Eureka Video Viewing Guide Name: _____

Today we will watch 6 short video clips from a program called **Eureka**. (Yes, the videos are a little old, and might seem like they are meant for children, but they are REALLY great at showing difficult concepts in an easy-to-understand way!)

Go to **tinyurl.com/eurekaplaylist** . We will begin with watching Video 16. During each video, fill in the blanks below. Then, in between each video, answer the questions that follow.

VIDEO #16: MOLECULES IN SOLIDS

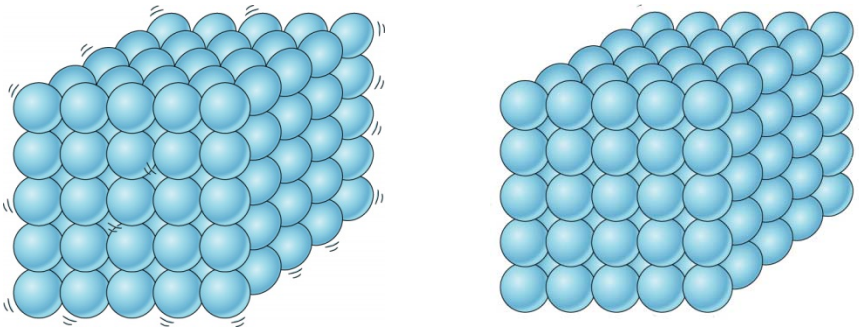
The 3 states of matter are _____, _____ and _____.

In a solid the "little lumps" act as if they are held together by _____.

The "little lumps" are scientifically called _____ from Latin: *moles* (lump) and *cula* (little)

After watching the video, answer the following questions:

Solid at 25°C **Solid at 35°C**



1. Are the solids pictured in the lattice above *moving* at all? How do you know? Explain *how* they are moving.

2. Look at the small cartoon "motion lines" on the solid at **25°C.** Correctly draw the "motion lines" for the solid at the right, which has a higher temperature of **35°C**. Explain why you drew the "motion lines" differently.

The story so far: All solids consist of "little lumps" of matter which are continuously vibrating in a lattice pattern. It is this lattice structure of "little lumps" that keeps the solid from falling apart. These "little lumps" are called molecules.

VIDEO #17: MOLECULES IN LIQUIDS

Solids keep their _____.

Liquids have no shape of their own. They take on the shape of the _____ that they are in.

Liquids will flow due to the force of _____.

When a solid is heated enough, the molecules move around freely and are no longer held together by their force of _____. The speed of the molecules has caused them to slip out of their regular _____.

When liquids are cooled enough, they turn into _____

After watching the video, answer the following questions:

3. Remember that liquids and solids are held together by **intermolecular forces**, such as dispersion forces, dipole-dipole attractions, or even hydrogen bonds. Which state of matter (solid or liquid) has molecules with more freedom to move?

4. In general, which state of matter (solid or liquid) would have less intermolecular forces?

5. Explain how your answer in #3 above is consistent with your answer in #4 above. Why does one state of matter have more freedom to move than the other, in terms of its intermolecular forces holding it together?

The story so far: As the molecules in a solid get hotter, they vibrate faster and faster, until their mutual force of attraction is no longer strong enough to hold them together. This causes them to slip out of their lattice pattern, which therefore falls apart. When the lattice structure of molecules in a solid has collapsed, we say the solid melted.

VIDEO #18: EVAPORATION AND CONDENSATION

When molecules of a liquid "escape" the liquid, they become a _____.

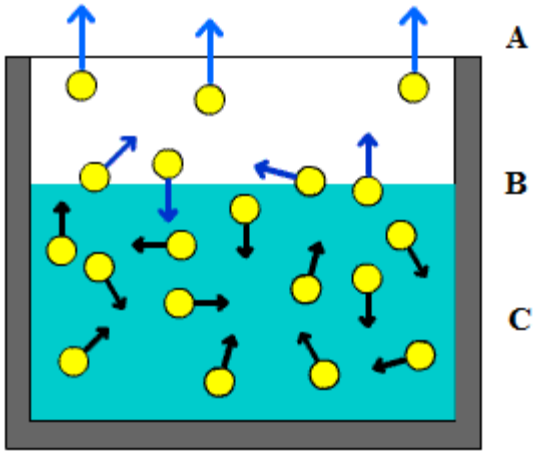
This process of change from a liquid to a gas is called _____.

When the molecules of a gas cool enough, they can't overcome their attraction and they turn into a _____.

The change of state from a vapor/gas to a liquid is called _____.

After watching the video, answer the following questions:

6. Using the picture to the right, which group(s) of molecules (Group A, Group B, or Group C) are experiencing **intermolecular forces** which hold them together?



7. Which group(s) are able to escape immediately if they possess enough kinetic energy (energy of motion) to overcome the intermolecular forces holding them together?

8. What could be done to increase the rate of escaping (evaporation) of the molecules? Why will this work? Explain your answer based upon the speeds of the molecules.

The story so far: When molecules escape from a liquid, they spread out in all directions to form a gas, or vapor. This process is called evaporation: the change of state from liquid to a gas. When gas molecules are cooled, they go slower and crowd together more densely to form a liquid. This process is called condensation: the change of state from a gas to a liquid.

VIDEO #19: EXPANSION AND CONTRACTION

The molecules in a gas move in all _____

Hot molecules take up more space than _____ molecules.

The word for taking up more space is _____

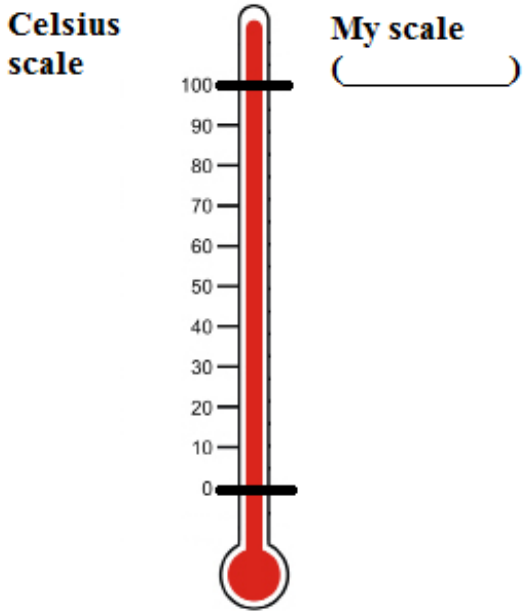
The word for taking up less space is _____

After watching the video, answer the following question:

9. Explain why a balloon increases in volume when it is heated, according to the Kinetic Molecular Theory of gases. Your answer must talk about *collisions* of molecules.

The story so far: When matter, in any of its three states, gets hot, its molecules go faster and take up more space, and the solid, liquid or gas expands. When matter gets cold, its molecules go slower and take up less space, and the solid, liquid, or gas contracts.

VIDEO # 20: MEASURING TEMPERATURE



Mr. _____ invented a way of measuring hotness and coldness.

The freezing point of water is _____°C.

The boiling point of water is _____°C.

Room temperature is about _____°C.

Normal body temperature is _____°C.

Mr. Celsius' "hotness meter" is called a _____.

After watching the video, answer the following questions:

10. Make your own relative temperature scale using the thermometer to the right. Name the scale after yourself! ☺ You decide to base your scale on these criteria:
    a. The freezing point of water is equal to **the number of pets at your home**
    b. The boiling point of water is equal to **your current age**
    c. Draw a reasonable number of evenly-spaced divisions ("degrees") for your scale on the right-hand side
11. Now, using your temperature scale, if I have water which is 50 degrees Celsius, approximately how many degrees would that water be if it were measured with your unit of temperature? How do you know?

The story so far: When the degree of hotness (or temperature) of something goes up, its molecules go faster and it expands. This expansion can therefore be used to measure temperature itself. A device which does this is called a "hotness-meter", or thermometer. On the Celsius scale of the thermometer, the level to which the liquid contracts at the freezing point of water is labeled 0 °C, and the level to which the liquid expands at the boiling point of water is labeled 100°C.

VIDEO # 21: TEMPERATURE vs. HEAT *(watch carefully! This one is the most confusing, because it's a confusing concept!)*

The "degree of hotness" is like _____.

The "quantity of hotness" is like _____.

The temperature of water depends on the _____ of its molecules only.

The heat of the water depends on both its _____ and the _____ of its molecules.

After watching the video, answer the following questions:

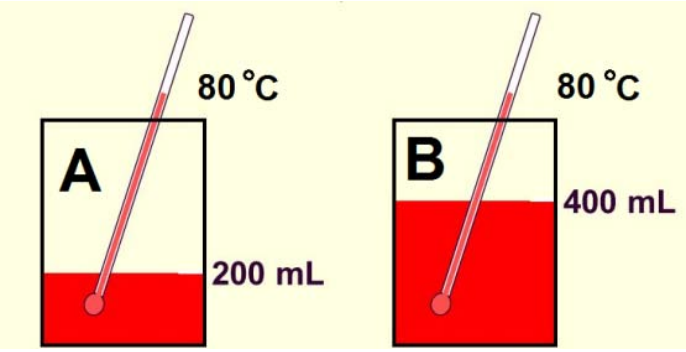
12. In each sentence below, fill in the correct word (either **heat** or **temperature**).
    a. Ouch! The water in the bathtub has a very high _____.
    b. When I put an egg into boiling water, the water transfers some of its _____.to the egg.
    c. I think I have a fever. Get a thermometer and measure my _____.
    d. Two cups of water sit in a refrigerator for a long time. One has much more water than the other cup. Both cups of water have the same _____.
    e. When a spoon is put into a bowl of hot soup, the _____ of the spoon will increase because the soup transfers _____ to the spoon.

13. Why is a 50°C bucket of water much better for heating up a swimming pool than a 100°C teacup of water? Explain. In your answer, be careful to use the words **heat** and **temperature** correctly.

Consider the two beakers to the right. Both beakers contain a sample of the same liquid.

14. In which beaker (if any) are the molecules moving faster? How do you know?

15. Which beaker has a greater total amount of **thermal energy**? How do you know?



16. A student predicted that when Beaker A is combined with Beaker B, the new temperature will be higher than 80°C because we have added the heat of both liquids together, so the new temperature must be greater than before. Explain why the student's rationale is incorrect, and make a new prediction about what will occur.