of many chemical compounds. There are several guidelines that will lead you to the correct solutions.

A neutral compound is one in which the charges on the ions (also called oxidation numbers) balance out to zero when combined.

One positive charge balances out one negative charge; two ions with a charge of 1+ each balance with one 2- charge, etc.

- Atoms with positive charges, or positive oxidation numbers, are written first in a formula and first in the name of the compound.
- In ionic compounds, metals with more than one oxidation number use Roman numerals in the NAME to indicate which ion is indicated. Roman numerals do not appear in formulas!!

Subscripts show the relative numbers of atoms or ions in a compound.

Entire polyatomic ions (ions made up of more than one element) are shown in parentheses if there is more than one of them in the formula and a subscript follows to show how many are needed. For example, aluminum (Al³⁺) nitrate (NO₃⁻) would be written as Al(NO₃)₃.

MATERIALS

positive and negative ion sheets scissors pencil

PROCEDURE

- 1. Cut out each of the ion models, keeping the cations (positive) separate from the anions (negative) by placing them in stacks. Note that the various ions are not the same size.
- 2. Select the sodium cation and enter the name and symbol in the first column of your data table. Place this cation model on your lab table.
- 3. Select the chloride anion with the same oxidation number (but opposite charge) as your cation. Enter the name and symbol of your anion in the first row.
- 4. Add the oxidation numbers and enter the total in your data table.
- 5. Place the anion to the right of the cation and note that they "fit" (they are the same size).
- 6. Repeat steps 4, 5 and 6 using the calcium cation in the second column and the phosphate polyatomic anion in the second row.
- 7. Place the calcium ion model on the left and the phosphate ion model on the right. Note they do not "fit" so you need to try various combinations of numbers of calcium and phosphate until they match each other. Enter the correct combination in your data table.
- 8. Continue making models until your data table is full.

Cations Naithous - Ca ²⁺ Mg ²⁺ Fe ³⁺ Cl ¹⁻ NaCl Sodium Chloride (1+) + (1-) = 0 CaCl ₂ Calcium Chloride (2+) + 2(1-) = 0 - - PO ₄ ³⁻ Na ₃ PO ₄ Sodium Phosphate 3(1+) + (3-) = 0 Ca ₃ (PO ₄) ₂ Calcium Phosphate 3(2+) + 2(3-) = 0 - - O ²⁻ - - - - - N ³⁻ - - - - -	Symbol Mania Worksheet		Period	Date			
Anions 1 Na ¹⁺ Ca ²⁺ Mg ²⁺ Fe ³⁺ Cl ¹⁻ NaCl Sodium Chloride (1+) + (1-) = 0 CaCl ₂ Calcium Chloride (2+) + 2(1-) = 0			- 1				Cations →
Cl ¹ NaCl Sodium Chloride $(1+) + (1-) = 0$ CaCl2 Calcium Chloride $(2+) + 2(1-) = 0$ PO43-Na3PO4 Sodium Phosphate $3(1+) + (3-) = 0$ Ca3(PO4)2 Calcium Phosphate $3(2+) + 2(3-) = 0$ Image: Calcium Phosphate $3(2+) + 2(3-) = 0$ O2-Image: Calcium Phosphate $3(2+) + 2(3-) = 0$ Image: Calcium Phosphate $3(2+) + 2(3-) = 0$ Image: Calcium Phosphate $3(2+) + 2(3-) = 0$ N3-Image: Calcium Phosphate $3(2+) + 2(3-) = 0$ Image: Calcium Phosphate $3(2+) + 2(3-) = 0$ Image: Calcium Phosphate $3(2+) + 2(3-) = 0$ N3-Image: Calcium Phosphate $3(2+) + 2(3-) = 0$ Image: Calcium Phosphate $3(2+) + 2(3-) = 0$ Image: Calcium Phosphate $3(2+) + 2(3-) = 0$ N3-Image: Calcium Phosphate $3(2+) + 2(3-) = 0$ Image: Calcium Phosphate $3(2+) + 2(3-) = 0$ Image: Calcium Phosphate $3(2+) + 2(3-) = 0$ N3-Image: Calcium Phosphate $3(2+) + 2(3-) = 0$ Image: Calcium Phosphate $3(2+) + 2(3-) = 0$ Image: Calcium Phosphate $3(2+) + 2(3-) = 0$ N3-Image: Calcium Phosphate $3(2+) + 2(3-) = 0$ Image: Calcium Phosphate $3(2+) + 2(3-) = 0$ Image: Calcium Phosphate $3(2+) + 2(3-) = 0$ N3-Image: Calcium Phosphate $3(2+) + 2(3-) = 0$ Image: Calcium Phosphate $3(2+) + 2(3-) = 0$ Image: Calcium Phosphate $3(2+) + 2(3-) = 0$ N3-Image: Calcium Phosphate $3(2+) + 2(3-) = 0$ Image: Calcium Phosphate $3(2+) + 2(3-) = 0$ Image: Calcium Phosphate $3(2+) + 2(3-) = 0$ N3-Image: Calcium Phosphate $3(2+) + 2(3-) = 0$ Image: Calcium Phosphate $3(2+) + 2(3-) = 0$ Image: Calcium Phosphate <th>NH₄¹⁺</th> <th><u> </u></th> <th>Fe³⁺</th> <th>Mg^{2+}</th> <th>Ca²⁺</th> <th>Na¹⁺</th> <th>Anions ↓</th>	NH ₄ ¹⁺	<u> </u>	Fe ³⁺	Mg^{2+}	Ca ²⁺	Na ¹⁺	Anions ↓
Cl ¹⁻ Sodium Chloride (1+) + (1-) = 0 Calcium Chloride (2+) + 2(1-) = 0 PO ₄ ³⁻ Na,PO ₄ Sodium Phosphate 3(1+) + (3-) = 0 Ca ₃ (PO ₄) ₂ Calcium Phosphate 3(2+) + 2(3-) = 0 O ²⁻ O ²⁻ Image: Calcium Phosphate 3(2+) + 2(3-) = 0 Image: Calcium Phosphate 3(2+) + 2(3-) = 0 N ³⁻ Image: Calcium Phosphate 3(2+) + 2(3-) = 0 Image: Calcium Phosphate 3(2+) + 2(3-) = 0 Image: Calcium Phosphate 3(2+) + 2(3-) = 0 N ³⁻ Image: Calcium Phosphate 3(2+) + 2(3-) = 0 Image: Calcium Phosphate 3(2+) + 2(3-) = 0 Image: Calcium Phosphate 3(2+) + 2(3-) = 0 N ³⁻ Image: Calcium Phosphate 3(2+) + 2(3-) = 0 Image: Calcium Phosphate 3(2+) + 2(3-) = 0 Image: Calcium Phosphate 3(2+) + 2(3-) = 0 N ³⁻ Image: Calcium Phosphate 3(2+) + 2(3-) = 0 Image: Calcium Phosphate 3(2+) + 2(3-) = 0 Image: Calcium Phosphate 3(2+) + 2(3-) = 0 N ³⁻ Image: Calcium Phosphate 3(2+) + 2(3-) = 0 Image: Calcium Phosphate 3(2+) + 2(3-) = 0 Image: Calcium Phosphate 3(2+) + 2(3-) = 0 N ³⁻ Image: Calcium Phosphate 3(2+) + 2(3-) = 0 Image: Calcium Phosphate 3(2+) + 2(3-) = 0 Image: Calcium Phosphate 3(2+) + 2(3-) = 0 N ³⁻ Image: Calcium Phosphate 3(2+) + 2(3-) = 0 Image: Calcium Phosphate 3(2+) + 2(3-) = 0 Image: Calcium Phosphate 3(2+) + 2(3-) = 0 <td></td> <td></td> <td></td> <td></td> <td>CaCl₂</td> <td>NaCl</td> <td></td>					CaCl ₂	NaCl	
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PO ₄ ³ Na ₃ PO ₄ Sodium Phosphate 3(1+) + (3-) = 0 Ca ₃ (PO ₄) ₂ Calcium Phosphate 3(2+) + 2(3-) = 0 Image: Calcium Phosphate 3(2+) + 2(3-) = 0 O ² - Image: Calcium Phosphate 3(2+) + 2(3-) = 0 Image: Calcium Phosphate 3(2+) + 2(3-) = 0 Image: Calcium Phosphate 3(2+) + 2(3-) = 0 N ³⁻ Image: Calcium Phosphate 3(2+) + 2(3-) = 0 Image: Calcium Phosphate 3(2+) + 2(3-) = 0 Image: Calcium Phosphate 3(2+) + 2(3-) = 0 N ³⁻ Image: Calcium Phosphate 3(2+) + 2(3-) = 0 Image: Calcium Phosphate 3(2+) + 2(3-) = 0 <th< td=""><td></td><td></td><td></td><td></td><td>(2+)+2(1-)=0</td><td>(1+) + (1-) = 0</td><td></td></th<>					(2+)+2(1-)=0	(1+) + (1-) = 0	
PO ₄ ³⁻ Nave and a second second and a second a					Ca ₂ (PO ₂) ₂	Na.PO.	
N ³ Southin Fillespinite Southin Fillespinite N ³ N Image: Southin Fillespinite Image: Southin Fillespinite					Calcium Phosphate	Sodium Phosphate	PO. ³⁻
O ²⁻ S(1+)+2(3+)+2(3+)+2 N ³⁻ Image: S(1+)+2(3+)+2 Image: S(1+)+2(3+)+2 Image: S(1+)+2 Image: S(1+)+2 Image: S(1+					3(2+) + 2(3-) = 0	3(1+) + (3-) = 0	104
O^{2} Image: Constraint of the second							
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							$\mathbf{v} = 1$
NO ₃							NO ₃ ¹⁻

1. Which cation from the models provided is not a metal?

- 2. Which element among the models provided have more than one oxidation number?
- 3. Why is it necessary to place parentheses around polyatomic ions when there are more than one needed to complete a neutrabrmula? Provide one example.