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|  | **Campbell House School Teaching and Learning Program** | | | | | | | | | | | | | | | | |
| **Title/Type of Unit: Chemical sciences**  **Duration: 10 weeks** | | | | | | | | | | | | | | | | |
| **Syllabus Outcomes**  **Stage 5** | *A student:*  **SC5-1VA** appreciates the importance of science in their lives and the role of scientific inquiry in increasing understanding of the world around them  **SC5-2VA** shows a willingness to engage in finding solutions to science-related personal, social and global issues, including shaping sustainable futures  **SC5-4WS** develops questions or hypotheses to be investigated scientifically  **SC5-5WS** produces a plan to investigate identified questions, hypotheses or problems, individually and collaboratively  **SC5-6WS** undertakes first-hand investigations to collect valid and reliable data and information, individually and collaboratively  **SC5-7WS** processes, analyses and evaluates data from first-hand investigations and secondary sources to develop evidence-based arguments and conclusions  **SC5-8WS** applies scientific understanding and critical thinking skills to suggest possible solutions to identified problems  **SC5-9WS** presents science ideas and evidence for a particular purpose and to a specific audience, using appropriate scientific language, conventions and representations  **SC5-17CW** discusses the importance of chemical reactions in the production of a range of substances, and the influence of society on the development of new materials | | | | | | | | | | | | | | | | |
| **Connectedness**  **Why does this learning matter?** | **Students learn to:**   * Explain chemical processes and in terms of atoms and energy transfers. * Explain natural radioactivity as atoms and energy transfers. * Describe examples of important chemical reactions. * Describe models of energy transfer * Apply understanding of energy transfers these to explain the phenomena of a lightning strike. * Analyse how the periodic table organises elements and use it to make predictions about the properties of elements. * Explain how chemical reactions are used to produce particular products and how different factors influence the rate of reactions. | | | | | | | | **Students learn about:**   * the structure of atoms in terms of the nucleus, protons, neutrons and electrons Chemical reactions * The mass and charge of protons, neutrons and electrons * alpha and beta particles and gamma radiation are released from unstable atoms * Introduced to the notion of the atom as a system of protons, electrons and neutrons, and how this system can change through nuclear decay. * matter can be rearranged through chemical change and that these changes play an important role in many systems. * the role of energy in chemical reactions * chemical reactions in terms of rearrangement of atoms | | | | | | | | |
| **Background and Key Ideas** | The unit focuses on changes in matter at a particle level, and distinguish between chemical and physical change. Students begin to classify different forms of energy, and describe the role of energy in causing change in systems, including the role of heat and kinetic energy in the rock cycle. Students use experimentation to isolate relationships between components in systems and explain these relationships through increasingly complex representations. They make predictions and propose explanations. Chemical sciences introduces the notion of the atom as a system of protons, electrons and neutrons, and how this system can change through nuclear decay. Students learn that matter can be rearranged through chemical change and that these changes play an important role in many systems. The unit focuses on how atomic structure and properties of elements are used to organise them in the periodic table. Students investigate how chemical reactions involve rearranging atoms to form new substances in which mass is not created or destroyed. | | | | | | | | | | | | | | | | |
| **Literacy Continuum** | Reading Texts | Comprehension | | | Vocabulary Knowledge | | Aspects of Writing | | | Aspects of Speaking | | | Phonics | Phonemic Awareness | | | Concepts About Print |
| **Student:** …  **Literacy Aspect:** Vocabulary Knowledge  **Element:** cluster 7 and cluster 10  **Teaching activities linked to program to increase learning:**  Knows the meaning of commonly used words in increasingly challenging texts and can demonstrate this knowledge when reading, writing and speaking. Students are creating hypothesis and explaining using written word what outcomes will occur in their experiment. Students are using simple sequencing words in new chemical science contexts.  Demonstrates understanding that words can have different meanings in different contexts. Demonstrates expanded content vocabulary by drawing on a combination of known and new topic knowledge. Students will extend their understanding of  words such as atom, nuclear, nucleus, proton, electron, charges. | | | | | | | | | | | | | | | | |
| **Numeracy Continuum** | Counting Sequences | | Counting as Problem Solving | | | Pattern and Number Structure | | Place Value | | | | Multiplication and Division | | | Fraction Units | | Length, Area and Volume |
| **Student:** …  **Numeracy Aspect:** Aspect 1 - Counting sequence: sequencing experimental steps and visual outcomes of the experiment.  Aspect 2 - Counting as a problem solving process  **Element:** Aspect 1 Number identification– MA2 – 4NA identifies numerals in the range 1 – 10 000.  Aspect 2 Factile counting - MA1 -5NA uses known facts, number structure and other non-count by –one strategies to solve problems.  **Teaching activities linked to program to increase learning:**   * Students are required to use sequencing when conducting an experiment, read measurements and ingredient lists, measure chemicals as well as time reactions and experimental processes. * Students practice adding measurements of ingredients and ratios of ingredients. | | | | | | | | | | | | | | | | |
| **Quality Teaching** | | | | | | | | | | | | | | | | | |
| **Intellectual Quality** | | | | **Quality Learning Environment** | | | | | | | **Significance** | | | | | | |
| * IQ1 Deep Knowledge * IQ2 Deep Understanding * IQ3 Problematic Knowledge * IQ4 Higher-order Thinking * IQ5 Metalanguage * IQ6 Substantive Communication | | | | * QLE1 Explicit Quality Criteria * QE2 Engagement * QE3 High Expectations * QE4 Social Support * QE5 Students’ Self-regulation * QE6 Student Direction | | | | | | | * S1 Background Knowledge * S2 Cultural Knowledge * S3 Knowledge Integration * S4 Inclusively * S5 Connectedness * S6 Narrative | | | | | | |
| **Teaching and Learning Lesson Overview** | | | | | | | | | | | | | | | | | |
| **The Elements of Learning & Achievement**    F:\Mock ups\Square elements\Numeracy.jpg      E:\Final V1\Final sq NO border\Sq Technology no bdr.jpg | **Safety in the Science room.**  ***Week 1:***  ***Weekly outcome:***  How to respond and behave in the science lab. Possible hazards and dangers with chemicals.  **Lesson 1:**  Safety procedures whilst using chemicals and conducting experiments  Student activity: Spot the hazard (on a drawn picture on the board) Using the spotting of hazards make a class record of rules and expectations for themselves and others whilst conducting experiments.  **Lessons 2 and 3:**  Cause and effect lesson. Learn about cause and effect and how actions have reactions. Match the cause and effect in equivalent columns as a pair. Students show how they are connected. Through discussions on cause and effect discuss cause and effect in experiments and chemical handling.  Step two: pic the inappropriate behaviours in the science room. Teacher reads out the scenario set as sponge-bob. Students identify the 20 safety hazards that were missed in the scene. Students hear teacher responses to scenarios that could occur in our classroom. Clear outlines of expectations and expected responses.  **States of matter**  ***Week 2***  ***Weekly outcome:***  Investigating the everyday; chemicals, materials and products within the household and world around you as an introduction to states of matter and the concept that all objects and items can be classed into a particle theory. Establishing a definition and the inherent differences between physical and chemical changes.  ***Key focus:***  Guided questioning and activities to build students awareness of products and their states of matter. Students learning activities guide them to generate the two big questions for the week:  1. Why do materials and products act differently? (Theorising around particles and their states of matter) and  2. How many different states of matter are in the world?  **Lesson 1**: Experimental Investigation into physical changes of objects – force.  ***Intro*** - Class discussion  Experiment task: Everyday materials can be physically changed in a variety of ways   * predicting and comparing how the shapes of objects made from different materials can be physically changed through actions such as bending, stretching and twisting * exploring how materials such as water, clay or play dough change when pushed, pulled and applied with force.   What does the word physical mean? What other words mean the same thing?  ***Body*** - Student investigation   * Students are given properties of objects table. * Students move in rotation between the set up tables with different substances. Students take their worksheet and pen and “play” with the objects at each station. * Once at the table students use the scrap paper to predict how they think the object will react when they pressure is applied. They then fold their paper and place it in the envelope on the desk. * Students then proceed to manipulate the objects at the table to fill the requirements of the worksheet (students leave blue column to link back from another lesson).   ***Conclusion*** - Class discussion   * What materials were some of these items made from? * Suggest why different parts of everyday objects such as toys and clothes are made from different materials * What would happen If we mixed the slime together with the clay? (Lets do it) * What other materials do you know of that we mix together? * Why do we do it? (example of paper that can be changed and remade or recycled into new products or poly-cotton as a mixture of man made and cotton so that it is strong, durable and wont wrinkle and is easily washed.   **Lesson 2**: Experimental Investigation into physical changes of objects – temperature. (ruler, tape, string, 3 balloons, scale, whiteboard eraser, water, cup measure needed for direct teaching)  ***Intro*** - Direct teaching and notebook game.  Experiment task: Investigating how liquids and solids respond to changes in temperature, for example water changing to ice, or melting chocolate   * predicting and comparing how the effect on products made from different materials and their physical change when experiencing changes in temperature. * exploring how materials such as water and chocolate can change when warmed or cooled   DT - Explain that different products and items have different physical properties. That is that they act different physically. Slime or goo in the experiment in the last lesson are malleable and move where as a brick has no potential to move or change in shape without breaking. The physical properties are called matter. Matter is anything that has mass and takes up space. If you are new to the idea of mass, it is the amount of stuff in an object. We know something is matter because it takes up space and weighs something. Not only is everything made up of matter, but matter also exists in 4 different states. There are four states of matter - solids, liquids, gases and plasma.  (https://www.youtube.com/watch?v=ELchwUIlWa8 - if needed to help explain matter.)  We will only focus on 3, solid, liquid and gases.  Using the 3 examples of matter show how they are matter because they take up space and have weight:  Solid - Whiteboard eraser measured and weighed  Liquid - Water measured in a cup and weighed  Gas – balloon measured by the circumference or the fact that it can fit into a box when not blown up but does take up space because it can no longer fit when I blow it up. Weighed by attaching an unblown balloon onto one end of a suspended ruler, and attaching a blown up balloon on the other end. What will happen?  ***Body*** – Direct teaching, notebook and experiment.  Notebook game – students are selected to move each item into the corresponding table depending on their physical properties.  At the end of the directed learning activities a time trial game is provided for students.  DT – some objects or substances have changes in their state of matter. At the moment the balloon In my hand is taking up all of this space, I can push it and change its shape. The air that Is inside is controlled and a contained. But if I pop the balloon the air escapes and the matter of the balloon is now very small (only what is left of the balloon case because it no longer holds air. Objects and items can move in-between these states of matter.  Do you know of any examples of this?  Experiment – 3 parts, liquid to gases. Liquid to solid and gases to liquid.  Part 1 – solid to liquid. Put water on stove, chocolate in bowl. Thermometer, what temperature does the chocolate melt?  *Or* Students how to turn milk into stone. https://www.youtube.com/watch?v=VFvik\_THcNQ  Part 2 – liquid to gas. Warm water and antacids in a plastic bag to form carbon dioxide. Gas takes up space because you can see that the bag is becoming bigger.  Part 3 – gas to liquid. Fill the jar with your ice cubes. There should be enough ice cubes so that they reach the top, but leave enough room so you can securely tighten the cap. Add to heaping tablespoons of salt into the jar, covering the ice. Screw on the lid of the jar tightly. Shake the jar vigorously for about 30 seconds.  Place the jar on a solid surface, such as a table. Leave the jar for a short while (about 10 minutes). When you return to your jar, observe if your jar has water droplets on the outside. Discuss how the salt lowers the freezing temperature of the ice.  ***Conclusion-*** direct teaching and experiment part 4  DT – if we left these products in their new state of matter would they stay this way? Concept explained Changes to materials can be reversible or irreversible  Experiment part 4 - describe what happens when materials are mixed. Using the chocolate that has been melted. Teacher adds cream to one quarter of the mixture. The chocolate in both forms is then emptied into chocolate moulds. They are both placed into the fridge. Students observe what happens to the chocolate.  **Lesson 3:** Practical uses of changes in states of matter. Concept of sustainability. Exploring how changes from solid to liquid and liquid to solid can help us recycle materials  ***Intro*** - Notebook game show quiz.  Predict the effect of heat on different materials by placing them in the appropriate column on the interactive whiteboard.  Dt - substances exist in different states depending on the temperature   * gases have mass and take up space, demonstrated by using balloons or bubbles * solids, liquids and gases change under different situations such as heating and cooling * not all substances can be easily classified on the basis of their observable properties reversible changes can be used to recycle materials * reversible reactions include melting, freezing and evaporating * there is a difference between pure substances and mixtures and identifying examples of each   ***Body*** - Direct teaching:  changes of state can be reversible or irreversible as explored in the previous lesson. Looking at the products just explored in the quiz lets look at the ways that’s products are changed. We looked at temperature last lesson, pressure the first lesson. Are there anymore? Cooling, rusting, burning, cooking. Some of these can change others we can not. The reason this is important is because it helps us keep these products in use or sustainable. Explain sustainability. Talk about how sustainability impacts how much we can re-use a product and how much we pollute the earth. Breaking down or building up products enables the proper control and destruction of items and products to preserve for the future.  Watch <https://www.youtube.com/watch?v=_5r4loXPyx8>  Outcome and discussion during experiment - Natural and [processed materials](http://www.australiancurriculum.edu.au/glossary/popup?a=S&t=processed+materials) have a range of physical properties that can influence their use   * describing a range of common materials, such as metals or plastics, and their uses * investigating a particular property across a range of materials * selecting materials for uses based on their properties * considering how the properties of materials affect the management of waste or can lead to pollution   Brainstorm ways we reuse and recycle for sustainability?  Experiment part 1- look at reusing paper or recycling. Using the link provided to set up and conduct the experiment. <https://www.acs.org/content/dam/acsorg/education/outreach/2007-cced-spring-edition-recycling-chemistry-can.pdf> What is actually happening? Explain that the solid is being turned into a liquid before being turned back into a solid.  Experiment part 2 - on recycling and classing the physical properties that influence the recycling of the product. <https://www.acs.org/content/dam/acsorg/education/outreach/2007-cced-spring-edition-recycling-chemistry-can.pdf>  ***Conclusion:*** discussion  What other ways are things changed before recycling.  What is wrong with just burning everything?  **Particle theory**  ***Week 3***  ***Weekly outcome:***  Students explore the concept that every object is made up of particles. This week focuses on the changes in matter at a particle level, and distinguishes between chemical and physical change. Students [compare](http://www.australiancurriculum.edu.au/glossary/popup?a=F10AS&t=Compare) physical and chemical changes and use the particle model to [explain](http://www.australiancurriculum.edu.au/glossary/popup?a=F10AS&t=Explain) and [predict](http://www.australiancurriculum.edu.au/glossary/popup?a=F10AS&t=Predict) the properties and behaviours of substances.  ***Key focus:***  Guided questioning, activities and experiments to build students awareness of states of matter within the particle theory model. Students become aware of the particle model and how this is used as a tool to describe objects physical components and their relationship to the objects chemical makeup.  By the end of the week students should be able to:   * identify using describing words the physical touch of the object, identify which state of matter the object fits into and then make a justification as to how the particles would be positioned within the object. * Name and explain two separation techniques.   **Lesson 4:** Introduction to the particle model. A model for the structure of matter is needed to explain why some objects are solids, gases or liquids. It explains why you are built the way you are while the desk is sturdy or your car at home doesn’t squish like a marshmallow in a car accident.  ***Intro –*** direct teaching  Dt- The particle model states that all matter is made up of particles, which are in constant motion.  These particles are also attracted towards one another.  1. All matter is made up of particles.  2. The particles are in constant motion  3. The particles are attracted towards on another.  ***Body –*** Direct teaching and student activity  Use the following to explain particle model (ipad lesson)  http://www.bbc.co.uk/bitesize/ks3/science/chemical\_material\_behaviour/particle\_model/activity/  Student learning activity: Students make an oscillating woodpecker on a rubber band. http://madebyjoel.com/2013/06/oscillating-bird-science-toy-for-kids.html  Teacher points out to students the concept of potential energy. The activity shows students the nature of rubber bands and the particle matter of an elastic band.  Dt – show students how the rubber band stretches. Discuss the resting state of the elastic band and the physical properties of the elastic band. What happens to the elastic band when it is stretched? How do the physical properties change? Is it harder or softer?  In a solid the particles are close together and in a fixed state. When the elastic band is lying on the table the particles are closer together, vibrating but not moving apart. When energy is supplied to the elastic band then the particles vibrate more violently and become free to move. When you see the moving in and out of the woodpecker pretend think of all the particles inside the elastic band violently vibrating together.  If you compare the elastic band to the plastic straw which one bends and moulds more easily? Compare the pair on the board drawing in how the particles are imagined inside. Are they more spread apart or closer together?  Dt - **Temperature** is a measure of the average energy of the particles. The faster the particles are moving the higher the temperature. The slower the particles are moving the lower the temperature.  Solids and liquids are very difficult to compress as the particles are close together. Gases however, can be easily compressed as their is plenty of space between the particles. This is why you can place compress the air in a bicycle pump even if your finger blocks the escaping air.  With cooler temperatures the particles slow down. This causes gas particles to condense. As the gas particles move past one another at a slower rate the attractive orces between them have a chance to act. Remember point three of the particle theory, "All particles are attracted towards one another”  **Conclusion-** Discussion and student activity  Discuss how the particles move and stand together in each three states of matter. Re-cap on the concept of vibrating particles in an object and how temperature affects this.  Student activity: Draw the particles proximity on the six objects on the worksheet by estimating.  **Lesson 5:** Consolidate the particle theory in models.  ***Intro*** - Student activity  Students are given: cardboard poster, headings (liquid, solid and gas), definitions of the states of matter, examples of each state of matter and a bowl of fruit loops. Students are to put their headings into three columns on their poster board. Students then match up the definition and then stuck the representative picture under the heading and definition.  Students are then to arrange the fruit loops using PVA glue onto the poster board to show how close the particles would be in the states of matter.  **Body -** Discussion and demonstration  Check students understanding and demonstration of understanding in the previous activity by going through the interactive web quest.  <http://chimianet.zefat.ac.il/download/3_states_matter.swf>  three activities to consolidate the three key aspects of particle theory.  Activity 1: particles of matter are constantly in motion. Use food colour in a beaker to show how particles in the water are moving which allows particles of food colouring to move in and around the water particles.  Activity 2: particles of matter attract each other. Talk through the molecular arrangement of particles in different phases of matter in water by going through their poster as if the solid, liquid and gas state were water. This shows level of attraction between articles changes for each phase of matter.  Activity 3: Particles of matter have space between them. Fill a beaker with 50 ml of sand and another with 50ml of water. Pour the water into the sand. Ask students why the resulting volume does not equal 100ml? point out the air bubbles that rise to the surface. Next demonstration use 50ml of water and 40ml Isopropyl antiseptic liquid. Ask students to hypothesis what will happen before you combine them. Ask students why the result is 88ml not 90ml. Discuss how the particles of water and isopropyl fit in between each other.  Activity 4: As temperature increases, particles of matter move faster. Discuss the reason there is space between the particles. As the temperature of the molecules increases, the particles gain kinetic energy. Particles that move faster bang into each other and create more space between them.  Conclusion: Student activity  Students write the four rules of particle theory and attach them to the poster board. Students play particle game. They must make three different particle examples using play dough balls and toothpicks. Students make a representation of a solid, liquid and gas. Students hold up the relevant particles when the teacher says a substance (e.g ice cube = solid = close together play dough balls.)  **Lesson 6:** Partial theory and the concept that particles are attracted to each other. Students find how they are attracted to each other and then separate particles.  Mixtures, including solutions, contain a combination of pure substances that can be separated using a range of techniques  ***Intro***: play the following game on the interactive whiteboard to link students memories from previous lessons. <http://www.bbc.co.uk/bitesize/ks2/science/materials/changing_states/play/>  Additional games:  http://www.bbc.co.uk/bitesize/ks2/science/materials/changes\_materials/play/  <http://www.bbc.co.uk/bitesize/ks2/science/materials/solids_liquids_gases/play/>  ***Body:*** Direct teaching and guided questing  Explain how molecule make up changes the dissolving nature of substances into one another.  Using red kidney beans and salt to represent beans as water molecules and salt to represent salt. 50ml of red kidney beans are mixed with 50 ml of red kidney beans. Representing water being mixed with water. Students are drawing a hypothesis during explanation. They start with two drawn beakers and draw in the amount of kidney beans in each. They then put a line down the page and heading of “after” they then draw what they think will happen.  Teacher demonstrates the same thing using red kidney beans and white beans. Students hypothesis again and draw their findings. Discussion about what has happened differently and why here isn’t 100ml total at the end. Teacher demonstrates the same thing using red kidney beans and white beans. This demonstrates that some molecules are bigger then others and that particles fit in-between each other, that’s why water and salt mix but do not increase in volume.  Teacher demonstrates this and measures the end result of the water and sees how the matter weighs more but stays the same in measurement because the molecules fit together.  *Experiment: Experiment in three parts* –  Filtration: Students conduct the following experiment as a pair: mixture of chalk and water is poured through a filter paper in a funnel, chalk particles remains as residue in the filter paper, while the water gets collected in the beaker below as filtrate.     * identifying the solvent and solute in solutions    investigating and using a range of physical separation techniques such as filtration, decantation, evaporation, crystallisation, chromatography and distillation   exploring and comparing separation methods used in the home  Teacher conducts the following experiment with the assistance of students. Crystallisation: <http://www.hometrainingtools.com/a/weather-experiments-project>  Evaporation: Teacher conducts the following experiment for students.  <https://www.youtube.com/watch?v=LrkGR1edXp4>  Throughout the process of experiment discuss with students the meaning of each technique, examples of these techniques in the environment or in everyday life. Students practice making hypothesis statements before the experiment is carried out.  **Conclusion:** Teacher and students create mind map of different separation methods, examples of each separation method and an outline of how the separation technique is used.  Revisit the three key points within the particle model.  **Atomic Structure**  ***Week 4***  ***Weekly outcome:*** By the end of the week students will be able to use the correct scientific terminology of the following words in correct references; atoms, protons, electrons, neutrons, Atomic mass, the nucleus, atomic forces, periodic table and elements. Students will be able to identify the charges of protons, neutrons and electrons and point out their position within a diagram. Students will be able to decipher the atomic number of an atom from a diagram and then find its correlating element name and symbol through correctly reading and managing the periodic table.  ***Key focus:*** Build learning activities to give students the vocabulary to and problem solving skills to work scientifically in concepts around states of matter and the particle theory. Recognise that elements in the same group of the periodic table have similar properties. Describe the structure of atoms in terms of electron shells. Explain how the electronic structure of an atom determines its position in the periodic table and its properties  **Lesson 7:** Gack experiment.  **Intro:** Students consolidate their understanding of the particle theory with a complex structure that changes its state of matter easily.  Students are introduced to the concept of gack a substance that moves freely similar to a liquid in some environments but shows properties of stiff stone like properties in different environments. Students are presented with worksheet and are to engage in whole class teacher lead discussion about a hypothesis. Teacher runs though key elements of an hypothesize:   * description of the phenomenon to be explained * What do you expect will happen? * Why do you expect it will happen?   Students hypothesize why they believe the Gack behaves in this manner. Students draw on their knowledge from the past two weeks including the notion of potential energy. Students hypothesize how and why the particles would look like within the gack at both stages and describe why force, temperature and energy affect the particles.  **Body*:*** students use the gack recipe to create a gack to the colour of their own choosing. Teacher and students set up sound system outside.  Using a metal tray studnets hold the gack against the metal speaker and play music to watch the reaction and changing state of matter that occurs with the gack.  Students experiment with different sounds and songs to see which provides the most energy or changes the potential energy into active energy.  **Conclusion:** Students and teacher throw out the gack and clean up. Students complete their worksheet, making note of their hypothesis and the outcome of the experiment. Teacher and students create a visual diagram as to what occurred and what the particles looked like at each stage and what the music tempo and bass was doing at each stage,  **Lesson 8:** Introduction to atoms as the name for particles within a state of matter. **Key concept: Atoms** are the foundation of chemistry. They are the basis for everything in the Universe. Matter is composed of atoms. Solids are made of densely packed atoms while gases have atoms that are spread out. We're going to cover basics like atomic structure and [bonding](http://www.chem4kids.com/files/atom_bonds.html) between atoms.  Intro: Direct teaching  Atoms are the smallest distinct unit of matter. Atoms are the small particles that we have been looing at for the past week. Atom is the scientific name for the particles we looked at. They are microscopic and you cannot see them with the naked eye. You need to remember that there are three basic parts to an atom. 1. Electrons 2. Neutrons 3. Protons. Electrons are the smallest piece that makes up the atom.  Today we will make an atom structure.  Body:  Watch the following: <https://www.youtube.com/watch?v=_lNF3_30lUE>  Students and teacher create a mind map of important words and phrases from the video. This should include, microscopic, neutrons, electrons, protons, atom, and basic particle for everything in the universe.  Students begin to create an atom themselves. Students are to use wire and pompoms to create a three dimensional representation of an atom. They are to draw a key to describe which coloured pompom represents which particle within the atom. (e.g. the green pompom is the proton). Students must also provide the charge for each particle. Students should be aware that the wire represents the **electron path.**  Conclusion: Students present their atoms to the teacher and SLSO. They must point and say the particle represented in their model to the teacher.  **Lesson 9:**Introduction to the periodic table and its importance to atoms. Students discover the link that the periodic table has to the make up of atoms. <http://www.proteacher.com/redirect.php?goto=1218>  **Intro:** class discussion about previous lessons. Students are guided through the name of the smallest particle of everything in the universe. Students are guided to talk about protons, neutrons and electrons and are encouraged to draw what they know an atom looks like.  Play the you-tube clip until 1.33 as a refresh as to what they learnt last lesson.  https://www.youtube.com/watch?v=QP0uqR7A1WQ  **Body:** students are introduced to the periodic table. Teacher directly teaches what the column and rows are called and how they are labelled. Each student is given a blank periodic table.  1. The teacher goes through on the board how to divide the table up into different sections that relate to electron charge. Students follow the boundaries put in on the interactive whiteboard by the teacher and colour their periodic table in accordance to this.  By the end of the lesson students should have a periodic table divided into ten colours and have a key that explains what each colour means.  2. After this students watch the rest of the you tube clip to consolidate this understanding and to build knowledge about the proton’s importance in giving an atom an atomic number.  3. Students play the periodic table scavenger hunt game <http://d43fweuh3sg51.cloudfront.net/media/assets/wgbh/phy03/phy03_doc_lpachhunt/phy03_doc_lpachhunt.pdf>  using ipads to look up the atomic number of the elements to complete the scavenger hunt.  <http://www.pbslearningmedia.org/asset/phy03_int_ptable/>  **Conclusion:** Atomic number show down game. Students are given three different rounds to be the fastest and most correct in drawing the atom make up for a called out element on the periodic table. Students use their knowledge from the lesson to decipher how many protons neutrons and electrons the atom has.  **Chemical bonding**  ***Week 5***  ***Weekly outcome:***  By the end of the week students will be able to select the mass number for an element using the periodic table. Students will be able to interpret the periodic table by finding and stating the atomic number of an element. Students will be able to problem solve by stating how many protons and neutrons an atom has by taking away a given atomic number away from the mass number of an element.  ***Key focus:***  Comparing atoms in terms of the mass, charge of protons, neutrons and electrons. Introducing the term Ions and isotopes and the difference between the two. Understanding atomic number and mass number of an atom.  **Lesson 10:** Atomic forces and positive and negative charge of atoms.  **Intro**: 1. Electrons, neutrons and protons bingo, 2.Periodic table scramble.  1. Students are presented with the atom bingo sheets and counters. The teacher reads out an atomic number and students must count the number of protons in the drawn atoms within their bingo sheet. If the numbers match they place a counter on the corresponding picture. He or she must match four in a row to win. When he or she does this they yell “bingo”.  2. Students must place the cut out elements back into the right order on the periodic table by working with the mass number. Once they have placed all the missing elements back in, they have completed the task.  **Body:**Direct teaching and student activity   * Atomic Forces   When it comes to atomic particles, opposites attract. Negative electrons are attracted to positive protons. This force of attraction keeps the electrons moving about the nucleus. An analogy is the way planets orbit the sun.   * What about particles with the same charge, such as protons in the nucleus? They push apart, or repel, each other. So why doesn’t the nucleus fly apart? The reason is a force of attraction between protons and neutrons called the strong force. The name of the strong force suits it. It is stronger than the electric force pushing protons apart. * The atomic number is the number of protons in an atom. This number is unique for atoms of each kind of element. For example, the atomic number of all helium atoms is 2. * The mass number is the number of protons plus the number of neutrons in an atom. For example, most atoms of helium have 2 neutrons, so their mass number is 2 + 2 = 4. This mass number means that an atom of helium has a mass of about 4 amu. * *Problem*: An atom has an atomic number of 12 and a mass number of 24. How many protons and neutrons does the atom have? * *Solution*: The number of protons is the same as the atomic number, or 12. The number of neutrons is equal to the mass number minus the atomic number, or 24 – 12 = 12.   Students attempt atomic number problem independently   * *Problem*: An atom has an atomic number of 8 and a mass number of 16. How many neutrons does it have? What is the atom’s mass in atomic mass units? * Ions and Isotopes * The number of protons per atom is always the same for a given element. However, the number of neutrons may vary, and the number of electrons can change. * Ions : Sometimes atoms lose or gain electrons. Then they become ions. Ions have a positive or negative charge. That’s because they do not have the same number of electrons as protons. If atoms lose electrons, they become positive ions, or cations. If atoms gain electrons, they become negative ions, or anions.   Student activity; Students experience the push and pull of atomic forces and select whether the atom has a negative or positive charge in each scenario.  Explanation of student activity; Lesson 4. 1 from this web page:  http://www.middleschoolchemistry.com/lessonplans/chapter4/lesson1  Students use plastic bags and a balloon to transfer energy between atoms.  Student worksheet:  <http://www.middleschoolchemistry.com/multimedia/chapter4/lesson1#protons_and_electrons>  **Conclusion:** class discussion and labelling of an element from the periodic table. Students and teacher discuss which is representative of the element symbol, the mass number and the atomic number. E.g:  https://dr282zn36sxxg.cloudfront.net/datastreams/f-d%3Ac448c79d45c70524aedc40a6ba5f69790e95852052ef0582ba515489%2BIMAGE_THUMB_POSTCARD_TINY%2BIMAGE_THUMB_POSTCARD_TINY.1    **Lesson 11:**  **In class ASSESSMENT FOR LEARNING TASK:**  This assessment is to be used for the purpose of enabling teacher to gain information about student’s knowledge, understanding and skills to inform teaching progress and focus for future weeks.  Assessing student’s skills in terms of how they are problem solving and critically thinking about the periodic table elements and the charges of protons. Assessing students relating protons, electrons and neutrons to the atomic number, Atomic mass, atomic forces and the positioning to the nucleus.  Students will be given a classification and sorting information task in which they must fill in the missing atomic number or mass. Students will link elements to their identifier on the periodic table and will problem solve through working with the electrons and protons to decipher how many protons and neutrons an atom has b taking away a given atomic number from the atomic mass.  The assessment task is to be written closer to the administration date to ensure it is at the appropriate level and utalises the same examples as in class questions. The assessment will take 30 minutes and be made of short answer questions and matching questions. The final two questions within the assessment will require students to justify or express an opinion as to what they believe the atomic number of a selected element and why and express an opinion in the form of a hypothesis for a future experiment using a justification scaffold.  Students are being assessed on the following through their demonstration of critical thinking:  **SC5-2VA** shows a willingness to engage in finding solutions to science-related personal, social and global issues, including shaping sustainable futures  **SC5-4WS** develops questions or hypotheses to be investigated scientifically  **SC5-8WS** applies scientific understanding and critical thinking skills to suggest possible solutions to identified problems  **Lesson 12:** Experiment: static electricity as charge in atoms  Experiment focus:   * Comparing atoms in terms of the mass, charge of protons, neutrons and electrons. * Investigate static electricity as a visual display of atoms sharing charge. * Atomic forces and positive and negative charge of atoms.   **Intro:** recap of last lesson, guided discussion about the two main charges of atoms, atomic number and atomic mass.  **Body:** Students investigate the concept of charged atoms and changing charge. Students understand that atoms compare as different charges but can change their charge through the concepts of attraction and repel. Students conduct at least two experiments. One will show an attraction of atoms and a joining of atoms whilst the other will show a repel or negative balance.  Students complete the following rejection of atoms experiment:  Make a colourful milk art.  <https://sciencebob.com/a-color-symphony/>  Students complete the following attraction of atoms experiment:  Make a gost dance without touching it  <https://sciencebob.com/make-a-static-powered-dancing-ghost/>  Teacher selects from the following (which best suit the students in the class).  Repel:  Bend water  <https://sciencebob.com/bend-water-with-static-electricity/>  Roll the can without touching it  <https://sciencebob.com/roll-a-can-with-static-electricity/>  Make a levitating orb  alloon stuck to wall<https://sciencebob.com/make-a-levitating-orb/>  **Conclusion:** pack up and discussion about the experiments and the outcomes. Guided question about the share of charge between the atoms.  **Acids and Bases**  ***Week 6***  ***Weekly outcome:***  Students will learn that matter can be combined to form both mixtures and compounds, and will learn the difference between the two. Students will learn that mixtures may be either homogeneous or heterogeneous. Students will learn that there are three types of mixtures, solutions, suspensions and colloids and will be able to recognize examples of each. Students will be able to give a brief overview of what a base, aid and neutral atom is and a general characteristics of each, (e.g it is bitter). Students will be able to explain acids and base chemical reactions are a result of the exchange of hydrogen ions.  ***Key focus***  The weeks key focus is acids and bases as a chemical reaction. Acid and base reactions are the exchange of one or more hydrogen ions.An element is a substance that is made entirely from one type of [atom](http://education.jlab.org/qa/atom.html) (hydrogen). A compound is a substance made from two or more different elements that have been chemically joined (water and table salt). A mixture is a substance made by combining two or more different materials in such a way that no chemical reaction occurs. A mixture can usually be separated back into its original components (a mixed bag of M&M’s)  **Lesson 13:** Introduction toAcids and bases and Common Chemicals found at Home  **Intro:** define acids and base discussion and direct teaching. Link acids and bases as a corner stone to chemical reactions that happen within nature and in man made conditions.  **Body:** Discuss the PH chart and scale with a visual representation.  <http://mocomi.com/acids-bases-useful/> - go through definitions and general properties of acids and bases with the entire class. Link back to last weeks lesson on ions. Whether a liquid is an acid or base depends on the type of ions in it. If it has a lot of [hydrogen](http://www.ducksters.com/science/chemistry/hydrogen.php) ions, then it is an acid. If it has a lot of hydroxide ions, then it is a base.  Teach the properties of acids and bases. In general, acids and bases have certain recognizable characteristics, which one can notice even without litmus paper.  Acids have a sour taste and can dissolve many materials. Citric acid, vinegar, and battery acid are all examples, as is the gastric acid that breaks down the food we eat.  Bases have a bitter taste and tend to be slimy or slippery. They can break down dirt and plaque by forming hydroxide bubbles and are therefore often used for cleaning. Soaps, dishwashing liquids, detergents, bleaches, hair conditioners, and baking soda are all examples.  Gather safe examples for a taste test for example orange juice, milk, baking soda, lemons.  Provide students with acid base or neutral table and have them fill in the name of the product and tick its correlating label. Is it an acid, base or is it neutral? acids will taste sour, while bases will taste bitter.  Provide students with litmus paper to test the PH level of each of the taste testing done throughout the lesson.  **Conclusion:** discuss acids and bases that students have in their homes or in the classroom. Discuss the use of each product and form a generalisation about the type of acid or base and then the use of that product within the home. E.g bleach is a cleaning chemical and is very acidic so it can eat away the bacteria. Cleaning chemicals must be high in acidic atoms. Therefore lemons too may have good cleaning properties.  **Lesson 14:** Experiment: Acid–base reactions  Students Learn about the differences between an acid and a base, make sherbet and experiment with universal indicator paper to see which substances are acids and which are bases. After adding certain substances and solutions to your universal indicator paper it will change colour, the colour it changes to depend on how strong an acid or base it is.   * Understand Acid base reactions as a type of chemical process typified by the exchange of one or more hydrogen ions * Develop an understanding of the nature of a chemical reaction of a base * Develop an understanding of the nature of a chemical reaction of an acid.   Students to conduct the explanation of acids and bases test the liquid experiment under the direction of the teacher:  <http://www.wikihow.com/Explain-Acids-and-Bases-to-Kids>  Teacher may choose to add on of the following acid based chemical reaction experiments to the second half of the lesson.  Chemical reaction in pop rocks: <http://www.instructables.com/id/Pop-Rocks/>  cabbage:<http://www.sciencekids.co.nz/lessonplans/chemistry/acidbase.html>  Making sherbet: <http://www.kidspot.com.au/kitchen/recipes/sherbet-210?ref=group_collection_view%2Ccooking-with-kids>  **Lesson 15:** elements and compounds and the periodic table.  **Intro:** discussion and direct teaching  What exactly is an element, a compound or a mixture? Atoms bond together to form compounds. The two classes of compounds, ionic and covalent, have quite different properties. Matter can be combined to form both mixtures and compounds. mixtures may be either homogeneous or heterogeneous.  **Body:** read through the compounds or mixtures worksheet in the chemical sciences resource folder.  Choose from the following to explain the difference between a compound, element and mixture.  <https://www.youtube.com/watch?v=avgFqlNML5o>  <https://www.youtube.com/watch?v=AfXxZwNLvPA>  <https://www.youtube.com/watch?v=MaZ7lsc5ub8>  Students conduct the following activity under teacher supervision. Identifying Mixtures and Compounds activity: Prepare a variety of mixtures and compounds for the students to identify as one of the following:  Mixture—Solution: Sugar in Water (heating the water may be required to fully dissolve the sugar) Lemon Juice in Water  Mixture—Suspension: Italian Salad Dressing (or other oil and vinegar salad dressing) Raisins and Cereal  Sand and Rocks Carbonated Soda  Mixture—Colloid:  Shaving Cream Marshmallows Milk  Compound: Baking soda and vinegar (allow students to combine, or combine in from of them) Water Salt Sugar  **Conclusion:** Discuss definitions of a compound, element and mixture.  Play element, compound or mixture pop quiz. Students decipher from a visual which category the product would fit into.  **Isotopes and radioisotopes**  ***Week 7***  ***Weekly outcome:***  Students will follow directions to investigate how being too large can make an atom unstable. Students will observe, record and interpret the results of their investigation. Students will design and make a model to represent an unstable atom using Jenga blocks and a marble. Students will be able to describe in simple terms how alpha and beta particles and gamma radiation are released from unstable atoms  ***Key focus:***  What is an isotope and how can isotopes become unstable? What part of the isotope is unstable and what happens when it becomes unstable?  **Lesson 16:** Isotopes  **Intro:** Students sit in circle with a bowl of mixed M&M’s on the table. Students take it in turns to choose one M&M and weigh it using a kitchen scale. Students mark down how much their M&M weighed.  Teacher points out that there is no other type of candy in the bowl. All that is inside are M&M’s. Students are to compare the weight of their M&M’s. Did some weigh the same? Did some not weigh the same? Why would some be heavier? Is the chocolate different around the outside of the m&m’s?  **Body:** students are given wire and pompoms and an atom card. Students are to look at the designated neutron, electron and proton number on the card and make the atom. Students are to also use the atomic number on the card to find which element they are making on the periodic table. (all students are making the element Hydrogen; just in different forms or isotopes.) Students are to present their completed atom to the class (or the teacher can assist with this.) The students tell the class which element they have made, how many electrons, protons and neutrons the atom has and its atomic number. When a few students have presented the question should be asked, if they are all hydrogen then why do they look different?  Introduce studnets to the concepts of isotopes as different versions. Just as the M&M has different versions, atoms have different versions like this. The hydrogen atom has many different versions. We call these versions Isoptopes. most elements have various isotopes (versions) that vary only in the number of neutrons in the  nucleus. The result is that some isotopes are heavier or lighter than others. For instance, there are two principal stable  isotopes of chlorine: Chlorine-35 and Chlorine-37.  Watch the following explanation of isotopes:  <https://www.youtube.com/watch?v=xjY5p-1CDr8>  Students complete page 1 of the following worksheet to consolidate and show their learning.  <http://www.asfa.k12.al.us/ourpages/auto/2014/12/1/66271652/IsotopesWorksheet.pdf>  **Conclusion:** discussion. Discuss the weight of the M&M’s from the introduction and that we can remember that isotopes are the same element but variations. That the nut inside some M&M’s is just a variation and like isotopes the M&M’s had a heavier inside of nucleus.  **Lesson 17:** Radioisotopes  **Intro:** Discussion.  Discuss with students what isotopes are and recover last lesson. Have students discussion lead to the question of are all atoms perfect in form and stable? Ask students what happens when an atom is too large? Sometimes isotopes are stable and happy. These are the elements that we see around us and find in nature. However, some isotopes are unstable.  **body:** Pile a few jenga blocks up into a tower. Roll the marble gently at the tower. Add a few more wooden blocks to the tower and roll the marble at the same speed at the tower. Repeat adding more blocks to the tower and rolling the marble at the tower at the same speed. Do this until you have built the highest tower that you can, or until the tower collapses, whichever comes first. Repeat the investigation at least two more times.  Record your observations of how many blocks you have gotten to before the tower collapsed.  Inquiry questions: When the tower was short, did the marble knock it over? As the tower got taller and taller, what happened to the stability of the tower? Did the tower get high enough for it to start collapsing by itself?  Direct teaching and guided questioning: Tell students they were creating a model for a radioisotope. That is an isotope that is unstable. At the beginning the small model of a tower was stable. It’s nucleus (or the building blocks) fitted together and worked well. The nucleus began to build. Each time you added a block you added potential energy. Sometimes isotopes become like this. Their nucleus builds and increases in the amount of energy that is within. When the energy builds up too much it begins to emit the energy outside of its core. What happened to the blocks? They fell apart and spread out. This is what radioisotopes nucleus do when they become unstable they break emitting the energy and break apart to a smaller mass. The smaller mass means a large amount of energy. The splitting is a big chemical reaction. Does the word radioisotope remind you of anything? Break it down? radio and isotope. What other words use the work radio? This is where the word radioactive comes from. It is the unstable isotopes splitting. Do these exist in the word? When isotopes are unstable they emit energy in the form of radiation. There are three main types of radiation or radioactive decay depending on the isotope.  Today, isotopes are classified as stable isotopes and others are classified as unstable, or radioactive, isotopes. Stable isotopes maintain constant concentration on Earth over time. Unstable isotopes are atoms that disintegrate at predictable and measurable rates to make a new atom of a different element by the emission of either a nuclear electron (beta particle) or a helium nucleus (alpha particle) and radiation.  Watch the clip on atomic bombs: <https://www.youtube.com/watch?v=RNYe_UaWZ3U>  Investigation into the radioisotope used for most atomic bomb; Uranium. Show picture and discuss:  Uranium is the heaviest of the naturally occurring elements. It can be found in row seven of the periodic table and is a member of the [actinide group](http://www.ducksters.com/science/chemistry/lanthanides_and_actinides.php). Uranium atoms have 92 electrons and 92 protons with six valence electrons. There are 146 neutrons in the most abundant isotope. Characteristics and Properties  Under standard conditions uranium is a hard silvery metal. It is malleable (meaning it can be pounded into a thin sheet) and ductile (meaning it can be stretched into a long wire). It is very dense and heavy.  Pure uranium is [radioactive](http://www.ducksters.com/science/chemistry/radiation_and_radioactivity.php). It will react with most nonmetallic elements to make compounds. When it comes into contact with air, a thin, black layer of uranium oxide will form on its surface.  Where is it found on Earth?  Uranium is about the 50th most abundant element in the Earth's crust. It can be found in very small traces in most rocks and in the ocean water. he Atomic Bomb  Uranium was used to create the first [atomic bomb](http://www.ducksters.com/history/world_war_ii/ww2_atomic_bomb.php) used in World War II. This bomb was called "Little Boy" and it was dropped on Hiroshima, Japan. Today nuclear bombs use other materials such as plutonium.  Extension resource in case of further questions from studnets. focuses on what actually happens when a radioactive isotope is used as a bomb and what happens to the mass when an isotope is dropped. Hydrogen versus atomic bombs.  <https://www.youtube.com/watch?v=bwAh3Z0shsE>  **Conclusion:** discuss radioactivity and radioactive isotopes.  **Lesson 17:** Experiment – home made ice-cream.  Combining atoms to lower the freezing point of ice. http://www.stevespanglerscience.com/lab/experiments/brown-sugar-homemade-ice-cream/  **Chemical reactions and their evidences**  ***Week 8***  **Lesson 18:** Elephant’s toothpaste experiment. Identifying the reactants and products in the chemical reaction. Modelling the oxygen and water rearranging their atoms to form hydrogen. Rearranging of hydrogen atoms when reacting with yeast.   * identifying reactants and products in chemical reactions * modelling chemical reactions in terms of rearrangement of atoms * describing observed reactions using word equations * considering the role of energy in chemical reactions * recognising that the conservation of mass in a chemical reaction can be demonstrated by simple chemical equations   <https://sciencebob.com/fantastic-foamy-fountain/>  **Lesson 19:** Lava lamp experiment: identifying reactants and products in chemical reactions. Students find that the Alka-seltzer as a product reacts with the water but not with the oil. Students investigate the carbon dioxide bubbles as the energy in chemical reactions and the product created.  <http://www.sciencekids.co.nz/experiments/easylavalamp.html>  **Lesson 20:** Mentos experiment: considering the mass in a chemical reaction and demonstrating a reaction of Mentos and coke in a simple chemical equation.  [Diet Coke & Mentos Geyser Eruption](http://www.sciencekids.co.nz/experiments/dietcokementos.html)  **Assessment as learning experiment task.**  **Assessing:** Skills in application and performance.  Students are required to conduct an experiment in which they are monitoring their own learning process, asking questions of themselves and practicing their experiment skills. Students are creating a hypothesis and controlled environment for the experiment. They are to create a safety evaluation using the model provided and identify risks and safety procedures for the experiment. Students can watch you-tube clips on the experiment and use the visual prompting from such clips. Students must then make a drawing or diagram of what the experiment set up as well as an equipment list. Students will each create a hypothesis and debate through class discussion the outcome of the experiment. Students are to link their hypothesis and intended outcome to one experiment or prior learning as evidence for their opinion. Students are to safely conduct the experiment and critique their own hypothesis and diagram post experiment. Students are to use tables, timing and scientific knowledge and language to monitor and record their findings. (depending on the class and students safe and responsible behaviours students can in pairs select an experiment from the week and demonstrate the experiment and lead the class in the investigatory and evaluation aspects of the experiment. Students will take it in turns to do the experiment in this manner.) Students will complete a self evaluation as well as the risk management plan, diagram and equipment list as evidence of assessment.  Students will be assessed on the following outcomes:  **SC5-5WS** produces a plan to investigate identified questions, hypotheses or problems, individually and collaboratively.  **SC5-6WS** undertakes first-hand investigations to collect valid and reliable data and information, individually and collaboratively  **C5-7WS** processes, analyses and evaluates data from first-hand investigations and secondary sources to develop evidence-based arguments and conclusions  ***Week 9:***  ***Weekly outcome:***  Students will be able to use the chemical name for two common substances. Students will be able to explain simple chemical bonding and explain what electrons are being gained or lost.  ***Key focus:***  Bonding of chemicals and the chemical names of common substances. Students focus on writing word equations for the bonding of electrons during simple chemical reactions.  **Lesson 21:**Naming Chemicals and Word Equation  **Intro**: Discussion and guided questioning.  Re-cover through discussion where atomic symbol is found on the periodic table for elements. Discuss how electrons are found in the shell of the atom and that the valence electrons are the electrons on the outermost shell of the atom. These are the ones that can be gained or lost in a chemical reaction.  **Body:** demonstrate with direct teaching how to find the electrons in an element and how to decipher the valence electrons. Show students how to read the number of electrons needed for a full outer shell. Have students find the oxidation number or number needed to be gained or lost.  Discuss with students the chemical names of common substances   |  |  | | --- | --- | | [aspirin](http://chemistry.about.com/library/graphics/blaspirin.htm) | [acetylsalicylic acid](http://chemistry.about.com/library/graphics/blaspirin.htm) | | [baking soda](http://chemistry.about.com/od/factsstructures/ig/Chemical-Structures---S/Sodium-Bicarbonate.htm) | [sodium bicarbonate](http://chemistry.about.com/od/factsstructures/ig/Chemical-Structures---S/Sodium-Bicarbonate.htm) | | borax | sodium borate; sodium tetraborate | | | chalk | calcium carbonate | | plaster of Paris | calcium sulfate | | salt, table | sodium chloride | | sugar, table | sucrose | | vinegar | impure dilute acetic acid | |  |  |   Students create element bands using ping pong balls pipe cleaners and investigate the sharing of electrons when elements bond together.  and Lesson preparation and resources on basics of bonding and word equations:  <http://sciencespot.net/Media/bondingbasics08_Info.pdf>  Student worksheet:  <http://sciencespot.net/Media/bondingbasics08_wkst.pdf>  Answers: <http://sciencespot.net/Media/bondingbasics08_wkstkey.pdf>  **Conclusion:** Discussion.  **Lesson 22:** Formation of ionic compounds  **Intro:** discuss with students Ions and chemical bonding. <http://www.middleschoolchemistry.com/lessonplans/chapter4/lesson5>  Show a video of sodium metal reacting with chlorine gas.  [Project the video Sodium and chlorine react.](http://www.middleschoolchemistry.com/multimedia/chapter4/lesson5#sodium_chlorine_react)  look at animations and make drawings of the ionic bonding of sodium chloride (NaCl). Students will see that both ionic and covalent bonding start with the attractions of protons and electrons between different atoms. But in ionic bonding, electrons are transferred from one atom to the other and not shared like in covalent bonding. Students will use Styrofoam balls to make models of the ionic bonding in sodium chloride (salt).  **Body:** Show an animation to introduce the process of ionic bonding.  [Project the animation Ionic bond in sodium chloride.](http://www.middleschoolchemistry.com/multimedia/chapter4/lesson5#ionic_bond_in_sodium_chloride)  Remind students that in covalent bonding, atoms share electrons. But there is another type of bonding where atoms don’t share, but instead either take or give up electrons. This is called ionic bonding. This animation shows a very simplified model of how sodium and chloride ions are formed.  Tell students that the attraction of the protons in the sodium and chlorine for the other atom’s electrons brings the atoms closer together. Chlorine has a stronger attraction for electrons than sodium (shown by the thicker arrow). At some point during this process, an electron from the sodium is transferred to the chlorine. The sodium loses an electron and the chlorine gains an electron.  Tell students that when an atom gains or loses an electron, it becomes an ion.  Sodium loses an electron, leaving it with 11 protons, but only 10 electrons. Since it has 1 more proton than electrons, sodium has a charge of +1, making it a positive ion.  Chlorine gains an electron, leaving it with 17 protons and 18 electrons. Since it has 1 more electron than protons, chlorine has a charge of −1, making it a negative ion.  When ions form, atoms gain or lose electrons until their outer energy level is full.  Give each student an [activity sheet](http://www.middleschoolchemistry.com/pdf/chapter4/4.5_student.pdf).  Have students write a short caption under each picture to describe the process of covalent bonding and answer the first three questions. The rest of the activity sheet will either be completed as a class, in groups, or individually depending on your instructions.  Review with students the process of ionic bonding covered in the animation so that students will understand why the sodium ions are positive and the chloride ions are negative.  **Conclusion:** Have students observe actual sodium chloride crystals and relate their shape to the molecular model.  This two-part activity will help students see the relationship between the arrangement of ions in a model of a sodium chloride crystal and the cubic shape of real sodium chloride crystals.  http://www.middleschoolchemistry.com/lessonplans/chapter4/lesson5  ***Week 10***  ***Weekly outcome:***  Students will be able to identify metal and non metal substances. Students will be able to explain characteristics of metal and non metal substances. Students will be able to identify the differences between **exothermic and endothermic reactions**.  ***Key focus:***  Properties of metals and non-metals. **Exothermic and endothermic reactions.**  **Lesson 22:** Properties of Metals and Non-metals  **Intro:** introduce students to the concept of metals and non metals.  Direct teach using notebook application:  **Body:** Non-metals share many similar properties including:   * They are either gas (hydrogen, oxygen, nitrogen) or solid (carbon, sulfur) under standard conditions. * They are not good conductors of electricity or heat. * They are very brittle in their solid form. * They are not malleable or ductile. * They generally have lower densities than metals. * They generally have lower melting and boiling points than metals. The one exception to this is carbon. * They have high ionization energies.   Interesting Facts about Non-metals   * Water is made up of the two nonmetals oxygen and hydrogen. * Even counting the halogens and the noble gases there are only 18 elements in the periodic table that are considered nonmetals. * Many nonmetals can gain metallic properties under very high pressures. * Selenium gets its name from the Greek word "selene" which means "Moon." * Carbon is the single most important element to the existence of life on Earth.   Properties of metals. A property is a word used to describe a material or object and tells us something about it.   * Metals are usually shiny. The shine that we see when light reflects off the surface of a metal is called the lustre of the metal. * Most metals are hard and they feel heavy. * We say metals are dense as their particles are packed close together. * Metals conduct electricity and heat well. (You will learn more about electricity next term. In Grade 6, you will learn about metals as conductors of electricity.) * Metals are malleable (they can be shaped into flat sheets) and they are ductile (this means they can be made into thin wire) * Most metals can be heated to high temperatures without melting or changing their shape, which is one of the reasons why pots and pans are made of metal. Can you think of any other reasons why pots and pans are made of metal? * Metals are mined from the Earth. You will learn more about this in another subject, Social Sciences.   Investigating metals and non-metals activity:  Materials: coins, metal spoon, metal pencil sharpener, metal nail or screw, paper clip or thumb tack, pin, steel wool, metal bottle top  Method: A few metal objects have been placed in front of you. Notice all the different shapes. Write the name of each object in the table below.  Hold each object in your hand. Does it feel hot or cold? Rough or smooth?  Look at each object carefully. Is it shiny or dull? Can you describe its colour?  Drop each object on the floor, or tap it. What sound does it make?  Write your observations in the table below (you may use words from the box below or you may use your own words).  Conclusion: discussion and pack up. Play metal or not game as a whole class. <http://flash.learning.com/ahascience-demo/AS-Treasure-Hunt/content/index.swf>  **Lesson 23:**Make magnetic slime and investigate the role of metal.  <http://www.stevespanglerscience.com/lab/experiments/magnetic-slime/>  **Lesson 24:Exothermic and endothermic reactions**  Endothermic Reactions  Reactions are reactions that need energy in the form of heat, to happen or proceed. You put heat INTO it.  Examples of some endothermic reactions: -Ice melting is an example of an endothermic process\*  *Activity:* Feel an Endothermic Reaction   * Mix Citric Acid solution in a plastic cup with baking soda solution * Allow kids to place two fingers into the cup to feel the reaction. They should feel it bubble more vigorously and their fingers should feel cold after a bit. * Ask them to describe what they feel/felt. See if they can explain where the heat in their fingers is going. * Explain: When you put your fingers in the solution, it will bubble and speed up because you're giving the acid and the base mixture the heat energy it needs to get going and keep going. * Also, it's taking the heat from your fingers so your fingers will feel cold in the solution and when you remove them.   Exothermic Reactions give off heat as they happen. They are the opposite of an endothermic reaction.  -When salt is made from Sodium and Chlorine (remember our periodic table), this is a reaction that gives off heat, or an exothermic reaction -When you light a match, this is an exothermic reaction  *Activity:* See a chemical reaction between Mentos & Diet Soda (Teacher-Demonstrated, Outdoors)- An exothermic reaction  What we did: We used a bottle of Diet Coke (because there's no sugar, it easily washes away without becoming sticky) and added the Mentos to it using a rolled. I used I strongly recommend if you want real fireworks that you add at least half to three quarters of the pack. I stuck with a website's recommendation of "4 Mentos" and this was a disappointment for me, although the kids thought it was great either way. Needless to say, I will be repeating the experiment with a bigger "bang" next time. Can't wait!  Show video either before or after demonstration: <http://www.youtube.com/watch?v=LjbJELjLgZg&feature=related>  *Source:* [*http://chemistry.about.com/od/reviewsproductguides/gr/stevespanglermentossodageyser.htm*](http://chemistry.about.com/od/reviewsproductguides/gr/stevespanglermentossodageyser.htm)  **Lesson 25:** **Lightning – energy transfer (experiment.)**  **Intro: Investigate lightning. Discussion about lightning as a natural phenomenon. Ways people have heard lightning being explained.**  Body: <https://www.youtube.com/watch?v=1Pg6JQgjKnI>  conduct experiment When you rub the balloon on your hair, the balloon builds up an electrical charge. This is called static electricity. When you touch the charged balloon to the end of the fluorescent light bulb, it causes the electrical charge to jump from the balloon to the bulb. The electrical charges cause the light bulb to illuminate. When a thunderstorm happens, the clouds become charged with electricity, just like the balloon.  Conclusion Discussion.  **Assessment of learning task: Poster on energy transfer and its effect on society.**  **Assessing:** Knowledge, recall and understanding  Students are to create a poster that explains energy transfer that occurs within chemical processes. Students may choose to further research energy transfer in terms of lightning and present their findings on key terms of and concepts of atom transformation when lightning strikes. Students are to use short sentences and phrases that describe the chemical reaction that is causing the energy transfer.  Students are also to classify the types of atoms that are use energy transfer in the chemical process. Students must specify how society is affected by the chemical reactions and energy transfers and suggest possible influences this has within society.  Students may choose to research a different energy transfer that occurs with chemical reactions other than lightning. Students may create a small presentation or demonstration experiment to show the class along with a paragraph that explains the chemical process.  Students are assessed on the following outcomes:  **SC5-9WS** presents science ideas and evidence for a particular purpose and to a specific audience, using appropriate scientific language, conventions and representations  **SC5-17CW** discusses the importance of chemical reactions in the production of a range of substances, and the influence of society on the development of new materials | | | | | | | | | | | | | | | **The Australian General Capabilities**  Aboriginal and Torres Strait Islander histories and cultures boriginal and Torres Strait Islander histories and cultures  Asia and Australia's engagement with Asia sia and Australia's engagement with AsiaSustainability ustainability  Critical and creative thinking ritical and creative thinking  Ethical understanding thical understanding  Information and communication technology capability nformation and communication technology capability  Intercultural understanding ntercultural understanding  Literacy iteracy  Numeracy umeracy  Personal and social capability ersonal and socail capability  Civics and citizenship ivics and citizenship  Difference and diversity ifference and diversity  Work and enterprise ork and enterprise | |
| **Special Needs Adjustments** | | | | | | | **School to Work** | | | | | | | | | | |
| * One-on-one support where required * Short lessons * Engaging topics * Behaviour management strategies * For individualised adjustments, please see personalised learning plans. * Visuals’ and kinaesthetic learning * Group learning * Discussion based topics * Investigation learning * Use of visuals and graphic organisers | | | | | | | * Improved communication skills * Developing understanding on people from different cultures * Language development * Collaborative learning * Self-manage * Become active global citizens by understanding conservation and safe chemical use * Numeracy and literacy comprehension skill building. | | | | | | | | | | |
| **Assessments. Type. Weight. Due Date** | | | | | | | | | | | | | | | | | |
| **Assessment for learning task:**  **Assessing:** Skills in analysis and critical thinking  **SC5-2VA** shows a willingness to engage in finding solutions to science-related personal, social and global issues, including shaping sustainable futures  **SC5-4WS** develops questions or hypotheses to be investigated scientifically  **SC5-8WS** applies scientific understanding and critical thinking skills to suggest possible solutions to identified problems  **30% total.** 10% Sorting information and matching task  10% analysing and evaluating atomic numbers and atomic mass section  10% collecting and selecting and showing atomic number symbol and mass on periodic table **task.**  **Assessment as learning experiment task.**  **Assessing:** Skills in application and performance.  **SC5-5WS** produces a plan to investigate identified questions, hypotheses or problems, individually and collaboratively.  **SC5-6WS** undertakes first-hand investigations to collect valid and reliable data and information, individually and collaboratively  **C5-7WS** processes, analyses and evaluates data from first-hand investigations and secondary sources to develop evidence-based arguments and conclusions  **40% total.**  10% risk management plan  5% hypothesis  5% diagram, description and equipment list.  5% conducting experiment  10% gathering data and evaluation of hypothesis and self evaluation.  **Assessment of learning task: Poster on energy transfer and its effect on society.**  **Assessing:** Knowledge, recall and understanding  **SC5-9WS** presents science ideas and evidence for a particular purpose and to a specific audience, using appropriate scientific language, conventions and representations  **SC5-17CW** discusses the importance of chemical reactions in the production of a range of substances, and the influence of society on the development of new materials  **30% total.**  10% poster information accuracy and use of scientific knowledge and language  5% visual presentation and creativity in poster design  10% evaluation and knowledge in understanding societal role in the interest of energy transfer. | | | | | | | | | | | | | | | | | |
| **Resource List** | | | | | | | | | | | | | | | | | |
| Listed throughout program.  Resource found in resource folder with program.  **http://www.irysec.vic.edu.au/page.php?id=247** | | | | | | | | | | | | | | | | | |

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| **Teacher Evaluation**  **Comments / Variations** | |
| Guiding Questions  What worked well?  What needed to be changed?  What do I think the students gained from this lesson?  How well did this unit match the Elements of Learning and Achievement?  What did I learn?  How will I use this experience to extend my practice in the future? | |
| **Date Commenced**: | **Date Finished**: |
| **Teachers Signature**: | **Assistant Principals Signature**: |