**WHAT IS A GAS?**

**http://www.chemtutor.com/gases.htm**

Gases appear to us as material of very low density that must be enclosed to keep together.

Unlike solids, gases have no definite \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

Unlike liquids, gases have no definite volume, but they completely fill a container.

**The volume of the container is the volume of the gas in it.**

A gas exerts a pressure on all sides of the container that holds it.

Gas can be compressed by pressures greater than the pressure the gas on its container.

The words vapour, fume, air or miasma also describe a gas.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_describes the common mixture of gases in the atmosphere.

A **miasma** is usually a bad-smelling or poisonous gas.

The words vapour and fume suggest that the gas came from a particular **liquid**.

e.g. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ or \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

In the gaseous state matter is made of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (atoms or molecules) that are not attached to each other.

The intermolecular or inter-atomic forces that hold solids and liquids have been overcome by the motion of the molecules.

The particles of a gas have too much thermal energy to stay attached to each other.

The motion and vibration of the atoms pull the individual molecules or atoms apart from each other.

**Liquid air** (with all of the molecules touching each other) has a density of 0.875 grams per milliliter.

By **Avogadro's law**, one mol of any gas occupies a volume of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_at standard temperature and pressure (STP).

**STP:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Standard Pressure is considered at \_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ here in **Montreal**.

We are not in the **Rockies**!

|  |
| --- |
| Patm = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |

1 mol of air is approx. 28.96 g

Therefore the density of air is at STP is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Liquid air is over 680 times more dense than the air at 101.3 kPa.

As an estimate, each molecule of gas in the air has 680 times its own volume to rattle around in.

Gases are mostly \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

**Each molecule of a gas can travel for a long distance before it encounters another molecule.**

We can think of a gas as having a 'point source of mass', that is, the volume of the molecule is

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ compared to the space it occupies.

When a gas molecule hits another one, they bounce off each other, ideally in a completely elastic encounter.

**Elastic collision**: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

There is pressure within the gas that is caused by the gas molecules in motion striking each other and anything else in the gas.

The pressure that a gas exerts on its container comes from the molecules of gas hitting the inside of the container and bouncing off.

**Pressure is caused by \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Pressure is measured in:**

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| --- | --- | --- | --- | --- | --- |
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|  |  |  |  |  |  |

**You must memorize these units and be able to convert from one to the other!!!**

There are some materials that do not appear in the form of a gas because the amount of molecular motion necessary to pull a molecule away from its neighbors is enough to pull the molecule apart.

For this reason you are not likely to see large biological molecules such as proteins, fats, or DNA in the form of a gas.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Gas** | **Formula** | **Uses** | **Source** | **Problem** |
| **Oxygen** |  | Medical—Welding |  |  |
| **Helium** |  | Balloons—Medical Equipment |  |  |
| **Argon** |  | Welding—Inert atmosphere for materials |  |  |
| **Carbon dioxide** |  | Carbonated beverages—Wart removal—GHG |  |  |
| **Acetylene** |  | Welding |  |  |
| **Propane** |  | Fuel for heat—Gas grills |  |  |
| **Butane** |  | Fuel for lighters and torches |  |  |
| **Nitrous oxide** |  | Propellant for whipped topping—Anaesthesia (dentistry) |  |  |
| **Freon—CFCs** |  | Coolant for air conditioners—refrigerators—freezers |  |  |
| **Methane** |  | Fuel for camping and fondues—Biofuel—GHG |  |  |
| **Sulfur dioxide/trioxide** |  | Preservative for dried fruits |  |  |
| **Nitrogen oxides** |  | Blood vessel dilator |  |  |
| **Ozone** |  | Disinfectant—UV protection |  |  |