**Chapter 4 notes: Adapted**

Vocabulary list (no definitions) for the chapter:

Matter gas quantitative property density liquid boiling point property volume qualitative property states of matter melting point mass chemistry solid physical change chemical change chemical property temperature

**Section 4.1 – describing matter**

Everything that you can see, touch/feel, smell and or taste is made of stuff, of *something*. This *something* is called MATTER.

Matter makes up every living thing and every material object.

The name of the study of MATTER and its CHANGES is CHEMISTRY.

(page 102, figure 4.1 lists matter)

Your eyes, nose, ears, mouth (sometimes), and skin help you observe and experience matter, to identify what it is, you need to perform tests on it.

To scientifically identify matter, we need to test it to find its PROPERTIES. A SET OF PROPERTIES of a type of MATTER are its special features and characteristics.

(Fools Gold/Pyrite and gold look the same, but each has its own set of characteristics, or properties – crystal shape, temperature that it melts at, hardness, and so on)

Types of properties:

**Quantitative; QUANTITY = NUMBER**. A property that has a specific number that is measurable. (Melting) temperature, (boiling) temperature, density are quantitative properties of matter. Temperature (a number in degrees Celsius) tells us how hot or cold something is. Melting points and freezing points are fixed (at sea level) for every type of matter!

**Qualitative; Quality = a term described using words**. Things like colour, shape and so on (some like red more than others, people may see the ‘same’ colour differently). Saying something is hot or cold is qualitative.

STATES OF MATTER

You need to know the **3 states of matter** – **solid, liquid and gas**.

**Solid** – Has a fixed shape and volume, does not matter the shape of the container that it is in.

**Liquid** – Has a fixed volume, but takes the shape of the container that it is in (flows).

**Gas** – Has no fixed shape or volume, so it takes the shape of the container it is in, and it fills whatever container you put it in.

(page 107 figure 4.6) Page 109 various examples of other properties.

**Section 4\_2 Notes: Measuring Matter**

**Mass**: the quantity of matter in an object

**Volume**: the amount of space an object/matter takes up

*All matter has these two characteristics*.

**Measuring Mass**

Use Kilograms (1000 grams) aka kg. 1 kg = 1000 g

“kilo” means “one thousand”

“milli” means “one one thousandth” notice the ‘th’ at the end? That means it is a smaller bit. “milligram” = 1/1000 of a gram. (0.001 g)

**Measuring Volume**

Use Litres (1L = 1000 cc or ‘cubic centimeters’ ) \*\*1 cc = the size of 1 die\*\*

Think of a 1 L milk container, that hold 1000 cc!! how many cc in 1 cubic meter??

1cc = 1 mL (1 cubic centimeter = 1 cubic milliliter)

**Volume** = l \* w \* h

When you plop a solid object into the water, if it floats, the amount of water (liquid) that is moved out of the way (displaced) will equal the mass of the object!

When you plop an solid object into water, if it sinks, the volume of water it displaces will equal its volume!

**DENSITY**

How do you take the mass of a chunk of stuff, that has a specific volume, and use this information to help identify it as a specific type of matter? You find its **DENSITY**:

**D = m / v**

Examples;

Pure water, mass of 1 kg, volume will be 1 L

D = m/v

D = 1 / 1

D = 1

Pure water has a density of 1.

Any object with a density greater than 1 will sink in water. Any object with a density less than water (lower than 1) will float in water.

Does ice have a density greater than or less than 1? What about a chunk of limestone? Wood?

Density of gas works the same, the less dense gas will rise higher in another gas….

Questions!!! Page 119 for models of the math.

**Section 4.3 – Changes in Matter (notes)**

There are two kinds of change that can happen to matter;

*Physical and chemical.*

**Physical** means that the type of matter doesn’t change, but the size or shape may change. Tearing up paper is a physical change, as it is still paper, only in smaller bits. Boiling water changes it’s state, but it is still water *vapour*. That water *vapour* can be condensed back into liquid water, so it is still water.

Taking a raw egg and scrambling the goo all up is a physical change, as it is still a raw egg…

*A change of state is a physical change!!!*

**Chemical change**

When you **chemically change** some matter, it becomes a different type of matter that is hard to return to the original type of matter. Burning (oxidizing) paper is a chemical change, as the paper decomposes into various different chemicals that once were combined together to make ‘paper’.

Cooking an egg is a chemical change, as you can’t change it back to a raw egg.

Every kind of matter has chemical properties that are unique to that type of matter, and these properties are used to identify that type of matter. Boiling point, freezing point, are just two chemical properties of matter. (page 125 figure 4.4)

Changes of state involve a change in energy, either adding or removing energy from matter:

Solid to liquid = melting ADD ENERGY (HEAT)

Liquid to solid = freezing/solidifying REMOVE ENERGY (COOL)

Liquid to gas = evaporation ADD ENERGY (HEAT)

Gas to liquid = condensation REMOVE ENERGY (COOL)

Solid to gas = sublimation ADD ENERGY (HEAT)

Gas to solid = sublimation REMOVE ENERGY (COOL)

We use models to show the behaviour of matter. ‘The **Particle Theory of Matter’** says that all matter is made of really small bits of identical matter – called **ATOMS**.

-the smallest units of matter are too small to be seen with the naked eye

-the smallest units of matter are always in motion, they vibrate, they rotate and they move from place to place.

-there are huge empty spaces between the particles in a gas

-there are some space between the particles in a liquid

-there is very little space between the particles in a solid

-the higher the temperature, the more energy there is and the faster the particles move

-each pure substance is made up of only one type of particle, and each different pure substance has its own specific type of particle