SNC1D6 Name:

5.1 Particle Theory of Matter & Classifying Matter

Learning Goals/Success Criteria: *At the end of this lesson, I will be able to:*

- ☐ Describe the Particle Theory of Matter and explain properties of solids/liquids/gases
- ☐ Classify pure substances & mixtures (homogenous vs heterogenous)

Your mission is to use the demonstrations and activities you see in class today to better understand and use your own evidence to support the Particle Theory of Matter. For each demonstration or activity, record how it supports the Particle Theory of Matter:

Station 1: Food Coloring + Hot Water VS Food Coloring + Cold Water

*Instructions: Place **ONE** drop of food colouring in the beaker of **COLD** water and **ONE** drop of food colouring in the beaker of **HOT** water. Do not stir or disturb the beakers as you observe them.*

a. What I observed: _____

_____

b. Supports Particle Theory of Matter because...._____

_____

c. Draw a diagram of the molecules to illustrate your observation.

Hot Water	Cold Water

d. "Pulse points" are those points on the body where you feel your heart beat – wrists, throat, under the ears, on the inner elbow and behind the knees. The veins are closest to the surface of the skin at these points and they are typically warmer than other parts of your body. Why do perfume manufacturers recommend putting perfume on pulse points?

_____

_____

Station 2: Oil + Water VS Alcohol + Water

Demo A: Water and Oil. Fill one graduated cylinder with 25 ml of oil and another graduated cylinder with 25 ml of water. Pour 25 ml of water into the graduated cylinder with 25 ml of oil.

a. What is the final volume in the cylinder with both water and oil? _____

b. What I observed: _____

_____

c. Supports Particle Theory of Matter because....._____

_____

Demo B: Water and Alcohol. Fill 25 ml of water in one graduated cylinder and 25 ml of isopropyl alcohol in another graduated cylinder.

a. What do you think the resulting volume will be? _____

b. Pour the alcohol into the water. What is the actual volume? _____

c. What I observed: _____

_____

d. Supports Particle Theory of Matter because....._____

_____

e. Draw a diagram of the molecules to illustrate your observation.

Water + Oil	Water + Alcohol

Station 3: Marshmallow and Vacuum Jar

Place one marshmallow under the bell jar and turn on the vacuum pump.

a. What I observed: _____

_____

b. Supports Particle Theory of Matter because....._____

_____

c. Draw a diagram of the molecules to illustrate your observation.

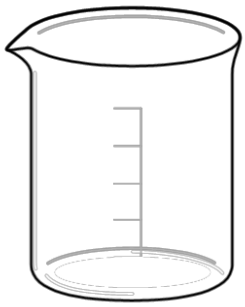
Regular Marshmallow	Marshmallow in Vacuum

Station 4: States of Matter

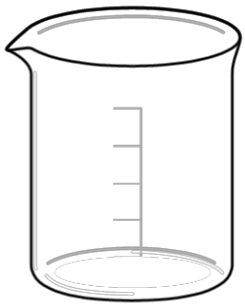
Explore what happens to matter as the temperature increases using the following websites:

- https://www.harcourtschool.com/activity/states_of_matter/
- http://www.harcourtschool.com/activity/science_up_close/501/deploy/interface.html

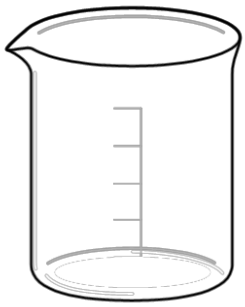
Record how the molecules are arranged and how they are moving for a solid, liquid, and a gas in the diagrams below:



Solid



Liquid



Gas

There is a fourth state of matter--Plasma! Draw what your group thinks that the particles are doing in the Plasma phases:

Solids, liquids, and gases are all states or phases of matter. When matter changes from one phase to another, we call this a ***phase change*** and these have specific names. Use arrows to label the diagram below to indicate what the name of each process that helps matter change from one phase to another (do some research if you need!):

Solid **Liquid** **Gas** **Plasma**

Station 5: Review

Go through a review activities and practice test on the following websites:

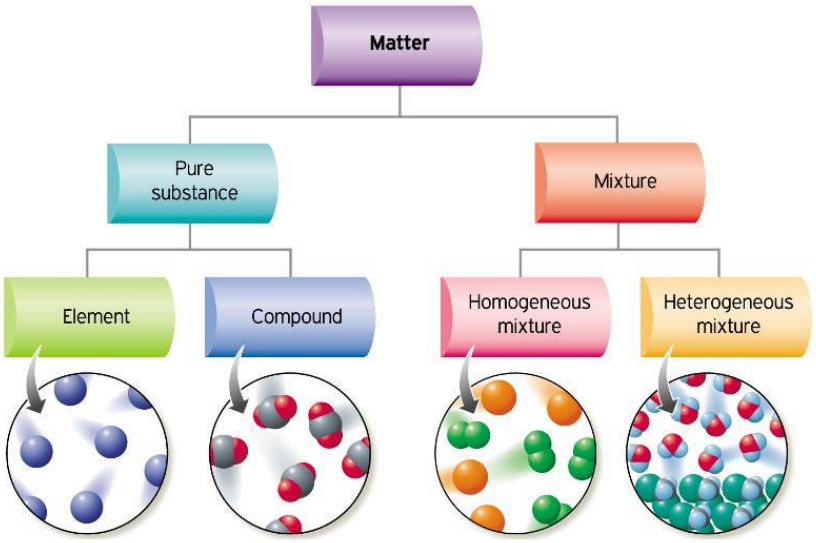
- https://www.bbc.com/bitesize/articles/zqpv7p3 (Search for **BBC What are solids, liquids, and gases?**)
- https://www.bbc.com/bitesize/guides/z2wmxnb/revision/1 (Search for **BBC solids, liquids, and gases**)

Complete a table of the different properties of solids, liquids and gases:

	Solids	**Liquids**	**Gases**
Attractions/Bonds			
Compressibility			
Movement			
Volume and Shape			

Station 6 – Classifying Matter

Matter can be classified according to different characteristics like their physical and chemical properties.



(Note: your text refers to heterogeneous mixtures as mechanical mixtures and homogeneous mixtures as solutions)

Pure substances are only made up of one type of particle, and can be further categorized into elements or compounds. We will look at elements and compounds in more detail in Chapter 6.

Mixtures are made up of two or more particles and can be further categorized into mechanical (heterogeneous) and solutions (homogenous). A ***mechanical (or heterogenous) mixture*** is a mixture in which the substances are distinguishable from each other. ***Hetero***genous means different and refers to the 2 separate phases of a mechanical mixture. A good example is oil and water.

The substances in ***a solution (or homogenous mixture)*** are not distinguishable from each other because the particles have actually dissolved. ***Homo***genous means same phase and a solution of salt water looks all the same. Solutions can look like pure substance but contain more than one type of particle dissolved in another.

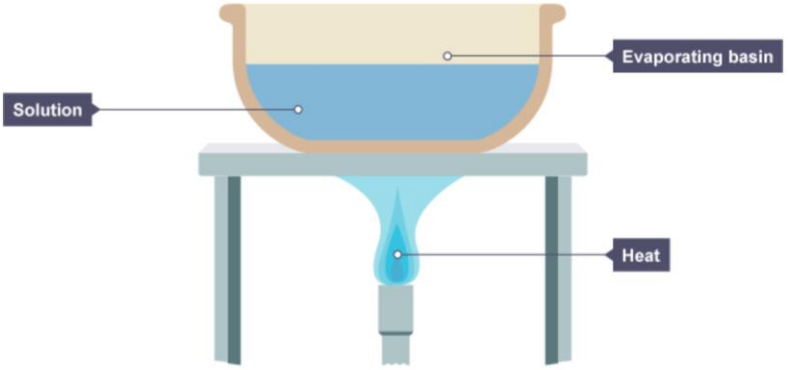
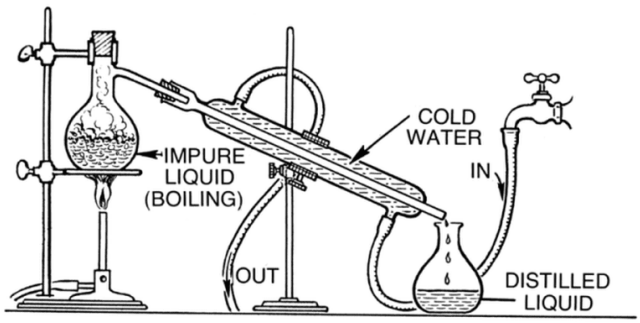
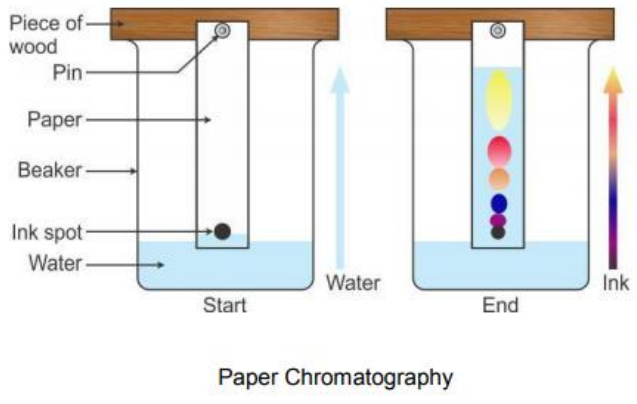
An easy way to tell a solution and mechanical mixture apart is that all liquid and gas solutions are transparent! The solutions remains stable and do not separate. Solutions of solid metals are called ***alloys***. Some common alloys are brass, bronze, solder, and rose gold.

Station 6 – Classifying Matter

Mixtures can be separated using different methods. *Go through the review activity at:*

- https://www.bbc.co.uk/bitesize/guides/zgvc4wx/revision/1

Make notes on the following methods:

Method	**Example**
A filter	
Evaporation	
Distillation	
Chromatography	 Paper Chromatography

Station 7 – Classifying Matter

Examine the samples provided and identify them as mechanical mixtures or solutions.

Sample	Observation	Mixture	
		Mechanical	Solution
A	Use a magnet to examine sample A		
B	Shake sample B and allow to rest on the bench for 2 min.		
C	Shine the flashlight through sample C		
D	Use the hand lens to examine sample D		
E	Add two drops to a small sample of E and mix.		
F	Use the hand lens to examine sample F		

Extension: Colloids are examples of heterogeneous mixtures that look like homogenous mixtures! Like solutions, they do not separate upon standing and cannot be separated by normal filtration. Like mechanical mixtures, they do not pass the light test. They are classified by the size of their particles. Colloids have particle sizes that consist of clumps of molecules. Some examples of colloids include: aerosols (fog, clouds, smoke, dust), foams (whipped cream), solid foams (marshmallow, Styrofoam), emulsions (milk, mayonnaise, lotion), gels (butter, gelatin), sols (ink, liquid detergent, shampoo) and solid sols (gemstones, some coloured glass & alloys). A sol is a colloid with a solid suspended in either a liquid or another solid.

Review & Recap – This can be completed as you go station to station and have extra time

Each of the activities/demos illustrated a different point in the Particle Theory of Matter.

The Particle Theory of Matter states:	**Activity/Demo that showed this point:**
1. All matter is made up of particles.	
2. All particles of one substance are identical.	
3. 3. Particles are in constant motion. (Yes! Even when they are frozen!)	
4. 4. Temperature affects the speed at which particles move.	
5. 5. Particles have forces of attraction between them.	
6. There are spaces between particles.	