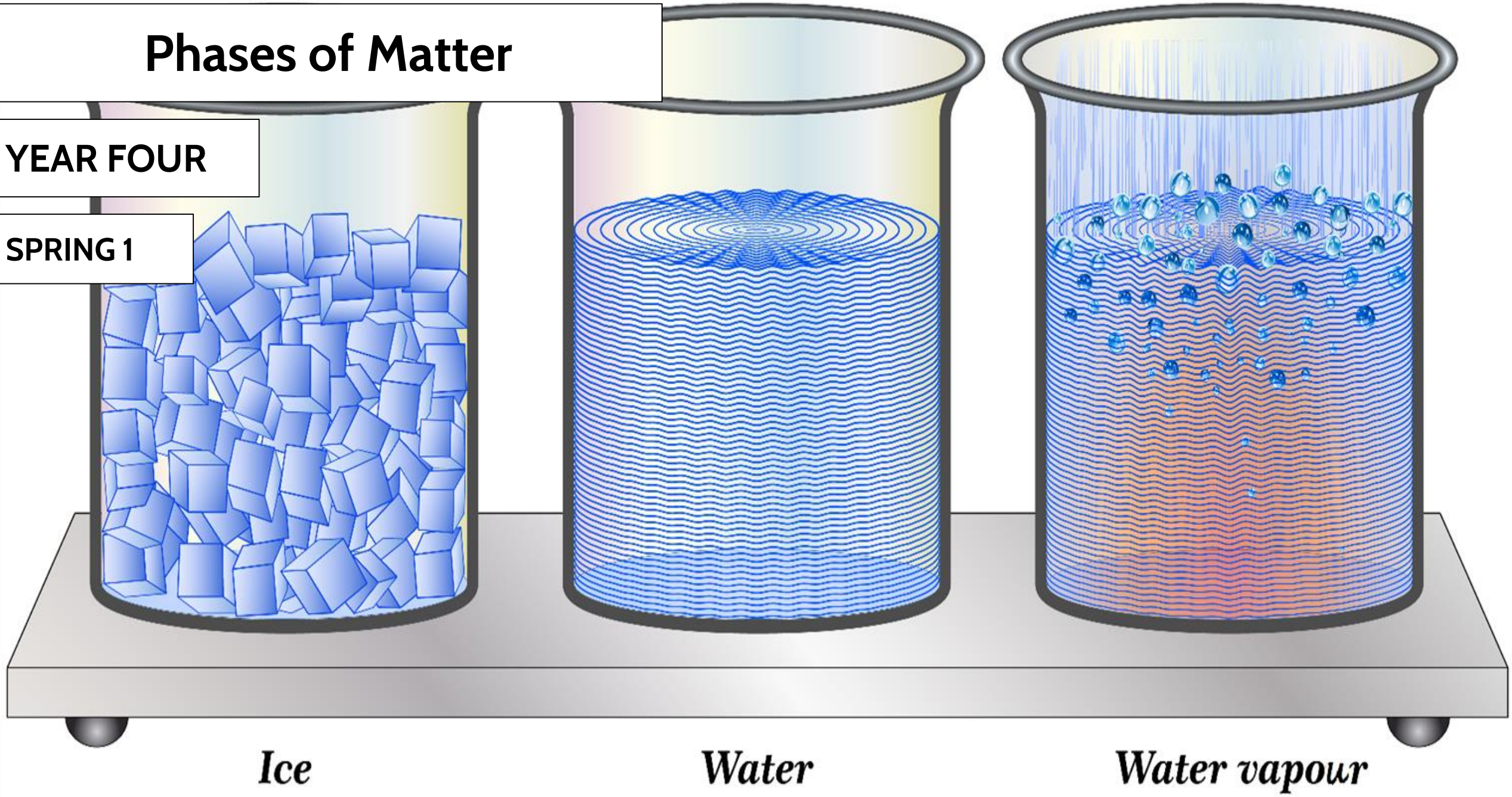
Phases of Matter

YEAR FOUR

SPRING 1



LESSON THREE

What happens when you heat or cool each state of matter?

Do Now – Retrieval practice from last term

1. Fill in the gaps below:

In solids: particles are very _____ together in a _____ pattern. Particles cannot _____ but can _____.

In liquids: particles are _____ together and in a _____ arrangement. The particles can _____ past each other.

In gases: particles are _____ _____ from each other and in a _____ arrangement. They are _____ constantly in all directions.

2. Say whether each of the following is 'true' or 'false:

a) Liquids are incompressible _____

b) Solids fill the container that they are in _____

c) Gases are compressible _____

d) Solids have a fixed shape _____

e) Liquids take the shape of the bottom of the container they are in _____

f) Gases stay in a fixed shape no matter which container they are in _____

From last year:

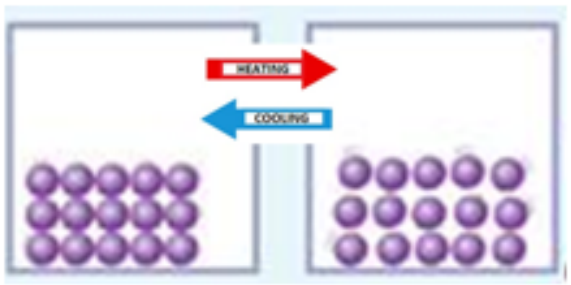
Add the arrows to this food chain to show the transfer of energy between organisms.

Read the following passage about heat and particles

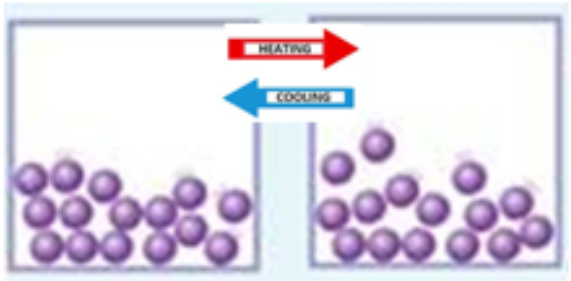
When heat is given to a substance, the particles in the substance begin to move more quickly. In a solid, this means that the particles will vibrate more. In a liquid and a gas, this means that particles will move with a faster speed.

When particles move more quickly, they push the particles around them more forcefully. This makes the particles spread out a bit more which means the substance they are in expands. This means the volume (the space taken up by the substance) increases.

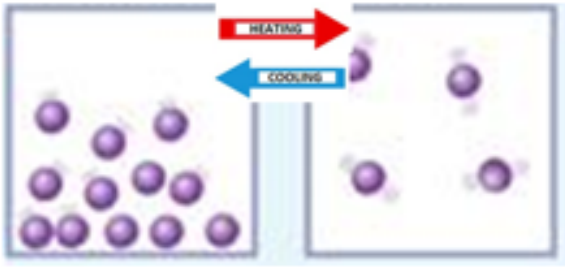
When a substance cools down, it loses some of its heat. This means the particles move less quickly. In a solid, this means that the particles will vibrate less and in a liquid and a gas this means that particles will move more slowly. As a result, the particles take up less room and the substance contracts (takes up less space).



Particles in a solid



Particles in a liquid



Particles in a gas

Find answers to questions below in the passage above

1. What to the particles in a substance if it is heated?

   If a substance is heated, the particles begin to _____.

2. What happens to the movement of particles in solids, liquids and gases when they are heated?

   In a solid, the particles will _____ more. In liquids and gases, the particles will move with a _____ .

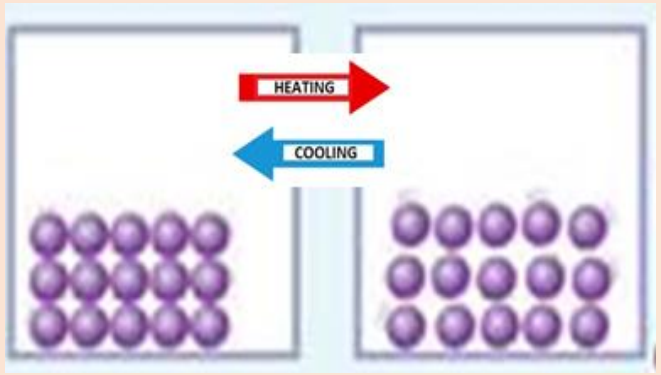
3. What happens to a substance overall when it is heated and why?

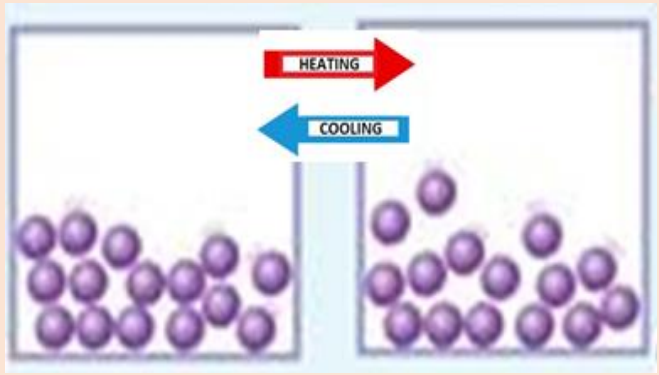
   When a substance is heated it e_____ (this means the volume i_____). This happens because the particles push each other more _____ which makes the particles s_____ o_____.

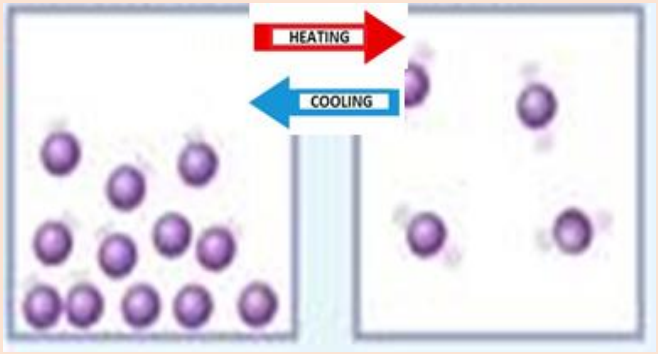
4. What happens to a substance overall when cools down and why?

   When a substance cools, it c_____ (this means the volume d_____). This happens because the particles take up less s_____.

Act out 'cold' particles and 'hot' particles in solids, liquids and gases

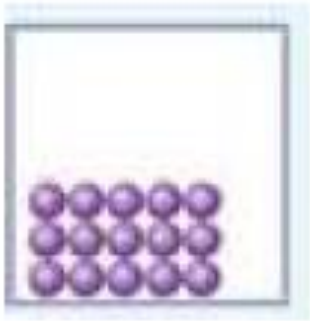






Label of the diagrams below to show with one of the following:

Cold solid | hot solid | cold liquid | hot liquid | cold gas | hot gas

 _____	 _____	 _____
 _____	 _____	 _____

Discuss with a partner - how we might we be able to tell if a substance has expanded or contracted?

Watch the demonstration of solids, liquids and gases being heated. Write down what you observe below

Demonstration	**Observation**
Solid – ball and ring experiment	When the solid ball was heated, I observed that _____ _____ _____
Liquid – potassium permanganate and capillary tube	When the purple liquid was heated, I observed that _____ _____
Gas – heated air creating bubbles	When the gas in the flask was heated, I observed that _____ _____

Watch the video of balloons being put into liquid nitrogen. What do you observe? Why does this happen?

How can heating and cooling be helpful in the following examples:

Putting a jar under the hot tap to help get the lid off	Heating the lid could be helpful because _____ _____
Using liquid in a thermometer to tell temperature	Heating the liquid in a thermometer when you place it in something hot is helpful because _____ _____
Cooling oxygen and hydrogen to put them into tanks	When storing gases like oxygen and hydrogen, cooling them is helpful because _____ _____

Why might be dangerous to heat a gas when it is trapped in a metal can?

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