

# Properties of Fluids

## SPH4C

Liquids and gases are both \_\_\_\_\_: a **fluid** is any substance that \_\_\_\_\_ and \_\_\_\_\_ of its container.

If the fluids are at rest, the study of them is called fluid \_\_\_\_\_.

If the fluids are in motion, the study of them is called fluid \_\_\_\_\_.

The science and technology of the \_\_\_\_\_ of liquids is called \_\_\_\_\_.

Similarly, the science and technology of the mechanical properties of \_\_\_\_\_ and other gases is called \_\_\_\_\_.

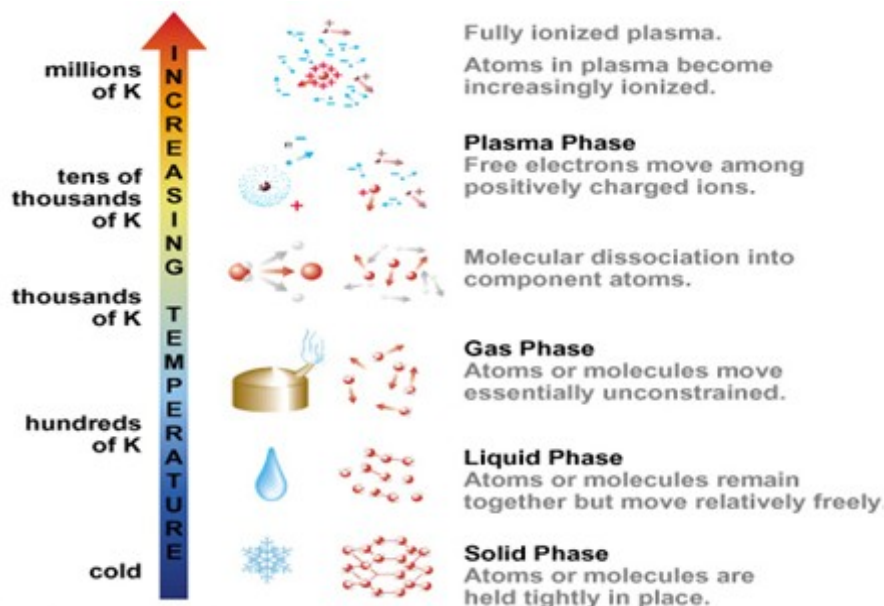
The study of hydraulics and pneumatics includes the study of fluids that are not enclosed, such as lakes and air in the atmosphere, as well as \_\_\_\_\_ that are enclosed:

A **hydraulic system** is a mechanical system that operates using a liquid under \_\_\_\_\_.

A **pneumatic system** operates using a gas under \_\_\_\_\_.

*What's the difference?* Liquids flow and take the shape of their container but maintain a constant \_\_\_\_\_. Gases \_\_\_\_\_ to fill the \_\_\_\_\_.

This is because the difference in what the \_\_\_\_\_ are doing.



## *Particle Theory Revisited*

1. All \_\_\_\_\_ is made up of extremely tiny particles.
2. Each \_\_\_\_\_ has its \_\_\_\_\_ of particles, different from the particles of other pure substances.
3. Particles are always \_\_\_\_\_. Particles at a higher temperature are generally moving \_\_\_\_\_ on average than particles at a lower temperature.
4. Particles \_\_\_\_\_ each other.

In a solid, the particles are moving \_\_\_\_\_ enough that this attraction keeps them in a \_\_\_\_\_.

In a liquid, the particles move fast enough that they can't stay in a rigid structure but they still want to \_\_\_\_\_.

In a gas, however, the particles are moving \_\_\_\_\_ and fly by each other, bouncing off the edges of the container.

Note that there is a 4th state of matter called \_\_\_\_\_ which has \_\_\_\_\_ that can conduct electricity and be influenced by magnetic fields.

It is similar to a \_\_\_\_\_ in its properties.

Gases are therefore highly \_\_\_\_\_: their particles can be forced back closer together.

This means that their \_\_\_\_\_, their \_\_\_\_\_, is variable.

Density has units of \_\_\_\_\_.

Example: A quantity of helium gas at 0°C with a volume of 4.00 m<sup>3</sup> has a mass of 0.712 kg at standard atmospheric pressure. Determine the density of this sample of helium gas.

## More Practice

1. Match each of the following terms on the left to its definition on the right.

_____ compressibility	A. a substance that can flow and take the shape of its container
_____ density	B. a fluid that maintains a constant volume
_____ fluid	C. a fluid that expands to fill the available volume
_____ gas	D. the study of the mechanical properties of gases
_____ hydraulics	E. the study of the mechanical properties of liquids
_____ liquid	F. the mass per unit volume of a substance
_____ pneumatics	G. the property of being able to occupy less volume

2.  $\text{H}_2\text{O}$  can be observed as ice, water, and water vapour. Which of these could be classed as a fluid?

3. Can iron ever be classed as a fluid? Explain.

4. A block of metal is 0.50 m long, 0.20 m wide, and 0.15 m high. Its mass is 128 kg.

(a) What is the volume of the block?

(b) What is the density of the block?

(c) What is the identity of the metal? (*You will need to look this up.*)