

# SNC2D CHEMISTRY

## CHEMICAL REACTIONS

### Molecular Compounds (P.165-168)

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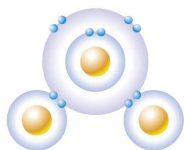
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## Molecular Compounds

### RECALL!

The atoms in molecular compounds share electrons to form the stable electron arrangements of the closest noble gas. As a result, the molecules they form are neutral. Ice ( $H_2O$ ) is an example of a molecular compound made up of neutral molecules.



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## Molecular Compounds

### NOTE!

The names of molecular compounds that do not contain hydrogen atoms use Greek prefixes to indicate how many atoms of each element are present in a compound. For example,  $P_2O_5$  is a molecular compound used in the manufacture of medicines. Its name is diphosphorus pentoxide. The "di" means "2," and the "pent" comes from "penta" and means "5".

Number of Atoms	Prefix
1	mono-
2	di-
3	tri-
4	tetra-
5	penta-
6	hexa-
7	hepta-
8	octa-
9	nona-
10	deca-

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 Activity: Molecular Compound Formulas (P.168)
**DO NOT COPY!**

1. Formulas for molecular compounds are written in the same way as ionic compounds, except in this case the molecule is a combination of two non-metals.

**NOTE!**

Since the atoms are sharing electrons, the ionic charge is sometimes called the **combining capacity** (i.e. the electrons that need to be shared).

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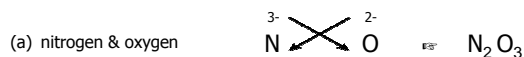
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 Activity: Molecular Compound Formulas (P.168)
**QUESTIONS**

1. Write the molecular compound formulas for the following combinations of elements.

**RECALL!**

- Write the element symbols with the non-metal furthest to the left first.
- Write the ionic charges for each element above the symbols.
- If possible divide the ionic charges by a common factor.
- Crisscross the ionic charges using them as subscripts. Ignore signs.

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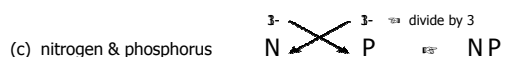
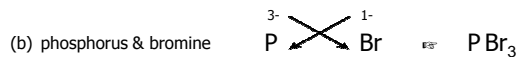
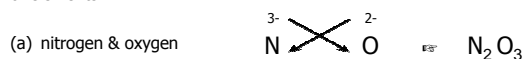
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 Activity: Molecular Compound Formulas (P.168)
**QUESTIONS**

1. Write the molecular compound formulas for the following combinations of elements.



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 Activity: Molecular Compound Names (P.167)
**DO NOT COPY!**

1. Write the name of the first element.
2. Write the name of the second element – change the ending to **ide**.
3. Add prefixes (mono, di, tri, ...) to indicate the number of each atom.

**NOTE!**

The prefix **mono** is only used for the 2<sup>nd</sup> element. When the 2<sup>nd</sup> element is oxygen the name is **monoxide** not **monooxide**.

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 Activity: Molecular Compound Names (P.167)
**QUESTIONS**

1. Write the ionic compound names for the previous combinations of elements.

(a) nitrogen & oxygen ( $N_2O_3$ )      **dinitrogen trioxide**

**RECALL!**

1. Write the name of the first element.
2. Write the name of the second element – change the ending to **ide**.
3. Add prefixes (mono, di, tri, ...) to indicate the number of each atom.

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 Activity: Molecular Compound Names (P.167)
**QUESTIONS**

1. Write the ionic compound names for the previous combinations of elements.

(a) nitrogen & oxygen ( $N_2O_3$ )      **dinitrogen trioxide**  
 (b) phosphorus & bromine ( $PBr_3$ )      **phosphorus tribromide**  
 (c) nitrogen & phosphorus (NP)      **nitrogen monophosphide**

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 Molecular Compounds

**PRACTICE**

1. Many fuels, such as methane,  $\text{CH}_4$ , and propane,  $\text{C}_3\text{H}_8$ , have similar chemical formulas.

(a) Why do you think these compounds are called hydrocarbons?

(a) because they **only** contain hydrogen and carbon atoms

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 Molecular Compounds

**PRACTICE**

1. Many fuels, such as methane,  $\text{CH}_4$ , and propane,  $\text{C}_3\text{H}_8$ , have similar chemical formulas.

(b) Are hydrocarbons molecular or ionic compounds? Why?

(b) molecular because the molecule consists of two non-metals – recall that hydrogen, although it is located in the top left corner of the periodic table, behaves mostly as a non-metal

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 Molecular Compounds

**PRACTICE**

1. Many fuels, such as methane,  $\text{CH}_4$ , and propane,  $\text{C}_3\text{H}_8$ , have similar chemical formulas.

(c) Gasoline is a mixture of hydrocarbons. It is made from oil. Oil deposits around the world are becoming more difficult to find and develop. Predict what effect this trend will have on the price of gasoline. Explain.

(c) as it gets harder to find oil the price will continue to increase

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 **Molecular Compounds**

**PRACTICE**

2. Many molecular compounds have simple names. Other molecular compounds have names that are familiar to us but do not follow a system. What are the simple names for:

(a)  $\text{H}_2\text{O}$       **water**  
 (b)  $\text{NH}_3$       **ammonia**  
 (c)  $\text{H}_2\text{O}_2$     **hydrogen peroxide**  
 (d)  $\text{CH}_4$       **methane**

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 **✓ Check Your Learning**

1. Write the chemical formula for each of the following molecular compounds.

(a) sulphur trioxide       **$\text{SO}_3$**   
 (b) carbon tetrabromide     **$\text{CBr}_4$**   
 (c) carbon monoxide       **$\text{CO}$**   
 (d) arsenic tribromide       **$\text{AsBr}_3$**   
 (e) phosphorus pentabromide  **$\text{PBr}_5$**

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 **✓ Check Your Learning**

2. Write the chemical names for each of the following molecular compounds.

(a)  $\text{CF}_4$       **carbon tetrafluoride**  
 (b)  $\text{P}_2\text{O}_5$       **diphosphorus pentoxide**  
 (c)  $\text{AsCl}_3$      **arsenic trichloride**  
 (d)  $\text{OF}_2$       **oxygen difluoride**  
 (e)  $\text{SiCl}_4$      **silicon tetrachloride**

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 **Check Your Learning**

3. Write the chemical formulas and names for each of the following combinations of elements.

(a) sulphur & bromine	$SBr_2$	sulphur dibromide
(b) phosphorus & chlorine	$PCl_3$	phosphorus trichloride
(c) nitrogen & hydrogen	$NH_3$	nitrogen trihydride
(d) silicon & oxygen	$SiO_2$	silicon dioxide
(e) carbon & chlorine	$CCl_4$	carbon tetrachloride

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 **Check Your Learning**

4. How do ionic compounds differ from molecular compounds?

<b>IONIC</b>	<b>MOLECULAR</b>
<ul style="list-style-type: none"> <li>• 1 metal and 1 non-metal</li> <li>• lose/gain electrons</li> <li>• name ends in ide</li> </ul>	<ul style="list-style-type: none"> <li>• 2 non-metals</li> <li>• share electrons</li> <li>• name ends in ide but also uses the prefixes mono, di, tri, ...</li> </ul>

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 **Check Your Learning**

5. From the following list of symbols, choose two elements that would likely form (a) a molecular compound and (b) an ionic compound.

Mg   S   Ca   K   O

(a) S & O  
(b) Mg & S, ...

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 **Check Your Learning**

6. Classify the compounds with these formulas as either molecular or ionic. Justify your choice.

(a)  $\text{Na}_2\text{O}$     ionic    one metal & one non-metal  
 (b)  $\text{H}_2\text{O}$     molecular    two non-metals  
 (c)  $\text{AlCl}_3$     ionic    one metal & one non-metal  
 (d)  $\text{PCl}_3$     molecular    two non-metals

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 **Writing Chemical Names & Formulas – REVIEW**

Chemical Name	Chemical Formula
Two non-metals? Use di, tri, ... for 1st element. Use mono, di, ... for 2nd element. i.e. $\text{N}_2\text{S}_4$ = dinitrogen tetrasulfide	Mono, di, ... in name? Molecular compound. mono = 1, di = 2, ... i.e. sulfur dioxide = $\text{SO}_2$
Transition metal (Fe, Sn, Pb, Cu)? Remember to put ionic charge in brackets after name of transition metal. i.e. $\text{FeCl}_3$ = iron (III) chloride	Transition metal (iron, tin, lead, copper)? Roman #s in brackets after name = ionic charge of metal. i.e. lead (IV) carbide = $\text{PbC}_4$
Two elements only? Name 1st element and change ending of 2nd element to "ide". i.e. $\text{Na}_2\text{O}$ = sodium oxide	Two elements only? Write symbols & ionic charges of elements. Ignore signs, reduce if possible, criss-cross #s. i.e. magnesium fluoride = $\text{MgF}_2$
Polyatomic ion? Refer to polyatomic chart. Put name of metal 1st and name of polyatomic ion 2nd. i.e. $\text{NaOH}$ = sodium hydroxide	Polyatomic ion? Write symbols & ionic charges of element and polyatomic ion. Ignore signs, reduce if possible, criss-cross #s. i.e. calcium nitrate = $\text{Ca}(\text{NO}_3)_2$

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 **Check Your Learning**

**TEXTBOOK**  
 P.168 Q.1-4 (X2)  
 P.171 Q.7,8,12,13    ⇒ EXTRA practice re chemical names & formulas

**WIKI (CHEMISTRY)**  
 🔍.... 2DCHEM - QUIZZ (Ionic & Molecular Compounds)

**REMEMBER!**

- Use the on-line quiz answers to check your answers (& for help when you run into difficulty).
- Mark your answers right or wrong as you check (& include the correct answers when necessary).
- Include a total at the top of the quiz before handing it in.

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