

# Is It a Greenhouse Gas?

## Student Information Sheet

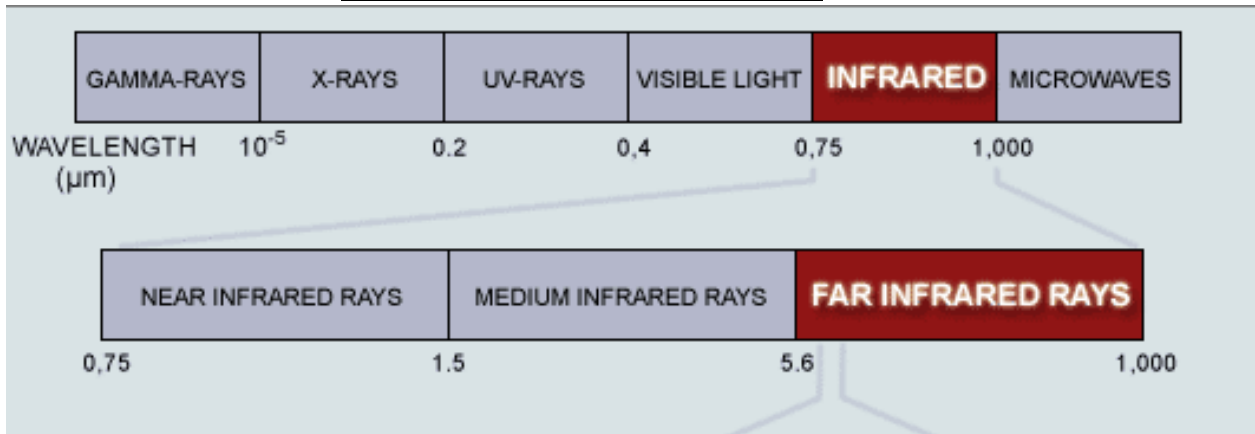


Image credit: <http://www.harmonyfarinfrared.com/images/wavelength-chart.gif>

**Air** is a mixture of gases comprising the Earth's [atmosphere](#). The mixture contains a group of gases of nearly constant concentrations and a group with concentrations that are variable in both [space](#) and [time](#). The atmospheric gases of steady concentration (and their proportions in percentage by volume) are as follows:

Gas	%
Nitrogen (N <sub>2</sub> )	78.084
Oxygen (O <sub>2</sub> )	20.946
Argon (Ar)	0.934
Neon (Ne)	0.0018
Helium (He)	0.000524
<a href="#">Methane</a> (CH <sub>4</sub> )	0.0002
Krypton (Kr)	0.000114
Hydrogen (H <sub>2</sub> )	0.00005
Nitrous Oxide (N <sub>2</sub> O)	0.00005
Xenon (Xe)	0.0000087
Carbon Dioxide	.039

Sources: <http://www.britannica.com/science/air>  
[https://en.wikipedia.org/wiki/Atmosphere\\_of\\_Earth](https://en.wikipedia.org/wiki/Atmosphere_of_Earth)

## ANSWER KEY

Gas	Number of Vibrational Modes*	Global Warming Potential (GWP)
CO <sub>2</sub>	Linear <u>4</u>	1
CH <sub>4</sub>	Non-linear <u>9</u>	21
O <sub>2</sub>	Linear <u>1</u>	0

### \*Number of Vibrational Modes Equations:

Non-linear molecules:  $3 * n - 6 =$  \_\_\_\_\_

Linear molecules:  $3 * n - 5 =$  \_\_\_\_\_

Where n = number of atoms in the molecule.

### *Example:*

For a water vapor molecule, H<sub>2</sub>O: H<sub>2</sub>O is non-linear and has three atoms, so we will use the non-linear molecule formula ( $3 * n - 6$ ), where  $n = 3$ .

Non-linear molecules:  $3 * 3 - 6 = 3$

Number of vibrational modes for H<sub>2</sub>O is 3.