Year 6 | **Science: Physical vs Chemical Change** | Lesson Plans Overview

General Capabilities and organising elements

Literacy	**Numeracy**	**ICT**	**Critical and Creative Thinking**	**Personal and Social Capability**	**Ethical Understanding**	**Intercultural Understanding**
Composing texts through speaking, writing and creating. Word knowledge Visual Knowledge	Using special reasoning Using measurement	Investigating with ICT Creating with ICT Communicating with ICT Managing and operating ICT	Inquiring – identifying, exploring and organising information and ideas Generating ideas, Reflecting on thinking and processes	Self-management Social awareness Social management	Exploring values, rights and responsibilities	Interacting and emphasis with others

Cross Curriculum Priorities

Aboriginal and Torres Strait Islander histories and cultures – Organising ideas	**Asia and Australia's engagement with Asia – Organising ideas**	**Sustainability – Organising ideas**
Country/ Place Culture People	Asia and its diversity Achievements and contributions of the peoples of Asia Asia-Australia engagement	Systems Word Views Futures

Strand: Science Understanding

Sub-strand: Biological Sciences	**Sub-strand: Chemical Sciences**	**Sub-strand: Earth Sciences**	**Sub-strand: Physical Sciences**
Year 3 Living things can be grouped on the basis of observable features and can be distinguished from non-living things (ACSSU044) **Year 4** Living things have life cycles (ACSSU072) Living things, including plants and animals, depend on each other and the environment to survive (ACSSU072) **Year 5** Living things have structural features and adaptations that help them to survive in their environment (ACSSU043) **Year 6** The growth and survival of living things are affected by the physical conditions of their environment (ACSSU094)	**Year 3** A change of state between solid and liquid can be caused by adding or removing heat (ACSSU046) **Year 4** Natural and processed materials have a range of physical properties; These properties can influence their use (ACSSU074) **Year5** Solids, liquids and gases have different observable properties and behave in different ways (ACSSU077) **Year 6** Changes to materials can be reversible, such as melting, freezing, evaporating; or irreversible, such as burning and rusting (ACSSU095)	**Year 3** Earth's rotation on its axis causes regular changes, including night and day (ACSSU048) **Year 4** Earth's surface changes over time as a result of natural processes and human activity (ACSSU075) **Year 5** The Earth is part of a system of planets orbiting around a star (the sun) (ACSSU078) **Year 6** Sudden geological changes or extreme weather conditions can affect Earth's surface (ACSSU096)	**Year 3** Heat can be produced in many ways and can move from one object to another (ACSSU049) **Year 4** Forces can be exerted by one object on another through direct contact or from a distance (ACSSU076) **Year 5** Light from a source forms shadows and can be absorbed, reflected and refracted (ACSSU080) **Year 6** Electrical circuits provide a means of transferring and transforming electricity (ACSSU097) Energy from a variety of sources can be used to generate electricity (ACSSU219)

Strand: Science as a human endeavour		**Strand: Science Inquiry skills**				
Sub-strand: Nature and development of science	**Sub-strand: Use & influence**	**Sub-strand: Questioning and predicting**	**Sub-strand: Planning and conducting**	**Sub-strand: Processing and analysing data and information**:	**Sub-strand: Evaluating**:	**Sub-strand: Communicating**:
Year 3-4 Science involves making predictions & describing patterns and relationships (ACSHE050 or 061) **Year 5-6** Science involves testing predictions by gathering data and using evidence to develop explanations of events and phenomena. (ACSHE081 or 098) Important contributions to the advancement of science have been made by people from a range of cultures (ACSHE082 or 099)	**Year 3-4** Science knowledge helps people to understand the effect of their actions (ACSHE051 or 062) **Yr 5-6** Scientific understandings, discoveries & inventions are used to solve problems that directly affect peoples' lives (ACSHE083 or 100) Scientific knowledge is used to inform personal & community decisions (ACSHE217 or 220)	**Yr 3-4** With guidance, identify questions in familiar contexts that can be investigated scientifically and predict what might happen based on prior knowledge. (ACSIS053 or 064) **Yr 5-6** With guidance, pose questions to clarify practical problems or inform a scientific investigation, and predict what the findings of the investigation might be. (ACSIS231 or 232)	**Yr 3-4** Suggest ways to plan and conduct investigations to find answers to questions (ACSIS054 or 065)Safely use appropriate materials, tools or equipment to make and record observations, using formal measurements and digital technologies as appropriate (ACSIS055 or 066) **Yr 5-6** With guidance, plan investigation methods to answer questions or solve problems (ACSIS086 or 103) Decide variable to be changed and measured in fair tests & accurately observe, measure and record data, using digital technologies as appropriate (ACSIS087 or 104) Use equipment and materials safely, identifying potential risks (ACSIS088 or 105)	**Yr 3-4** Use a range of methods including tables & simple column graphs to represent data, to identify patterns and trends. (ACSIS057 or 068) Compare results with predictions, suggesting possible reasons for findings (ACSIS215 or 216) **Yr 5-6** Construct and use a range of representations, including tables & graphs, to represent & describe observations, patterns or relationships in data using digital technologies as appropriate (ACSIS090 or 107) Compare data and use as evidence for explanations (ACSIS218 or 221)	**Yr 3-4** Reflect on the investigation, including whether a test was fair or not (ACSIS058 or 069) **Yr 5-6** Suggest improvements to the methods used to investigate a question or solve a problem (ACSIS091 or 108)	**Yr 3-4** Represent and communicate ideas and findings in a variety of ways such as diagrams, physical representations and simple reports (ACSIS060 or 071) **Yr 5-6** Communicate ideas, explanations and processes in a variety of ways, including multi-modal texts (ACSIS093 or 110)

Overview of Curriculum Content

Year: 6	Topic: Physical vs. Chemical Change?	
Strand	**Sub strand**	**Content Descriptions**
Science understanding	Chemical Sciences	Changes to materials can be reversible or irreversible (ACSSU095) Investigating change of state caused by heating and cooling; Investigating irreversible changes such as rusting, burning, and cooking; describe what happens when materials mix; Explore how reversible materials can be used to recycle materials.
Science as human endeavour	Nature and Development	Science involves testing predictions by gathering data and using evidence to develop explanations of events and phenomena (ACSHE098) and investigating how knowledge about the effects of using the Earth's resources has changed over time
	Use and Influence	Scientific understandings are used to solve problems that directly affect peoples' lives (ACSHE100). Scientific knowledge is used to inform personal & community decisions (ACSHE220)
Science inquiry skills	Questioning & Predicting	Pose questions and predict findings of an investigation (ACSIS231) With guidance, pose questions to clarify practical problems or inform a scientific investigation, and predict what the findings of an investigation might be (ACSIS232). Asking questions to understand the scope or nature of a problem and applying experience from previous investigations to predict the outcomes of investigations in new contexts
	Planning and Conducting	Accurately observe, measure and record data (ACSIS087 or 104); Use equipment and materials safely, identifying potential risks (ACSSIS088). Use digital technologies to record data (ACSIS104). With guidance, plan appropriate investigation methods to answer questions (ACSIS103). Following a procedure to design an experimental investigation
	Processing and analysing	Construct and use a wide range of representations to represent and describe observations (ACSIS107). Compare data and use as evidence for explanations (ACSIS221). Exploring how different representations can be used to show different aspects and relationships, processes or trends. Use digital technologies to construct representations, including dynamic representations.
	Evaluating	Suggest improvements to the methods used to investigate a question or solve a problem (ACSIS091)
	Communicating	Communicate ideas, explanations and processes in a variety of ways, including multi-modal texts (ACSIS110). Using a variety of communication modes, such as reports, explanations, and procedural accounts, to communicate science ideas. Using labelled diagrams, including cross-sectional representations, to communicate ideas and processes within multi-modal texts.

Sequence of Lessons Aligned to 5E inquiry Model

	5E Model Applied	Activities/ Learning Experiences
L1 50 min	**Engage:** Mentally engages students, captures interest, Able to express what they know	Extensive class discussion is made and students are all given opportunity to input to a class mind map on the different states of matter and their characteristics. This task is intended to recall previous learning (Year 5, ACSSU077, ACARA, 2013). Emphasise that students' current understanding of matter is probably limited to physical change. Teacher guides discussion to changes of state. A short demonstration is made about the new concept: some changes are physical others are chemical. (Choc pudding mix). Class discusses the process of the cake mix. The batter is liquid. What happens when it is baked? Students then conduct a questionnaire with each other. Students then make predictions of states of matter and their changes. Each student interviews one other. Students critique the given answer and make judgments or hypothesis of their own. Questionnaire is the first entry in the science journal created specifically for this unit. Students have the choice of making a digital journal or hardcopy journal.
L2 60 min	**Explore:** Hands on activity, explore the concept or skill. Make sense of the concept or skill (this may take more than 1 lesson and be combined with explore)	Students are given the opportunity to experiment with change of matter, both physical and chemical. Four workstations will be arranged in a wet area. Each station will have a simple experiment prepared for students to do. Two will demonstrate chemical change, and two will demonstrate physical change. Students will work through the experiments, using instructions provided. Students will work in groups of three (manager, director and speaker). Students are to choose a position not held within a group before. Collaboratively, they will record their observations in a table using excel. After this, students will discuss observations within their group and write an overall conclusion collaboratively for what was observed and what happened in each experiment. These will be presented to the class (by the speaker) at the next lesson.
L3 50 min	**Explain:** Explanations are made on the concept or skill. Explanation follows experience.	Begin by having students present the findings of last lesson. Each group presents findings of 1 experiment. On the EWB, note the findings in a table. Through class discussion, expound on the visible differences between chemical and physical reactions observed in lesson 2. Physical change is reversible, chemical change is irreversible (refer again to cake batter from lesson 1). Visit class website to identify the differences. Students then create diagrams in their journals (illustrations, diagrams, flow charts, and other forms of drawing can be used) to illustrate chemical vs. physical change observed in lesson 2. Illustrations should include annotations showing all aspect of the change (i.e., heat applied, substance dissolved, change in colour etc.)
L4 50 min	**Elaborate:** Provides opportunities to apply the concept or skill. Develops a deeper understanding of the concept or skill (this may include an investigation) *This lesson is combines the chemical science learning with human responsibility to sustainability.*	Begin with discussion on the application of chemical and physical changes in everyday life. Introduce students to the work of material scientists. Play quick game (link on class website) to demonstrate that new materials are constantly being produced. Chemical and physical changes are part of these processes. Students work in their groups of three to investigate the use of chemical changes and their application in everyday life by exploring the recycling process. Each group will choose one material (plastic, glass or paper) and research the origin, process, and end product using the links prepared on the class website. During the research, students will note the processes as dot points within their journals. Each group will then design a poster to illustrate the processes involved in recycling that material (heat, pressure, addition of materials…). Students will then devise a short slogan to emphasise the benefits of recycling. Encourage students to discuss their findings and the process of recycling with their group members.
L5 50 min	**Evaluate:** Continue the development of the understanding of the skill and evaluate their learning.	Open lesson with excerpts from video "tragedy in India" to share the importance of the understanding that scientists have of chemical reactions. Each student uses data collected throughout the 4 previous lessons (dot points, sketches, and all journal entries) to create a learning reflection page. In two or three paragraphs, students reflect on their learning. Students may choose to write a 'draft' and complete the final copy at home. Students should summarise what they have learned by writing a personal reflection on what was learned within this unit. This would include a summary and critique of the differences between chemical and physical changes (headings will be provided to ensure a comprehensive reflection of learning). Students should incorporate vocabulary learned throughout the unit. The journal entries should all be collated (include a scanned copy of lesson 4 poster).

Lesson Plan 1

Lesson Title: Changes in state: physical or chemical? **ENGAGE**

Intended Learning Objectives

By the end of this lesson students will be able to:

1) Recall the three common states of matter and describe their physical characteristics (ACSSU077)
2) Work independently to evaluate data collected through the questionnaire performed with a peer.
3) Propose a hypothesis to scenarios given, based on previous knowledge and experiences (ACSHE098)

Students' Prior Knowledge (based on year 5 Chemical science content ACSSU077)

1) Substances exist in three common forms of matter are solid, liquid and gas.
2) Heating and cooling change or affect the states of matter.
3) From previous experiences, understand what it means to create a hypothesis.

Materials

- Mind map template to use during introduction (Appendix 1.1).
- Cake mix (and ingredients). Have items measured in separate containers to save time.
- Questionnaire document - one copy per student. (Appendix 1.2)

Lesson Steps

Preparation for this Unit

Welcome to our chemical science unit - Physical vs. Chemical! We will learn about the differences between the two changes that can take place to any material. Explain that throughout the next 5 lessons, students will create a "Chemical Sciences" journal. You can choose to prepare the journal as:

1) A section in your science project books
2) Digitally (using programs such as PPT, publisher, or InDesign)
3) As a separate booklet.

Some of the tasks must (others may) be completed digitally. These will be printed and added to the journal. If students have questions or would like more information, all journal details are available on the Class Website. Encourage students to view the final marking rubric (Appendix 5), which is also available of the Class Website. They are to glue this into the back of their journals. Encourage students to read through the marking criteria. Explain that some tasks will need to be handed in directly after a lesson, for feedback before the next lesson.

Intro – 15 minutes

- Collaboratively create a mind map, using template (Appendix 1.1) to recall previous learning of the 3 common states of matter. Recall matter and their characteristics. Discuss and highlight the physical properties of each material and possible physical change. Ask students to sketch the three states into the 1st page of journal.
- Introduce chemical change – when matter is transformed into a new substance.
- Demonstrate: Cake mix. Have ingredients ready. Add egg, water, and mix. Commentate as each substance is added to the mixture. What is happening to the liquid? What happens when it is baked?
- Explain: some substances change state (relate to mind map) and others react when mixed. This is called a chemical change or a chemical reaction.
- Explain that now students will perform a questionnaire (on another student).

Main body (35 min)

Students conduct questionnaire and record results (Appendix 1.2). Explain the process. You are now going to perform a questionnaire on someone in this class. Your interviewee is going to predict what will happen to the scenarios presented in the questionnaire (combining different substances). After 15 min, you will find a new partner, and change over (be the interviewee or vice versa). On completion, give students time to analyse their questionnaire and record their own hypothesis.

Conclusion (5 min)

Ask a few students to share their own hypothesis. Hands up if your own answer was different to that of the person you interviewed? Explain that this is ok. Our knowledge and experiences shape our understanding and interpretation of things. At the next lesson we will, hands-on, 'experience' each of the experiments in the questionnaire. Please leave your journals with teacher. If you have not quite completed, this may be done as homework.

Key Questions to Ask

1) Can you recall the physical properties of solids, liquids, and gas?
2) What makes matter change between states?
3) What process made the cake batter turn into a solid? (Baking/heat)
4) While demonstrating cake mix: batter is liquid, why? (It takes the form of the baking dish.)

Assessment

1) Ensure all students participate in and contribute to class mind map.
2) Observe students during the questionnaire. Note students that show exceptionally or inadequate enthusiasm. Look for qualities such as speaking clearly and eye contact.
3) Students record hypothesis in journal. Provide short written feedback (just on sticky note) prior to lesson 2. Check that students have made their own judgment and analysis of the scenario posed and recorded their own hypothesis. Mark will be given when journal is marked with final rubric (Appendix 5).

Lesson Plan 2

Lesson Title: See For Myself: Chemical and Physical Change

Intended Learning Objectives

By the end of this lesson students will be able to:

1) Describe the conditions and influences involved in a change of state (ACSSU095).
2) Recognise that chemical change is the transformation of one substance into another by observing the reactions within the given experiments (ACSSU095).
3) Work collaboratively to formulate interpretations and ideas of observations made during the experiments.

Students' Prior Knowledge

1) Students should have some understanding that state change involve changes in conditions such as temperature and pressure (Year 5, ACSSU077).
2) Know how to use Excel to create a table.
3) Safety in a science lab.
4) Group positions and their responsibilities – manager, director, and speaker.

Materials (physical items you will use in the lesson)

Set up two stations of each experiment, so that each group can participate at once.

- Experiment Work Sheet for each group (Appendix 2.1).
- Experiment 1: 6 tbsp. bicarbonate soda, 3 cups vinegar, 6 plastic bottles, and 6 balloons.
- Experiment 2: 1 large & 6 small beakers. Kettle. Chocolate pieces.
- Experiment 3: 6 disposable plastic plates, 3 syringes (each with different food colour), and small, labelled container with detergent.
- Experiment 4: 6 small glass jars. 1.5 litres cream (at room temperature).

Lessons Steps

Into (5 min)

Discuss: Last lesson we questioned each other and presented a hypothesis about certain scenarios. Today we will explore these. Our mind map showed water in three states. Our cake batter showed liquid changing into a solid. Explain that these processes involve two different reactions. When water is heated, we get steam (gas). Through the process of baking (heat), the cake liquid became a solid.

Use random class grouping table (Appendix 2.2) to group students into three. There will be two groups of four. Explain that students will need to take on a different position within their group. During the experiments, notes will be drafted onto worksheet (Appendix 2.1). Explain that students will work together to enter data into excel sheet, and later a copy will be printed for each journal. **Review safety rules for the class**. Refresh by asking students to recall class rules. How can we keep each other safe during this lesson?

Main Body (55-60 min)

Students rotate their way to work through experiments (see Appendix 2.2). When all four experiments have been completed, students discuss their observations. Was it a chemical reaction or a physical change? Students work collaboratively to write a formal conclusion for one of the experiments. Conclusion should include: 1) what matter was used, 2) how did it change, 3) describe what happened during the process, and 4) what is the end result (teacher should use document to project these for easy reference on the EWB (Appendix 2.3)). Students who complete the task early, should visit class website to view other chemical/physical reactions Physical vs. Chemical .

Conclusion (5 min)

Clean up. Encourage groups to discuss their discoveries between in other in more detail during break times. Remind students that these and other chemical change experiments videos are available on the Class Website. Students may wish to view these at home, with parents or friends. Explain that each group is to present their conclusion to the class at the start of the next lesson.

Key Questions to Ask as students do their experiments:

1) Is the matter changing state?
2) Is the matter producing bubbles, change in colour, or change in smell?
3) Is the substance changing in shape or form?
4) Have you recorded *all* the observations?

Assessment

1) During the task, check group tables and notes. Are observations recorded thoroughly (systematically, comprehensively, and descriptively)? Have students noted the changes of state and changes of end product in their table? Give formative feedback during the lesson.
2) Observe groups to ensure students are working together. Input from each group member. Anecdotal notes to ensure.
3) Mark tables with journal rubric (Appendix 5)
4) Group presentation will be scored using journal rubric (Appendix 5).

Lesson Plan 3

Lesson Title: SO WHAT'S the DIFFERENCE? **EXPLAIN**

Intended Learning Objectives

By the end of this lesson students will be able to:

1) Use the data collected through the experiments to describe in their own words the difference between a chemical change and a physical change. (ACSSU095).
2) Apply understanding of the difference between physical and chemical changes to recognise that physical changes are reversible, whereas chemical changes are irreversible. (ACSSU095).
3) Represent their findings using various formats such as annotated and labelled diagrams (ACSIS221).

Students' Prior Knowledge

1) Recognise that matter is in three forms: solid, liquid, gas.

Materials

- Electronic Whiteboard
- Quick Quiz (Appendix 3.1)
- Table template for easy recording during presentations (Appendix 3.2)

Lessons Steps

Into (20 min)

Straight into class presentations. Allow for questions or comments after each presentation. As presentations are given, teacher will record major observations in a table (Appendix 3.2) on the EWB.

Main Body (25 min)

Use data in table to expound on the differences between physical and chemical changes. Refer back to experiments and to cake batter (lesson 1). Visit the class website to show students videos on the differences Physical vs. Chemical . Engage class in discussion: what are some of the characteristics of physical change? Emphasises the process of water to ice to water. Cake batter to cake. Introduce reversible and irreversible. Demonstrate quickly by scrunching up a piece of paper. Ask students if this is still a piece of paper. Explain that is has changed shape/form, but is still paper. Ask students to go back over their observations table. Which experiments/mixtures are reversible and which ones are irreversible.

For your science journal, draw diagrams for two of the four experiments. Ensure one is a chemical change and the other is a physical change. Use arrows and carefully label the diagrams. Use colour to make the diagrams attractive and vibrant. Ensure that you annotate the process that changed each of the substances. Summarise each diagram with a paragraph explaining why this is a physical or chemical reaction. (Students may sit in their groups for this activity. However, each student needs to present his or her own two diagrams).

Conclusion (5 min)

Students may need to complete task at home. End lesson by doing super-quick quiz (Appendix 3.1). Side 1 vs. side 2 of the class. Use this to reinforce learning. Try to determine what other learning might need to be covered for students to understand the difference between a chemical change and a physical change. Encourage students to visit the Class Website during free activity time to play the games provided to reinforce learning.

Key Questions to Ask

1) Characteristics of a physical change are?
2) Characteristics of a chemical change are?
3) What process or processes change matter?
4) If something is reversible, it can be…
5) If something is irreversible, it…

Assessment

1) Use rubric (Appendix 5) to mark and provide feedback for presentation. Take anecdotal notes as students give presentations. Check for clear intonation, volume, and eye contact.
2) Students should hand up journals at end of lesson. Teacher to ensure diagrams and summary correctly define a physical/chemical reaction.
3) Ensure labelled and annotated diagrams reflect all stages of chemical or physical change.

Lesson Plan 4

Lesson Title: The Why and What of Chemical and Physical Changes

Intended Learning Objectives

By the end of this lesson students will be able to

1) Demonstrate understanding of the chemical changes that are part of recycling today by creating a poster that illustrates the cycle (ACSSU095).
2) Apply their understanding of chemical change to its use in everyday life by detecting the process in recycling (ACSSU095).
3) Reflect on the value of recycling as part of sustaining, and caring for, the environment by proposing a slogan for their posters.

Students' Prior Knowledge

1) Chemical changes are irreversible. Physical changes are reversible.
2) Recycling is the process of changing waste into useful products
3) Understand the use and application of slogans

Materials

Stack of A4 white cardboard
A glass jar and a recyclable plastic bottle

Lessons Steps

Into (10 min)

Refresh: we have physical changes that are *reversible* and chemical changes, which are *irreversible.*
Everything that we can see or feel is matter. But, it all had to start somewhere. Lets for a moment reflect on the beginning of matter. Look at this bottle, this computer screen, or your book. What is it made of? We need to appreciate that all things started as something else. Very often, things are made by combining different types of matter or by processing matter through heat, pressure, compaction and other processes.

Today we will look at the broader use of chemical changes or reactions. Discuss some of the ways we encounter changes to matter or chemical reactions in our everyday life (scrambled eggs, boiling water, combustion heater etc.). Visit: Class Website - Games to play (with the whole class) the "Matter" game, which demonstrates how processes change matter into new products. Relate this to recycling. Quick chat about the process of recycling. We throw rubbish into recycle bin, truck collects, depot separates and so on. Then, depending on what it is, the material will undergo change (all sorts of changes) and be restructured into new materials.

Main Body (35 min)

This is your opportunity to research the way chemical change is used today. Students are given link to class website recycling page (Class Website - Recycling). They are to choose one of the following: paper, plastic or glass. Two links plus a video per material have been provided. One link is focused on graphic representation of its recycling stages, the other is in written form. Students should work in their teams (same as lesson 2). All research should be taken from class website. During the research process, students should dot points of interest and learning into their journals. When the full cycle of recycling that material is known, students will (as a group) create an A4 poster of the recycling process of their chosen material. Students will work together to devise a slogan that promotes recycling or the benefits thereof. The posters will be scanned and printed into each journal.

Conclusion (5 min)

Students may need to complete the poster at the end of the next lesson. Call class together and emphasis the issues the world would have if there were no way to recycle. Material scientists are people who are constantly working on designing new materials as well as improving the ones we already have and the processes of recycling.

Key Questions to Ask

1) When researching the recycling process, think about the experiments in lesson 2.
2) What caused change in state or product?
3) What processes are involved?

Assessment

1) Make careful observation to ensure all students participate in the research and poster task.
2) Give verbal feedback as students work.
3) Tell students to reflect on the process. Why is it important that we recycle? The slogan should reflect this thinking.
4) Give feedback and bonus score for slogans that reflect the value and benefits of recycling on the environment.
5) Mark the poster using journal rubric. (Appendix 5)

Lesson Plan 5

Lesson Title: Reflection of Learning

Intended Learning Objectives

By the end of this lesson students will be able to:

1) Explain in their own words the difference between physical and chemical changes using vocabulary acquired throughout the unit such as reversible, irreversible, chemical reaction, heating, cooling...
2) Respond to their learning in this unit by completing a personal reflection on topics covered this unit.
3) Formulate a personal interpretation of the benefits of chemical changes and their use today in their reflective writing task. (ACSSU095).

Students' Prior Knowledge (summary in 3 dot points)

1) Chemical reactions are different to physical changes (lesson 1, 2, & 3).
2) Understand that recycling involves chemical changes to materials (lesson 4)
3) Students should have had some experience with reflective writing.

Materials (physical items you will use in the lesson)

Have posters scanned and printed ready for students to add to journals.
Have photos of lesson 2 ready to add to journals.

Have four journal headings prepared on EWB (Appendix 4)

Lessons Steps

Into (5 min)

Refresh the job and responsibilities of Material Scientists. Who can tell me what they do? Engage students by sharing excerpts from the "Chemistry in India" video. Discuss how understanding of chemical sciences can prevent such disasters.

This is the last of our chemical science lessons. The task for this lesson is to reflect on our learning in this unit. This will be done through a 'reflective writing' task which is the final entry to your science journals.

Main Body (40 min)

You will write approximately one page on the issues covered in this unit. Encourage students to look back in the journal. Headings may be used. Encourage students to write a first draft on scrap paper. Students may also choose to use the class computers for this task. The following topics must be covered:

1. The difference between physical and chemical change
2. My predications vs. experiment results
3. Chemical changes are used in everyday life
4. Why I would like to be *or* would not like to be a Material Scientist!
   (project these headings on EWB)(Appendix 4).

Conclusion (5 min)

Students may need to complete task at home. Thank students for being enthusiastic and excited learners. Chemical vs. physical changes are only a small part of the chemical sciences. But, as learned, they make up an important part of everyday life. Journals are due Friday. Students who finish tasks early are welcome to visit videos, games, and links on the Class Website - Games

Key Questions to Ask

1) Intro: What type of projects or investigations do material scientists perform?
2) Are there any parts of this unit that you would like more information on?
3) Does anyone have any questions?
4) What fascinated you the most about chemical reactions?
5) What fascinated you the most about physical changes?

Assessment

1) Reflective writing task will give evidence of student understanding of the topic. Assess reflective writing task using journal rubric (Appendix 5).
2) Do summative assessment of entire journal using the journal rubric (Appendix 5).

Appendix 1

- **1.1 Mind Map Template**
- **1.2 Questionnaire**

Appendix 2

- **2.1 Experiment Instruction Sheet**
- **2.2 Class Grouping Table**
- **2.3 Conclusion Guidelines Doc.**

Appendix 3

- **3.1 Quick Quiz**
- **3.2 Table for class collected data**

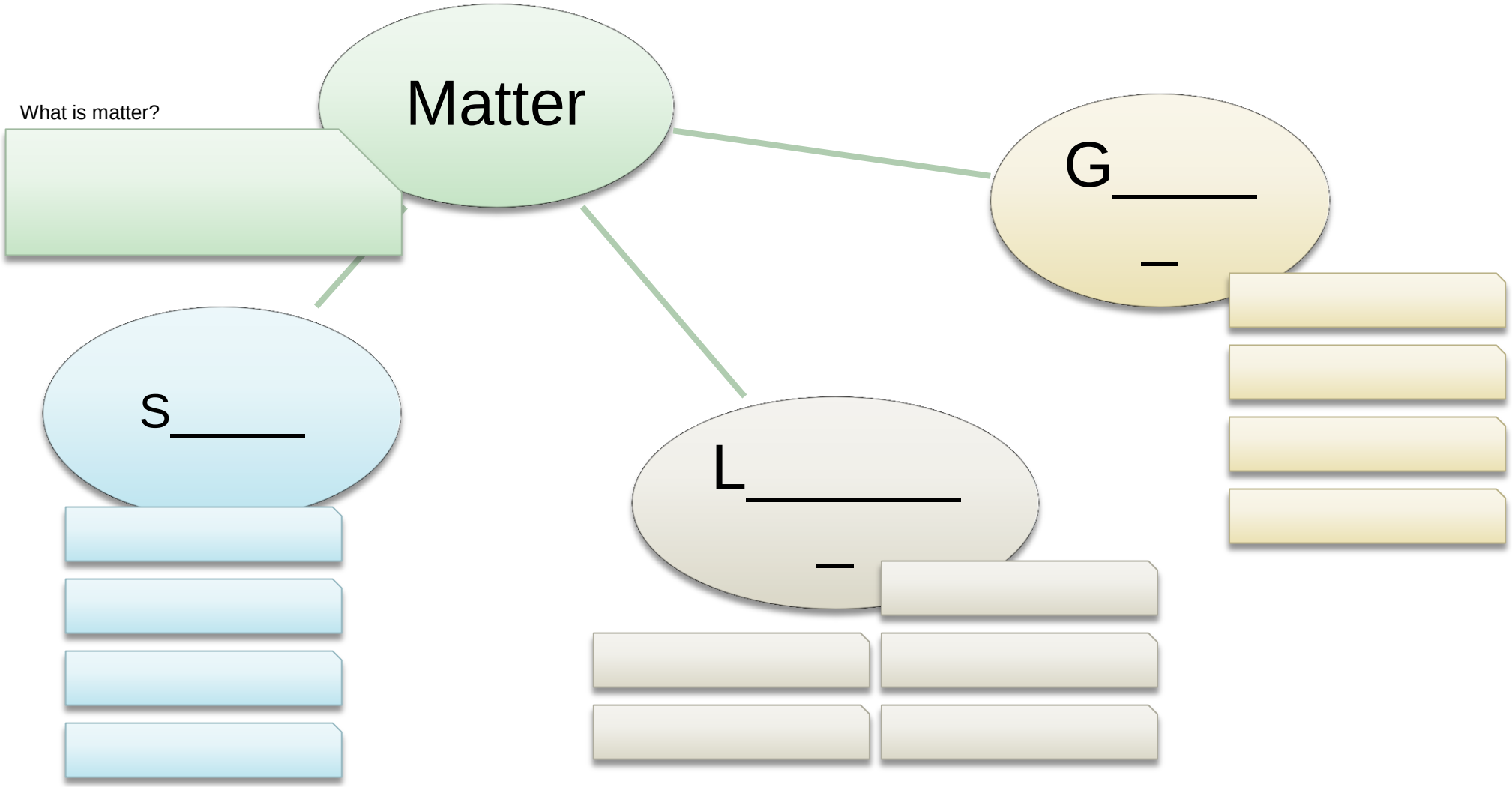
Appendix 4

- **Journal Entry Headings Doc.**

Appendix 5

- **Rubric for marking journal**

Appendix 1
1.1 Mind Map Template



Appendix 1
1.2 Questionnaire

QueStionnaire

What we know and think about physical and chemical changes…

Your Name:_____

Name of Interviewee: _____

Steps:

1. Introduce yourself to your interviewee.
2. Explain what you will be doing (asking for responses to the questions posed).
3. Perform the questionnaire.
   (You will need to be seated so that you can record the answers as you go).
4. Evaluate the answer given. Write your own prediction below.

1 While Dad was cooking breakfast the other day, Mum was baking my favourite chocolate cake. Mum measured out the correct about of baking soda, and placed this in a measuring cup. At the same time, Dad was trying to measure out ¼ cup of vinegar for the eggs he was poaching. He accidentally poured the vinegar into the measuring with Mum's vinegar! What do you think happened?

Response of Interviewee:

_____

_____

My Prediction:

_____

_____

2 **Later in the morning, Mum wanted to ice her cake with chocolate. She grabbed a clean bowl and threw in some chocolate pieces. She placed the bowl over a pot with boiling water, switched off the hotplate, and left the kitchen. What on earth was going on?**

Response of Interviewee:

_____

_____

My Prediction:

_____

_____

3 **I noticed that Mum had left cream on the counter in a little glass jar overnight. I picked up the jar and swished it around. The cream covered the edges of the jar. As I was doing this, Mum walked in. "Don't touch that – I'm going to make butter a bit later". How do you think you could turn cream into butter?**

Response of Interviewee:

_____

_____

My Prediction:

_____

_____

4 **Towards the evening, I was lounging on the sofa. "Hey," called my Dad. "Come and check this out." I wandered over to the kitchen table. Dad had a plate of milk. He had dropped three different food colourings along one edge. As I stood beside him, Dad added a drop of detergent to the opposite edge. Wow! Do you know what happened?**

Response of Interviewee:

_____

_____

My Prediction:

_____

_____

Appendix 2
2.1 Experiment Sheet

Experimenting

Follow instructions carefully. Ensure all team members participate equally. Discuss what you see and record in table below.

Work Station 1

Instructions:

- Use the funnel provided to put 1 tablespoon of bicarbonate soda into the balloon.
- Take an empty plastic bottle and use the funnel to put half a cup of vinegar into the bottle (use the measuring cup provided).
- Carefully stretch the balloon opening over the bottle. Don't let the bicarbonate soda spill into the vinegar until the balloon is firmly stretched over the bottle's neck.
- Wait until all group members are watching, then lift the balloon to let the soda fall into the bottle.
- When you have completed the experiment, rinse the funnel and measuring cup in preparation for the next group.

	Observations	**Describe**
What was done? (heat applied, stirred, etc.)		
Did it change?		
How did it change?		
Compare the end product to the starting material.		

Appendix 2.1 continued…

Work Station 2

Instructions:

- Break off 4 pieces of chocolate and place into the smaller beaker.
- Boil the kettle. Be careful with the hot water and steam.
- Half fill the larger beaker with hot water.
- Place the smaller beaker into the larger one.
- Watch and wait.
- After 4 minutes, remove the smaller beaker and carefully drain the water from the larger beaker in preparation for the next groups experiment.

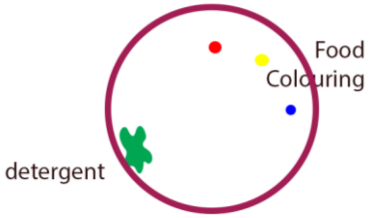
	Observations	**Describe**
What was done? (heat applied, stirred, etc.)		
Did it change?		
How did it change?		
Compare the end product to the starting material.		

Appendix 2.1 continued…

Work Station 3

Instructions:

- Take a plastic plate and gently pour milk into it (approximately 1 cm deep).
- Using the syringes provided, drop food 3ml of each food colouring into the milk. Drop these to one side of the plate (see diagram below). Use the measurements on each syringe to accurately drop 3ml.
- On the opposite side of the plate, drop a tiny bit of detergent into the milk.
- Watch and record what happens.
- Carefully place your plate aside and tidy the workbench before you leave for the next station.



	Observations	Describe
What was done? (heat applied, stirred, etc.)		
Did it change?		
How did it change?		
Compare the end product to the starting material.		

- Appendix 2.1 continued…

Work Station 4

Instructions:

- Half fill a glass jar with the cream provided.
- Add 1/8 teaspoon of salt.
- Tighten the lid as firmly as you can.
- Within your group, take turns shaking the jar. You will need to shake in one direction (ie. Up and down) for three full minutes.
- Set the timer, and shake for one minute each.
- Open the jar. You will find butter has formed.
- Ensure the workbench is tidy before you leave for the next station.

	Observations	**Describe**
What was done? (heat applied, stirred, etc.)		
Did it change?		
How did it change?		
Compare the end product to the starting material.		

- Experiment 4: Jar 1/3 filled with cream.

Appendix 2
2.2 Class Grouping Table

Class Grouping Chart

Janice	Kylie	Ben	Suzie
Fred	Shanna	Peter	Alex
Lydia	Lachlan	Emily	Samantha
Talitha	Michael	Calvin	Joel
Helen	Jessica	Annette	Sam

There will be two groups of four for this task.

Appendix 2

2.3 Conclusion Guidelines to display on EWB

Your Conclusion should cover:

1) What matter was used?
2) How did it change?
3) Describe what happened during the process
4) What is the end result?
5) What does the end product look like?

Appendix 3

3.1 Quick Quiz

QuiCk QuiZ

Q1 Melting is a good example of _____ change?

Q2 Irreversible means that:
- a) A material is difficult to handle
- b) The material cannot be returned to its original state
- c) A new state has occurred

Q3 True of False? A substance can change colour when a chemical change has occurred.

Q4 What happens when a solid is heated to its boiling point?

Q5 Which of the following is an example of chemical change:
- a) The sawdust in a workshop
- b) The rust on a nail
- c) A melted ice block?

Q6 Last night you put your drink bottle in the freezer. This morning during recess, you grabbed your drink bottle only to find it dripping wet! Is this a good example of a physical change or a chemical reaction?

Q7 The steam of boiling water is a good example of _____ change?

Q8 The process of melting butter involves:
- a) A chemical reaction
- b) Heat
- c) A scientific process?

Q9 Mum had left over melted chocolate from the chocolate icing she had made. She placed the bowl in the fridge. When the chocolate had set she returned it to the melting chocolate container. Is this a good example of reversible or irreversible change?

Q10 True or False? Scrunching up a piece of paper is an example of physical change.

Questions adapted from http://www.sciencekids.com and http://www.bbc.co.uk/bitesize/ks2/science

Appendix 3

3.2 Table for Class Collected Data

(To be used during group presentations to summarise observations).

	What did you do? (Heat, mix, stir…)	**What happened?** What changes did you see?	**Physical Change?** (yes, no, or don't know)	**Chemical Change?** (yes, no, or don't know)
Experiment 1 **Bicarbonate and vinegar**				
Experiment 2 **Chocolate**				
Experiment 3 **Milk dish with food colouring**				
Experiment 4 **Cream in a jar**				

Appendix 4
Lesson 5 - Journal Entry Headings

Display on EWB to assist and guide reflective writing

1. The difference between physical and chemical change

- Describe what you learned in this unit
- Use terminology that describes the characteristics of a chemical/physical change (such as reversible)

2. My predications vs. experiment results

- Reflect on what you thought would happen
- How accurate were you?
- What did you learn?

3. Chemical changes are used in everyday life

- Briefly mention material scientists
- Expound on how chemical changes are used in the recycling process that you researched

4. Why I would like to be *or* would not like to be a Material Scientist!

- Was there something in this unit that really fascinated you?
- Have you been inspired to research a certain material or process?

Appendix 5
Rubric for Science Journal

Year 6, Term 2, 2013
Unit: Chemical Sciences

Physical vs. Chemical Changes
MARKING RUBRIC

Name _____

	Inadequate (0-3)	Satisfactory (4-6)	Good (7-8)	Excellent (9-10)
Lesson 1				
Questionnaire **Score ____/10**	Student was bored and unenthusiastic when conducting the questionnaire. Not all responses were recorded.	Student conducted the questionnaire. The responses are recorded.	Student showed enthusiasm when conducting the questionnaire. Student spoke clearly. Responses are well recorded.	Student was enthusiastic when conducting the questionnaire. Used a clear, loud voice. Used eye contact throughout. Responses are well recorded with lots of detail.
Hypothesis **Score ____/10**	No or very little thought was given to make a hypothesis.	Hypothesis present for all four experiments. Thought processes and reasoning is present.	Hypothesis present for all four experiments. Thought processes and reasoning is present in detail.	A very detailed hypothesis was given for all four experiments. Thought processes and reasoning is given in depth and detail.
Lesson 2				
Tables (notes recorded during the experiments) *Group mark. The mark will be allocated to each member.* **Score ____/10**	No or very few notes were taken during the experiments. The table is incomplete.	Notes were taken. The details were limited. Few changes during the processes were recorded.	Notes taken were clear and accurate. Most of the processes were recorded.	Notes taken during the lesson are clear, accurate, and descriptive. All processes are noted; change in material, temperature or pressure applied, reactions and observations.
Group presentation **Score ____/10**	Presentation was unorganised. Team members did not assist the speaker.	The presentation was given. Group members supported the speaker. The data presented was correct.	The presentation was given with enthusiasm. Group members supported the speaker. The data presented was accurate and detailed.	Speaker was clear and easy to understand. Maintained good eye contact. Other team members were supportive and had input in the presentation. The data presented was detailed, accurate, and well described.
Lesson 3				
Representations of chemical and physical changes **Score ____/10**	The summary of learning was incomplete or not completed.	The summary of learning was complete. Diagrams were used. Diagrams were accurate in content. Processes were labelled.	The summary of learning was well presented. Diagrams, annotations, and illustrations were used. Content was accurate.	The summary of learning presented multiple types of illustrations: flow charts, diagrams, and other illustrations. All illustrations were carefully annotated. Presentation was superb: used various colours and layout. The content was accurate and descriptive.

Lesson 4				
Poster **Score ____/10**	Poster is incomplete or not completed.	Poster is complete. The information and processes of recycling are illustrated.	Poster is well presented. The information and processes of recycling are all present and clearly annotated.	Poster looks fantastic. Illustrations are vibrant. Information on the recycling process is comprehensive in content and. Every stage of the process used to recycle this material is carefully outlined.
Collaborative learning skills **Score ____/10**	Group didn't work together. Some students did not participate.	Students worked together. Students listened to each other and discussed the process within the group.	The group worked together well. Students listened to each other and lots of discussion was evident. All students had an input.	The group consistently worked together. Every member showed enthusiasm and had input.
Slogan **Score ____/10**	No slogan present.	Slogan is present and reflects the value in recycling.	Slogan has had careful thought. Reflects the value of recycling very well.	Brilliant slogan! Short, concise, and makes a good point.
Lesson 5				
Reflective writing **Score ____/10**	Reflective writing task is incomplete or not completed. Writing has no relation to the headings given.	Reflective writing task is complete. All four of the given headings have been addressed. Writing demonstrates sound: • Understanding of the difference between physical and chemical changes • A reflection on the accurateness of the hypothesis presented in lesson 1 • How changes to material are used in everyday life • Understanding of the work of a material scientist.	Reflective writing task is carefully written and descriptive. All four of the given headings have been addressed. Writing demonstrates good: • Understanding of the difference between physical and chemical changes • A reflection on the accurateness of the hypothesis presented in lesson 1 • How changes to material are used in everyday life • Understanding of the work of a material scientist.	Reflective writing task has been thoughtfully completed. All four of the given headings have been addressed in detail and in depth. Writing demonstrates excellent: • Understanding of the difference between physical and chemical changes • A reflection on the accurateness of the hypothesis presented in lesson 1 • How changes to material are used in everyday life • Understanding of the work of a material scientist.
Journal Overall				
Writing and Presentation **Score ____/10**	Journal is incomplete. Journal contains spelling errors. Little or no effort has been made in presentation.	Journal is complete. Journal has been completed with care. There are few spelling errors. Some care and effort is evident in the presentation of the journal.	Journal has been submitted with all aspects covered. The written tasks contain minimal or no spelling errors. Work is neat and tidy. The overall presentation of the journal is very good.	Journal has been submitted with all aspect covered. The written tasks have no spelling errors. Care in presentation is evident. The journal is neat and contains evidence of care and precision. Presentation is fantastic.

Comments:

Overall Mark ____/100