Science 9
Chapter 3: Elements Combine to Form Compounds

Make a title page: Draw and colour images and words from chapter 3 - no computer images

Total marks this page: / 15
Section 3.1: Compounds (page 76)
1. A ___________ is a pure substance made up of two or more kinds of ___________ that are ___________ combined. When they combine, the atoms of one element make ___________ (bonds) with the atoms of another element in very specific ways. Compounds are either ___________ or ___________. In ___________ compounds, atoms join together by ___________ electrons. In ___________ compounds, ___________ charged ___________ attract each other.

2. Define:
   - chemical bond: ______________________________________________________
   - covalent compounds: ________________________________________________
   - molecule: __________________________________________________________
   - ionic compounds: ____________________________________________________
   - ionic lattice: ________________________________________________________

3. Read pages 77 and 78. Explain how covalent and ionic compounds are similar.

   ________________________________________________________________

   Explain how they are different.

   ________________________________________________________________

In the space below, draw the Bohr model of water (figure 3.2a) – covalent compound. In the space below draw the Bohr model of sodium chloride (fig. 3.3 – last pair).
4. Do Reading Check on page 79. Do numbers 1, 2, 3, 4, 5. Write full sentences.

5. Molecules, Ions, and Polyatomic Ions -- Read pages 79 and 80. Answer the questions. True or False
   a) Covalent and ionic bonds can be found in the same compound. ____________
   b) Some atoms can lose a varying number of electrons to form a molecule. ____________
   c) A polyatomic atom is an atom with a very strong ability to form bonds. ____________
   d) The prefix poly means many. ____________
   e) The dichromate ion can be used to see if someone has had alcohol. ____________
   f) Dichromate has 3 oxygen atoms and 4 chromium atoms. ____________
   g) A polyatomic ion has its atoms joined by ionic bonds. ____________
   h) Carbonate, nitrate, and phosphate are other kinds of polyatomic ions. ____________
   i) Ammonium is a negative polyatomic ion. ____________
   j) The polyatomic ion carbonate is $CO_3^{2-}$ ____________

There are 4 false statements above. Correct them and write them as true statements below.

6. Reading Check Page 80. Do 2, 3, 4, and 5 Write in full sentences.

Total marks this page: 19
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Section 3.2: Names and Formulas of Ionic Compounds (page 84)

1. Each ___________ compound has a name that _______________ the two types of __________ it contains. An ionic compound also has a _______________ formula that show the ___________ of the ions in the compound. In an ionic compound with only _____ elements, the first one is always a positive ___________ ion and the second one is always a negative _______________ ion. A metal that can form an ion in more than one way is described as _______________. The name of a multivalent ion includes a _______________ numeral to indicate the positive charge. _______________ ions contain the atoms of more than one element.

2. IUPAC stands for _______________.

Read Page 85. Circle the best word in brackets in the sentences below.

a) A chemical name indicates the (molecules / elements) present in the compound.

b) Sodium Chloride is the name of (table / rock) salt.

c) In an ionic compound the (positive / negative) ion is named first.

d) The positive ion is always a (metal / nonmetal) in a compound containing two elements.

e) In an ionic compound the (positive / negative) ion is named last.

f) The negative ion is always a (metal / nonmetal) in a compound containing two elements.

g) The metal’s name (changes / does not change) in an ionic compound.

h) The non metal’s name always ends with (ide / ate) in an ionic compound.

i) Iron’s name (changes / does not change) in a compound like FeO.

j) Oxygen’s name (changes / does not change) in a compound like FeO.

3. Complete the table below. Refer to Table 3.1 in your book – you may need a periodic table.

| Element name | Name in ionic compound | Symbol | | Element name | Name in ionic compound | Symbol |
|--------------|------------------------|--------| | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

Look at table 3.2 on page 85. What is the name of each ionic compound with these elements:

Sodium and chlorine _______________

Zinc and oxygen _______________

Total marks this page: 25
4. Define Chemical Formula:

Copy the **Steps for Writing the Name** of the ionic compound containing two elements in the space below. Use only the left side of Table 3.3 on page 86.

Step 1:

Step 2:

Step 3:

Practice Problems: In the compounds listed at the bottom of page 86, state the names of the elements, how many of each there are, and the name of the compound. The first one is done for you.

<table>
<thead>
<tr>
<th>Formula</th>
<th>Metal ion</th>
<th>#</th>
<th>Non metal ion</th>
<th>#</th>
<th>Name of Compound</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>Al\textsubscript{3}</td>
<td>Aluminum</td>
<td>1</td>
<td>Iodine</td>
<td>3</td>
</tr>
<tr>
<td>b</td>
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</tbody>
</table>
5. Rules for Writing the Formulas of Ionic Compounds (page 87)

In an ionic compound, the _______ charges _______ the _______ charges. You can use this balance to find the _______ of _______ ions to _______ ions. Then use the ratio to write _______ in the formula.

The word subscript comes from the prefix _______ which means _______ and the suffix _______ which means _______. Subscripts are used in the formulas of ionic compounds to show the _______ amounts of each ion.

Copy theSteps for Writing the Formulaof the ionic compound containing two elements in the space below. Use only the left side of Table 3.4 on page 87.

Step 1: ____________________________________________

Step 2: ____________________________________________

Step 3: ____________________________________________

Step 4: ____________________________________________

Practice Problems: Do all of numbers 1 and 2 on page 87. An example is given for each.

Question 1: Write the question down and answer it for each one.

Example: K⁺ with O²⁻ You need 2 K⁺ to balance the one O²⁻. Formula: K₂O

1a) ____________________________________________

1b) ____________________________________________

1c) ____________________________________________

1d) ____________________________________________

1e) ____________________________________________

1f) ____________________________________________

Question 2: Write the question down and answer it for each one.

Example: Calcium iodide Ca²⁺ I⁻ (From periodic Table) Formula: CaI₂

2a) ____________________________________________

2b) ____________________________________________

2c) ____________________________________________

2d) ____________________________________________

2e) ____________________________________________

2f) ____________________________________________

2g) ____________________________________________

Total marks this page: /
6. Compounds Containing a Multivalent Metal (page 88)

The prefix __________ means __________ and the suffix __________ refers to the capacity of the _____________. Multivalent metals can form two or more ____________ positive ion with ____________ ion charges.

Use the periodic table on page 54. Fill in the table below. The first two are done for you.

<table>
<thead>
<tr>
<th>Metal</th>
<th>Symbol</th>
<th>Possible charge(s)</th>
<th>Single or multi valent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vandium</td>
<td>V</td>
<td>5+ 4+</td>
<td>multivalent</td>
</tr>
<tr>
<td>Aluminum</td>
<td>Al</td>
<td>3+</td>
<td>single valent</td>
</tr>
<tr>
<td>Iridium</td>
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<td></td>
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<tr>
<td>Sodium</td>
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<td></td>
<td></td>
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<tr>
<td>Mercury</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Iron</td>
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<td></td>
<td></td>
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<tr>
<td>Zinc</td>
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<tr>
<td>Copper</td>
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<td></td>
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<tr>
<td>Zirconium</td>
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<td></td>
<td></td>
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<tr>
<td>Calcium</td>
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<tr>
<td>Manganese</td>
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<td>Lead</td>
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<tr>
<td>Plutonium</td>
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</tbody>
</table>

Total marks this page: 20
To ______________ between two ions formed from multivalent metals, you need to name each ion. The name must contain the ion’s _________________. We use Roman Numerals to do this. 1 = ____  2 = ____  3 = ____  4 = ____  5 = ____  6 = ____  7 = ____

Copy the **Steps for Writing the Formula** of the ionic compound containing a multivalent metal in the space below. Use only the left side of Table 3.7 on page 89.

Step 1: ____________________________________________________________

Step 2: ____________________________________________________________

Step 3: ____________________________________________________________

Step 4: ____________________________________________________________

Practice Problems (page 89): Do all of number 1. The first one is done for you.

<table>
<thead>
<tr>
<th></th>
<th>Compound name</th>
<th>Positive ion &amp; charge</th>
<th>Negative ion &amp; charge</th>
<th>Formula</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>Chromium (II) Chloride</td>
<td>Cr^{2+}</td>
<td>Cl^-</td>
<td>CrCl_2</td>
</tr>
<tr>
<td>b</td>
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Total marks this page: /
Copy the **Steps for Writing the Name** of the ionic compound containing a multivalent metal in the space below. Use only the left side of Table 3.8 on page 90.

**Step 1:**

**Step 2:**

**Step 3:**

**Step 4:**

**Step 5:**

**Step 6:**

**Practice Problems (page 90):** Do all of number 1. The first one is done for you.

<table>
<thead>
<tr>
<th></th>
<th>Formula</th>
<th>Positive ion &amp; charge</th>
<th>Negative ion &amp; charge</th>
<th>Name of Compound</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>CrBr₂</td>
<td>Cr²⁺</td>
<td>Br⁻</td>
<td>Chromium (II) bromide</td>
</tr>
<tr>
<td>b</td>
<td></td>
<td></td>
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</table>
7. Turn to page 92 in your book. There are 21 different **negative** polyatomic ions named there. Write the formula for each one combined with either Sodium or Calcium. Two are done for you.

<table>
<thead>
<tr>
<th>Name</th>
<th>Compound with Na⁺</th>
<th>Compound with Ca²⁺</th>
</tr>
</thead>
<tbody>
<tr>
<td>a acetate</td>
<td>NaCH₃COO</td>
<td>Ca(CH₃COO)₂</td>
</tr>
<tr>
<td>b carbonate</td>
<td>Na₂CO₃</td>
<td>CaCO₃</td>
</tr>
<tr>
<td>c chlorate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>d chlorite</td>
<td></td>
<td></td>
</tr>
<tr>
<td>e chromate</td>
<td></td>
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</tr>
<tr>
<td>f cyanide</td>
<td></td>
<td></td>
</tr>
<tr>
<td>g dichromate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>h hydrogen carbonate</td>
<td></td>
<td></td>
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<tr>
<td>i hydrogen sulphate</td>
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<tr>
<td>j hydrogen sulphide</td>
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<td></td>
</tr>
<tr>
<td>k hydrogen sulphite</td>
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<td></td>
</tr>
<tr>
<td>l hydroxide</td>
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<tr>
<td>m hypochlorite</td>
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<tr>
<td>n nitrate</td>
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<tr>
<td>o nitrite</td>
<td></td>
<td></td>
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<tr>
<td>p perchlorate</td>
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<tr>
<td>q permanganate</td>
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<td>r phosphate</td>
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<td>s phosphite</td>
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<td>u sulphite</td>
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</table>

Total marks this page: /
The only one different from all the negative polyatomic ions is Ammonium, which is $\text{NH}_4^+$. Complete the formulas for ionic compounds with ammonium below.

Ammonium and chlorine ________________ Ammonium and Sulphur ________________
Ammonium and hydroxide ________________ Ammonium and phosphate ________________

Copy the Steps for Writing the Formula of the ionic compound containing polyatomic ions in the space below. Use only the left side of Table 3.9 on page 91.

Step 1: __________________________________________
Step 2: __________________________________________
Step 3: __________________________________________
Step 4: __________________________________________

Do practice problems 1 (all) and 2 (all) on page 91. Write the question down and answer it.

1a) __________________________________________
1b) __________________________________________
1c) __________________________________________
1d) __________________________________________
1e) __________________________________________
1f) __________________________________________
1g) __________________________________________
1h) __________________________________________
1i) __________________________________________
1j) __________________________________________
2a) __________________________________________
2b) __________________________________________
2c) __________________________________________
2d) __________________________________________
2e) __________________________________________
2f) __________________________________________
2g) __________________________________________
2h) __________________________________________
8. Do Understanding Key Ideas (page 95) - Numbers 4 – 6 (all) Write question and answer.

4a)

4b)

4c)

4d)

4e)

4f)

4g)

4h)

4i)

4j)

4k)

4l)

5a)

5b)

5c)

5d)

5e)

5f)

5g)

5h)

5i)

5j)

5k)

5l)

6a)

6b)

6c)

6d)

6e)

6f)
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Section 3.3: Physical and Chemical Changes (page 96)

1. __________ changes produce ________ substances with new __________. __________ changes, such as changes of ________________, do not change the ______________ of the substance. Both physical and chemical changes are accompanied by __________ changes. Evidence that a chemical change has occurred includes __________ change: __________, __________, __________ produced or consumed; appearance of ______________ of gas form; and/or formation of a ________________.

2. Physical Changes (page 98) – Name the 10 examples of physical changes mentioned.
   ___________________________ ___________________________ ___________________________ ___________________________
   ___________________________ ___________________________ ___________________________ ___________________________
   ___________________________ ___________________________ ___________________________ ___________________________

3. Evidence of Chemical Changes.
   A chemical change produces ________ substances with new ________________ and is always accompanied by __________ changes, which might or might not be ________________. In a chemical change, new ______________ are formed while other bonds are ________________.
   Define the following words (Use glossary or get the definition from the text on page 96 & 99):
   Reactants: ___________________________
   Products: ___________________________
   Exothermic: ___________________________
   ___________________________
   ___________________________
   ___________________________
   ___________________________

   Endothermic: ___________________________
   ___________________________
   ___________________________
   ___________________________

What evidence often accompanies a chemical change? 4 points
   ___________________________
   ___________________________
   ___________________________
   ___________________________

Total marks this page: 18
4. Read page 99. Answer the following questions:
   a) Can chemical and physical changes occur at the same time? Explain, and give an example.

   b) Give an example of an exothermic reaction.

   c) Give an example of an endothermic reaction.

5. Reading Check (Page 99) Do all of 1, 2, and 3.
   1) natural gas is a__________________ oxygen is a__________________
      carbon dioxide is a__________________ water is a__________________
   2a) boiling water is an example of a__________________
   2b) tearing clothes is an example of a__________________
   2c) rusting of a nail is an example of a__________________
   2d) lighting a match is an example of a__________________
   3a) melting of an ice cube is__________________
   3b) burning a candle is__________________
   3c) grinding up sea salt is__________________
   3d) rain turning to snow is__________________

6. Applications of Chemical Changes (page 100)
   Define corrosion ________________________________
   What is rust? ________________________________
   What are two ways to prevent rust? ________________________________

   Give 2 examples of how corrosion can be beneficial (1 for aluminum and 1 for copper)
   Aluminum: ________________________________
   ________________________________
   Copper: ________________________________
   ________________________________

   Explain how drying fish in a smokehouse is an example of both chemical and physical changes.
   ________________________________
   ________________________________

Total marks this page: 21
7. Do Checking Concepts (page 105). Do numbers 1, 2, 3, 6 **Write full sentences.**
   a) 
   b) 
   c) 

2a) 
   b) 

3a) 
   b) 

6

Total marks this page: 8