

Name: _____

Room: _____

ANSWER

Key

FLUIDS

Particle Theory of Matter

The five main points of the Particle Theory of Matter are:

- 1) All matter is made up of tiny particles
- 2) All particles of the pure substance are identical.
- 3) Different substances are made of different particles.
- 4) Particles are always moving (more energy = faster)
- 5) Attractive forces between particles (closer the stronger the force)

Fluids and Density

A Fluid can be defined as anything that Flows. Its ability to flow is determined by the distance and cohesion between its particles.

All fluids spread out evenly when acted on by an outside force.

Density is the total mass of a substance that occupies a particular volume (space).

Density can be described as the "crowdedness" of the particles that make up matter. Write an analogy: A class crowded into an

elevator is like high density particles

Particle Theory states that different substances have different sized particles. The size of the particles determines how many particles "fit into" a given space. Each substance has its own density based on particle size.

Also, the particles of a substance are separated by spaces between them, which along with particle size also determine its density.

In general, solids are most dense, gases are the least dense, and liquids are in the middle.

Determining Density: Mass vs. Volume

Mass is the amount of matter (particles) in a substance.

Volume is the amount of space a substance occupies.

To determine the density of an object (D) we calculate its mass to volume ratio.

$$D = \frac{m}{V} \quad \text{Density} = \frac{\text{Mass}}{\text{Volume}}$$

Hypothesize what happens to the density of a substance if the temperature or pressure changes?

Temperature: As temperature increases, Density decreases and vice versa

Pressure: As pressure increases, Density increases and vice versa.

Density values are always quoted for a constant temperature and pressure.

Measuring the density of a regular shape (sphere, rectangle, square) uses formulas such as $L \times W \times H$ to calculate the volume in cm^3 and mass (weight on a scale) in grams (g).

Archimedes principle → Measuring the density of an irregular shape requires the use of water displacement, to determine the volume and the mass (weight on a scale) in grams (g).

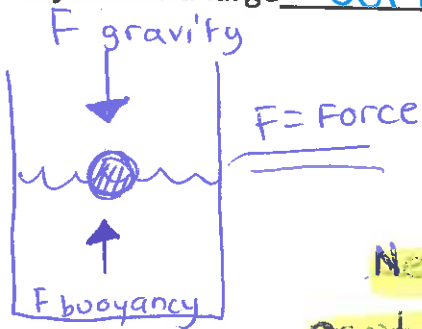
used density + displacement for the Kings crown → Measuring the density of a liquid requires that you weigh the liquid (subtract the weight of the container it's in) and determining the volume which is read directly off the container in mL.

Buoyancy

Buoyancy is the upwards force that a fluid exerts on an object less dense than itself.

The particles of a fluid exert a force in an opposite direction to the force of gravity. Buoyant force is measured in Newton's (N).

Hollow shape traps air \rightarrow overall density lower
Water can support objects that have densities greater than water as long as the object has a large Surface area.



positive buoyancy =
objects less dense than
the fluid that float

Negative buoyancy = more dense
that sink

neutral = same
Viscosity Force

Viscosity is the resistance of a fluid to a change in shape or movement. It is the opposite of Fluidity.

Fluids that are viscous do not flow easily or quickly.

Viscous materials do not allow other matter to flow through them easily.

(Think of thick honey vs water)

Flow Rate

Even though all fluids flow, they flow at different rates ^(speeds) because they have different viscosities.

Another way to define viscosity is resistance to flowing.

This resistance causes internal friction (rubbing) between the particles

A fluid's ability to flow depends on the energy that the particles have to move around which is affected by temperature and pressure.

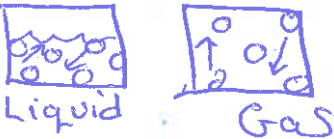
A fluid's viscosity decreases as the fluid is heated and increases as the fluid is cooled.


Changes in temperature have an opposite effect on the viscosity of a gas.

A gases' viscosity increases as its temperature rises, and decreases as its temperature goes down.

An increase in pressure causes a rise in viscosity for all fluids; however, the rise is much greater in gases than liquids.

Three-Point Approach for Words and Concepts

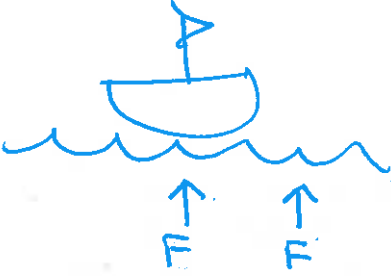
Definition	Word or Concept	Diagram
Matter that contains particles that will move past one another <u>"Flow"</u>	fluid	 <p>Liquid Gas</p>
liquid or gas	Use in a sentence	

Definition	Word or Concept	Diagram
Resistance of a fluid to change shape or movement.	viscosity	<p><u>Water vs Honey</u></p>  <p>Honey viscous</p>
"thick = viscous"	Use in a sentence	

Definition	Word or Concept	Diagram
The movement of particles past one another in a given time	flow rate	
	Use in a sentence	

Definition	Word or Concept	Diagram
<u>5 main points</u>	Particle theory of matter	
	Use in a sentence	

Three-Point Approach for Words and Concepts

Definition	Word or Concept	Diagram
Force opposing gravity exerted by particles in a fluid.	Buoyant force	
* Upward Force of Fluids	Use in a sentence	

Definition	Word or Concept	Diagram
A force exerted over a specific surface area	pressure	
	Use in a sentence	

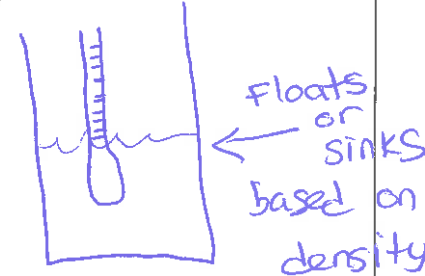
Definition	Word or Concept	Diagram
The ability of a fluid to be squeezed into a smaller volume.	compressibility	Gas = compressible because particles are far apart liquid = considered almost incompressible because particles closer together
	Use in a sentence	

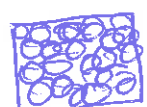
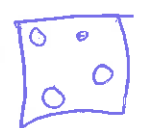
Definition	Word or Concept	Diagram
Pressurized system that uses moving liquids.	hydraulic	• examples Gas pump cars = hydraulic brakes Dishwasher
	Use in a sentence	

- A force is applied at one point and transmitted to another point.

Three-Point Approach for Words and Concepts

Definition	Word or Concept	Diagram
<p style="color: blue;">Pressurized system that uses moving air + other gases.</p>	<p>pneumatic</p>	<p style="color: blue;"><u>examples</u></p> <ul style="list-style-type: none"> • dentist drill • car jacks • tire filling air machine
	Use in a sentence	

Definition	Word or Concept	Diagram
<p style="color: blue;">An instrument for measuring the density of liquids.</p>	<p>hydrometer</p>	 <p style="color: blue;">floats or sinks based on density of liquid</p>
	Use in a sentence	

Definition	Word or Concept	Diagram
<p style="color: blue;">The amount of substance that occupy a volume (space)</p>	<p>density</p>	<p style="color: blue;">High Density</p> 
	Use in a sentence	<p style="color: blue;">Low Density</p> 

Fluids vs. Non-Fluids

Cut out and paste or draw a variety of pictures in the appropriate column on the t-chart below. You must include at least 5 images of each.

Fluid	Non-Fluid