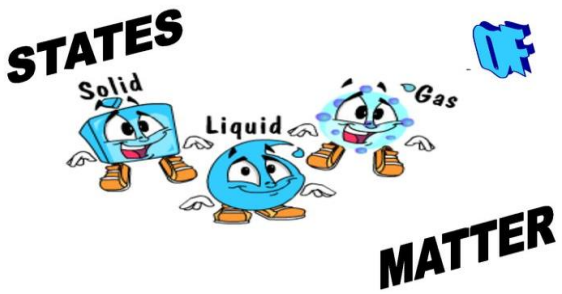
Year 5 Science & Technology Unit 2020

Material World - A Matter of Materials

Term:	Two & Three	Duration:	10 weeks	Grade:	Five	Year:	2020

UNIT OVERVIEW

This unit focuses on the properties of a range of materials and the way in which they are combined and separated. Students investigate the different properties of solids, liquids and gases, and consider combining and separating mixtures. This unit introduces students to fundamental concepts of chemistry and is an introduction to materials technologies.



OUTCOMES

***ST3-1WS-S** Working Scientifically*
plans and conducts scientific investigations to answer testable questions, and collects and summarises data to communicate conclusions

ST3-2DP-T *Design & Production*
plans and uses materials, tools and equipment to develop solutions for a need or opportunity

ST3-6MW-S *Material World*
explains the effect of heat on the properties and behaviour of materials

SKILLS FOCUS

Working Scientifically

Questioning & Predicting
- pose testable questions
- make and justify predictions about scientific investigations

Planning and conducting investigations
- identify questions to investigate scientific ideas
- plan and apply the elements of scientific investigations to answer problems
- identify potential risks in planning investigations
- manage resources safely
- decide which variable(s) is to be changed, measured and kept the same, in fair tests
- select appropriate measurement methods, including formal measurements and digital technologies, to record data accurately and honestly
- reflect on and make suggestions to improve fairness, accuracy and efficacy of a scientific investigation
- manage investigations effectively, individually and in groups

Processing and analysing data
- construct and use a range of representations, including tables and graphs, to represent and describe observations, patterns or relationships in data
- employ appropriate technologies to represent data
- compare data with predictions
- present data as evidence in developing explanations

Design & Production

Researching and planning
- research, identify and define design ideas and processes for an audience
- consider functional and aesthetic needs in planning a design solution
- develop, record and communicate design ideas, decisions and processes using appropriate
- technical terms
- produce labelled and annotated drawings including digital graphic representations for an audience
- consider sustainability of resources when researching and planning design solutions
- manage projects within time constraints

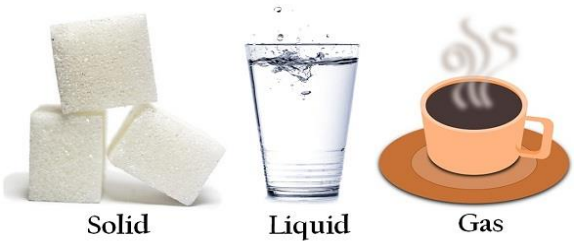
Producing and implementing
- select and use tools competently for specific purposes
- accurately cut, join, bend and measure a range of selected materials to construct the designed
- solution
- demonstrate safety and sustainability when choosing resources to produce designed solutions,
- managing constraints and maximising opportunities
- develop project plans that consider resources when producing designed solutions individually
- and collaboratively

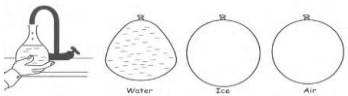
ASSESSMENT

Assessment: ***For*/ *As*/ *Of*** Learning

- ❑ Properties of water & air investigation (**Assessment For Learning**)
- ❑ Liquid Investigation (**Assessment For Learning**)
- ❑ Hot Air, Cold Air Investigation (**Assessment For Learning**)
- ❑ Combining materials investigation (**Assessment For Learning**)
- ❑ Design a simple experiment (**Assessment Of Learning**) and reflection (**Assessment As Learning**)

ESSENTIAL INQUIRY QUESTIONS	CONTENT	
States of Matter 1. How can the state of materials be changed and manipulated? **Mixtures** 2. What is the result of combining materials?	**States of Matter** Students: ▪ investigate and compare the properties of solids, liquids and gases	**Mixtures** Students: ▪ explore that when materials are combined the result is either a mixture or a new substance, for example: o salt and water o bicarbonate of soda and vinegar ▪ identify that mixtures can be separated using different techniques

TUNING IN TO THE INQUIRY		
	Tuning In (*Baseline Data)*	**Reviewing Tuning In Data** (*What did the tuning in tasks reveal to us about students' interests and needs? What questions did they pose that can help drive learning?)*
▪ How can we assess students' prior knowledge and experience in relation to this context? ▪ How will we record this information for later assessment? ▪ What can we do to PROVOKE interest/enthusiasm/curiosity/motivation? ▪ How can we assist students to make "conceptual connections" and see relationships to and links with their own lives?	▪ Examine an image or objects showing three different states of matter  ▪ Use the thinking routine **Think Puzzle Explore** to gauge understanding & misconceptions about the concept of mater. The explore component can be sorting wonders into topic areas. o What do you think you know about matter and its states? o What questions or puzzles do you have? o How might we explore the connections between our wonderings?	

CONTENT	LEARNING AND TEACHING: SHARED INQUIRY	EVALUATION	RESOURCES
States of Matter Students: ▪ investigate and compare the properties of solids, liquids and gases Curriculum Links: ❼Mathematics ○ Mass ○ Volume ○ Shape 3D/2D ○ Data ❼English ○ Descriptive language 	**Key Inquiry Question** How can the state of materials be changed and manipulated? ▪ Watch *Changing Water: States of Matter* (stop video at 2:44). Use the thinking routine **Plus One** to record key information from the video ▪ Define key terms solid, liquid, gas, matter and properties ▪ What is a fair test and what are the scientific variables? Watch Scientific Variables and discuss the 3 variables. Groups could generate a poster to explain the 3 types and how they contribute to a fair test. ▪ Small groups investigate the properties of water and air using balloons. ❖ Hypothesis – *What do you think will happen?* Explain why. ❖ Variables – ▪ *What will be the **dependent variable**? What are you going to measure?* ▪ *What will be the **independent variable**? What are you going to change?* ▪ *What variables will you need to **control**? What will you need to keep the same?* Day 1: ○ Fill two with water (one for freezing) and fill one with air ○ Label the balloons – solid liquid gas. ○ Make observations and predictions about each balloon using detailed diagrams. ○ Measure the circumference and weigh the balloons. ○ Place one water balloon in the freezer. Day 2: ○ Add to observations and re-measure the circumference and weigh, making note of any changes making predictions as to why. ○ Graph data, discussing with other groups why the data is not all the same. Experiment with Google sheets to create and compare data. ○ Explore the behaviour of each balloon as the matter is released. One by one undo/cut the top off the balloons – pour liquid into another container, let air out & peel balloon off the ice. Draw detailed diagrams to show and explain differences (**Assessment For Learning**) **(ST3-1WS-S, ST3-2DP-T, ST3-6MW-S)**		VIDEO: Changing Water: States of Matter https://www.youtube.com/watch?v=tuE1LePDZ4Y VIDEO: Scientific Variables https://www.youtube.com/watch?v=0A55QRyJHPM ❼balloons (3x each group) ❼water ❼freezer ❼tape measure ❼scales ❼scissors ❼Science journals ❼Chromebook/ Computer/ iPad

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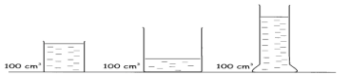
States of Matter Students: ▪ investigate and compare the properties of solids, liquids and gases Curriculum Links: ❼Mathematics ○ Volume ○ Data ○ Time 	**Key Inquiry Question** How can the state of materials be changed and manipulated? ▪ Why do liquids change shape? What happens when you heat or cool liquids? Using a given volume of water small groups investigate what happens when water (room temperature) is poured into different containers. Groups compose an investigation report, including: ○ Hypothesis – *What do you think will happen?* Explain why. ○ Variables – ▪ *What will be the **dependent variable**? What are you going to measure?* ▪ *What will be the **independent variable**? What are you going to change?* ▪ *What variables will you need to **control**? What will you need to keep the same?* ○ Draw and observe the change of shape ○ Make predictions about how high the water will rise in each container ○ Reason with evidence as to how and why liquids change shape. ▪ Introduce and define the term viscosity – a liquids resistance to flowing. Not all liquids are the same. Some are thin and flow easily – these have low viscosity. Others are thick and gooey and have a high viscosity. ▪ Investigate if all liquids freeze when placed in a conventional freezer → e.g. vegetable oil, maple syrup/honey, flat lemonade, vinegar and vinegar with salt. ○ Hypothesis – *What do you think will happen?* Explain why. ○ Variables – ▪ *What will be the **dependent variable**? What are you going to measure?* If all liquids freeze in a conventional freezer ▪ *What will be the **independent variable**? What are you going to change?* E.g types of liquids ▪ *What variables will you need to **control**? What will you need to keep the same?* E.g. amount of liquid used, storage container, location in freezer ○ Record observations about the experiment and build an explanation (**Assessment For Learning**) **(ST3-1WS-S, ST3-2DP-T, ST3-6MW-S)**		❼water ❼measuring cups ❼containers of different shapes and sizes ❼Science journals ❼trays ❼different liquids (e.g. vegetable oil, maple syrup/honey, flat lemonade, vinegar, salt) ❼Science journals ❼zip lock bags → freezer → measuring tools ACARA Yr 5 Science Work Sample – Above Satisfactory http://docs.acara.edu.au/curriculum/worksamples/Year_5_Science_Portfolio_Above.pdf

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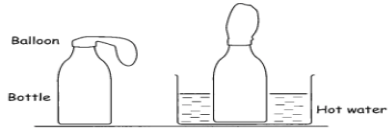
States of Matter Students: ▪ investigate and compare the properties of solids, liquids and gases Curriculum Links: ❼Mathematics ○ Mass ○ Data ▪	**Key Inquiry Question** How can the state of materials be changed and manipulated? ▪ Watch *What's Matter?* *https://www.youtube.com/watch?v=ELchwUIlWa8* ▪ Investigate the difference between hot air and cold air. Compile an investigation report that includes: ○ Hypothesis – *What do you think will happen?* Explain why. ○ Variables – ▪ *What will be the **dependent variable**? What are you going to measure?* ▪ *What will be the **independent variable**? What are you going to change?* ▪ *What variables will you need to **control**? What will you need to keep the same?* ○ Investigation sequence: ▪ Place a balloon on top of an empty small plastic bottle. ▪ Stand the bottle in warm water and observe what happens. Why might this occur? ▪ Remove the bottle from the water placing it into chilled water, allowing it to cool. What happens now? Why does this happen? ▪ What conclusions can you draw about hot and cold air? What might this mean for the weather??  ▪ Watch *Get Blown Away With This Air Experiment (5:59)* *http://education.abc.net.au/home#!/media/103418/* ▪ Examine the essential question. How might we go about answering this? What evidence have we gathered to support our responses? What questions do we still have about states of matter? The thinking routine **Claim Support Question** would be a useful tool to scaffold student thinking. (**Assessment For Learning**) **(ST3-1WS-S, ST3-2DP-T, ST3-6MW-S)** ▪ Add understandings, diagrams, questions etc. to the science wall		❼small bottle ❼water ❼jug ❼balloon

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Mixtures Students: ▪ explore that when materials are combined the result is either a mixture or a new substance, for example: ○ salt and water ○ bicarbonate of soda and vinegar ▪ identify that mixtures can be separated using different techniques Curriculum Links: ❼Mathematics ▪ Fractions ▪ Volume ▪ Capacity ❼English ▪ Poetry: Matter ▪ Speaking & Listening Presentations	**Key Inquiry Question** What is the result of combining materials? ▪ Discuss what are reversible and irreversible changes in matter and define the key terms. ○ Burning paper (irreversible) – demonstrate and discuss how when paper is burnt it turns to ash and cannot be returned to its former state. ○ Burning a candle (reversible) – demonstrate and discuss how when you burn a candle the wax turns into a liquid. However, it can be moulded back into its original form. ▪ Steel wool rust investigation – explain that the class will be observing the effects of different products on steel wool over a period of time. ○ Using 3 jars – fill one with water, one with water with salt added and one with water that has had either vinegar or bleach added to it. ○ Place a piece of steel wool into each jar. ○ Have students predict what effects they think the solutions will have on the steel wool, if any. Examine the changes to the steel wool over time in different solutions (Record observations daily on class chart). ▪ Investigate the reactions that occur when two different materials are combined, in small groups. Some examples could include: ☐ salt and water ☐ bicarb soda & vinegar – produces lots of froth ☐ lemonade and sultanas – watch the sultanas dance up and down as the gas lifts them to the surface, pops, escapes and allows them to drop to the bottom. ☐ Water, vegetable oil, food colouring and soluble aspirin (DIY Lava Lamp: instructions and video (click link) ☐ Use a device to record the experiment reactions ☐ Corn starch, water and food colouring (makes slime - Mythbusters Walking on water video link) ○ Investigation Sequence: make predictions about what might occur, determine the variables to make it a fair test, draw and label diagrams to show reactions, explain what occurred during each experiment and reason with evidence as to why they think this might be. (**Assessment For Learning**) **(ST3-1WS-S, ST3-2DP-T, ST3-6MW-S)**		❼Science journals ❼paper ❼lighter ❼candle ❼steel wool x 3 ❼3 jars ❼water ❼salt ❼vinegar ❼salt ❼water ❼bicarb soda ❼vinegar ❼lemonade ❼sultanas ❼containers ❼vegetable oil ❼food colouring ❼soluble aspirin ❼iPad

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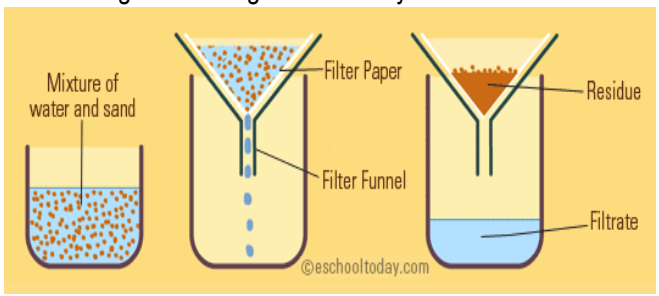
Mixtures Students: ▪ explore that when materials are combined the result is either a mixture or a new substance, for example: ○ salt and water ○ bicarbonate of soda and vinegar ▪ identify that mixtures can be separated using different techniques Curriculum Links: ❼Mathematics ▪ Fractions ▪ Volume ▪ Capacity ❼English ▪ Poetry: Matter ▪ Speaking & Listening Presentations	**Key Inquiry Question** What is the result of combining materials? ▪ Introduce and define the key terms mixing, separating and filtration. ▪ How can materials be mixed together and then separated? ○ Hypothesis: *How do you think you might separate the two materials?* ○ Determine the variables to make it a fair test ○ Small groups mix water and sand together and examine how the process of filtration can be used to separate the sand from the water ☐ Include labelled diagrams ☐ Draw conclusions and reason with evidence and what occurred during the investigation and why  ▪ M&M experiment. Can I separate the sugar coating from the chocolate? ○ Small groups investigate what happens when M7M's are combined with water. ☐ Place a small dish with water on a table ☐ Place different coloured M&M's in a circular pattern in the water, with one on the centre ☐ Make predictions and record observations about what occurs and why this happens ☐ Video: http://education.abc.net.au/home#!/media/103792/from-chocolate-buttons-to-magic-patterns ▪ Examine the essential question. Small groups design a simple experiment to demonstrate combining or separating mixtures & present to the class with reasoning and evidence. Record presentations and upload to Seesaw to share to a wider audience **Assessment Of Learning (ST3-1WS-S, ST3-2DP-T, ST3-6MW-S)** ▪ Reflect on learning and group collaboration (**Assessment As Learning**)		❼Science journals ❼sand ❼strainer/ funnel ❼filtration paper ❼M&M's fun size ❼small plates ❼water ❼Science journals ❼iPad devices OPTIONAL: ❼lab coats ❼safety glasses

Scientific Investigation Report

Task:	
Hypothesis: What do you think will happen? Explain why.	
Variables: What will be the **dependent variable**? What are you going to measure?	
Variables: What will be the **independent variable**? What are you going to change?	
Variables: What variables will you need to **control**? What will you keep the same?	

Observe: What happened? What did you see? Draw labelled diagrams.	

Explain: What occurred during the experiment? Why do you think that might be?	
Fair Test: Was this a fair test? Why or why not?	
Improvements: How might you improve this investigation next time?	