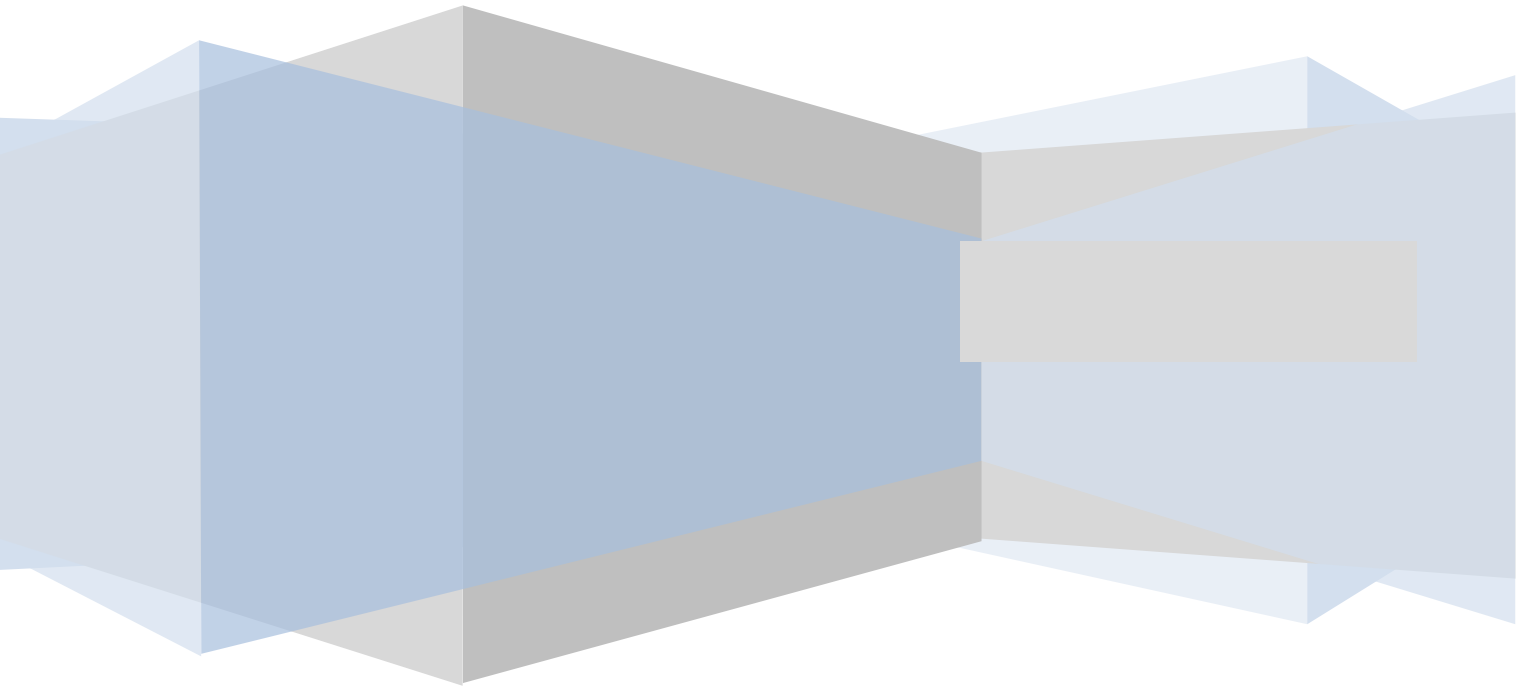
Particles of Chemistry

Visualising Matter and Solutions

Enda Carr



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Chapter 1: Making Particles Move

Fill in I p.8 before beginning!!

Task 1 [Some groups]: You are given a dropper, food colouring and some water in 2 beakers. One beaker contains water from the fridge [4 ^{o}C]while the other contains water at room temperature [21 ^{o}C] You will investigate what happens when you allow 2-3 drops of food colouring to fall from the dropper to the water inside the 2 beakers.

What do you think will happen if the water in the beakers is at different temperatures?

_____

What happened [Result]?_____

Why did this happen [Conclusion]?_____

Is there anything about the way you did the experiment that you could vary besides temperature?

_____

What did you do to make this a fair test? _____

Draw what you did:

Task 2 [Some groups]: Two pieces of tissue paper are dampened with water. One is put on a hot plate while the other is left on a cool surface.

What is your Prediction? _____

What happened [Result]?_____

Why did this happen [Conclusion]?_____

Is there anything about the way you did the experiment that you could vary?

_____

How could you make this a fair test? _____

Draw what you did:

Task 3 **[Some Groups]:** Two balloons are not fully inflated so they can **fit in a beaker**. One is left in a beaker of warm water while the other is placed in a beaker of colder water.

What is your Prediction about the size of the balloons after a few minutes?

_____

What happened [Result]?_____

Why did this happen [Conclusion]?_____

Is there anything about the way you did the experiment that you could vary?

_____

How could you make this a fair test? _____

Draw what you did:

Task 4 **[Some groups]:** One person in your group is given a thermometer and asked to hold the bulb at the bottom. The thermometer contains alcohol with a red dye in it.

What is your Prediction regarding the level of the alcohol in the tube?

_____

What happened [Result]?_____

Why did this happen [Conclusion]?_____

Is there anything about the way you did the experiment that you could vary?

Draw what you did:

From the experiments that you carried out today, can you explain what energy cause substances to do?

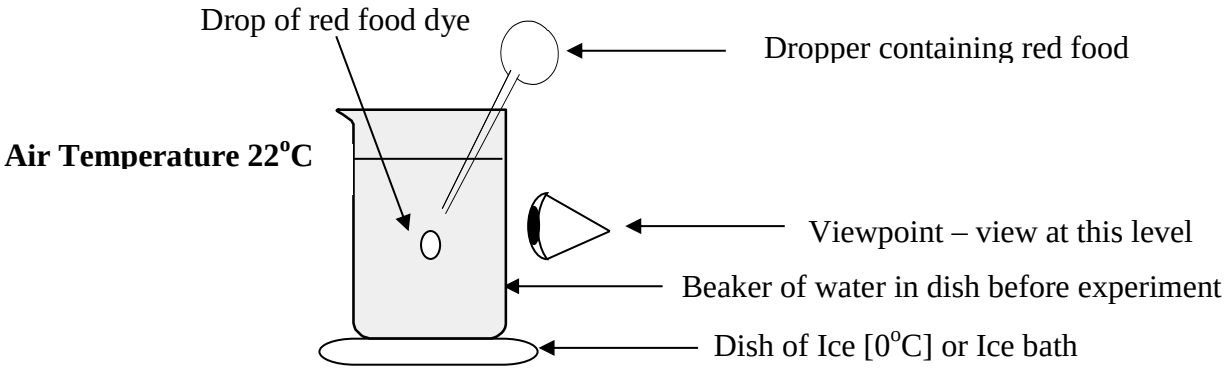
_____

Prediction of the Movement of Food Dye under water Depending on Temperature

A beaker of water is sitting on ice at 0^oC. The temperature of the water is 20^oC at the top.

If you were given a dropper with red food colouring, and you squeezed out the colouring from the dropper at about halfway down the depth of the water.

Talk to the other members in your group and see if you can you predict what you would see from the viewpoint. Draw arrows to represent the movement of the dye [*Big arrows* mean *much movement* and *little arrows* mean *little movement*].



1.1 Draw what you predict will happen on the mini-whiteboard

1.2 In what part of the beaker do you think the dye will move most? _____

1.3 Why do you think that this will be the case? _____

Task 5 [Demonstration]: Formation of particles of Ammonium chloride

Method 1: Your teacher will put a piece of cotton wool soaked in Ammonia into one end of a glass tube and a piece of cotton wool containing Hydrochloric acid at the other end of the same glass tube.

Method 2: Your teacher will place a drop of Ammonia onto a tile. Then a drop of Hydrochloric acid will be dropped at a distance of about 2cm from the drop of ammonia.

1.4. Mark on either 'Method1' Before or 'Method 2' Before drawings on the next page where you predict new particles form due to the reaction.

1.5 Describe *what* appears and say which chemical it appears beside

_____

1.6 Can you think of how you can *increase the amount of* what appears?

_____

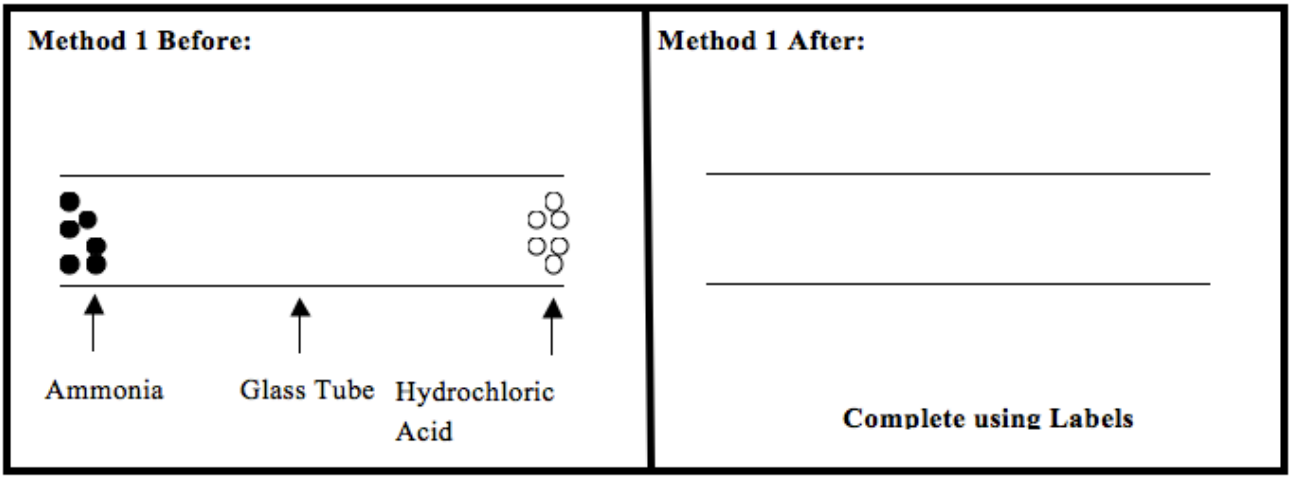
1.7 Can you think of why this appears closer to one of the chemicals than the other one

_____

1.8 Which was your favourite type of animation and why?

_____

Draw the Production of Ammonium chloride gas from ONE of the Demonstrations



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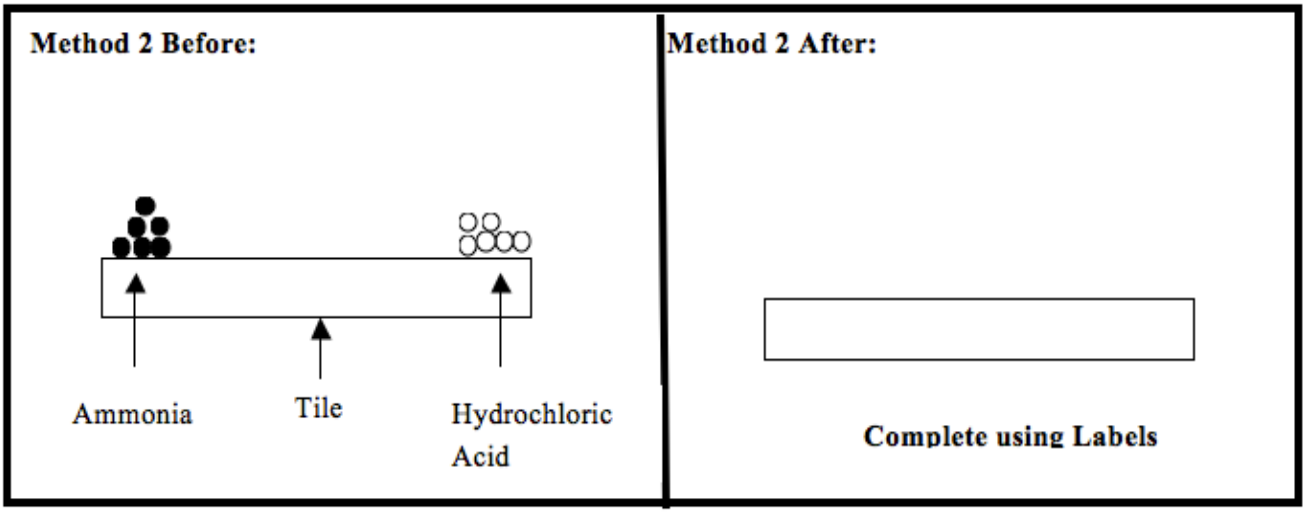
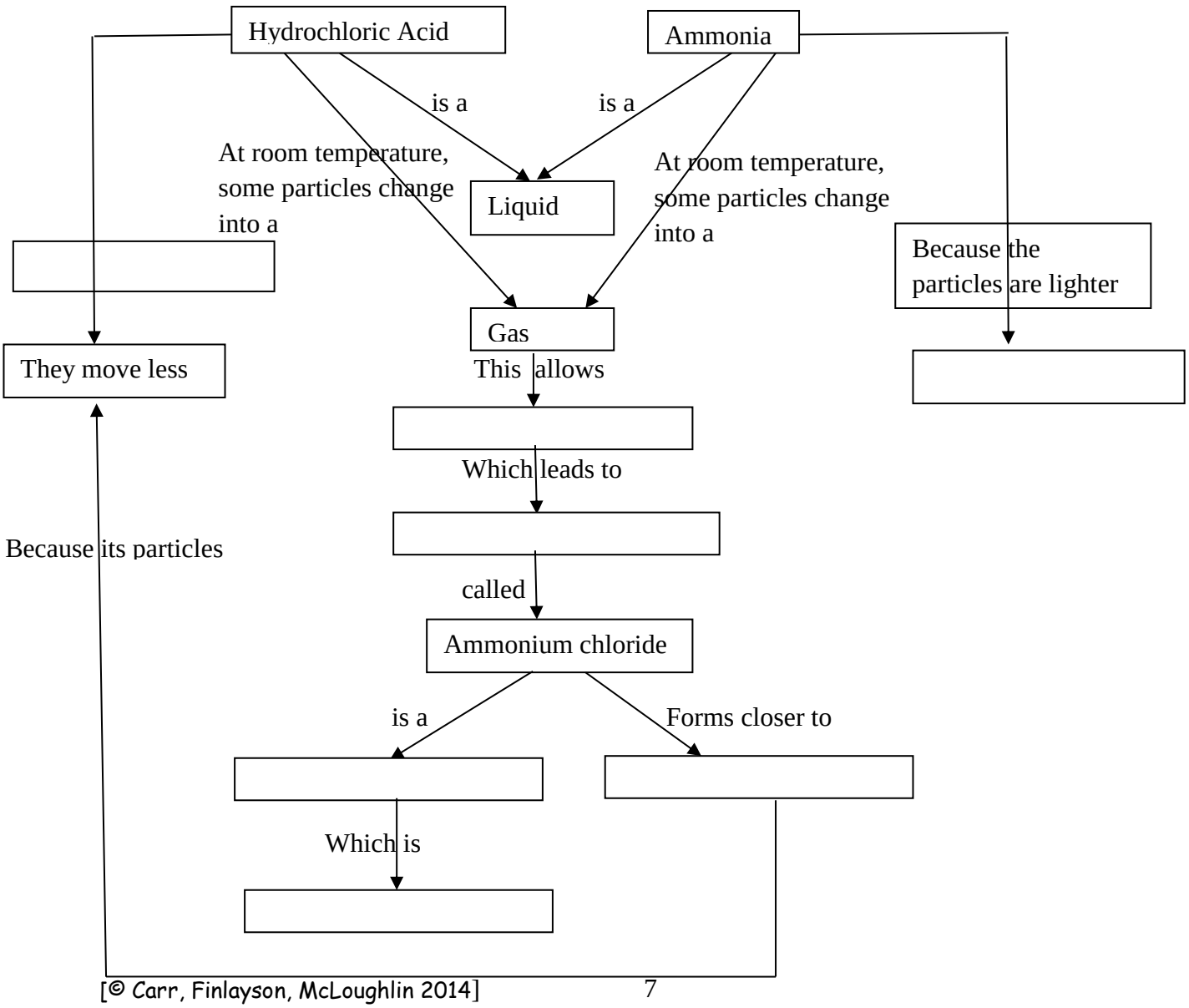


Concept Map 1- Focus Question: How do you know Gases are made of particles?

Can you complete the concept map below using some or all of the words or phrases from this selection:

- hydrochloric acid
- they move more
- white gas
- formation of new particles
- visible
- mixing
- is made of heavy particles so



My Own Notes on What I learned about Particles and Energy in this Chapter:

I. What I thought about how to make particles of a substance move at the beginning of the lesson:

_____

II. What I have learned or think about 'energy and particle movement' now:

_____

III. What made me change my mind:

_____

IV. Which bit did I find difficult:

_____

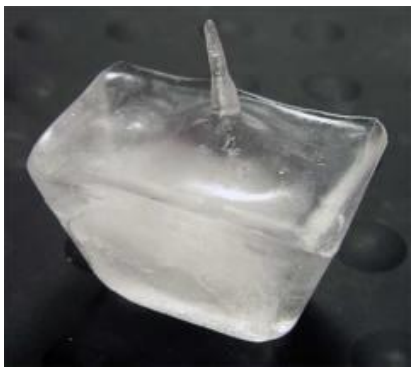
V. How can I make sure that I understand this before the next lesson?

_____

Fill in I. p.14 before beginning!!

Chapter 2: Matter

Modelling Matter



Solid **Liquid** **Gas**

2.1. Can you explain why the water stayed in the bucket? _____

Keeping ***attractive*** forces in mind, from the swinging bucket and Newton's apple; can your group act out the behaviour of the particles in a solid, a liquid or a gas.

Making Models of Matter

Given a lunchbox and some plastic particles, can you make models of a solid, liquid and a gas. One of your group will present the model to the class.

Draw Particle Models of Solids, Liquids and Gas States **(use a pencil)**

– use arrows (smaller or larger) to show amount and direction of movement of particles

e.g. ◯ or ◯ or ◯

Solid	**Liquid**	**Gas**

2.2 How the 'Forces of Attraction' in the states of matter compare with each other:

The particles in a _____ are more attracted than the particles in a _____ which are themselves more attracted than the particles in a _____.

Human Modelling of Matter:

Break into groups of five: can you model being a solid, liquid or gas – use 'mass of body' tags

i. Did the number of *people in your group* change during this exercise?

_____

ii. Did *your own* body mass change during this exercise?

_____

iii. Did the total body mass of *your group* change during the exercise?

_____

iv. Did your size of height change during the exercise?

_____

v. Did your body change into somebody else's during the exercise?

_____

vi. What changed during as your group modelled a solid, a liquid and a gas?

_____

vi. If you repeated the modelling exercise in a much bigger space – would the extra space affect the way the members of your group can move? _____

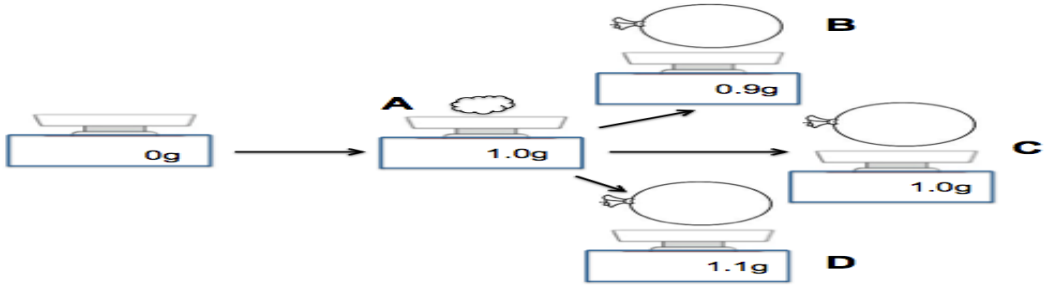
viii. After checking answers i. to iv. with your group, if a set of particles weighed 8g as a **solid**, what would it weigh if it was turned into a **liquid**?

_____

ix. What would the same particles weigh if it was then turned into a **gas**?

_____

Based on your answer, predict and circle from B, C or D as to what reading is likely to appear on the weigh balance when the empty balloon (A) is inflated.



x. Consider how particles of a ruler move if a student tips the end of a ruler as it lies flat on a table.

Try to think of other real-world examples of how liquids and gases may move.

Now match the states of matter with the action in the left column by marking each box with a or an .

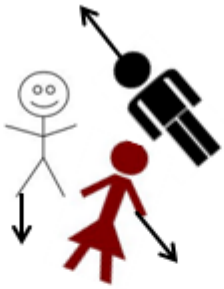
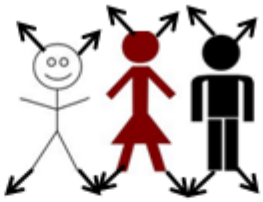
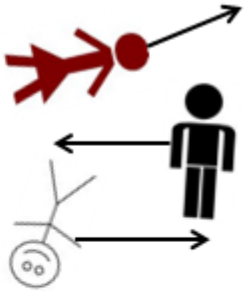
Action	**Solid Particles**	**Liquid Particles**	**Gas Particles**
Spin			
Vibrate			
Slide			
Move Randomly			
Strongest Attractive Forces between particles exist in a			
Action	**Solid**	**Liquid**	**Gas**
Least Attractive Forces between particles			
Least Empty Space between particles			
Most empty space between particles exist in a			

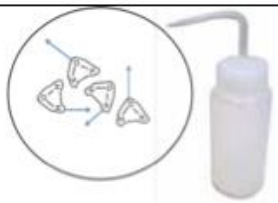
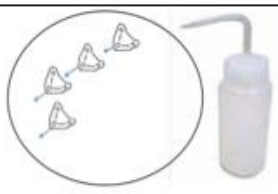
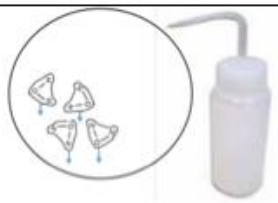
xi. Write a short paragraph on describing the relationship between the **amount of space** any of the three states of matter can take up and the **attractive forces** present in that state using words such as: 'solid', 'liquid', 'gas', 'strongest', 'weakest', 'attractive force'.

_____

_____

xii. Using this information: 40Kg 50Kg 60Kg - complete the table below.

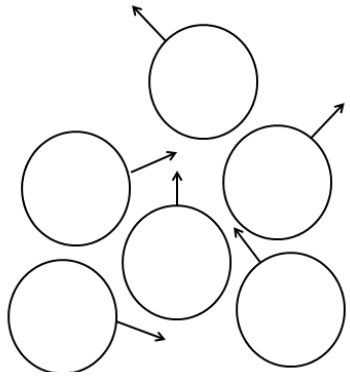
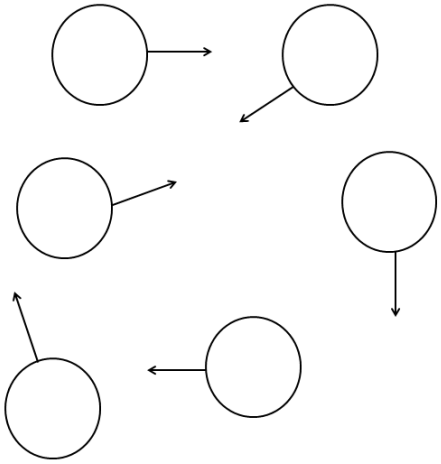
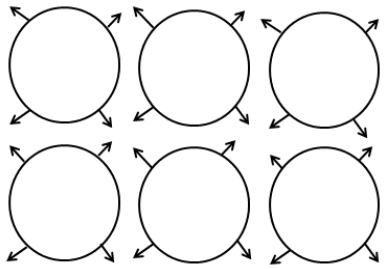
Matchstick Model			
State of Matter			
Mass of this State			

A	B	C	D
			

xiii. Imagine you had microscopic glasses on and the particles in the black circle are what you can see in a drop of water moving. Which is the best representation for water moving through the air from the wash-bottle after the bottle has been squeezed – Explain

_____

xiv. Identify: a)0.01g of solid b) 0.01g of liquid c) 0.01g of gas

Explain how all three states can have a mass of 0.01g.

_____

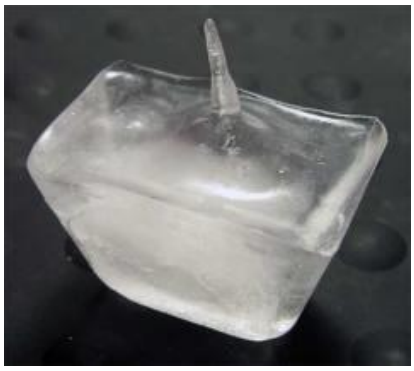
xv. Write a paragraph regarding the **liquid state** using most of the following words or phrases: 'Take up all available space', 'moderate', 'randomly', 'slide', 'flow', 'same distance apart as solid particles', 'attractive forces', 'disordered pattern'.

_____
_____
_____
_____
_____

xvi. Circle the meaning of 'Attractive forces' you think fits best below

REPULSION PUSH APART PULL TOGETHER STATIC

My Own Notes on What I learned about Matter in this Chapter:



Solid

Liquid

Gas

I. What I thought about the differences between how solids, liquids and gases behave at the beginning of the lesson:

_____

II. What I have learned or think about it now:

_____

III. What made me change my mind:

_____

IV. Which bit did I find difficult:

_____

V. How can I make sure that I understand this before the next lesson?

_____

Chapter 3: Volume

Volume is the amount of space that something occupies.

For a regular solid [a solid such as a book] whose length, height and width you can measure with a ruler, there is a formula you can use to obtain the volume. The formula is as follows:

Volume = Length x Width x Height

Example: The height of a concrete block is 9cm. It's width is 6cm, while it's length is 12 cm.

Using the formula: Volume = Length **x** Width **x** Height

= 12cm **x** 6cm **x** 9cm = 648 cm^3

Task 6: Using a ruler, calculate the volume of your science workbook.

Length = _____cm Height = _____cm Width = _____cm

Volume = _____ = _____cm^3

Task 7: Using a ruler, calculate the volume of a microwave oven where you live.

Length = _____cm Height = _____cm Width = _____cm

Volume = _____ = _____cm^3

Task 8: Using a ruler, calculate the volume of a cereal box.

Length = _____cm Height = _____cm Width = _____cm

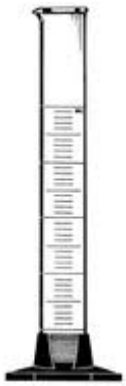
Volume = _____ = _____cm^3

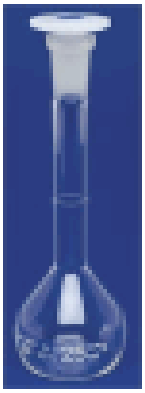
Which item took up the greatest volume? _____

Which item took up the least volume? _____

Fill in I p.31 before beginning!!

Chapter 4: Characteristics of Matter





Graduated Cylinder **Beaker** **Volumetric Flask**

Task 9: Complete the following steps in order – the equipment needed is labelled above.

4.1. You are given a graduated cylinder with 50cm^3 of water in it (check if there actually is).

4.2. Note the shape of the water in the blank space. _____

4.3. Pour the water from the cylinder into a beaker. Note the shape of the water here: _____

4.4. Finally, using a funnel, transfer the water into a volumetric flask . Once again, note the shape of the water here: _____.

Now answer the following questions:

4.5 Use a graduated cylinder to show if the volume of water changed or not during the experiment.

Repeat Task 9, **4.1** to **4.4** if you wish to (perhaps there was spillage\0.

_____

4.6 What did you notice about the *shape* of the water throughout the experiment.

_____

4.7 What state of matter was under the lid of the volumetric flask **before** the water was funnelled into it <u>and</u> what *shape* did it take up?

State of Matter under lid before water added _____

Shape of Matter under lid before water added: _____

4.8 What happened to this matter when the lid was taken off the volumetric flask and what *shape* did it take up?

What Happened without lid? _____

Shape when lid was taken off: _____

4.9 What is the name of this substance and how did it change it's *shape*?

Name: _____ How? _____

4.10 Did it change it's *volume* [the amount of space it takes up] and if you think it did, can you work out approximately the new volume using a meter stick?

_____

4.11 Using 3 syringes, half fill each with one of three items in the following order:

i. Copper pieces **only** ii.Water **only** iii.Air **only**

In each case, block the opening of the syringe with your thumb and try to press down the plunger.

The meaning of the word compressible is given at the bottom of the page. Indicate which of the three substances is compressible _____

4.12 A bicycle tube is filled with air using a pump.

Explain why you think the tube which fits inside a tyre filled with a gas and not a solid?

_____

4.13 Is the table in front of you compressible? Explain why you think it is made this way?

_____

New Words:

Compress = to press or squeeze something together or into a smaller space

Compressible = to be able to be pressed or be squeezed into a smaller space

Task 10: You are given a beaker, some vinegar, some baking soda and candles.

4.14 See if you can make gas and test if it can extinguish a candle? What do you predict will happen?

_____

4.15 Describe how you tested if it does

_____
_____

4.15 What could you vary about this experiment to make the process more effective?

_____

Characteristics of Matter

Cards in Groups of Three:

Using cards, the dealer will lay down a card with the properties of a state of matter on it and the aim for the players is to call out 'solid', 'liquid', 'gas' 'liquid or gas', 'liquid or solid' before the other person. Divide into groups of two or three and one dealer.

From your observations and answers to questions 4.1 to 4.15, can you complete the following table by ticking for the correct match. (Use pencil)

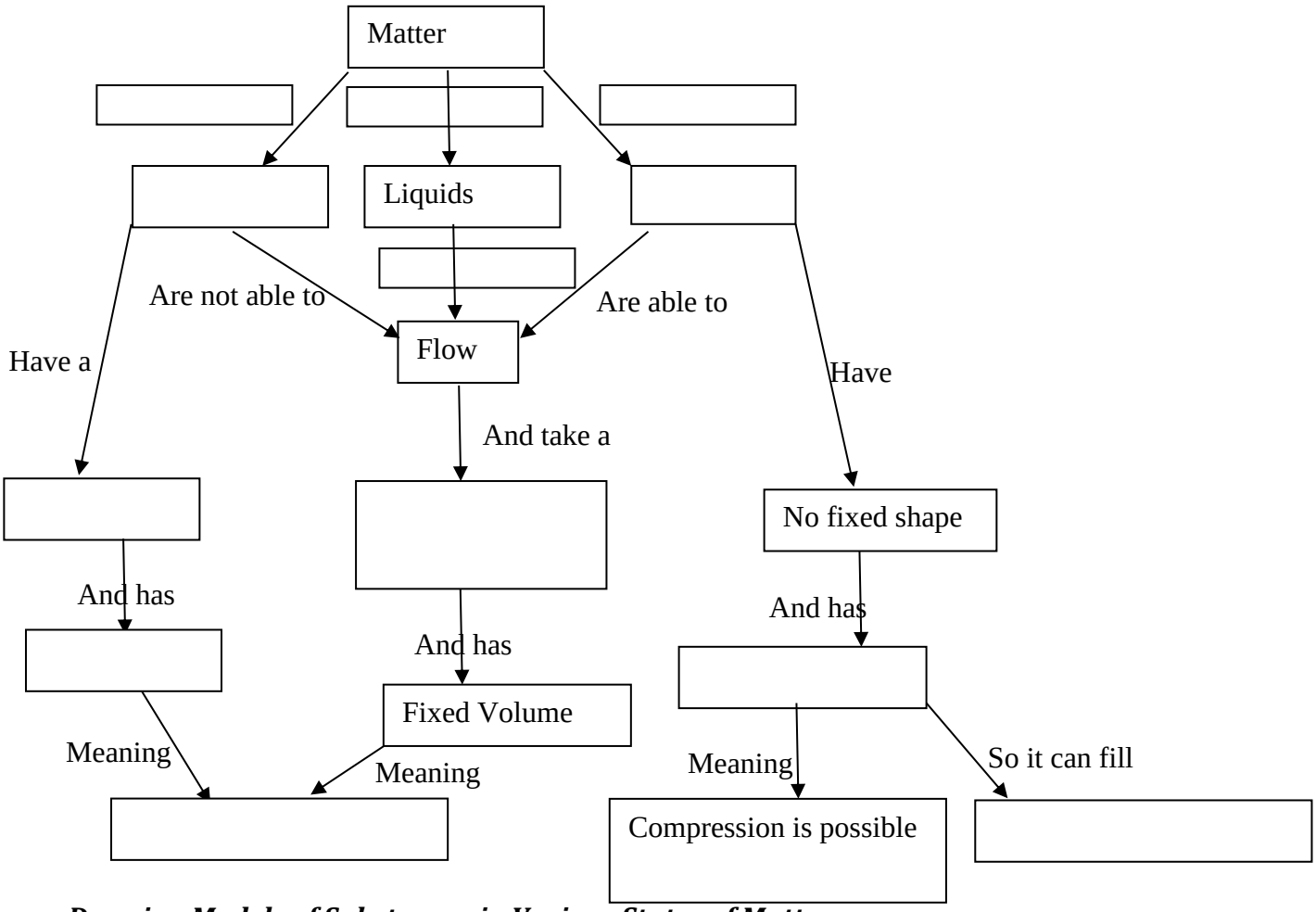
Table 1

Characteristic / Property	**Solid**	**Liquid**	**Gas**
Constant volume			
Takes up the shape of the container it's in			
Compressible			
Flows			
Fills All available space			
Moves randomly			

Concept Map 2 – Focus Question: How does Matter Behave?

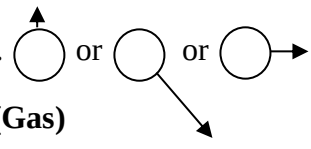
Complete the map below from the selection of words or phrases:

fixed shape; no compression is possible; gases; no fixed volume; the shape of container it is in; is made of; liquids; flow; fixed volume; solids; is not able to; compression is not possible; all available space; is able to **(Some words or phrases may be used more than once)**



Drawing Models of Substances in Various States of Matter

Complete the following diagrams by repeating the units as you see fit[in pencil]:

Hint: Look at which state of matter it is and <u>use arrows</u> to indicate movement e.g.  or or

Iron = Fe (**Solid**) Water = H_2O (**Liquid**) Oxygen = O_2 **(Gas)**

Fe		

Simulation One: Matter Basics

i. Describe the behaviour of the solid state particles?_____

ii. Press the liquid button and then the gas button – what do you notice?

_____

iii. Change your particle selection from **Argon to Neon.** Again move between the solid, liquid and gas states of matter for Neon – besides their colour what difference do you see between them?

_____

iv. Besides pushing the buttons to change from solid to liquid to gas, can you find another way?

_____

v. Change the selection **to oxygen** - how many small particles make up a oxygen particle?

_____

vi. Change the selection **to water** - how many small particles make up a water particle?

Chapter 4: Characteristics of Matter

_____

vii. Give the names of the three changes of state in correct order as *heat* is increased.

a. _____ b._____ c._____

viii. How do you go from a gas back to a solid? _____

ix. While the distance between solid and liquid particles is similar, explain how solid and liquid particles are differrent to each other: _____

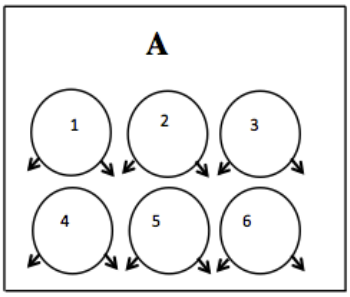
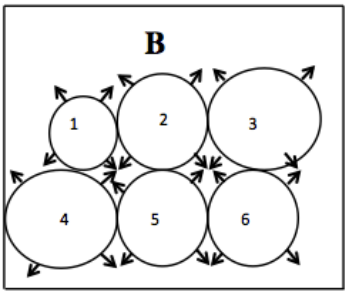
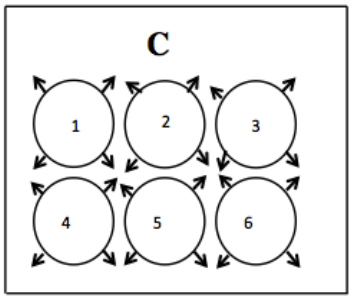
Choose the Correct Model of the Solid State of Matter

Below are twelve representations of particles a pure solid.

1. Analyse them and choose which you think are the best **3** representations of particles for this solid.

2. Give a reason below each diagram you choose as correct, why you think that it is correct.

3. Also, give a reason below each diagram you choose as incorrect, why you think each one of the representations is not correct.

Representation	Representation	Representation
		
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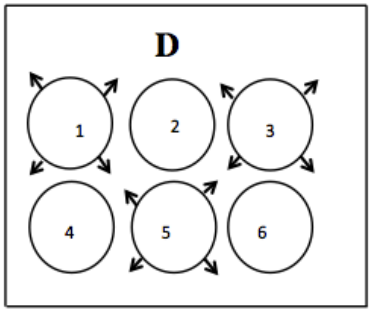	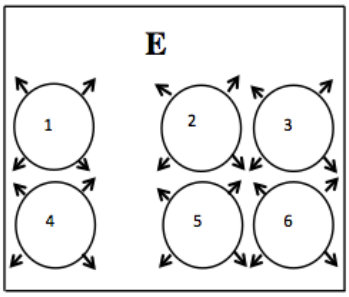	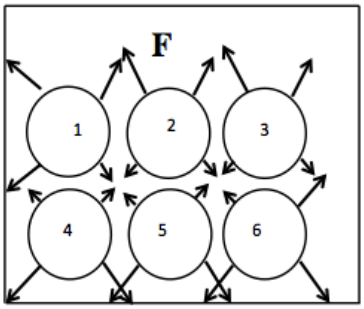
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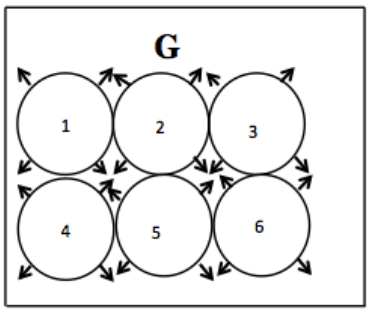
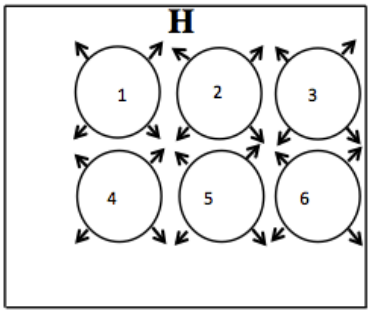
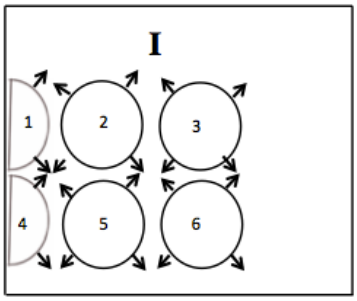
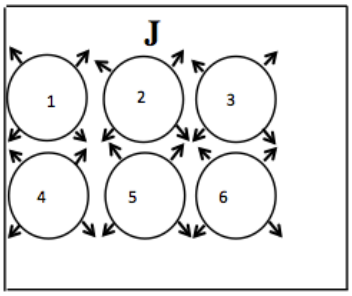
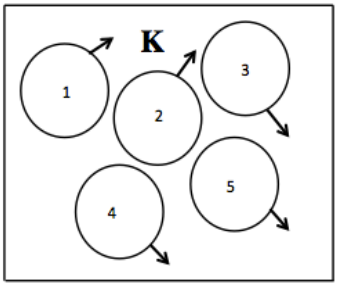
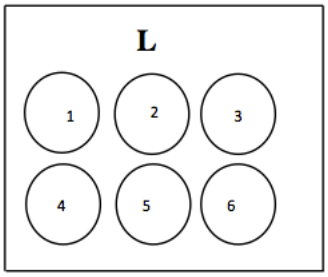
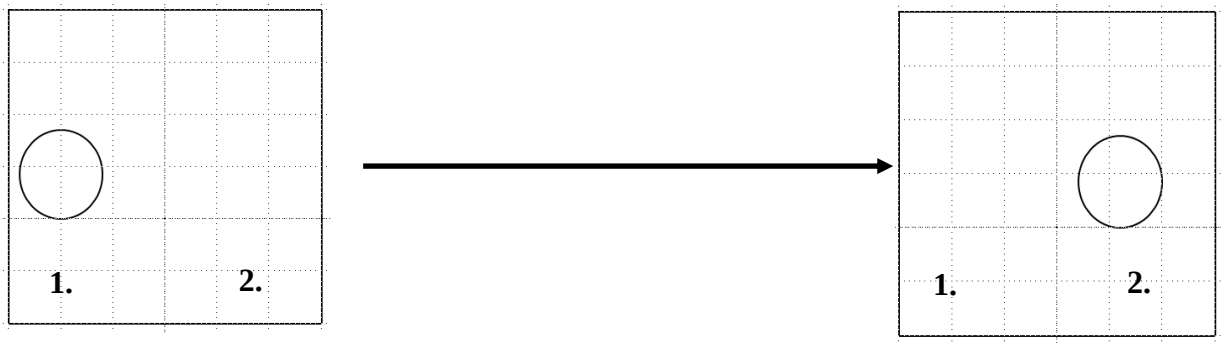
		
Reason	**Reason**	**Reason**

		
Reason	**Reason**	**Reason**

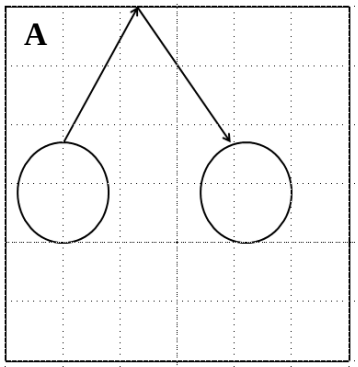
Some Types of Particle Movement

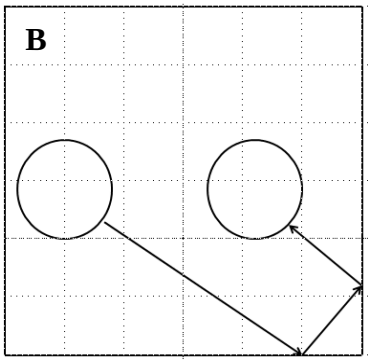
A particle of gas moves in a box. It travels from position **1.** to position **2.** The position of the particle before movement and after movement is shown in the diagrams below.

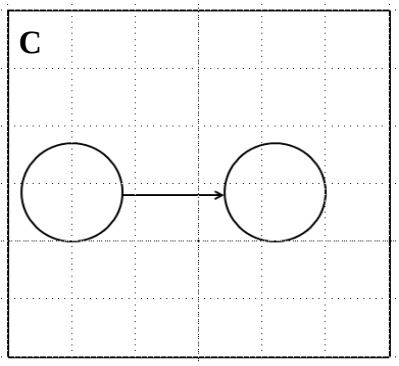
Before Movement **After Movement**



Select from boxes **A** to **C** which represents the <u>shortest path</u> the particle could take to move from position **1.** to position **2**.







Choose the Correct Model of the Liquid State of Matter

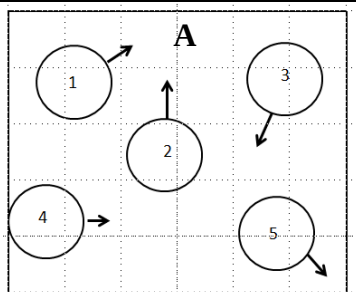
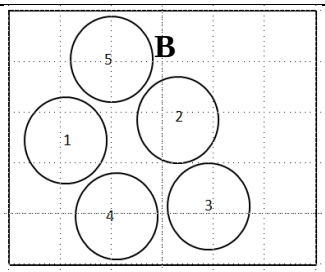
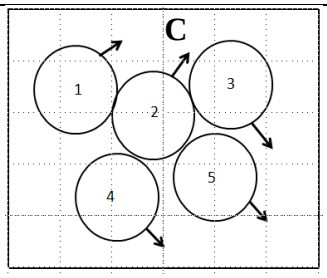
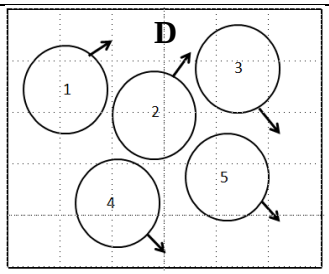
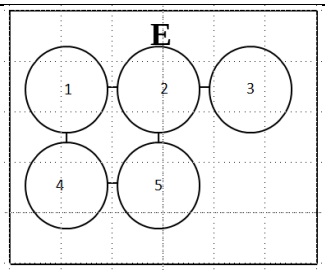
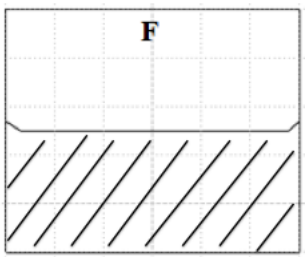
Below are representations of a **pure** liquid.

1. **2.** **1.** **2.** **1.** **2.**

1. Analyse them and choose which you think is the **single best** representation of particles in the liquid state.

2. Give a reason below each diagram, why you think that this representation is correct.

3. Also, give a reason below each diagram, why you think each one of the other representations is not correct.

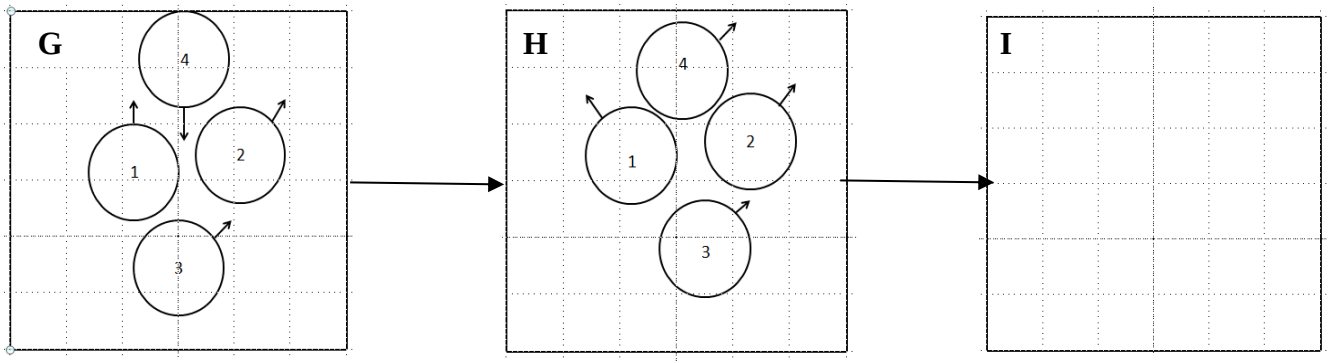
Representation	**Representation**	**Representation**
		
Reason	**Reason**	**Reason**
		
Reason	**Reason**	**Reason**

Movement of Liquids

Liquid Number 1:

Particles of a pure **liquid** are shown moving in a square container below. Arrows are provided to approximately indicate the size of the movement of the particles and the direction of that movement. Box H shows the location of the particles following their movement in Box G.

- Use Box I to draw where you think the particles are located <u>after their</u> movement in Box H.
- Pay attention to the grid given in each box to help you position the particles
- Also pay attention to the numbers on the particles to help you track their movement.

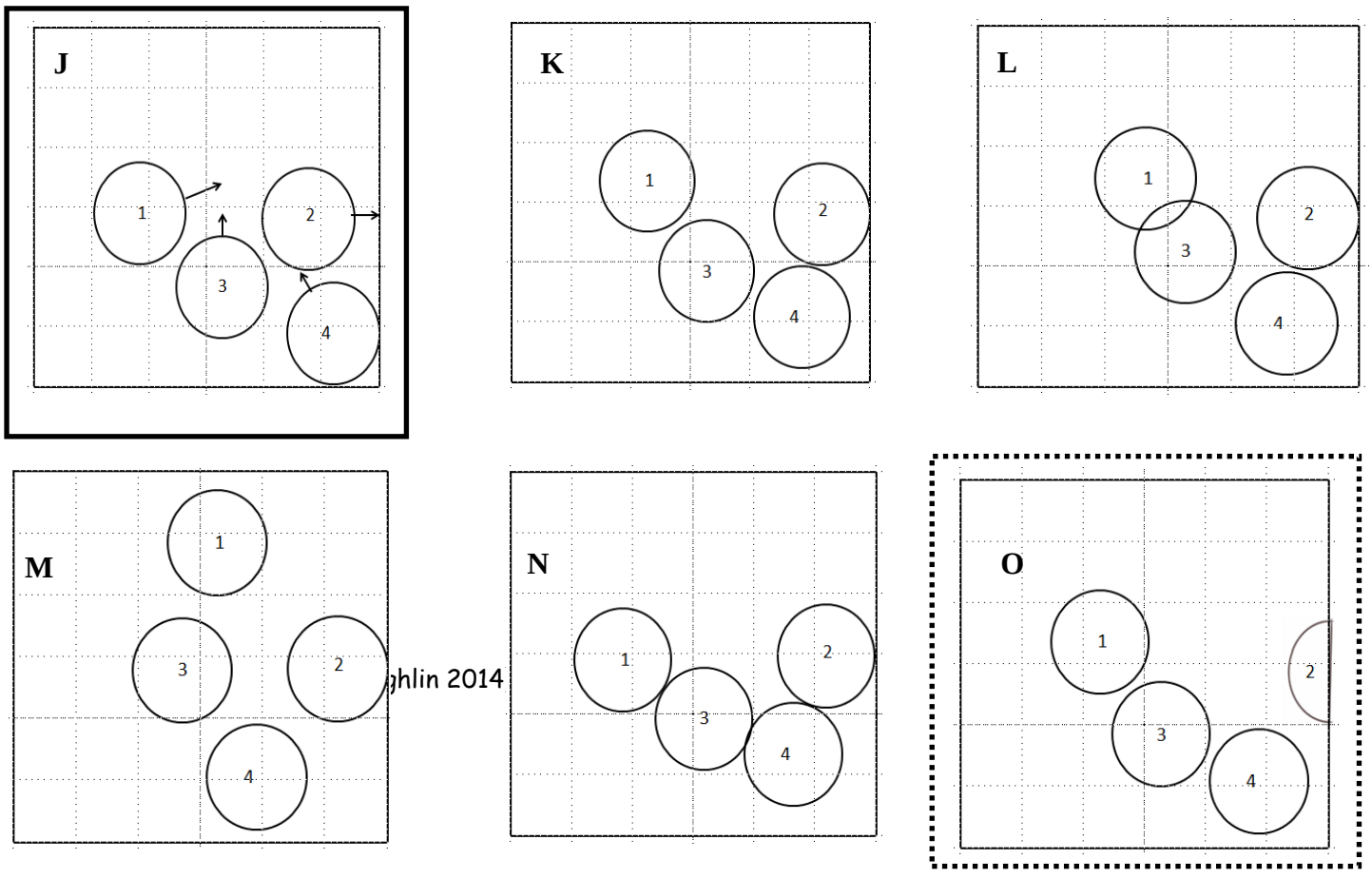


<u>Liquid Number 2:</u>

Particles of a **pure** <u>liquid</u> are shown moving in another square container {Box J} below. Arrows are provided to approximately indicate the size of the movement of the particles and the direction of that movement.

Use the arrows in box J to predict **where the particles will be located NEXT** and **select** one of the boxes **K** to **N** as the best representation of your idea.

- Pay attention to the grid given in each box to help you position the particles
- Also pay attention to the numbers on the particles to help you track their movement.



Explain why Box **O** <u>is not</u> a good representation of where the particles move to.

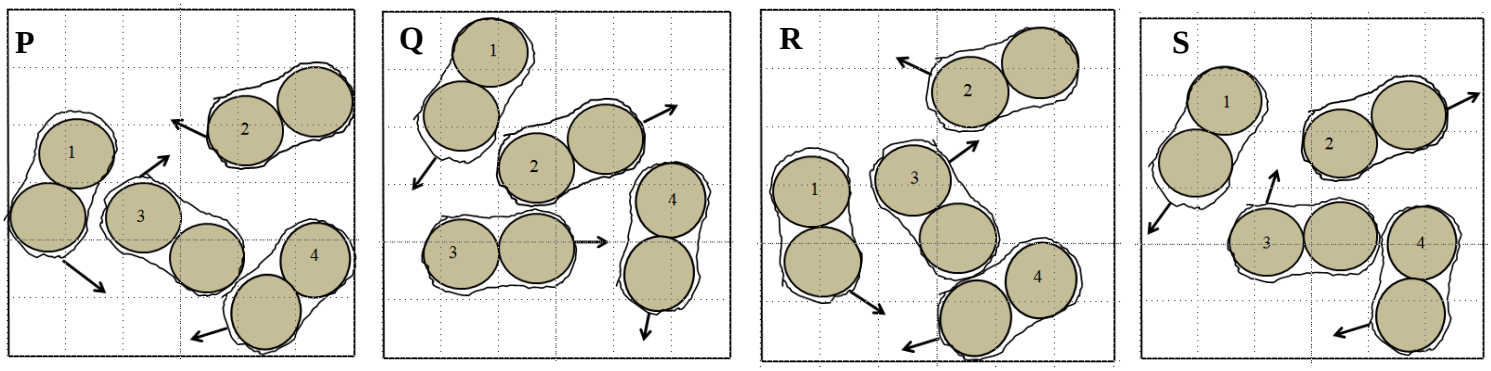
_____

<u>Liquid Number 3:</u>

Particles of a **pure** <u>liquid</u> are shown moving in another square container below. Arrows are provided to approximately indicate the size of the movement of the particles and the direction of that movement.

The sequence of diagrams P, Q, R, S that is shown below is incorrect.

Examine the particles in each of the boxes. Write the correct sequence below the diagrams.



Note: Pay particular attention to the numbers on the particles to keep track of their movement.

Correct Sequence: _____, _____, _____, _____

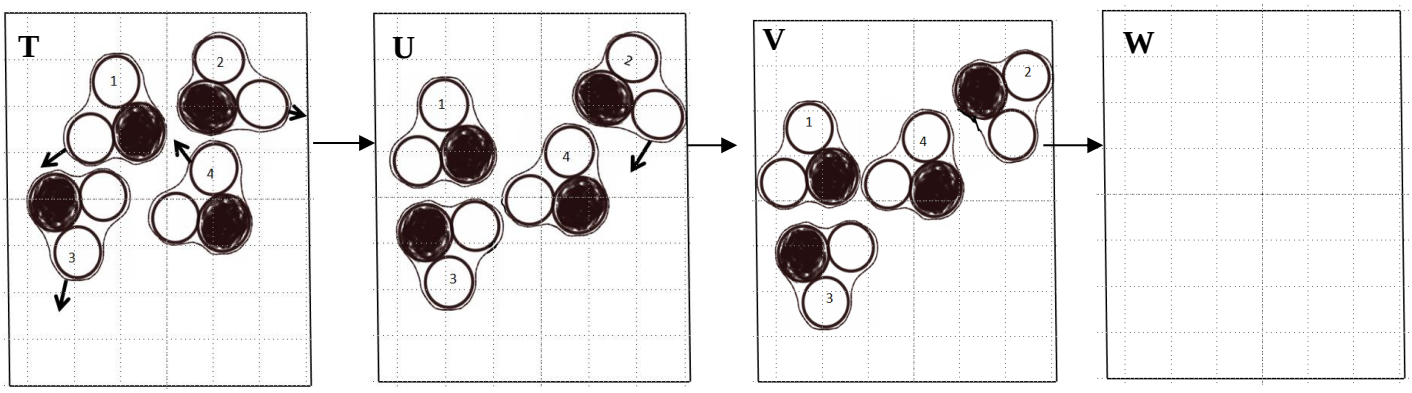
<u>Liquid Number 4:</u>

Particles of a pure **liquid** are shown **moving** in a square container {Box T} below.

i. Looking at the particles and movement arrows in Box T, <u>fill in arrows beside the three particles in box U</u> that have none. This is to indicate the direction you think that they ARE NOW moving in.

ii. Also <u>predict and draw what the arrows in box V might look like</u>.

iii. Finally, <u>draw what the particles in box W may look like</u> following their movement in Box V.



Complete the following sentence by filling in the gaps:

While particles of liquids can move _____ in any direction, they only *change* direction when they _____ off another particle or a container wall.

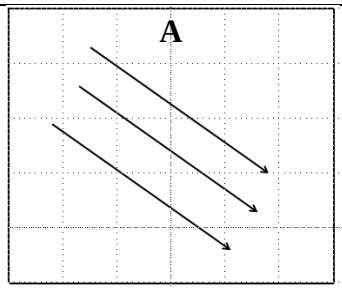
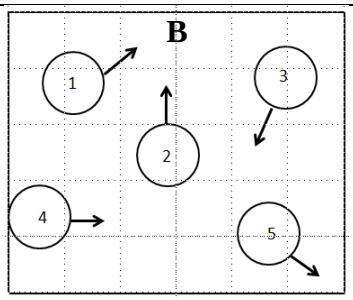
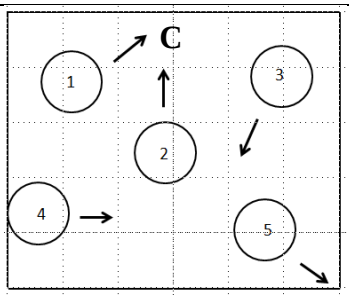
Choose the Correct Model of the Gas State of Matter

Below are fifteen representations of particles of a pure gas.

1. Analyse them and choose which are the best **four** representations of a gas (**Hint:** 2 between A and F are correct).

2. Give a reason below each diagram you choose, why you think that that representation is correct.

3. Also, give a reason below <u>each other</u> diagram, why you think it is incorrect.

Representation	**Representation**	**Representation**
		
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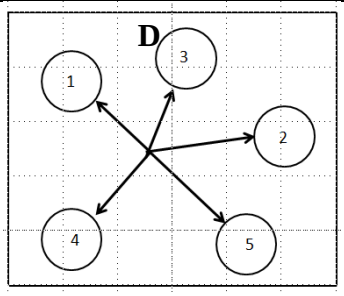	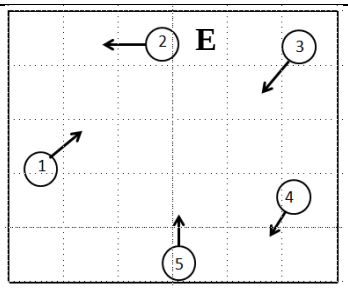	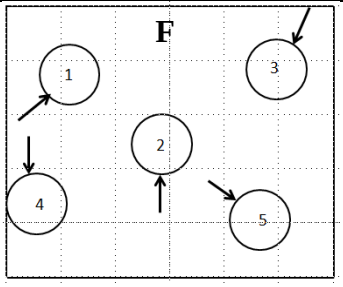
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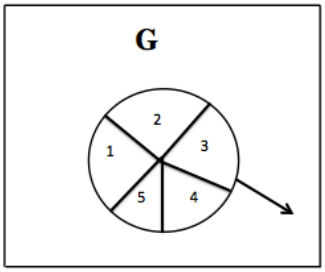
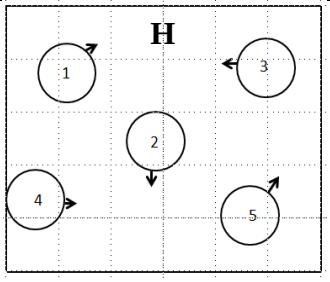
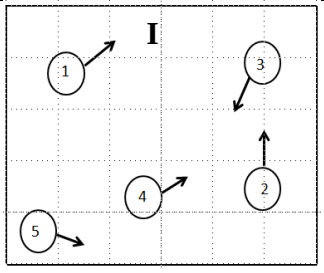
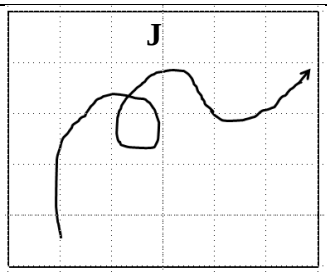
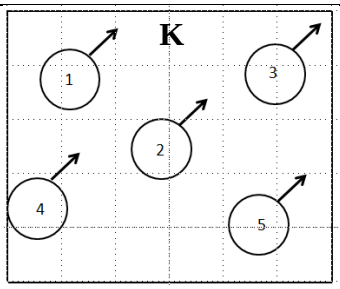
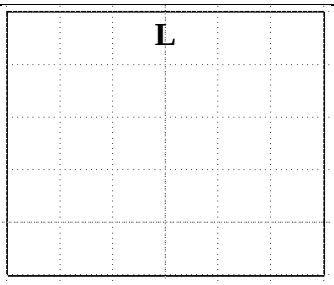
		
Reason	**Reason**	**Reason**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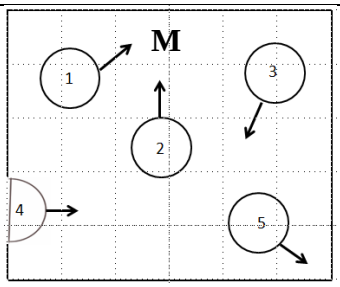	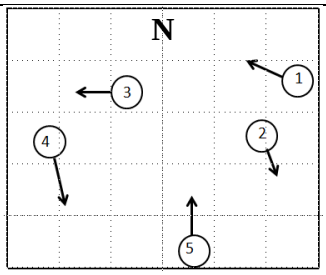	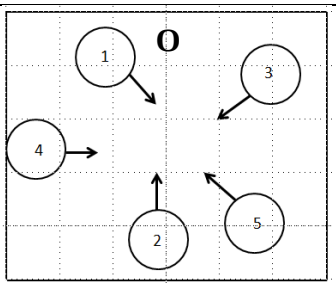
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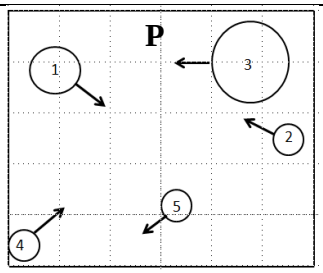
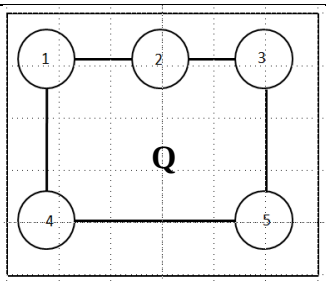
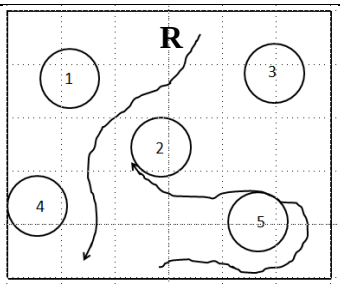
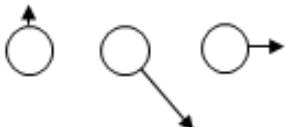
		
Reason	**Reason**	**Reason**

In the square box is one particle of mercury. Solids can change into liquids and liquids to gases.

1. Draw what **5 particles** of mercury looks like in each of the states of matter using arrows to indicate *the amount and direction* of particle movement e.g.



2. Fill in answers <u>below the particulate models</u> that you draw.

Solid **Liquid** **Gas**

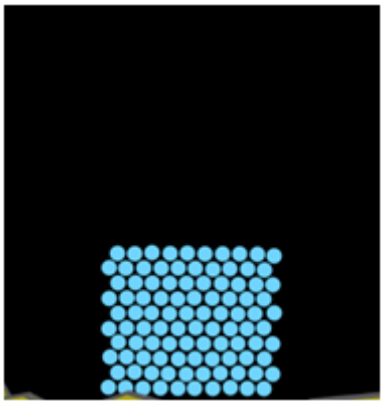
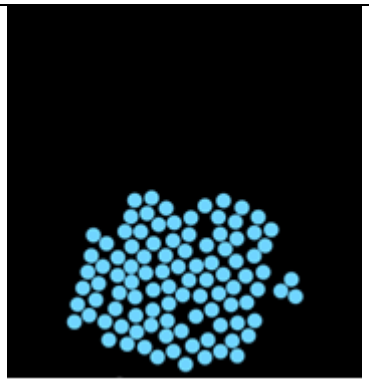
Hg		
If the mass of Mercury in the Solid State = 1g	**What is the mass of Mercury in the Liquid State = ___g**	**Mass of Mercury in the Gas State = ___g**

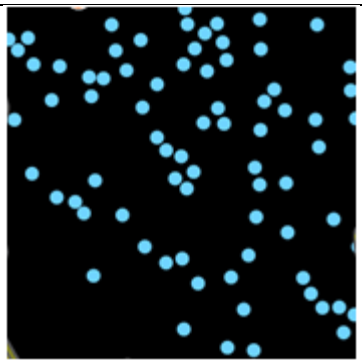
No. of Solid particles = _5_ No. of Solid particles = ___ No. of Solid particles = ___

What Particles of Matter Do When Behaving as Solids, Liquids and Gases:

Match the pictures of the three states of matter with the following words or phrases. Words or phrases can be used for more than one state.

1. Particles slide past each other; **2.** Particles move far apart; **3.** Very strong attraction between particles, **4.** Particles vibrate; **5.** Particles use up all available space; **6.** Moderate Attraction between particles, **7.** Particles can bounce off the walls of the container; **8.** A lot of heat likely to be involved **9.** Particles have more energy to move far; **10.** Most Disorder **11.** Particles can move randomly, **12.** Particles have less energy to move far, **13**. Particles take up little space, **14**. Particles can bounce off one another, **15.**Weak attraction between particles; **16.** Little heat likely to be involved **17.** Least disorder

State	Number of Matching Description
	
	

4. Using 6 particles, draw **the opposite** to how you would consider how a gas would behave in the box.

5. Model using Chemsense how 6 particles of a solid would behave. Then show these particles changing into and behaving as a liquid. Finally show these particles behave as a gas. Show **at least four frames** for each state.

Check Appendix 3 for instructions.

My Own Chapter Notes On what I learned about the way Matter Behaves

I. What I thought about how solids, liquids and gases were drawn at the beginning of the chapter:

_____

_____

II. What I have learned or think about how they are drawn now:

_____

_____

What made me change my mind:

_____

Which bit did I find difficult:

_____

How can I make sure that I understand this before the next lesson?

_____

Fill in I. p.39 before beginning!!

Chapter 5: Diffusion & Matter

Your teacher will spray some perfume in a corner of the room. A) What do you notice after a few minutes? B) Write down who smelled the perfume **first** and **last** and if the perfume stayed in a particular part of the room.

_____

_____

***Human Modelling*:** Divide into one small group e.g. 5 students (wearing labcoats to represent perfume particles) and a large group of all remaining students (wearing no lab-coats and representing air particles). All together, model being particles of perfume diffusing through the air.

Whether you were a perfume particle or an air particle in the modelling exercise – answer the following:

i. What happened if you walked into the wall?

_____

ii. What happened if you walked into another person?

_____

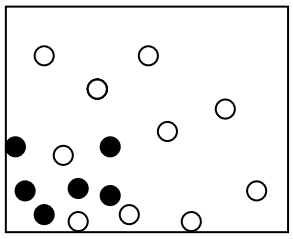
iii. How many directions could you go in?

_____

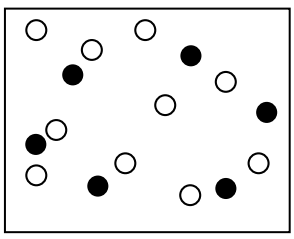
iv. How much space in the room can be used up when doing the exercise?

_____

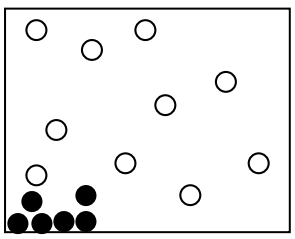
Task 11 : Number the sequence of diagrams in their correct order (1-4).



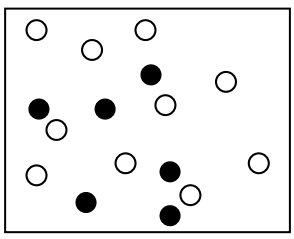
Number ___



Number ___



Number ___



Number ___

New Words:

Mimic = to copy

Question Maria brought flowers which she had kept in a fridge for a few hours in a hotel kitchen for the bride at the wedding reception.

At the same time, the bride was presented with a bunch of flowers by Liz which had been lying on the seat in her car during a one hour drive to the wedding on a sunny summers day. Remembering what you learned about energy and movement, which flowers had the stronger smell? Explain.

_____
_____
_____

In Fridge →

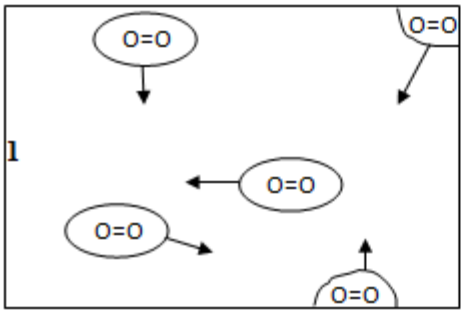
→ In Car

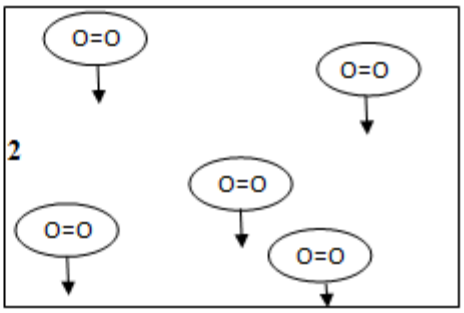
If the above pictures represent the two sets of flowers that were given to the bride afterwards, is this a fair test? Explain.

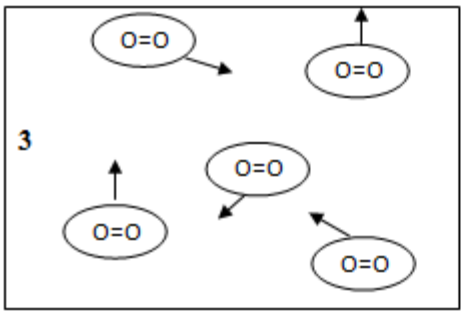
_____
_____
_____

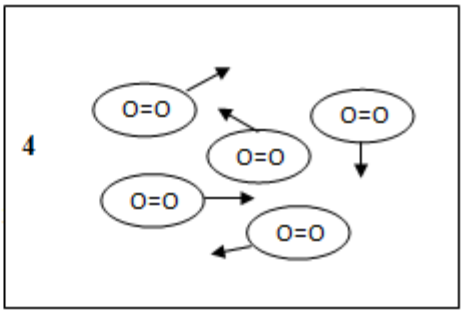
Behaviour of Gases

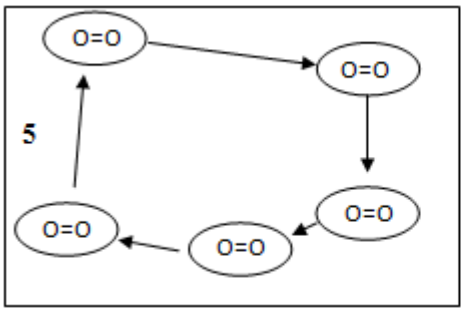
If oxygen particles (O=O) , is pumped into a large <u>empty box</u>, indicate the best representation for the gas in the box?

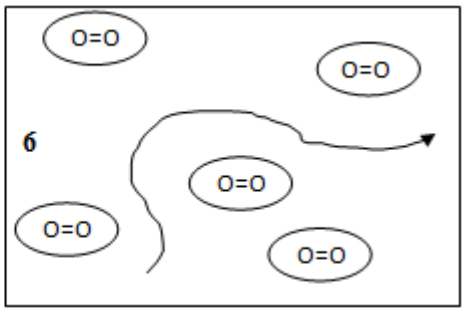


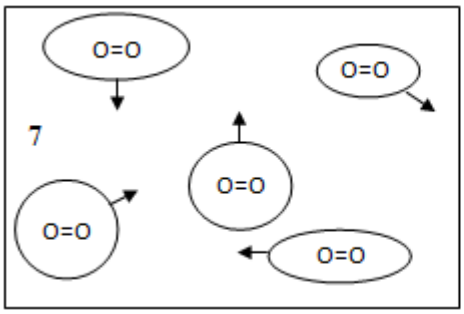












i. Which box is the best representation of the particulate model of oxygen? _____

ii. What exists between the particles? _____ – shade this in

iii. Write three or four points as to why you picked this model as representing oxygen gas?

_____
_____
_____

iv. Can you divide the following statements into true or false

Statement	T / F
i. Particles of a gas can only move down in the direction of gravity	
ii. Particles of a gas bounce off each other	
iii. Particles of a gas explode like bubbles when they meet each other	
iv. Particles of a gas explode like bubbles when they meet a container wall	
v. Particles of a gas can move in all directions	
vi. Particles of a gas bounce off walls of a container	
vii. Particles of gas do not move very much	

viii. Particles of a gas fill all available space	
ix. Particles of a gas need wind to move	
x. Particles of a gas can move because of the heat energy in the room	

v. What is wind?

_____

vi. Other than shaking the box, how could you get the particles of oxygen in a sealed glass box to move faster?

_____

Behaviour of Liquids

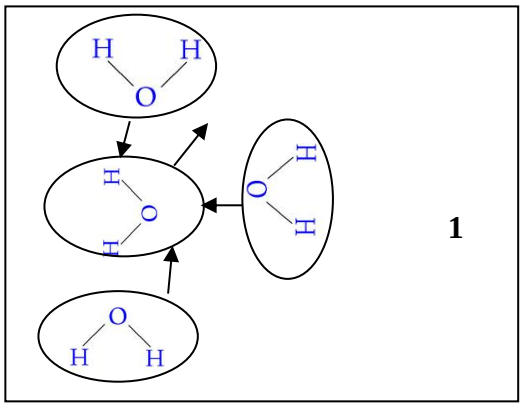
i

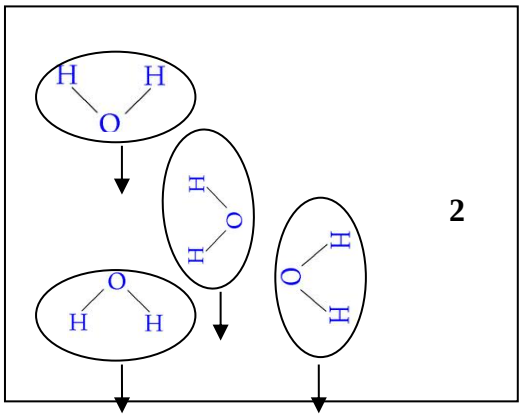
ii

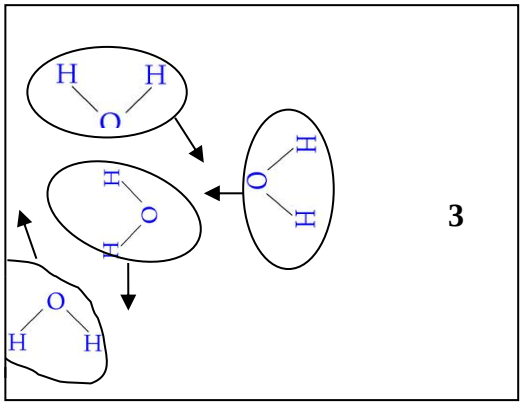
iii.

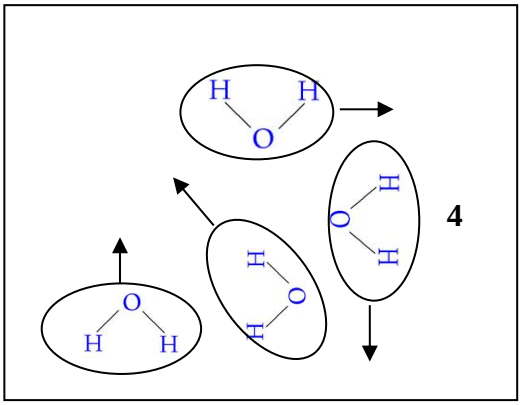
In the diagram above, there are images from left to right of **i.** a fire hydrant in Chicago, **ii.** a geyser in Iceland and **iii.** a waterfall in Wicklow. Draw arrows <u>on top of the images above</u> (i. – iii). to show the movement of water in each image.

Particles of Water









i. Which box is the best representation of the particulate model of water? _____

ii. Write **two or three** points as to why you picked this model as representing liquid water?

_____

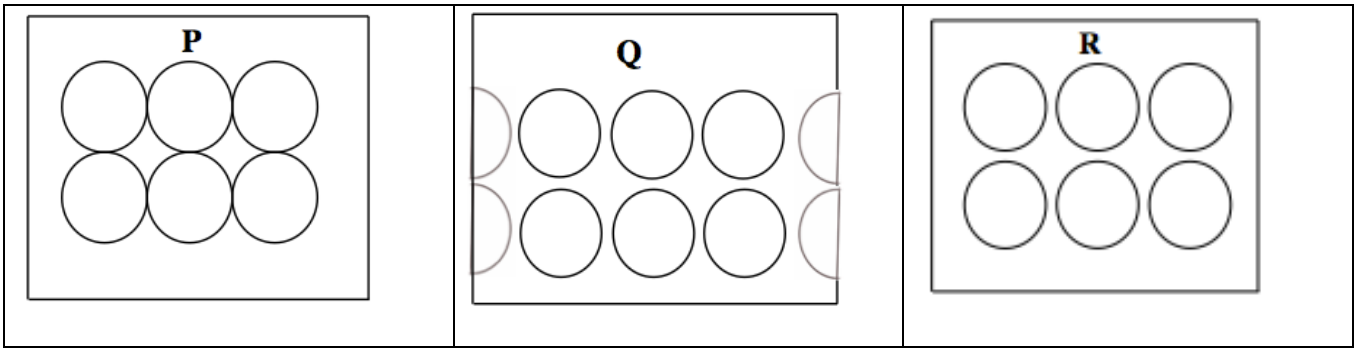
_____

_____

iii. Can you divide the following statements into true or false

Statement	**T / F**
i. Particles of a liquid can only move down in the direction of gravity	
ii. Particles of a liquid bounce off each other	
iii. Particles of a liquid explode like bubbles when they meet each other	
iv. Particles of a liquid explode like bubbles when they meet a container wall	
v. Particles of a liquid can move in all directions	
vi. Particles of a liquid bounce off walls of a container	
vii. Particles of a liquid are more clustered than gas particles	

Behaviour of Solids



i. Which box is the best representation of the particulate model of a solid? _____. Draw movement arrows on this diagram to indicate that the particles are solids. Remember that the bigger the size of the arrow that you use, the more distance the particles can move from their starting point.

ii. Write a sentence as to why you picked this model as representing a solid?

_____

iii. Take a ruler and set half of it on a table and the other half off the table. Touch the upper side at the end that is off the table with your hand. What happens?

_____

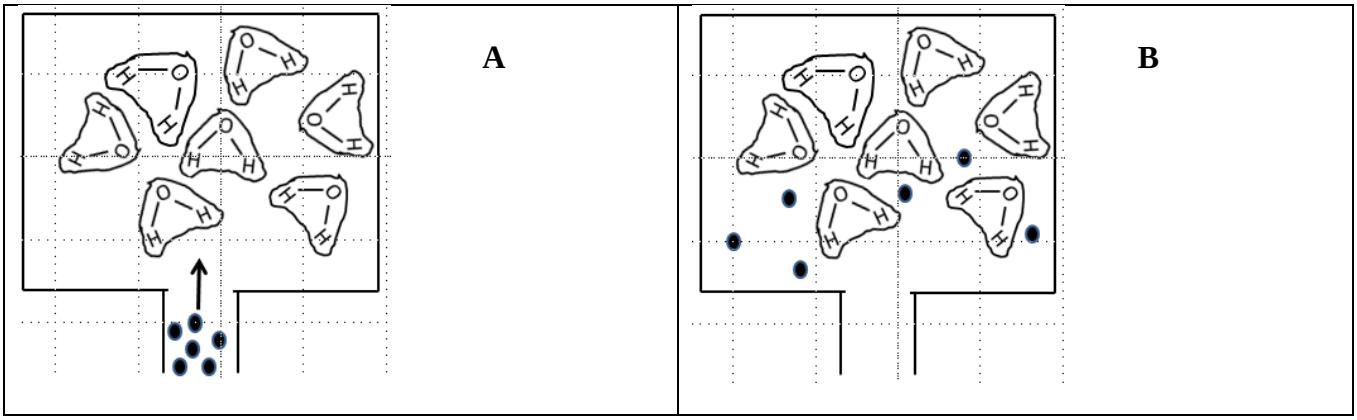
iv. In which state of matter do you think diffusion can occur a) fastest and b) slowest – can you explain?

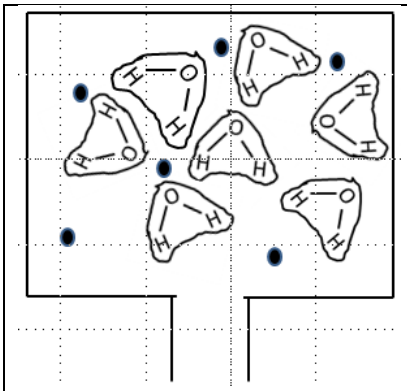
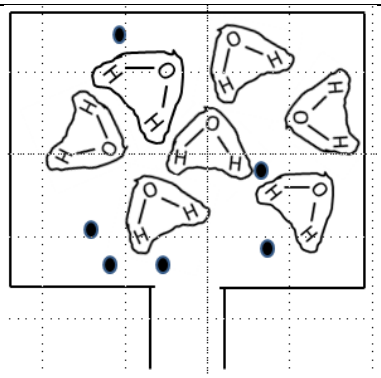
_____

_____

v. Select which diagram represents where diffusion of particles of dye has occurred fully within liquid water particles (The dye particles are represented by black dots). Diagram A shows the container of water particles before the dye is released into to it.

Full or **complete** diffusion corresponds with Diagram _____.



 **C**	 **D**

vi. Explain your choice:

_____

_____

Watch the video showing **lead nitrate** and **potassium iodide** in water

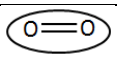
vii. Give evidence that diffusion has taken place

_____

viii. Which solid material has diffused through the water more – can you explain?

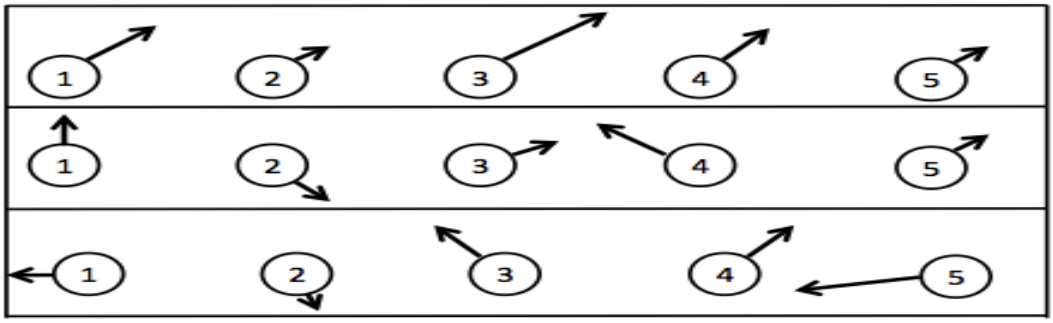
_____

ix. **Four chlorine** gas particles are released into a container with **four gas particles** of oxygen.

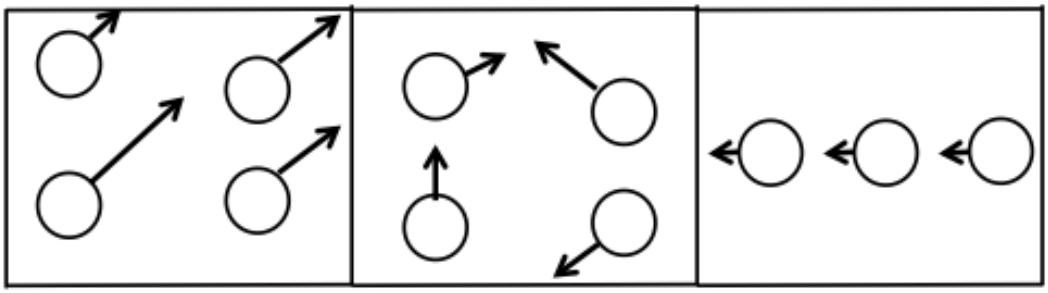
A particle of oxygen (O_2) looks like this:	
A particle of chlorine (Cl_2) looks like this:	

Draw what the eight particles in the box look like when the chlorine particles have <u>fully diffused</u> into the particles of oxygen.

x. Circle the atom **in each row** which is able to move the most:



xi. Identify the box where particles are moving **randomly**:



1. **2.** **3.**

My Own Chapter Notes on Diffusion of Solids, Liquids and Gases

I. What I thought about the spreading out of solids, liquids and gases at the beginning of the chapter:

_____

II. What I have learned or think about how they spread out now:

_____

III. What made me change my mind:

_____

IV. Which bit did I find difficult:

_____

V. How can I make sure that I understand this before the next lesson?

_____

Fill in I p.46 before beginning!!

Chapter 6: Changes of State

Your teacher will place a few drops of acetone on the back of someone's gloved hand and a few drops of water onto the back of someone else's gloved hand. Can you predict what will happen.

Note: Acetone is the chemical name for nail varnish remover.

1. My Prediction for i)water and ii)acetone:

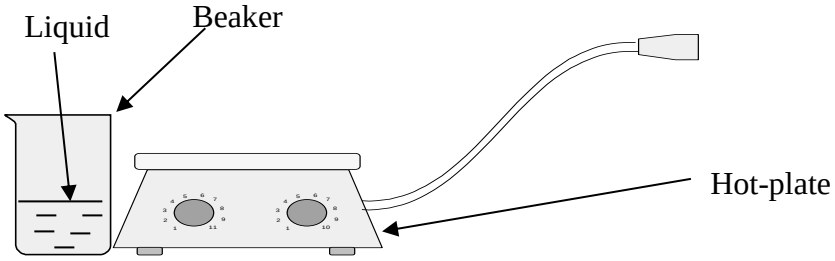
_____

2. What do you think happened to the acetone on the back of this person's hand? Explain.

What happened? _____

Why? _____

Task 12: You are given a beaker with one of the following liquids: water, acetone or ethanol, a hot plate, a clock glass, a marker. Can you use the marker to prove that evaporation occurred?



Describe using bullet points what you did [procedure]:

_____
_____
_____
_____

Watch the following clip on 'Changes of State of Matter'. In this example you will watch an animation of water changing state. Then fill in the blanks below.

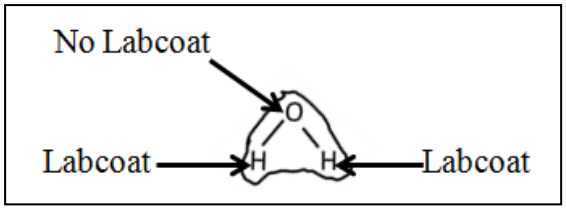
Description of Changes of State:

In the beginning, water particles were in the _____ state. After receiving heat energy from the _____, the attractive forces between the particles became _____ strong. At this stage, water changed from a _____ to a _____ state. After receiving even more heat energy, the _____ forces between the particles of water became less strong. At this stage, water changed from a _____ to a _____ state. If there was 100g of water in the

solid state, then, there will be __g of water particles when it changes to the liquid state, and __g of water particles when it changes to the gas state. The state where the particles of water have the greatest amount of space between them is the _____ state. The state where the particles have the greatest amount of energy is the _____ state. As attractive forces between particles gets bigger, the space between particles becomes _____.

Split into pairs – the person with longer hair is A and the other is B. You have one minute to read the passage on the previous page. After a minute B will place down the sheet and summarise the main points. A will check for accuracy. Then you will swap roles.

Human Modelling: Consider that each water particle (symbol = H_2O) contains two hydrogens and an oxygen [person modelling hydrogen wears a labcoat]. You can link arms to represent the bonding between the H's and O's within the water particle.



Can you then mimic in groups what happens to water particles as they go from solid ice to liquid to gas?

When you were modelling,

1. Explain if there was any difference in your **size** if you were in a different state to another?
   _____
2. Explain if there was any difference in your **mass** if you were in a different state to another?
   _____
3. Explain if there was any difference in the amount of **space** around you if you were in a different state to another?
   _____
4. Explain if there was any difference in your **ability to move** if you were in a different state to another? _____
5. What is needed for the ice to **liquid to gas** change of state to happen? _____
6. What will you need to do to do the opposite and change water from a **gas back to a liquid**?
   _____
7. Did your body change into someone else's?
   _____

Simulation 2: Matter Basics

1. Open the **Matter Basics** Simulation
2. You are <u>not allowed</u> to use the buttons labelled ‘solid’; ‘liquid’; ‘gas’ to change state.
3. Find another way of changing Argon from **Solid to Liquid** – Hit the ‘Pause’ button when you think Argon is in the <u>liquid state</u> and show it to your teacher
4. Change Argon from the **liquid to gas** state – Hit the ‘Pause’ button when you think Argon is in the <u>gas state</u> and show it to your teacher
5. Change Argon from the **gas to liquid** state
6. Finally, change Argon from the **liquid to solid** state

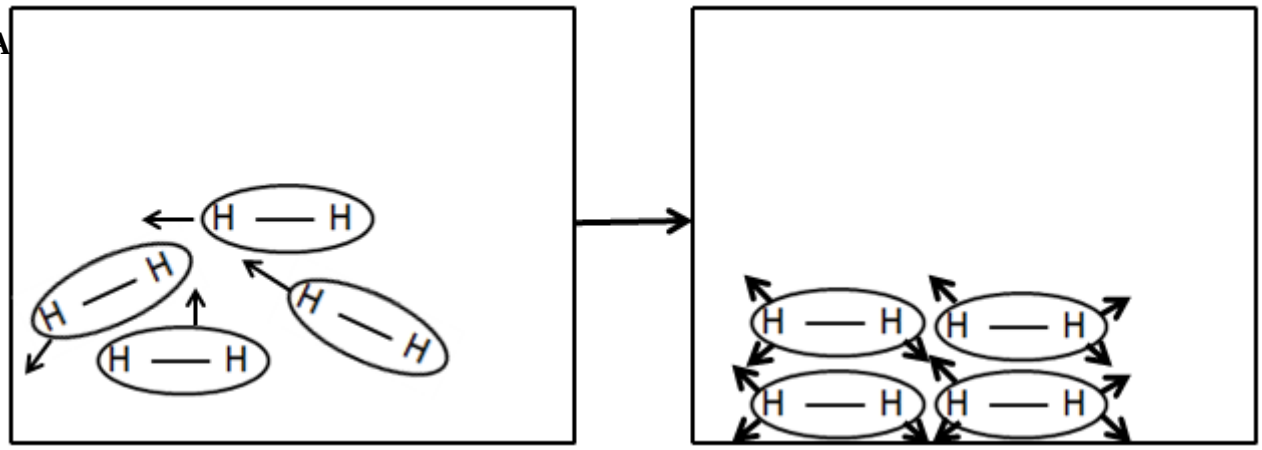
Look at the following <u>definitions</u> and try to find the exact step number it corresponds to in the set of instructions that you have just completed in the pHET simulation exercise above.

Name of Change of State of Matter	Matches which Step Number in Simulation 3
Melting	
Freezing	
Evaporation	
Condensation	

Visualising Changes of State of Matter

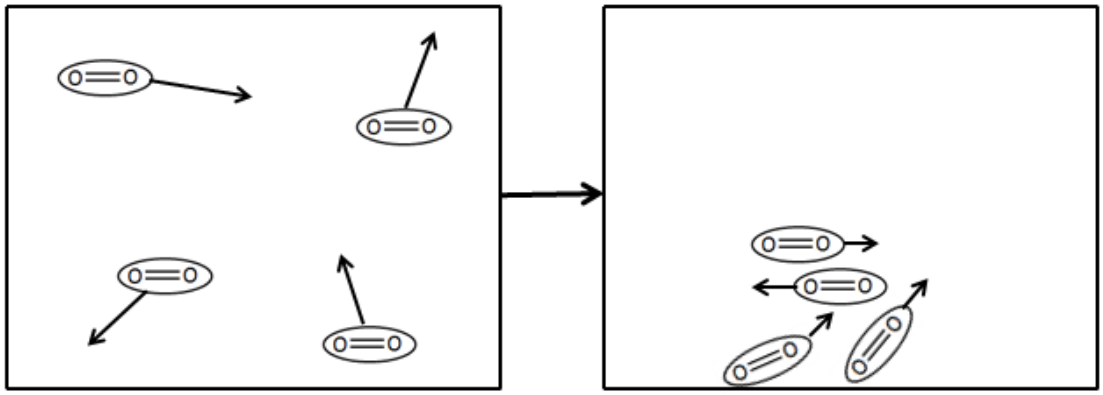
Identifying changes of state using the words Melting; Evaporation; Condensation; Freezing

A



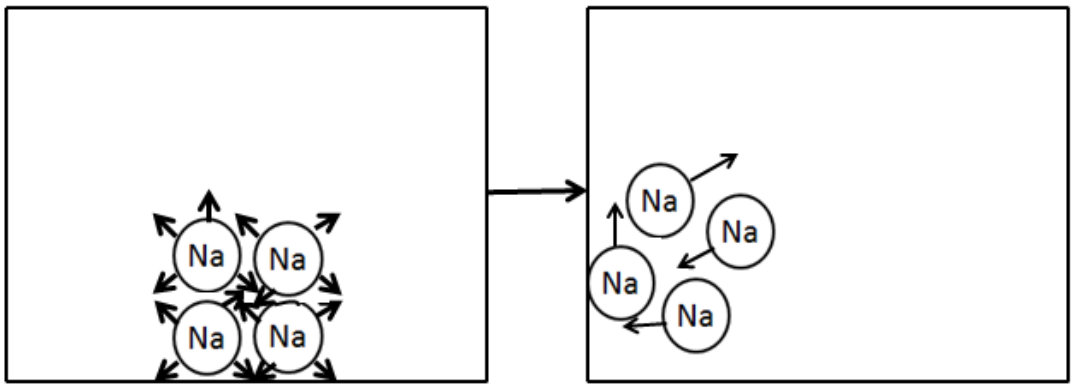
The change of state above is _____. It occurred because the temperature increased / decreased. (Circle if correct)

B



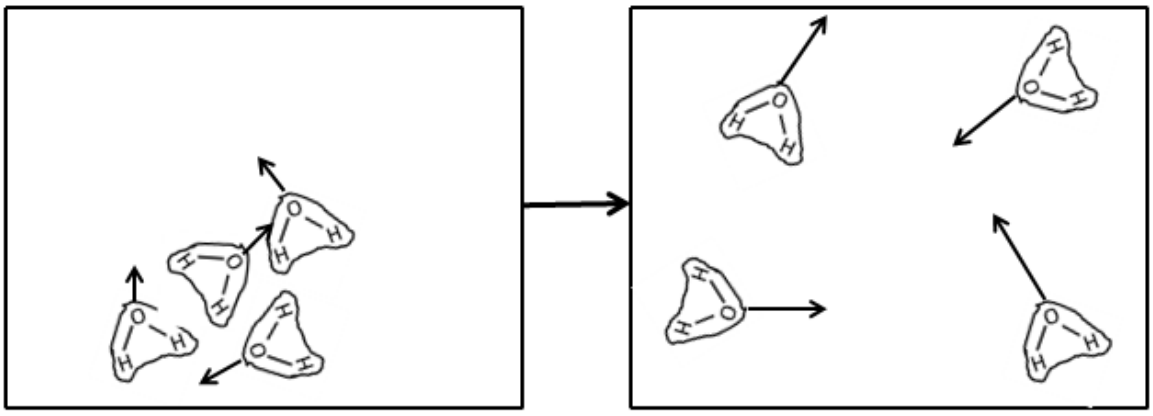
The change of state above is _____. It occurred because the temperature increased / decreased. (Circle if correct).

C



The change of state above is _____. It occurred because the temperature increased / decreased. (Circle if correct).

D

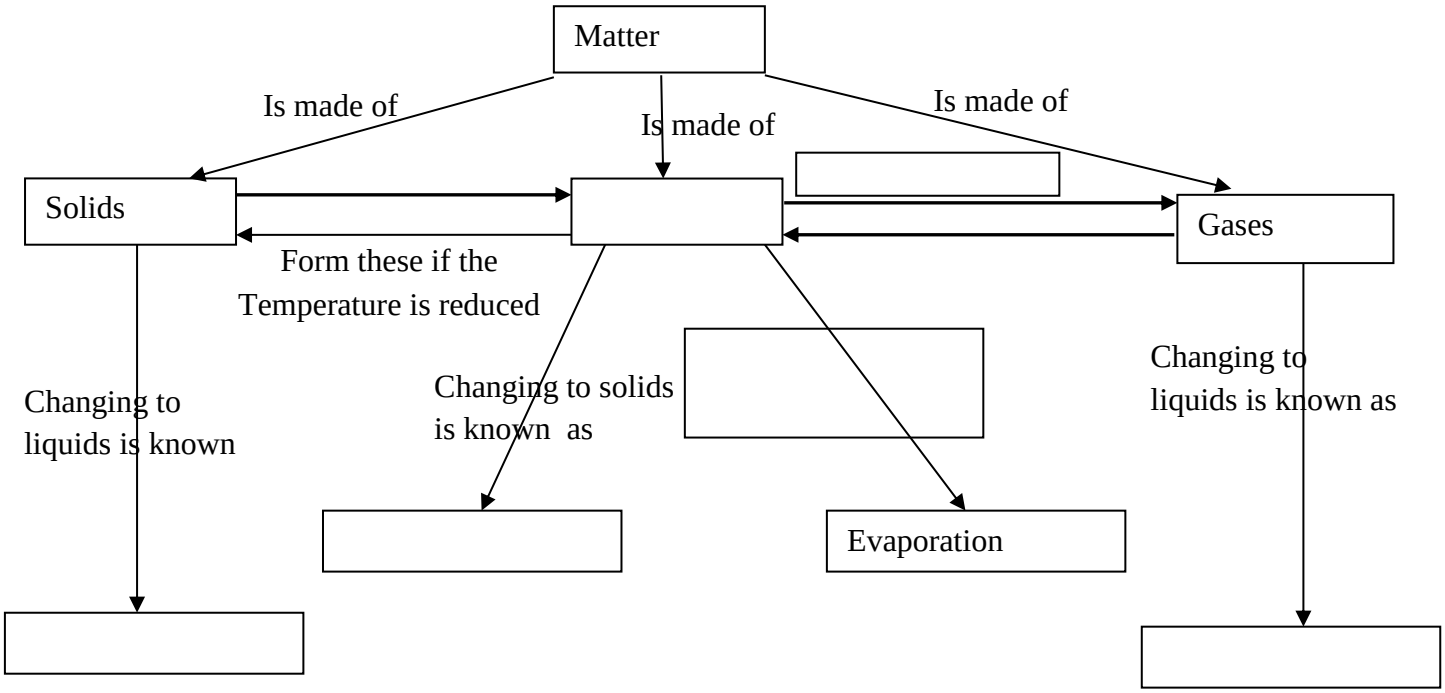


The change of state above is _____. It occurred because the temperature increased / decreased. (Circle if correct).

Concept Map 3 – Focus Question: How does Matter Change from one State to Another? Hint: Revise Models A --> D pgs 40 & 41 BEFORE attempting

Complete the map below using <u>some of</u> the words or phrases from the selection given in the table below:

condensation	freezing	colourless
is made up of	reduce temperature	diffusing
form these if the temperature is increased	melting	changing to gas is known as
liquids		



Modelling Condensation

Use the two boxes below to draw what 6 particles of water look like when condensation is taking place. Use Diagram D on the page 40 as an example of the types of particles that you need to draw.

Water particle = H_2O = 

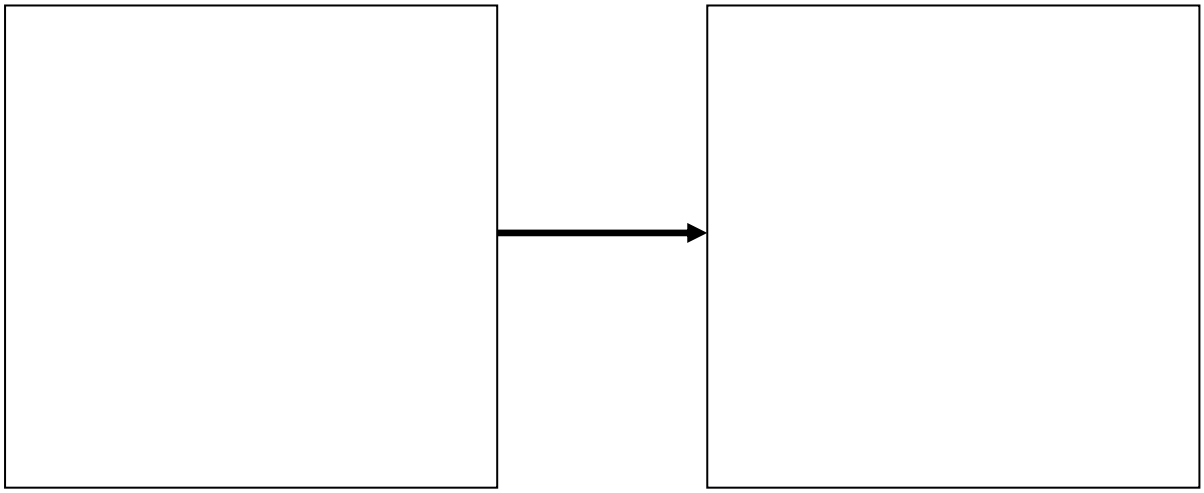
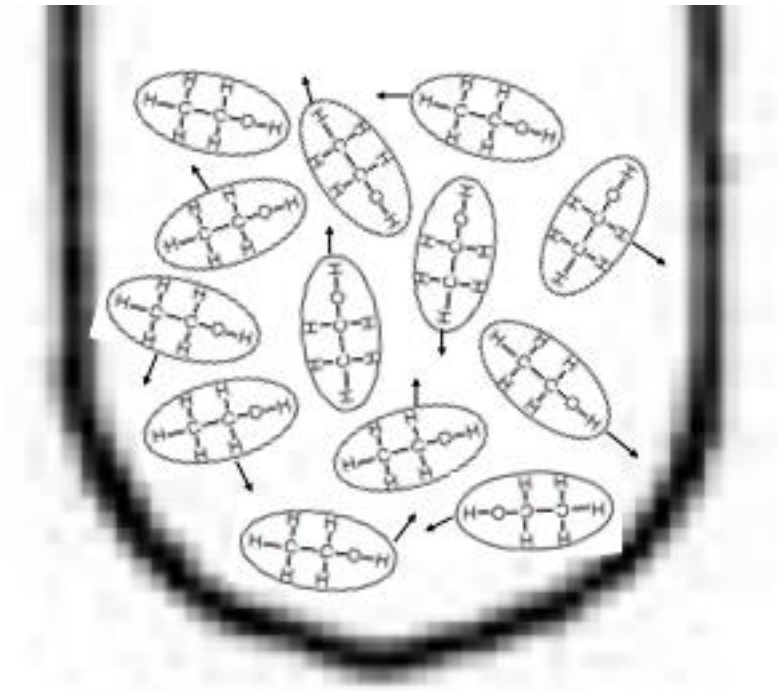


Diagram 1 A Test Tube of Ethanol being heated in a beaker of hot water

Diagram 2



A test tube of pure ethanol which is beginning to boil in a beaker of hot water is shown in diagram 1. Diagram 2 shows how the particles of ethanol might look if you could view them with a microscope.

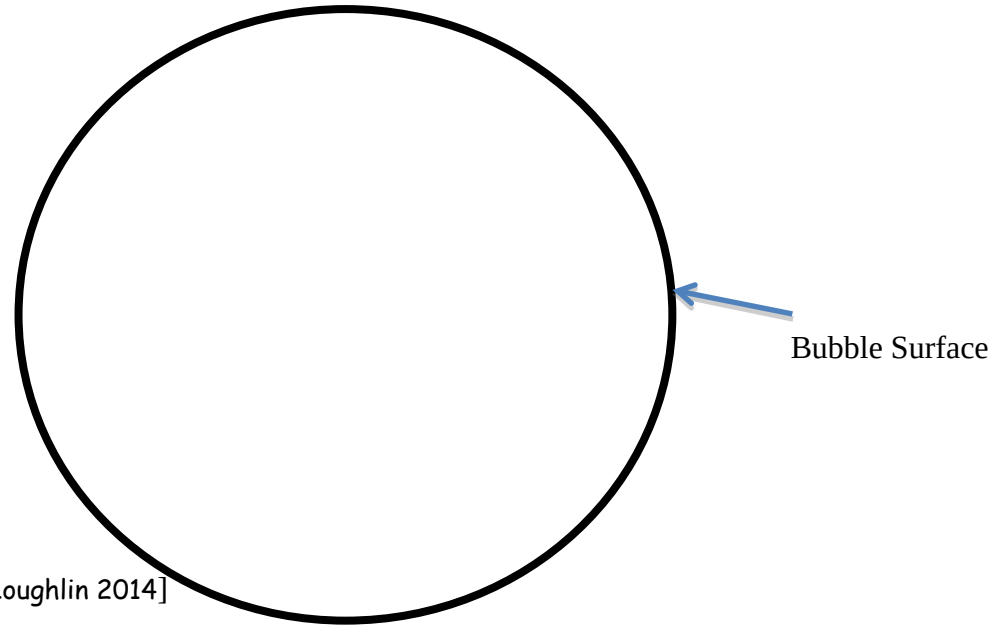
i. Looking at Diagram 1, can you work out where the bubbles first begin to appear and why do you think this is?_____

ii. Given that the ethanol is pure and so only contains ethanol particles, what particles do you think are inside the bubbles and what state are they in?

Particles inside Bubbles: _____State of Particles: _____

iii. A bubble in the ethanol is shown below in Diagram 3 – can draw what particles are inside it.

Diagram 3

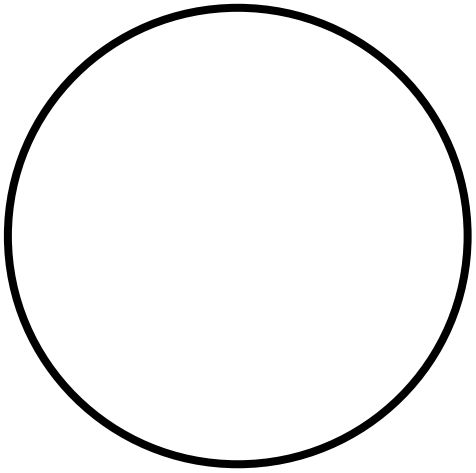


Draw below what particles **in** bubbles of pure water (Symbol =H_2O) will look like as it begins to boil in Diagram 4?

You can see what a particle of water looks like

on pg 38.

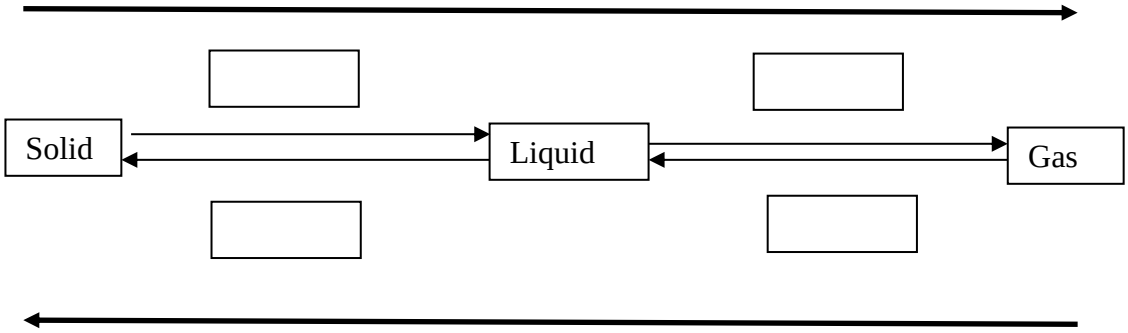
Diagram 4



Changes of State Summary Map

Can you complete the following summary concept map using the four words used as definitions in Table 6.1 on pg 40 as a guide.

Temperature Increases in this direction



Temperature _____ in this direction.

Change of State Drawings

Draw the particles of water (Formula =H_2O) in the solid and liquid and gas states paying attention to their **size**, **movement** and the **distance between them**. One particle is drawn already for you. Use an arrow to show that a particle can move. A **bigger arrow** means they can **move more** from their starting point, while a **smaller arrow** means that they can **move less** e.g. : → or ⟶ or ⟶. Then answer the questions underneath the diagram (also on the next page).

Solid **Liquid** **Gas**

No. of particles of water I drew in the Solid state = _____

No. of particles of water I drew in the Liquid state = _____

No. of particles of water I drew in the Gas state = _____

Mass of water in the Solid state = 8g

Mass of water in the Liquid state = ___g

Mass of water in the Gas state = ___g

My Own Chapter Notes on Matter Changing State

I. What I thought about matter changing state at the beginning of the chapter:

_____

_____

II. What I have learned or think about it now:

_____

_____

III. What made me change my mind:

_____

IV. Which bit did I find difficult:

_____

V. How can I make sure that I understand this before the next lesson?

_____

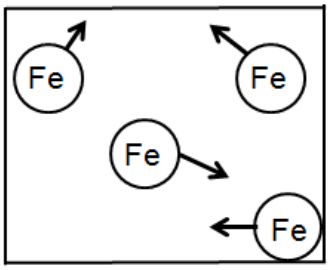
Fill in I. p.51 before beginning!!

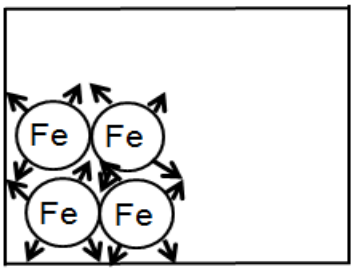
Chapter 7: Symbols of Particles

7.1. ***Models & Symbols:*** Insert the correct state below the models.

A) Information: Symbol for Iron = Fe

One Iron particle = (Fe)



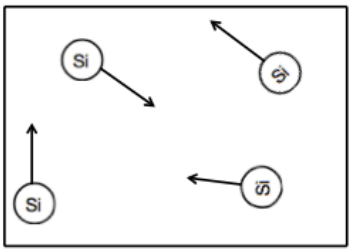


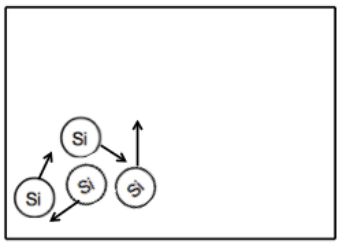
i. State of Iron = _____

ii.State of Iron = _____

B) Information: Symbol of Silicon = Si

Silicon particle = (Si)



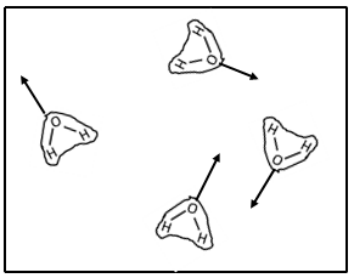


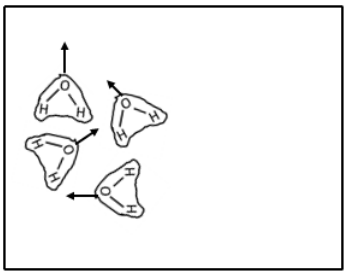
i. State of Silicon = _____

ii. State of Silicon = _____

C) Information: Symbol of water = H_2O

Particle of water =



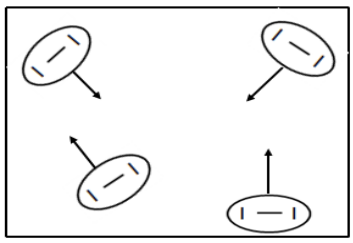


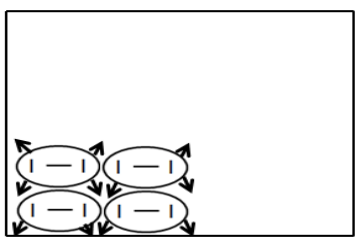
i. State of Water = _____

ii. State of Water = _____

D) Information: Symbol of Iodine = I_2

Particle of Iodine = (I — I)



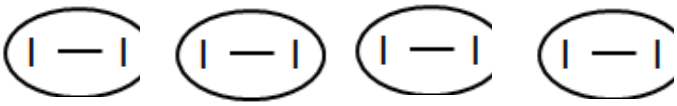
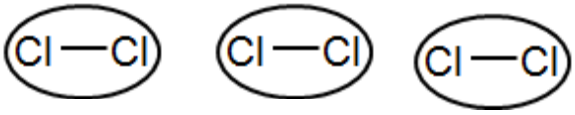
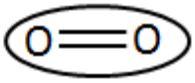
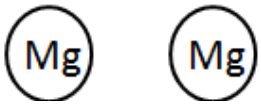
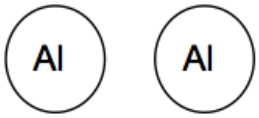
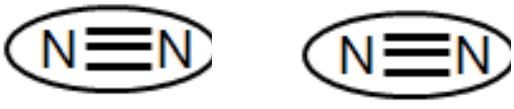


[© (48]

i. State if Iodine = _____

ii. State of Iodine = _____

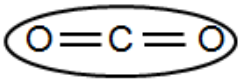
7.2. Mix and Match Symbols to the Particles – Fill in the matching letter

Symbol	Matching letter	Particle Drawing
O_2		a. 
H_2O ← a.		b. 
$2N_2$		c. 
H ← g.		d. 
2Mg		e. 
$4I_2$		f. 
$3Cl_2$		g. 
2Al		h. 
$2O_2$		i. 
$2H_2O$		j. 

i. Explain what you think a big number in a formula represents?

_____

ii. Explain what you think a small number in a formula represents? _____,

ii. Can you give the symbols / formula for the following particle 

Symbols / Formula = _____

iii. Methane has a formula of CH_4 - Can you draw a particle of methane in the space below(use the molymod set to make it first; Use white particle to represent H and a black particle to represent C)

iv. Build and give the symbol for the following structure of Hydrogen Sulfide (use the white molymod particles to represent H and they red particle to represent S) 

_____

v. Write the formula to represent these molecules_____ 

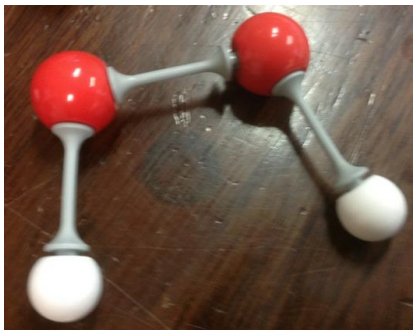
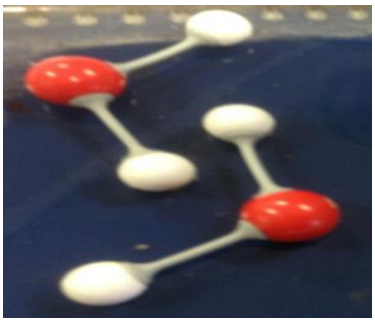
vi. Build four Hydrogen molecules (symbol = H_2) with molymod particles and write the formula

Formula = _____ Draw these in the box below.

Build two methane molecules (symbol = CH_4) with molymod particles and write the formula.

Formula = _____ Draw these in the box below.

From the box below, circle which particles can be represented by the formula $2H_2O$.

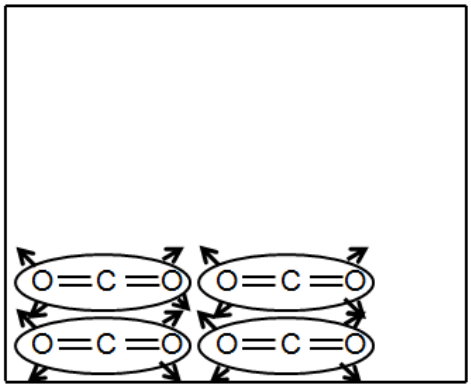

3. *Particles of Compounds*

Match the pictures with the particle models for the *compound* carbon dioxide [CO_2] below:

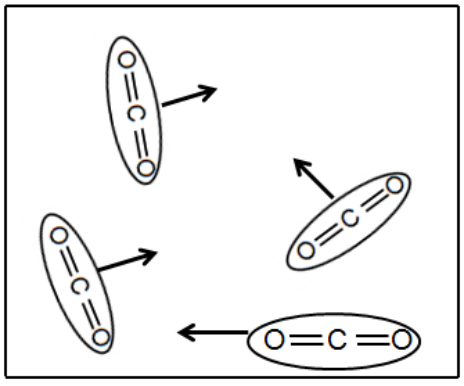
A. Carbon dioxide Gas (CO_2)

B. Carbon dioxide Solid (CO_2) - Dry Ice

C.



D.



i. A matches with ____ . This is because _____.

ii. B matches with ____ . This is because _____.

iii. Which symbol below accurately indicates the representation of particles in **Box C**?

a. $2O_2$ **b.** $4CO$ **c.** $4Br_2$ **d.** $4CO_2$ **e.** Other

iv. Write a symbol that could accurately represent the particles in **Box D** – explain

_____

My Own Chapter Notes on Particles and Symbols

I. What I thought about how symbols could represent particles at the beginning of the chapter:

_____

_____

II. What I have learned or think about using symbols to represent particles now:

_____

_____

III. What made me change my mind:

_____

IV. Which bit did I find difficult:

_____

V. How can I make sure that I understand this before the next lesson?

_____

Fill in I. p.64 before beginning!!

Sebastien Chabal Characteristics:

1.

2.

3.

Chapter 8: Elements, Atoms, Molecules & The Periodic Table

Research

Pick an element that interests you from the periodic table and research it on www.rsc.org/periodic-table. Take down a number of points about it in the box below.

Information

Watch the video or listen to a podcast lower on the page and add a few more points to your information.

Information

Pick the same element and see what it reacts with on http://www.msichicago.org/play/goreact/. Write some points of information on what your element reacts with and the new materials it can form below. Make a poster on your element using this information .

Information

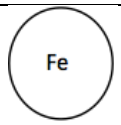
Characteristics of Elements

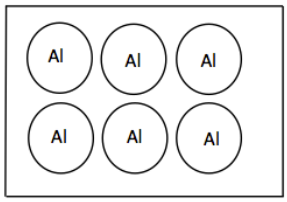
1. Look at the elements on display, select three and describe their characteristics below:

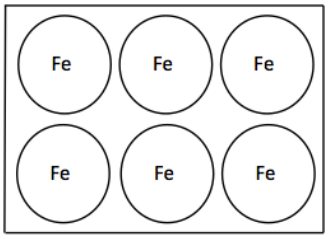
Name of Element Examined	Characteristics of Element Examined

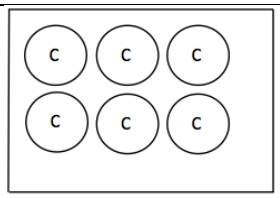
2. Watch your teacher model an element with a sheet of paper and divide it up to model of an *unchangeable* atom.

The following are diagrams of what a scientist might see using a powerful microscope on certain elements. (they won't contain symbols)

Unchangeable Aluminium Atom	= 	*Unchangeable* Iron Atom	= 	*Unchangeable* Carbon Atom	= 







IUPAC Periodic Table of the Elements

1																	18
1 H hydrogen [1.007; 1.009]	2		Key: atomic number Symbol name standard atomic weight									13	14	15	16	17	2 He helium 4.003
3 Li lithium [6.938; 6.997]	4 Be beryllium 9.012											5 B boron [10.80; 10.83]	6 C carbon [12.00; 12.02]	7 N nitrogen [14.00; 14.01]	8 O oxygen [15.99; 16.00]	9 F fluorine 19.00	10 Ne neon 20.18
11 Na sodium 22.99	12 Mg magnesium 24.31	3	4	5	6	7	8	9	10	11	12	13 Al aluminium 26.98	14 Si silicon [28.08; 28.09]	15 P phosphorus 30.97	16 S sulfur [32.05; 32.08]	17 Cl chlorine [35.44; 35.46]	18 Ar argon 39.95
19 K potassium 39.10	20 Ca calcium 40.08	21 Sc scandium 44.96	22 Ti titanium 47.87	23 V vanadium 50.94	24 Cr chromium 52.00	25 Mn manganese 54.94	26 Fe iron 55.85	27 Co cobalt 58.93	28 Ni nickel 58.69	29 Cu copper 63.55	30 Zn zinc 65.38(2)	31 Ga gallium 69.72	32 Ge germanium 72.63	33 As arsenic 74.92	34 Se selenium 78.96(3)	35 Br bromine 79.90	36 Kr krypton 83.80
37 Rb rubidium 85.47	38 Sr strontium 87.62	39 Y yttrium 88.91	40 Zr zirconium 91.22	41 Nb niobium 92.91	42 Mo molybdenum 95.96(2)	43 Tc technetium	44 Ru ruthenium 101.1	45 Rh rhodium 102.9	46 Pd palladium 106.4	47 Ag silver 107.9	48 Cd cadmium 112.4	49 In indium 114.8	50 Sn tin 118.7	51 Sb antimony 121.8	52 Te tellurium 127.6	53 I iodine 126.9	54 Xe xenon 131.3
55 Cs caesium 132.9	56 Ba barium 137.3	57-71 lanthanoids	72 Hf hafnium 178.5	73 Ta tantalum 180.9	74 W tungsten 183.8	75 Re rhenium 186.2	76 Os osmium 190.2	77 Ir iridium 192.2	78 Pt platinum 195.1	79 Au gold 197.0	80 Hg mercury 200.6	81 Tl thallium [204.3; 204.4]	82 Pb lead 207.2	83 Bi bismuth 209.0	84 Po polonium	85 At astatine	86 Rn radon
87 Fr francium	88 Ra radium	89-103 actinoids	104 Rf rutherfordium	105 Db dubnium	106 Sg seaborgium	107 Bh bohrium	108 Hs hassium	109 Mt meitnerium	110 Ds darmstadtium	111 Rg roentgenium	112 Cn copernicium		114 Fl flerovium		116 Lv livermorium		

57 La lanthanum 138.9	58 Ce cerium 140.1	59 Pr praseodymium 140.9	60 Nd neodymium 144.2	61 Pm promethium	62 Sm samarium 150.4	63 Eu europium 152.0	64 Gd gadolinium 157.3	65 Tb terbium 158.9	66 Dy dysprosium 162.5	67 Ho holmium 164.9	68 Er erbium 167.3	69 Tm thulium 168.9	70 Yb ytterbium 173.1	71 Lu lutetium 175.0
89 Ac actinium	90 Th thorium 232.0	91 Pa protactinium 231.0	92 U uranium 238.0	93 Np neptunium	94 Pu plutonium	95 Am americium	96 Cm curium	97 Bk berkelium	98 Cf californium	99 Es einsteinium	100 Fm fermium	101 Md mendelevium	102 No nobelium	103 Lr lawrencium

Notes

- IUPAC 2009 Standard atomic weights abridged to four significant digits (Table 4 published in *Pure Appl. Chem.* 83, 359-396 (2011); doi:10.1351/PAC-REP-10-09-14). The uncertainty in the last digit of the standard atomic weight value is listed in parentheses following the value. In the absence of parentheses, the uncertainty is one in that last digit. An interval in square brackets provides the lower and upper bounds of the standard atomic weight for that element. No values are listed for elements which lack isotopes with a characteristic isotopic abundance in natural terrestrial samples. See PAC for more details.

- "Aluminum" and "cesium" are commonly used alternative spellings for "aluminium" and "caesium."

- Claims for the discovery of all the remaining elements in the last row of the Table, namely elements with atomic numbers 113, 115, 117 and 118, and for which no assignments have yet been made, are being considered by a IUPAC and IUPAP Joint Working Party.

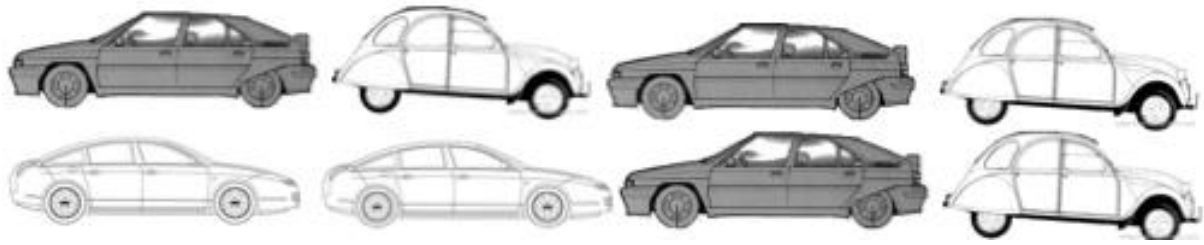
For updates to this table, see iupac.org/reports/periodic_table/. This version is dated 1 June 2012.

INTERNATIONAL UNION OF PURE AND APPLIED CHEMISTRY

Symbols: Using a periodic table of elements, can you find the symbols for the elements on display.

Element Name	**Symbol**	**Element Name**	**Symbol**	**Element Name**	**Symbol**

3. How many cars are in the diagram below? ___ How many types of cars are there? ___



Looking at the diagrams at the bottom of pg 52, explain how many types of atom are in any element _____

4.

Jenny goes in to a jewellery shop to buy a pair of ear-rings. The shop assistant advises her to buy earrings made from the metal Xylomus – symbol 'X'. He explains that they are very expensive because Xylomus is a pure substance and because it is an element.
a) How could Jenny check to see if this story is the truth?

b) Should she buy it?

_____
_____

Element: is a pure substance which contains **one type of** atom

Elements and their States of Matter

Not all elements are solids - two are liquids and eleven are gases at room temperature ($25^{o}C$).

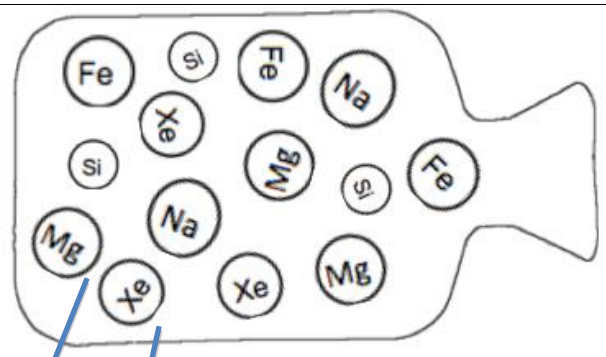
The interesting thing about gases of elements is that they can be made from single **atoms** or **pairs of atoms**.

5.

- An element contains one **type** of atom.
- A compound contains more than one **type** of atom.

Use the above descriptions to answer the questions below

i.



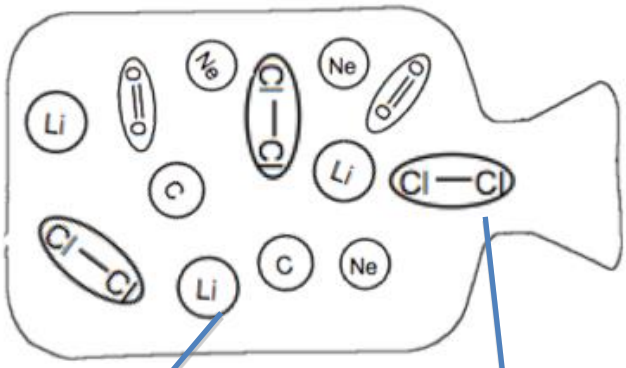
List the symbols of each element as presented by their atoms in the space above – examples are given.

Mg, Xe

_____

Number of elements presented in container i. = _____

ii.



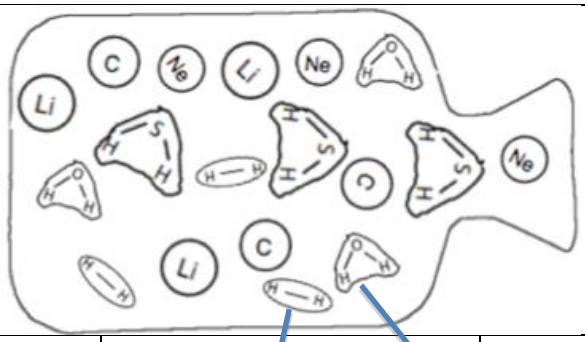
Divide the particles into two separate categories and draw the particles below – examples are given.

Atoms	Molecules
Li	Cl — Cl

Number of Elements presented in container ii. = _____

6. Categorise <u>each particle</u> you see in the bag – some examples are given.

iii.



Draw <u>each</u> single **atom** of an Element <u>once</u> below	Draw <u>each</u> **molecule** of an Element <u>once</u> below	Draw <u>each</u> **molecule** of a Compound <u>once</u> below
		

You may use skittles to build your particles if it helps you to visualise molecules.

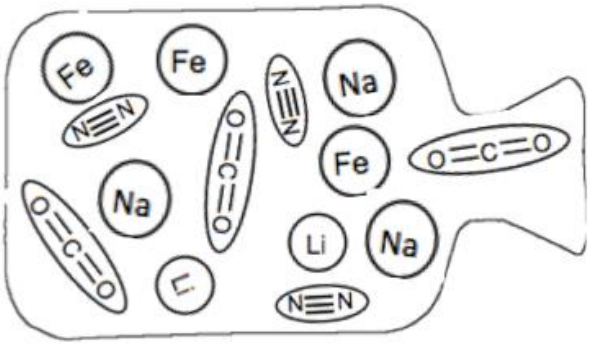
a. No. of Elements presented in iii.= _____ No. of Compounds presented in iii.= _____

b. Write what you understand of 'molecule' in terms of atoms.

_____

7.

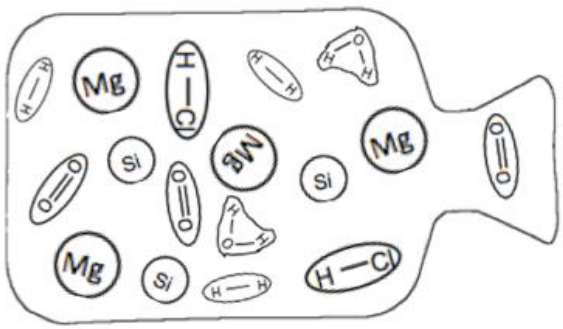
iv.



Draw <u>each</u> single **atom** <u>once</u> below	Draw <u>each</u> **molecule** of an Element <u>once</u> below	Draw <u>each</u> **molecule** of a Compound <u>once</u> below

No. of Elements presented in iv.= _____ No. of Compounds presented in iv.= _____

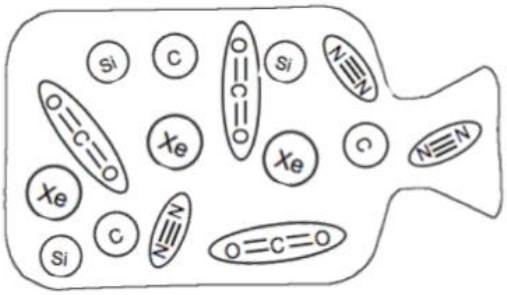
v.



Draw <u>each</u> single **atom** <u>once</u> below	Draw <u>each</u> **molecule** of an Element <u>once</u> below	Draw <u>each</u> **molecule** of a Compound <u>once</u> below

No. of Elements presented in v.= _____ No. of Compounds presented in v.= _____

vi.

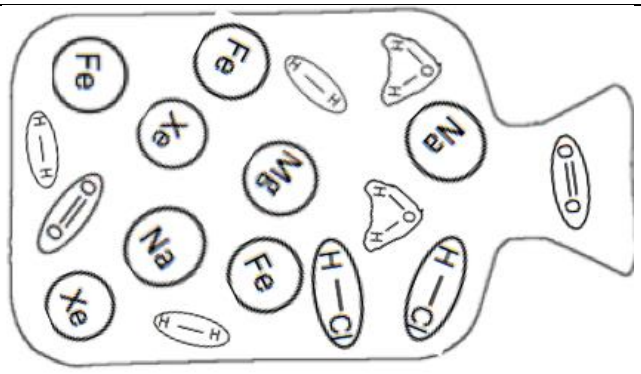


Draw <u>each</u> single **atom** <u>once</u> below	Draw <u>each</u> **molecule** of an Element <u>once</u> below	Draw <u>each</u> **molecule** of a Compound <u>once</u> below

No. of Elements presented in vi.= _____ No. of Compounds presented in vi.= _____

8.

vii.



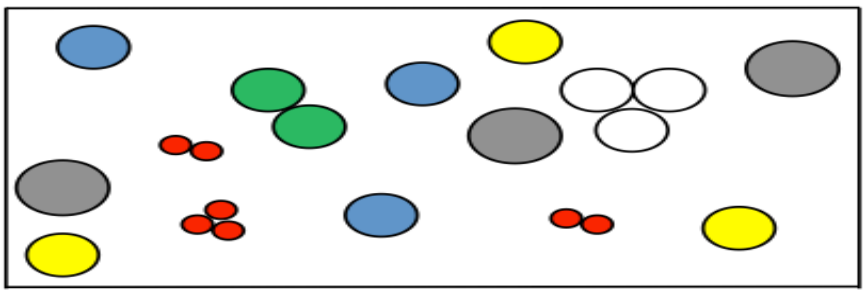
Number of Elements in vii.= _____ Number of Compounds in vii. = _____

9. Examine the bag you are given and separate out molecules of **elements** and molecules of **compounds** from them. Share your answer with the group beside you and see if they agree.

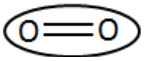
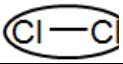
What is total number of elements represented by models in the bag? _____

Now pool the contents of your bag on the desk with those of another group. Make elements and compounds on the desk using the selection of particles.

Circle the diatomic molecules of elements as you see fit



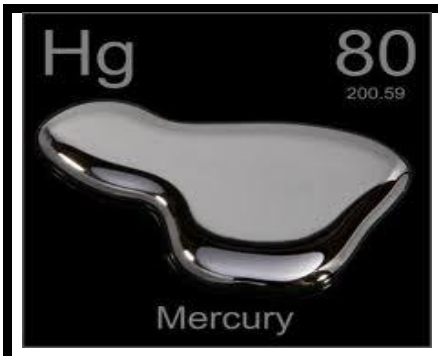
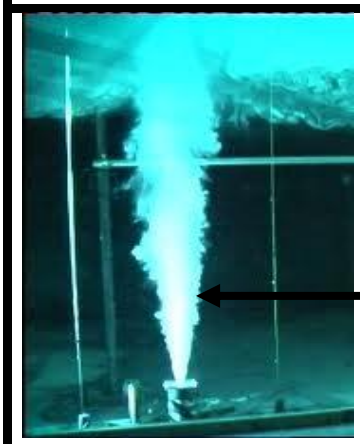
10. Complete the table below on Gas Classification and circle the noble gases on the IUPAC Periodic Table on a previous page:

Name of Gas	Symbol	Smallest Particle	Made of Atoms or Molecules	Tick if a Noble gas – they are made of Atoms only
Hydrogen	H_2			
Helium	He		Atom	
Nitrogen	N_2			
Oxygen	O_2		Molecule	
Flourine	F_2			
Neon	Ne			
Chlorine	Cl_2			
Argon	Ar			
Krypton	Kr			
Xenon	Xe		Atom	
Radon	Rn			

Atomic and Molecular Models

Using playdough or Chemsense make one model from **atoms** or from **molecules** to match one of the elements in the pictures below. Your teacher will tell you which element to model. One of your group will explain your model to the class.

Then using pencil, draw **atomic** or molecular **models** to match the following elements and their state of matter. Use the playdough models as guides. More exercises are available in Appendix 1 at the back of the booklet. Chemsense instructions are in Appendix 4.

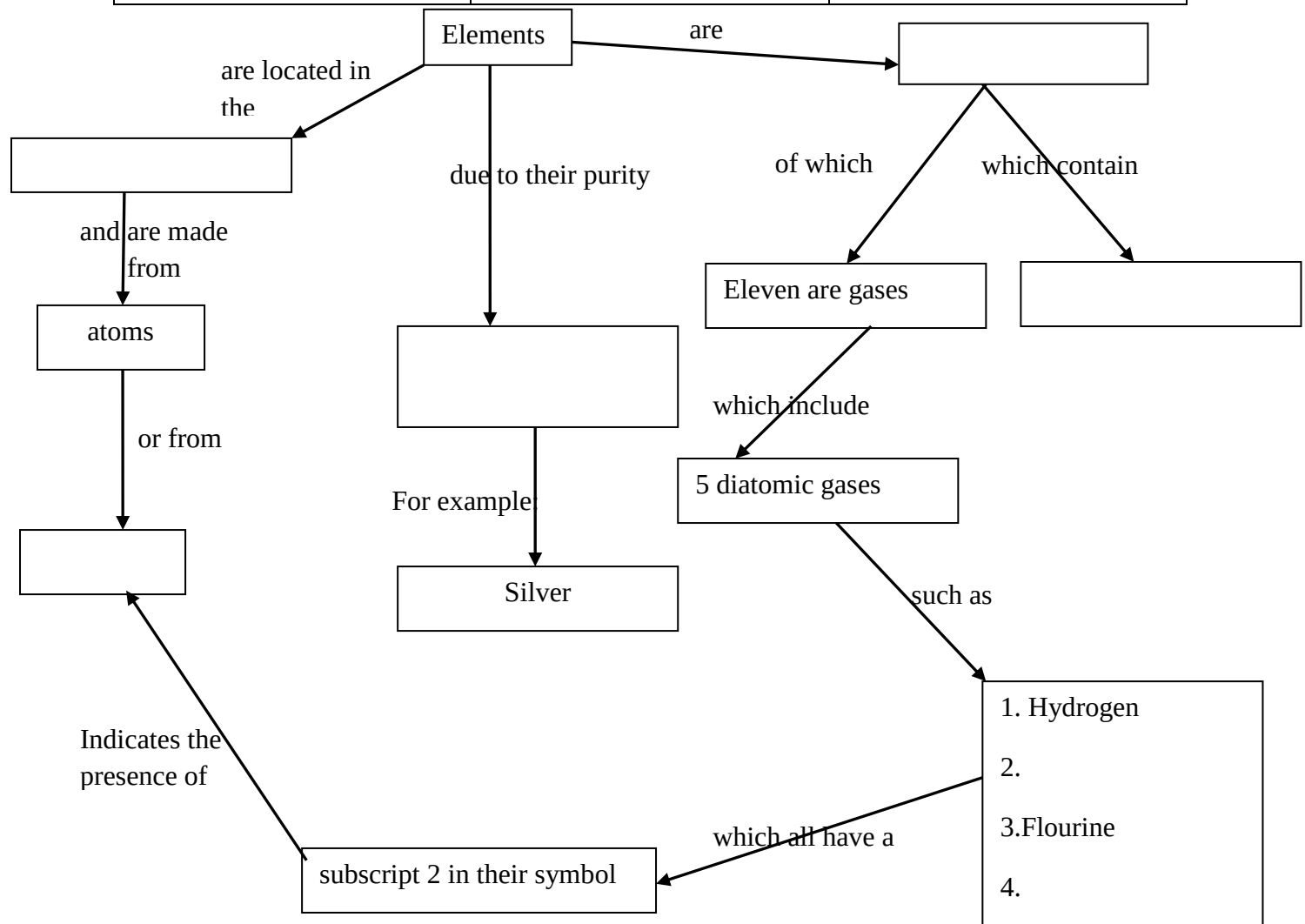
Actual Picture of Element	**Your Atomic or Molecular Model**
 **Mercury Liquid** **Circle the correct symbol for Mercury** **hG gH hg Hg HG**	**Draw at least Five Particles**
 **Hydrogen Gas [Symbol = H_2]**	**Draw at least Five Particles**

 **Calcium** **Circle the correct symbol for Calcium** **Ca ca Ac cA CA**	**Draw at least Five Particles**
 **Cobalt** **Circle the correct symbol for Cobalt** **co CO Oc Co OC**	**Draw at least Five Particles**
 **Oxygen [Symbol = O_2]**	**Draw at least Five Particles**

 *Water [Symbol = H_2O]*	**Draw at least Five Particles**
 *Carbon Dioxide [Symbol = CO_2]*	**Draw at least Five Particles**

Concept Map 4: Use the following words or phrases to complete the concept map below:

Only one type of atom	*Oxygen*	*Periodic table*
Pure substances	*Nitrogen*	*They are sometimes expensive*
Chlorine	6 noble gases	*molecules*



New Word:

Diatomic means **2** atoms joined together in a molecule.

My Own Chapter Notes on Atoms, Elements, Molecules and the Periodic Table

I. What I thought about atoms, elements and molecules at the beginning of the chapter:

_____

_____

II. What I have learned or think about them now:

_____

_____

III. What made me change my mind:

_____

IV. Which bit did I find difficult:

_____

V. How can I make sure that I understand this before the next lesson?

_____

Fill in I. p.69 before beginning!!

Chapter 9: Compounds & Mixtures

1. Circle which of the following could be symbols of elements on a periodic table?

a. MM **b.** De **c.** Xe **d.** OO

e. Ot **f**. GH **g**. Gr **h**. im

Use the periodic table and confirm which is / are the actual elements _____

2. ***Using The Periodic Table:*** Using the copy of the Periodic Table of Elements on p.52

Can you find the underlined component elements of the compounds listed below?

Compound	Name of Element 1	Chemical Symbol of Element 1	Name of Element 2	Chemical Symbol of Element 2
Sulfur dioxide				
Iron Sulfide				
Magnesium chloride				

When two elements are chemically combined – a **compound** is formed.

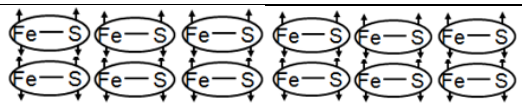
'Chemically combined' means that heat is usually involved (revise in 2nd year).

Often compounds' names indicate which elements they are made from.

3. Molecules: Draw one molecule of ironsulfide by looking at the diagram 1 below

Note: iron sulphide has a formula **FeS**.

Diagram 1

	**Draw One Molecule**

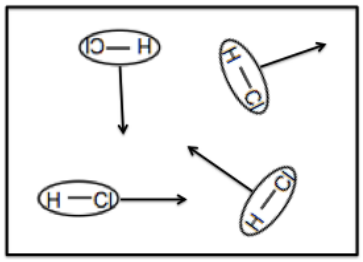
4. Now draw **the atoms** that make up one molecule of ironsulfide.

One Molecule	
Atom1	**Atom2**

5. What is the state of matter of iron sulfide in the left side of diagram1 above?_____

6. Draw <u>one molecule</u> of hydrogen chloride gas by looking at Diagram 2

Diagram 2

	**Draw One Molecule**

Now draw **<u>the atoms</u>** that make up one molecule of hydrogen chloride.

One Molecule	
Atom1	**Atom2**

7. Can you write the chemical symbol for the compound hydrogen chloride? _____

What is the state of matter of hydrogen choride in the left side of diagram 2 above?

_____

Ironsulfide :

8. Watch how some iron and sulfur is heated by your teacher in a test-tube. Place the compound formed in the 4th column /box in the Table 1 (on next page). Place some of <u>each</u> substance in the **first 3 columns / boxes** in this table below.

Note: Think of a mixture as being like a jig-saw in that it can be separated.

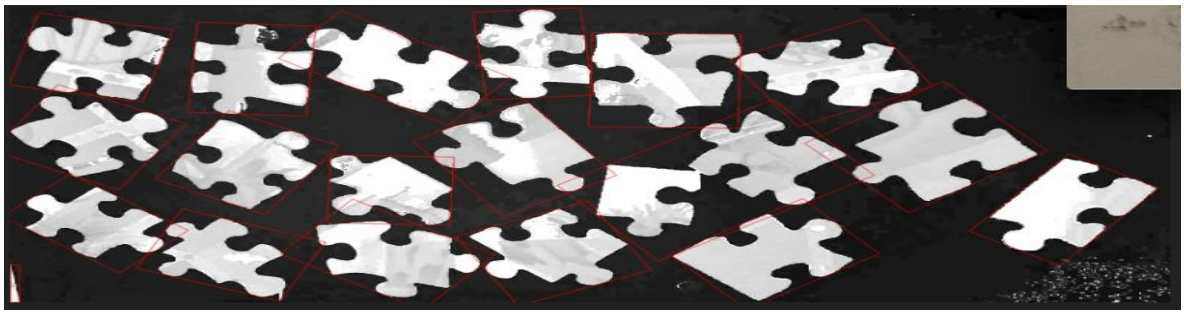


Table 1:

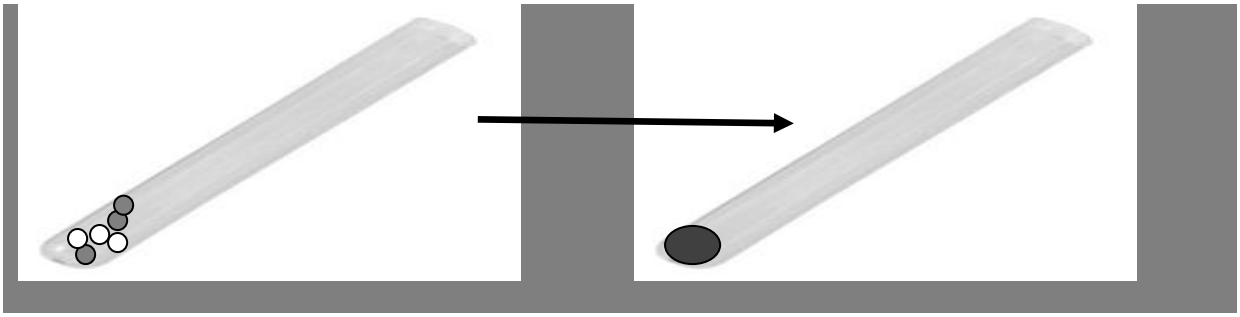
Sulfur	**Iron**	**Make a Mixture of Sulfur & Iron**	**Compound called Iron sulfide**
Symbols: S	**Fe**	**Fe & S**	**FeS**

Use Table 2 that follows to describe sulfur, iron, a mixture of iron and sulfur and the compound ironsulfide.

Table 2:

	Sulfur	**Iron**	**Mixture of Sulfur & Iron**	**Compound called Iron sulfide**
Symbol	**S**	**Fe**	**Fe & S**	**FeS**
Property 1				
Property 2				
Possible to Separate? (Yes/ No)				
Draw 5 Particles (Use Symbols)				

S particle = ○ Fe particle = ●



Mixture of **4g** of Fe + **3g** of S <u>before</u> heating

Compound of FeS <u>after</u> heating = ___g

i. If 8g of iron and 6g of sulfur were used to make the iron sulfide can you predict the weight of the iron sulfide? _____

ii. How could you check your answer? _____

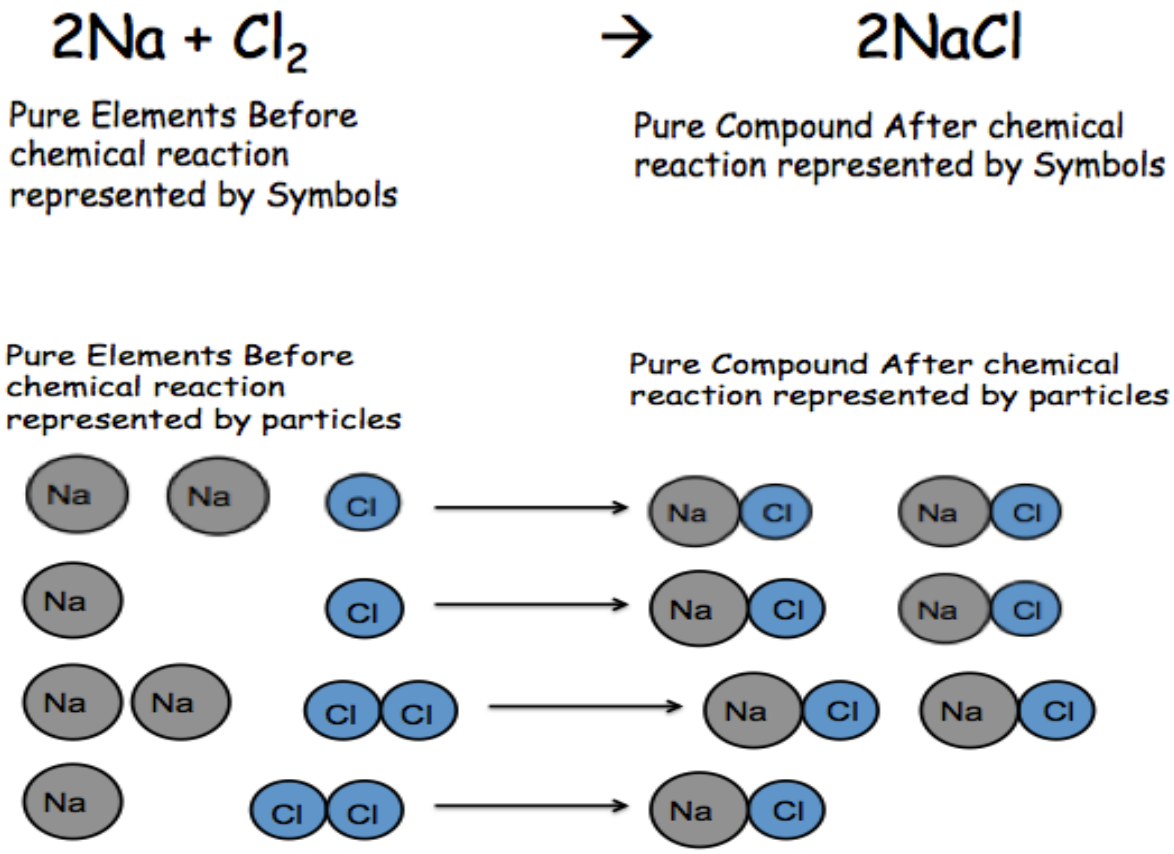
iii. Elements are made up of _____ type of atom. Compounds are made up of more than ___ type of atom.

Sodiumchloride : Watch the video clips about the elements chlorine and sodium.

Following the video clips, can you list two properties / characteristics of chlorine & sodium.

Chlorine [Cl_2] **Draw smallest particle here:**	**Sodium [Na]** **Draw smallest particle here:**
1st Property.	**1st Property.**
2nd Property .	**2nd Property.**

iv. This equation states the formation of sodium chloride (NaCl). Pick the one correct representation of this reaction from the four following the equation.



v. Given the properties of the elements sodium and chlorine are unpleasant or dangerous to a person, can you make a prediction about the of properties a compound made from chemically combining sodium and chlorine would have; **My Prediction is:**

_____

_____

The substance your teacher has placed in a bag on the bench in front of you is the **actual product** of chemically combining sodium and chlorine. List two of its properties.

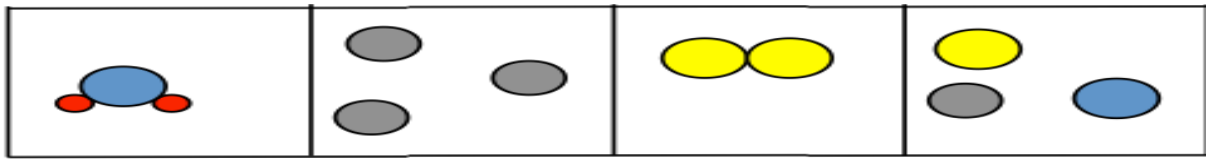
1._____

2. _____

3. Can you explain why water can be used to put out fires even though there is an oxygen atom in its' molecule? Remember tha element oxygen helps fuels to burn.

_____ Water molecule =

4. Circle the boxes where atoms are chemically combined:



My Own Chapter Notes on Compounds and Mixtures

I. What I thought about compounds and mixtures at the beginning of the chapter:

_____

_____

II. What I have learned or think about them now:

_____

_____

III. What made me change my mind:

_____

IV. Which bit did I find difficult:

_____

V. How can I make sure that I understand this before the next lesson?

_____

Fill in I. p.73 before beginning!!

Chapter 10: Modelling Molecules of Compounds

Simulation Three: Building Multiple Molecules – Collection1, 2, 3 etc.

a) Ensure that you are on the 'Make Molecules' tab and it is sky blue

The molecules that you must make are on the right hand side. The idea is to drag and drop atoms from the buckets and place them on the sky blue work area.

- Move **between kits** using the yellow arrows to assemble models
- When your molecule is made, take a look at it in three dimensions by selecting the **green 3D icon** that appears. Spin the molecule in all directions by dragging it and check what it looks like in '*space filling'* and '*ball and stick'* forms.
- Work through from Collection 1 to Collection 3

b) Switch to the 'Collect Multiple' tab and it is sky blue and fill in the blanks below **as you work.**

In Collection 1, when the screen on the right reads

Goal: $4H_2$; This means that you make _____ molecules. There are _____atoms in each molecule . The *big number* (the co-efficient) is the number of _____. The *small number* (the subscript) is the number of _____ in each molecule.

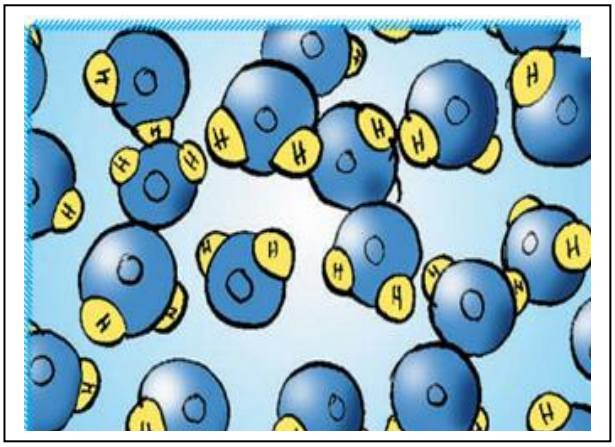
Goal: $2O_2$; This means you make _____ molecules. There are _____atoms in each molecule. The *big number* (the co-efficient) is the number of _____. The *small number* (the subscript) is the number of _____ in each molecule.

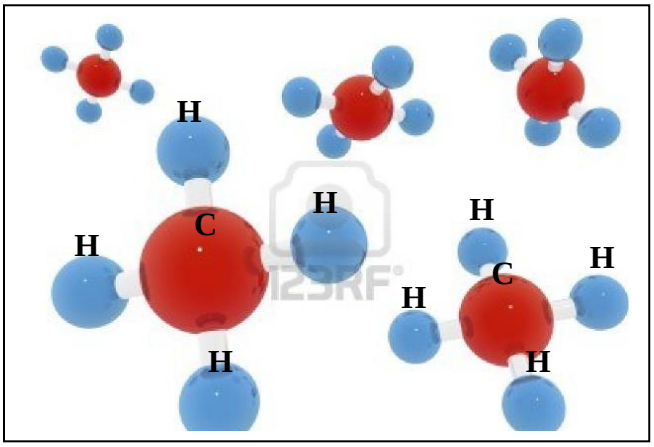
Goal: $2CO_2$; This means you make _____ molecules. There are _____atoms in each molecule. The *big number* (the co-efficient) is the number of _____. What is the total number of atoms in a carbon dioxide molecule? _____

Goal: $2NH_3$; This means you make _____ molecules. There are _____atoms in each molecule. The *big number* (the co-efficient) is the number of _____.

c)

`

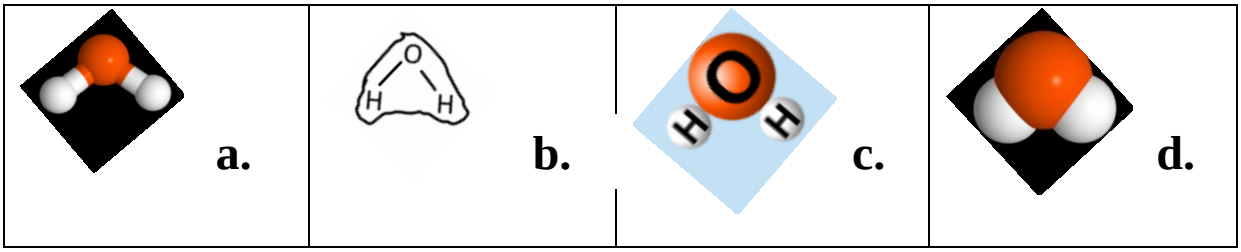




Looking at the diagrams of water (H_2O) and methane (CH_4) above, Complete the following paragraph using the words or phrases; **atoms, molecules, chemically combined, pure**.

Compounds are _____ substances because each compound is made up of the same _____. The _____ are bonded together in the molecule. Compounds are made of two or more elements that are _____ _____.

d) Which model of the water molecule (Symbol = H_2O) do you think is the best representation? Are they all equal or does one in particular have an advantage over the other three?

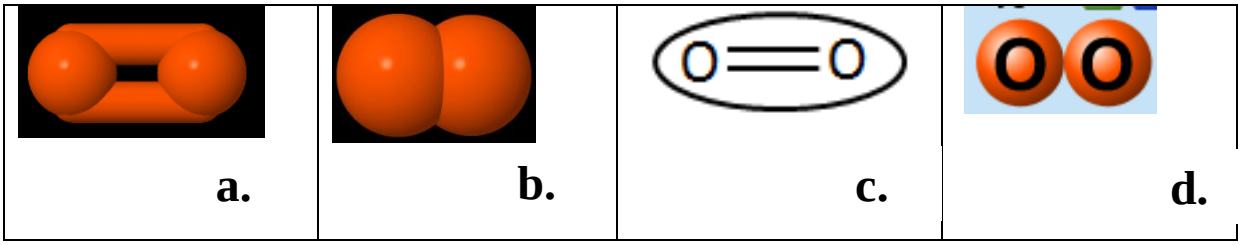


Best Representation: _____

Reason:

_____

e) Which model of the oxygen molecule (Symbol = O_2) do you think is the best representation? Are they all equal or does one in particular have an advantage over the other three?

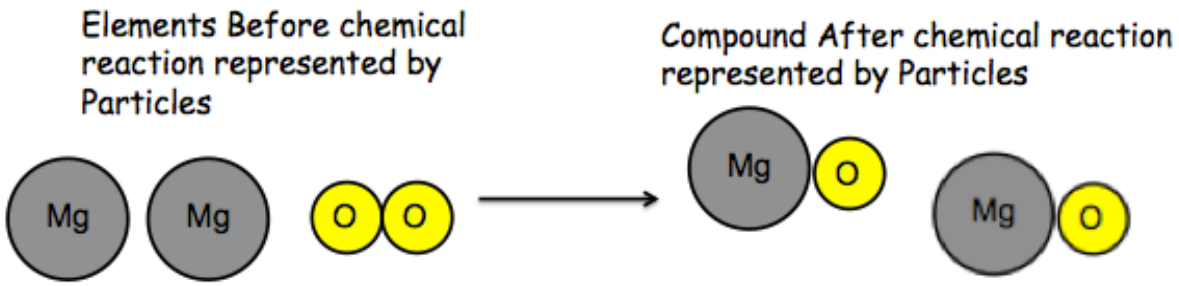


Best Representation: _____

Reason:

_____

f) The diagram below shows a representation of the reaction between magnesium and oxygen.

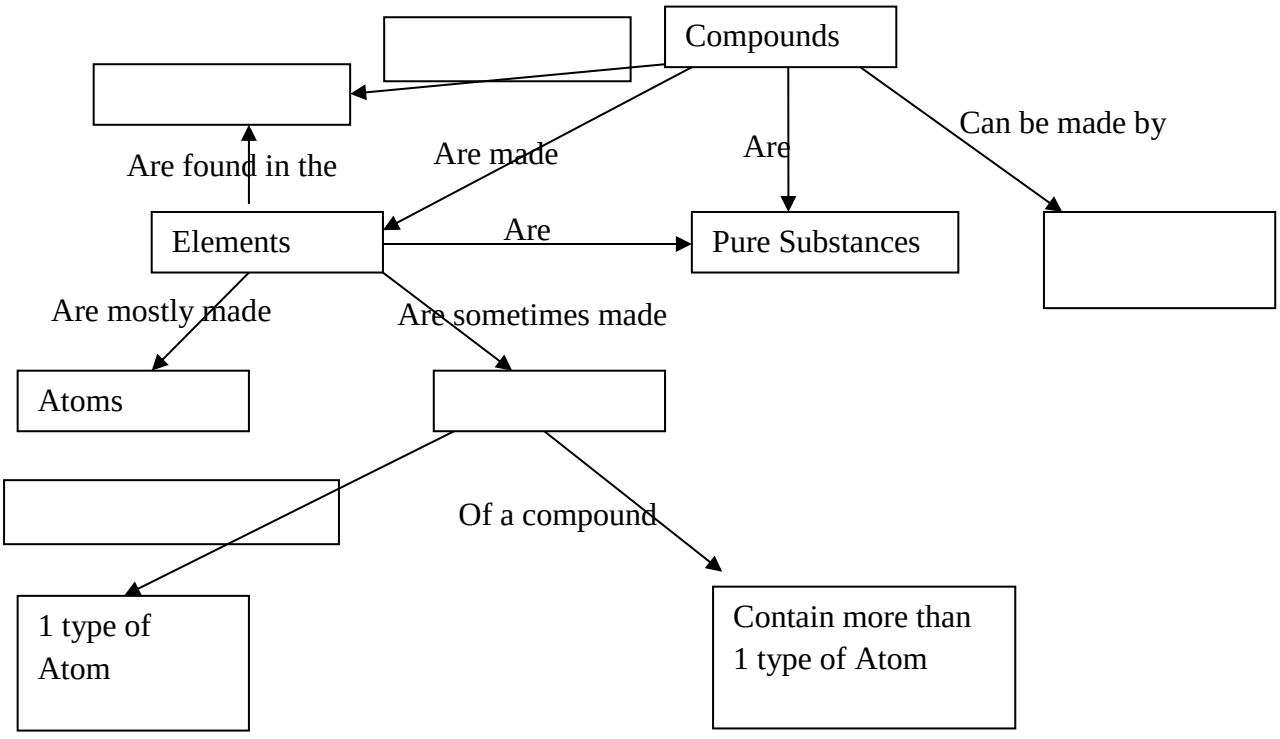


Pick the <u>one correct</u> equation that represents this reaction from the four below.

Elements Before chemical reaction represented by Symbols		Compound After chemical reaction represented by Symbols
$Mg_2 + O_2$	→	$2MgO$
$Mg + O^2$	→	$2MgO$
$2Mg + O_2$	→	$2MgO$
$2Mg + O^2$	→	$2MgO$

Concept Map 5 – Focus Question: What is the relationship between Compounds and Atoms?

Complete the map below using the words or phrases: molecules; of an element contain only; heating two or more elements; Are not found in; Periodic Table



My Own Chapter Notes on Modeling Compounds

I. What I thought about modelling molecules of compounds at the beginning of the chapter:

_____

_____

II. What I have learned or think modelling them now:

_____

_____

III. What made me change my mind:

_____

IV. Which bit I find difficult:

_____

V. How can I make sure that I understand this before the next lesson?

_____

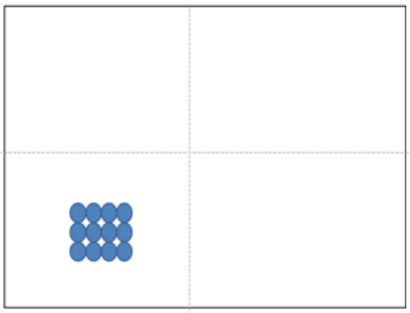
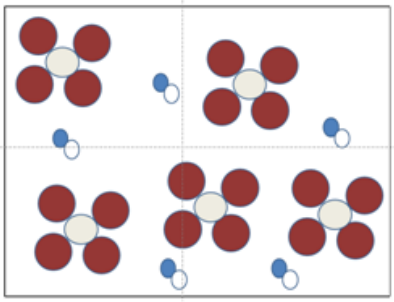
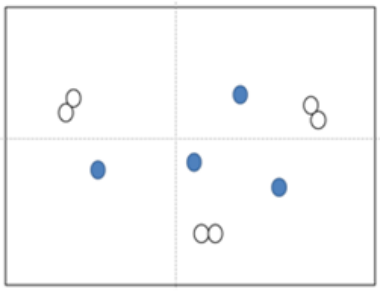
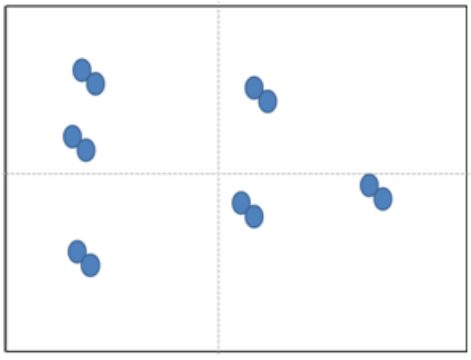
Fill in I. p.76 before beginning!!

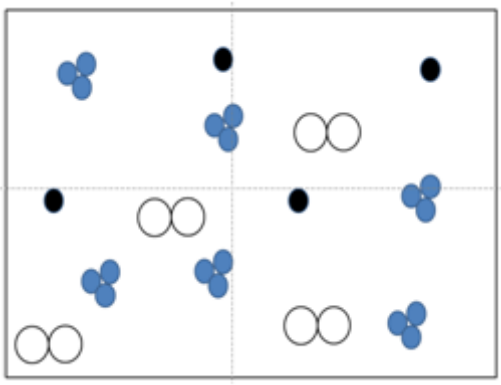
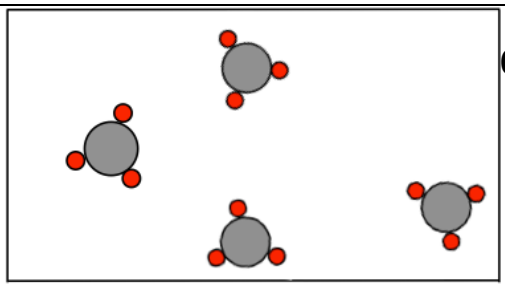
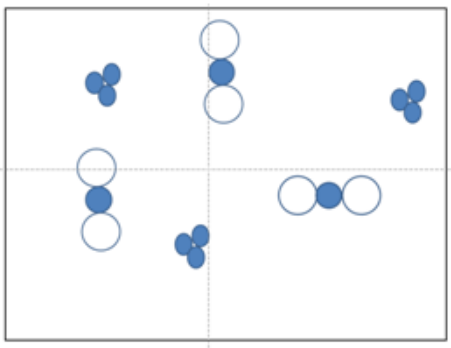
Chapter 11: Models of Mixtures

The following diagrams shows one of an element, a compound or a mixture.

Pick out which of these **three words** is appropriate to each diagram.

If you choose 'mixture' – say if it is a mix of an a) '**element and element'**, b) '**compound and compound'** c) **'element and compound'.**

 **1.**	**My choice is:**
 **2.**	**My choice is:**
 **3.**	**My choice is:**
 **4.**	**My choice is:**

 **5.**	**My choice is:**
 **6.**	**My choice is:**
 **7.**	**My choice is:**

Pure Substance: One with a constant composition.

Given the above definition, select from 1. to 7 which are pure substances.

My Own Chapter Notes on Models of Mixtures

I. What I thought about models of mixtures at the beginning of the chapter:

_____

_____

II. What I have learned or think about it now:

_____

_____

III. What made me change my mind:

_____

IV. Which bit did I find difficult:

_____

How can I make sure that I understand this before the next lesson?

_____

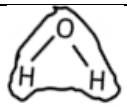
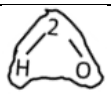
Fill in I. p.78 before beginning!!

Chapter 12: Symbols of Elements & Compounds

Select from the table below the best representation of the mercury atom (symbol = Hg). Draw your selection into the empty box on the right of the table.

hg	H g	Hg	**My Selection**

Select from the table below the best representation of the water molecule (symbol = H_2O). Draw your selection into the empty box on the right of the table.

			**My Selection**

Select from each row the best representation of the nitrogen molecule N_2. Draw your selection into the column of empty boxes on the right of the table.

N2	N N	2 N	**My Selection**
n_2	N≡N	N	**My Selection**
N_2 N_2	N2	N_2	**My Selection**
N≡N	N_2 N_2		**My Selection**

From the four selections you have chosen, can you now choose a single best representation of the nitrogen molecule which may have an advantage over the others?

Selection: _____

Reason: _____

My Own Chapter Symbols of Elements and Compounds

What I thought about symbols of elements and compounds at the beginning of the chapter:

_____

What I have learned or think about it now:

_____

What made me change my mind:

_____

Which bit did I found difficult:

_____

How can I make sure that I understand this before the next lesson?

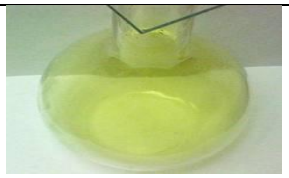
_____

Appendix 1

Using playdough or Chemsense, make models from atoms or from molecules to match the following elements in the pictures below. One of your group will explain your model to the class.

Then using a pencil, draw atomic or molecular models to match the following elements. Use the playdough models as guides.

Modelling Compounds

	
Liquid Nitrogen (N_2)	Water (H_2O)
	
Hydrogen Gas (H_2)	Chlorine gas (Cl_2)
	
Carbon dioxide gas (CO_2)	Solid Carbondioxide (CO_2) = Dry ice
	
Solid Carbon (C) Diamond	Carbon monoxide gas (CO)
	
Solid Iron (Fe)	Solid Cobalt

Summary of Elements and Compounds

Substance	**Formula**	**Is it an element or compound**	**Drawing of Model of 5 Atoms or Molecules**	**If made of molecules, how many atoms per molecule?**
Liquid **Nitrogen**				
Liquid **Water**				
Hydrogen Gas				
Chlorine Gas				
Carbon Dioxide Gas				
Solid **Carbon dioxide**				
Solid **Carbon**				
CarbonMonoxide Gas				
Solid **Iron**				
Solid **Cobalt**				

Appendix 2

Definitions

Matter: Is anything which takes up space and has mass e.g. solids, liquid, gases.

Atom: Is a building block.

Molecule: Composed of two or more atoms chemically combined.

Element: A substance mad up of only one type of atom.

Compound: Consists of two or more elements chemically combined.

Appendix 3

Model using Chemsense how **6** particles of a solid would behave (use **four frames**). Then show these particles changing into and behaving as a liquid (use **four frames**) . Finally show these particles behave as a gas (use **four frames**).

Opening ChemSense

1. Select Desktop icon
2. Select the folder icon at the bottom left of the screen 
3. Under 'Devices and Drivers', select OS(C:)
4. Select Program files
5. Select Chemsense Animator folder
6. Select ChemSenseAnimator with this logo:

Before you Start

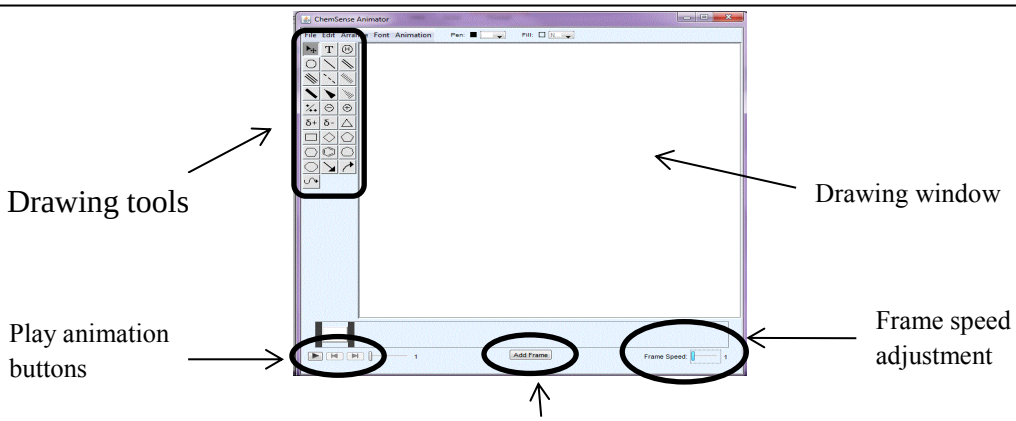
Adjust frame speed at <u>bottom right</u> of your screen to 1 or 2

Saving your Work

1. Select File tab
2. Select Save As
3. Select Desktop
4. Find the folder 'Mr. Carr's Class'
5. Give your work a title
6. Select Save

Reopening your Work

1. ChemSense Animator must be open
2. File -> Open -> Desktop ->Mr. Carr's Class



Animating particles

1. Locate the  button and click on it.
2. Click on the area of the drawing window where you wish to place your atom.
3. To move it, click the  button and when it darkens select your atom and move it.
4. To move on to the next frame, click on add frame.

Saving

1. Use Ctrl + S and File → Export to Animated GIF.

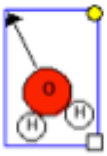
Appendix 4

To model molecules of something, decide which state it is in and then model **four molecules** using **four frames**.

Refresh how to work with Chemsense in Appendix 3 on the previous page.

Animating Molecules

1. Locate the button and click on it – this brings up the periodic table.
2. Click on the atom you want and click in the drawing window.
3. To move it, click the button and when it darkens select your atom and move it.
4. Add other atoms to your molecule.
5. Add movement arrows by selecting
6. To make a second molecule, click and drag a box around the whole molecule.



7. Select 'Group' to group your molecule together.
8. **Copy** your molecule by selecting 'Edit' → 'Duplicate'. Move it off the original.
9. **Rotate:** use the yellow circle at the top right hand corner.
10. To move on to the next frame, click on add frame.