Naming Covalent Compounds Worksheet

Grade 11 Chemistry · Greek prefixes, names from formulas, and formulas from names

Name: Date: Score: / 24

Naming a Compound of Two Nonmetals

The prefix tells you how many atoms. Memorise these ten.

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

FIRST element
full element name, unchanged
prefix ONLY if there is more than one atom

SECOND element
prefix ALWAYS, even for one atom
and change the ending to -ide

N_2O_4 → 2 nitrogen = **di + nitrogen** · 4 oxygen = **tetra + oxide** → **dinitrogen tetroxide**

Note the spelling: tetra + oxide loses the a. So does mono + oxide, giving monoxide.

These prefixes are for two nonmetals only.
A metal with a nonmetal is ionic, and ionic names never take prefixes.

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Before you start: every compound here is two nonmetals. The first element keeps its full name and takes a prefix only when there is more than one atom; the second element always takes a prefix and always ends in -ide.

Part A · Name to Formula

Write the chemical formula for each name.

#	Name	Formula
1	carbon dioxide	
2	dinitrogen tetroxide	
3	phosphorus pentachloride	
4	sulfur hexafluoride	
5	dinitrogen pentoxide	
6	carbon tetrachloride	

Part B · Formula to Name

Write the systematic name for each formula.

#	Formula	Name
1	CO	
2	SO_3	
3	PBr_3	
4	N_2O	

5	Cl_2O_7	
6	CS_2	

Part C · Mixed Practice Read each row carefully — the direction changes.

#	Given	You need	Answer
1	SiO_2	the name	
2	iodine heptafluoride	the formula	
3	NO_2	the name	
4	tetraphosphorus decoxide	the formula	
5	OF_2	the name	

Part D · Spot the Error Each name below is wrong. Say what rule was broken, then write it correctly.

1. CO_2 has been named **monocarbon dioxide**.

   Correct name: _____

2. N_2O_4 has been named **nitrogen oxide**.

   Correct name: _____

3. CCl_4 has been named **carbon tetrachlorine**.

   Correct name: _____

4. SF_6 has been named **sulfur sixfluoride**.

   Correct name: _____

Part E · Challenge Prefixes belong to covalent compounds only.

1. Decide whether each compound is ionic or covalent, then write the systematic name of the covalent ones only: MgO, CO, K_2S, SF_4, $AlCl_3$.

   Answer: _____

2. Magnesium always forms Mg^{2+} and chlorine always forms Cl^{-}. Use this to explain why $MgCl_2$ is simply called magnesium chloride, while calling NO_2 "nitrogen oxide" is not good enough.

Answer: _____

3. Nitrogen and oxygen form all six of these compounds: NO, NO_2, N_2O, N_2O_3, N_2O_4, N_2O_5. Name each one, then explain what this shows about why prefixes matter.

Answer: _____

Answer Key · Naming Covalent Compounds

Full worked solutions — Grade 11 Chemistry

Part A · Name to Formula

1. carbon dioxide
   CO_2
2. dinitrogen tetroxide
   N_2O_4
3. phosphorus pentachloride
   PCl_5
4. sulfur hexafluoride
   SF_6
5. dinitrogen pentoxide
   N_2O_5
6. carbon tetrachloride
   CCl_4

Part B · Formula to Name

1. C × 1, O × 1
   carbon monoxide
2. S × 1, O × 3
   sulfur trioxide
3. P × 1, Br × 3
   phosphorus tribromide
4. N × 2, O × 1
   dinitrogen monoxide
5. Cl × 2, O × 7
   dichlorine heptoxide
6. C × 1, S × 2
   carbon disulfide

Part C · Mixed Practice

1. **silicon dioxide**
2. **IF_7**
3. **nitrogen dioxide**
4. **P_4O_{10}**
5. **oxygen difluoride**

Part D · Spot the Error

1. the prefix mono is never used on the first element
   carbon dioxide
2. both elements need a prefix, or the name fits several compounds
   dinitrogen tetroxide
3. the second element changes its ending to -ide
   carbon tetrachloride

4. the count is written as a Greek prefix, not an English number
   sulfur hexafluoride

Part E · Challenge

1. • MgO: contains the metal Mg, so ionic — no prefixes
   • CO: two nonmetals, so covalent
   • K_2S: contains the metal K, so ionic — no prefixes
   • SF_4: two nonmetals, so covalent
   • $AlCl_3$: contains the metal Al, so ionic — no prefixes
   Covalent: CO is carbon monoxide; SF_4 is sulfur tetrafluoride

2. • magnesium forms only Mg^{2+} and chlorine only Cl^{-}, so the charges can balance in one way and one way only — $MgCl_2$
   • the name magnesium chloride therefore points at a single compound, and a prefix would add nothing
   • nitrogen and oxygen share electrons instead, and can do so in several proportions, so "nitrogen oxide" does not identify anything on its own
   Ionic charges fix one ratio, so no prefix is needed. Covalent elements can combine in many ratios, so prefixes are the only way to say which compound is meant.

3. • NO is nitrogen monoxide
   • NO_2 is nitrogen dioxide
   • N_2O is dinitrogen monoxide
   • N_2O_3 is dinitrogen trioxide
   • N_2O_4 is dinitrogen tetroxide
   • N_2O_5 is dinitrogen pentoxide
   • every one of these is a compound of the same two elements, so a name without prefixes would be ambiguous six ways over
   All six share the same two elements, which is exactly why the prefixes cannot be dropped.