

9 Science: Chemical Reactions and Change

Achievement Standard:

Science Understanding:

By the end of Year 9, students explain chemical processes and natural radioactivity in terms of atoms and energy transfers and describe examples of important chemical reactions. They describe models of energy transfer and apply these to explain phenomena. They explain global features and events in terms of geological processes and timescales. They analyse how biological systems function; respond to external changes with reference to interdependencies, energy transfers, and flows of matter.

Science as a Human Endeavour:

They describe social and technological factors that have influenced scientific developments and predict how future applications of science and may affect people's lives.

Science Inquiry Skills:

Students design questions that can be investigated using a range of inquiry skills. They design methods that include the control and accurate measurement of variables and systematic collection of data and describe how they considered ethics and safety. They analyse trends in data, identify relationships between variables and reveal inconsistencies in results. They analyse their methods and the quality of their data, and explain specific actions to improve the quality of their evidence. They evaluate others' methods and explanations from a scientific perspective and use appropriate language and representations when communicating their findings and ideas to specific audiences.

Unit Specific Information: Essential Questions

- *What is an atom?*
- *How do I use the periodic table?*
- *How do humans know the structure of atoms?*
- *What are molecules and compounds?*
- *What is a chemical reaction?*
- *What is an exothermic reaction?*
- *How do I design experiments about exothermic reactions?*

Assessment Details:

Formative assessment: Week 4

Item 3: Written Exam - 2 parts

Part 1 Science Understanding

Conditions: Individual, 5 minutes perusal; 60 minutes

exam time; using Kirwan High School exam protocols

Part 2 Science as a Human Endeavour – Stimulus response

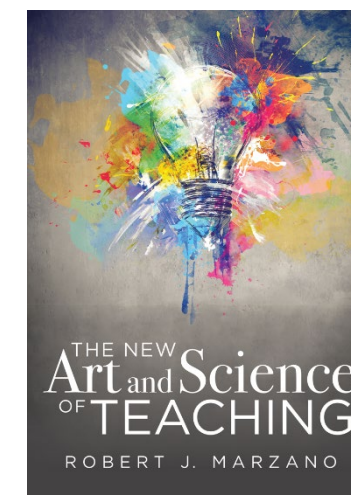
Conditions: Individual, 5 minutes perusal; 15 minutes

stimulus; 45 minutes response time, using Kirwan High

School exam protocols

Item 4: Student Experimental Report

Conditions: group and individual, 10 in class lessons



READING / VIEWING / LISTENING:

Core Texts:

Text: OBI-9

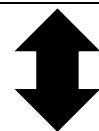
p. 39 Rutherford's model of the atom

p. 40-41 Atoms and their masses

p. 44-45 Arranging Electrons

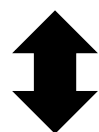
COMPREHENSION SKILL FOCUS:

Summarising
Magnet Summaries



THINKING:

Describe
Explain



WRITTEN / SPOKEN / MULTI-MODAL TEXT

Short Response
Student Experiment

HIGHLY VALUED LANGUAGE FEATURE FOCUS:

[insert relevant feature/s]

Priority Standards

4	<p><i>The students will:</i> Evaluate a given diagram of atoms for its accuracy Evaluate and design experiments about chemical reactions and heat transfer Evaluate given statements about the changes to atomic models over time</p>
3	<p><i>Students will:</i> Compare electrons, neutrons and proton Determine an element's number of protons, neutrons and electrons using the periodic table Determine the elements and their amount in a given chemical formula Explain and justify the chemical processes</p> <ol style="list-style-type: none"> 1. Conservation of mass 2. Exothermic chemical reactions 3. Chemical bonding (EXTENSION) <p>Explain how JJ Thompson's and Rutherford's experiments contributed to the modern atomic model</p>
2	<p><i>Students will:</i> Describe electrons, neutrons and proton in terms of charge and placement in an atom Describe atoms using atomic number and mass Identify the elements in a given chemical formula Describe the chemical processes of</p> <ol style="list-style-type: none"> 1. Conservation of mass 2. Heat using particle theory 3. Chemical reactions 4. Chemical bonding <p>Describe JJ Thompson's and Rutherford's experiments about the atomic model</p>

Learning Goals:

Strands and Sub-Strands	Australian Curriculum Content Descriptors	Kirwan High Goals – Students can...
Science Understanding Chemical Sciences	<p>All matter is made of atoms which are composed of protons, neutrons and electrons; natural radioactivity arises from the decay of nuclei in atoms (ACSSU177)</p> <p>Elaborations:</p> <ul style="list-style-type: none"> describing and modelling the structure of atoms in terms of the nucleus, protons, neutrons and electrons comparing the mass and charge of protons, neutrons and electrons 	<ol style="list-style-type: none"> Define matter and atoms Describe the structure of atoms in terms of protons, neutrons and electrons. Compare the mass and charge of protons, neutrons and electrons. Describe the overall neutrality of elemental atoms using protons, neutrons and electrons (EXTENSION) Use The Periodic Table to identify elements, their symbols and their number of protons, neutrons and electrons Recognise elements 1-20 of the periodic table by analysing a simple Bohr's diagram of protons, neutrons and electrons. Draw a simple Bohr's diagram of elements 1-20 (EXTENSION)
	<p>Chemical reactions involve rearranging atoms to form new substances; during a chemical reaction mass is not created or destroyed(ACSSU178)</p> <p>Elaborations:</p> <ol style="list-style-type: none"> identifying reactants and products in chemical reactions describing observed reactions using word equations recognising that the conservation of mass in a chemical reaction can be demonstrated by simple chemical equations 	<ol style="list-style-type: none"> Define molecules and compounds Compare molecules/compounds with elemental atoms Determine the elements and their number making up molecule and compound chemical formula Define chemical bonds as the attraction between two atoms (ALL) caused by one atom sharing, taking or giving electrons with another atom (EXTENSION) Define chemical energy as the energy stored in the chemical bonds of molecules and compounds Compare physical change and chemical change Define chemical reaction, reactant and product Identify the reactant and products in a word equation (ALL) and in a chemical formula equation (EXTENSION) Describe chemical reactions using word equations, including combustion and acid-metal reactions. Recognise formula chemical equations have the same elements and number in reactants and products –following the Conservation of Mass Law (EXTENSION) Recognise that mass is not created nor destroyed during a chemical reaction (Conservation of Mass)
	<p>Chemical reactions, including combustion and the reactions of acids, are important in both non-living and living systems and involve energy transfer (ACSSU179)</p> <p>Elaborations:</p> <ul style="list-style-type: none"> investigating reactions of acids with metals considering the role of energy in chemical reactions 	<ol style="list-style-type: none"> Recall heat and temperature Explain the energy transfer process of exothermic chemical reactions, including acid-metal reactions
Science as a human endeavour	<p>Scientific understanding including models and theories is contestable and is refined over time through a process of review by the scientific community (ACSHE-157)</p> <p>Advances in scientific understanding often rely on developments in technology and the technological advances are often linked to scientific discoveries (ACSHE 158)</p>	<ol style="list-style-type: none"> Compare given atomic models of Democritus, Dalton, JJ Thompson and Rutherford over time. (Bohr is extension) Compare testable hypotheses vs reason-based logical analysis (EXTENSION) Describe the technologies JJ Thompson and Rutherford used to advance human's understanding of the atom

Science Inquiry Skills Questioning and Predicting	Formulate questions or hypotheses that can be investigated scientifically (ACSIS164)	<ol style="list-style-type: none"> 1. Identify the independent and dependent variables of an investigation to formulate a hypothesis. 2. Formulate a research question from a hypothesis.
Science Inquiry Skills Planning and Conducting	Plan, select and use appropriate investigation methods, including field work and laboratory experimentation, to collect reliable data ; assess risk and address ethical issues associated with these methods (ACSIS165)	<ol style="list-style-type: none"> 1. Identify the variables to be controlled to conduct a valid experiment. 2. Select appropriate tools to measure accurate and reliable raw data. 3. Describe relevant safety, ethical and environmental risk of an experiment and how to manage it.
Science Inquiry Skills Processing and analysing data and information	Analyse patterns and trends in data, including describing relationships between variables and identifying inconsistencies (ACSIS169)	<ul style="list-style-type: none"> ✓ Use given algorithms to process raw data <ol style="list-style-type: none"> a. Central tendency: Mean, median, mode b. Variance (precision): range, standard deviation (EXTENSION) c. Variance (accuracy): Mean absolute deviation ✓ Analyse experimental data to <ol style="list-style-type: none"> a. Describe trends, patterns and relationships b. Identify and describe inconsistencies in results
Science Inquiry Skills Evaluating	Evaluate conclusion, including identifying sources of uncertainty and possible alternative explanations, and describe specific ways to improve the quality of the data (ACSIS171)	<ol style="list-style-type: none"> 1. Interpret data to draw conclusions 2. Identify systematic and random errors. 3. Use identification of systematic and random errors, to suggest ways improvement the experiment to collect more precise and accurate data.
Science Inquiry Skills Communicating	Communicate scientific ideas and information for a particular purpose, including constructing evidence-based arguments and using appropriate scientific language, conventions and representations (ACSIS174)	<ol style="list-style-type: none"> 1. Select appropriate scientific language, genre conventions and representation for a Student Experimental Report. 2. Construct tables, graphs and diagrams to communicate experimental results 3. Use appropriate referencing conventions

Possible Habit of Mind:

<p>Exploring Meaning of the HOM By the end of this unit students will be able to:</p>	<p>Expanding Capacity for using the HOM By the end of this unit students will be able to:</p>	<p>Increasing Alertness for the HOM By the end of this unit students will be able to:</p>	<p>Extending Values of the HOM By the end of this unit students will be able to:</p>	<p>Building Commitment towards the HOM By the end of this unit students will be able to:</p>
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General Capabilities: This unit provides opportunities for students to engage in following capabilities:

<p>Literacy</p> <ul style="list-style-type: none"> ✓ Comprehending texts through listening, reading and viewing ✓ Composing texts through speaking, writing and creating ✓ Text knowledge □ Grammar knowledge ✓ Word knowledge ✓ Visual knowledge <p>Numeracy</p> <ul style="list-style-type: none"> ✓ Estimating and calculating with whole numbers ✓ Recognising and using patterns and relationships □ Using fractions, decimals, percentages, ratios and rates □ Using spatial reasoning □ Interpreting statistical information □ Using measurement 	<p>ICT</p> <ul style="list-style-type: none"> □ Applying social and ethical protocols and practices when using ICT □ Investigating with ICT ✓ Creating with ICT ✓ Communicating with ICT □ Managing and operating ICT <p>Critical and creative thinking</p> <ul style="list-style-type: none"> ✓ Inquiring - identifying, exploring and organising information and ideas ✓ Generating ideas, possibilities and actions ✓ Reflecting on thinking and processes ✓ Analysing, synthesising and evaluating reasoning and procedures 	<p>Personal and social capability</p> <ul style="list-style-type: none"> ✓ Self-awareness ✓ Self-management ✓ Social awareness ✓ Social management <p>Ethical understanding</p> <ul style="list-style-type: none"> □ Understanding ethical concepts and issues ✓ Reasoning in decision making and actions □ Exploring values, rights and responsibilities <p>Intercultural understanding</p> <ul style="list-style-type: none"> □ Recognising culture and developing respect □ Interacting and empathising with others □ Reflecting on intercultural experiences and taking responsibility
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Cross Curriculum Priorities:

<ul style="list-style-type: none"> □ Aboriginal and Torres Strait Islander histories and cultures 	<ul style="list-style-type: none"> □ Asia and Australia's engagement with Asia 	<ul style="list-style-type: none"> ✓ Sustainability
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Differentiation [for small groups or individuals]:

1. Individualise formative assessment tools provided with alternative resources
2. Include increased scaffolding around assigned formative assessment task where needed
3. Plan open-ended lesson tasks that require higher order thinking skills from more capable students
4. Make use of heterogeneous collaborative groups to gain different perspectives
5. Make use of homogeneous collaborative groups to tailor tiered questions
6. Attend to any individual work plan requirements
7. Collect and analyse student profiles for literacy and numeracy needs

Learning Sequence

Week	Day 1	Day 2	Day 3
1	<ul style="list-style-type: none"> Re-establish routines and procedures Students reflect on last terms Levels of Achievement (see reflection proficiency scale) What is matter? <ul style="list-style-type: none"> Define matter and atoms 	<p>Learning Sequence 1:</p> <ul style="list-style-type: none"> What is an atom? <ul style="list-style-type: none"> Define matter and atoms Describe the structure of atoms in terms of protons, neutrons and electrons Compare the mass and charge of protons, neutrons and electrons Describe the overall neutrality of elemental atoms using protons, neutrons and electrons (EXTENSION) Draw a simple Bohr's diagram of elements 1-20 (EXTENSION) How do I use the periodic table? <ul style="list-style-type: none"> Use The Periodic Table to identify elements, their symbols and their number of protons, neutrons and electrons Recognise elements 1-20 of the periodic table by analysing a simple Bohr's diagram of protons, neutrons and electrons. 	<p>Learning Sequence 1:</p> <ul style="list-style-type: none"> What is an atom? <ul style="list-style-type: none"> Define matter and atoms Describe the structure of atoms in terms of protons, neutrons and electrons. Compare the mass and charge of protons, neutrons and electrons Describe the overall neutrality of elemental atoms using protons, neutrons and electrons (EXTENSION) Draw a simple Bohr's diagram of elements 1-20 (EXTENSION) How do I use the periodic table? <ul style="list-style-type: none"> Use The Periodic Table to identify elements, their symbols and their number of protons, neutrons and electrons Recognise elements 1-20 of the periodic table by analysing a simple Bohr's diagram of protons, neutrons and electrons.
<p>Learning Thru Reading – Magnet Summaries</p>			
<p>Text: OBI-9</p>			
<p>p. 39 Rutherford's model of the atom</p>			
<p>p. 40-41 Atoms and their masses</p>			
<p>p. 44-45 Arranging Electrons</p>			
2	<p>Learning Sequence 1:</p> <ul style="list-style-type: none"> What is an atom? <ul style="list-style-type: none"> Define matter and atoms Describe the structure of atoms in terms of protons, neutrons and electrons. Compare the mass and charge of protons, neutrons and electrons Describe the overall neutrality of elemental atoms using protons, neutrons and electrons (EXTENSION) Draw a simple Bohr's diagram of elements 1-20 (EXTENSION) How do I use the periodic table? <ul style="list-style-type: none"> Use The Periodic Table to identify elements, their symbols and their number of protons, neutrons and electrons 	<p>Learning Sequence 2:</p> <ul style="list-style-type: none"> How do humans know the structure of atoms? <ul style="list-style-type: none"> Compare given atomic models of Democritus, Dalton, JJ Thompson and Rutherford over time. (Bohr is extension) Compare testable hypotheses vs reason-based logical analysis (EXTENSION) Describe the technologies JJ Thompson and Rutherford (provided in stimulus) were used to advance human's understanding of the atom. Compare testable hypotheses (Dalton, JJ Thompson and Rutherford) vs reason-based logical analysis (Democritus) (EXTENSION) 	<p>Learning Sequence 2:</p> <ul style="list-style-type: none"> How do humans know the structure of atoms? <ul style="list-style-type: none"> Compare given atomic models of Democritus, Dalton, JJ Thompson and Rutherford over time. (Bohr is extension) Compare testable hypotheses vs reason-based logical analysis (EXTENSION) Describe the technologies JJ Thompson and Rutherford (provided in stimulus) were used to advance human's understanding of the atom. Compare testable hypotheses (Dalton, JJ Thompson and Rutherford) vs reason-based logical analysis (Democritus) (EXTENSION)

	<ul style="list-style-type: none"> ✓ Recognise elements 1-20 of the periodic table by analysing a simple Bohr's diagram of protons, neutrons and electrons. 		
		Learning through Reading	
3	Learning Sequence 3: <ul style="list-style-type: none"> • What are molecules and compounds? <ul style="list-style-type: none"> ✓ Define molecules and compounds ✓ Compare molecules/compounds with elemental atoms ✓ Determine the elements and their number making up molecule and compound chemical formula ✓ Define chemical bonds as the attraction between two atoms (ALL) caused by one atom sharing, taking or giving electrons with another atom (EXTENSION) ✓ Define chemical energy as the energy stored in the chemical bonds of molecules and compounds 	Learning Sequence 3: <ul style="list-style-type: none"> • What are molecules and compounds? <ul style="list-style-type: none"> ✓ Define molecules and compounds ✓ Compare molecules/compounds with elemental atoms ✓ Determine the elements and their number making up molecule and compound chemical formula ✓ Define chemical bonds as the attraction between two atoms (ALL) caused by one atom sharing, taking or giving electrons with another atom (EXTENSION) ✓ Define chemical energy as the energy stored in the chemical bonds of molecules and compounds 	Learning sequence 4 <ul style="list-style-type: none"> • What is a chemical reaction? <ul style="list-style-type: none"> ✓ Compare physical change and chemical change ✓ Define chemical reaction, reactant and product ✓ Identify the reactant and products in a word equation (ALL) and in a chemical formula equation (EXTENSION) ✓ Describe chemical reactions using word equations, including combustion and acid-metal reactions. ✓ Recognise that mass is not created nor destroyed during a chemical reaction (Conservation of Mass) ✓ Recognise formula chemical equations have the same elements and number in reactants and products –following the Conservation of Mass Law (EXTENSION)
	Learning through Reading and Data		Learning through Doing
4 Mon- PH	Formative and Student Reflection– C standard only Correct in class Collect – put in port folio Learning sequence 4 <ul style="list-style-type: none"> • What is a chemical reaction? <ul style="list-style-type: none"> ✓ Compare physical change and chemical change ✓ Define chemical reaction, reactant and product ✓ Identify the reactant and products in a word equation (ALL) and in a chemical formula equation (EXTENSION) ✓ Describe chemical reactions using word equations, including combustion and acid-metal reactions. 	Reteach, Revise or Extend Differentiate based on your students and their results.	Reteach, Revise or Extend Differentiate based on your students and their results. You may want to retest with Formative as an exit pass to inform your teaching for the following lesson.

	<ul style="list-style-type: none"> ✓ Recognise that mass is not created nor destroyed during a chemical reaction (Conservation of Mass) ✓ Recognise formula chemical equations have the same elements and number in reactants and products –following the Conservation of Mass Law (EXTENSION) 		
5 EXAM	Reteach, Revise or Extend	Exam part 1 Science Understanding	Exam part 2 (30 minutes) Human as Science endeavour - stimulus
6	<p>Learning sequence 5 <i>What is an exothermic reaction?</i></p> <ul style="list-style-type: none"> ✓ Recall heat and temperature ✓ Define chemical bonds as the attraction between two atoms (ALL) caused by one atom sharing, taking or giving electrons with another atom (EXTENSION) ✓ Define chemical energy as the energy stored in the chemical bonds of molecules and compounds ✓ Explain the energy transfer process of exothermic chemical reactions, including acid-metal reactions <p><i>How do I design experiments about exothermic reactions?</i></p> <ul style="list-style-type: none"> ✓ Identify the independent and dependent variables of an investigation to formulate a hypothesis. ✓ Formulate a research question from a hypothesis. ✓ Use given algorithms to process raw data <ul style="list-style-type: none"> a. Central tendency: Mean, median, mode b. Variance (precision): range, standard deviation (EXTENSION) c. Variance (accuracy): Mean absolute deviation ✓ Analyse experimental data to <ul style="list-style-type: none"> a. Describe trends, patterns and relationships 	<p>Learning sequence 5 <i>What is an exothermic reaction?</i></p> <ul style="list-style-type: none"> ✓ Recall heat and temperature ✓ Define chemical bonds as the attraction between two atoms (ALL) caused by one atom sharing, taking or giving electrons with another atom (EXTENSION) ✓ Define chemical energy as the energy stored in the chemical bonds of molecules and compounds ✓ Explain the energy transfer process of exothermic chemical reactions, including acid-metal reactions <p><i>How do I design experiments about exothermic reactions?</i></p> <ul style="list-style-type: none"> ✓ Identify the independent and dependent variables of an investigation to formulate a hypothesis. ✓ Formulate a research question from a hypothesis. ✓ Use given algorithms to process raw data <ul style="list-style-type: none"> d. Central tendency: Mean, median, mode e. Variance (precision): range, standard deviation (EXTENSION) f. Variance (accuracy): Mean absolute deviation ✓ Analyse experimental data to <ul style="list-style-type: none"> c. Describe trends, patterns and relationships 	<p>Learning sequence 5 <i>What is an exothermic reaction?</i></p> <ul style="list-style-type: none"> ✓ Recall heat and temperature ✓ Define chemical bonds as the attraction between two atoms (ALL) caused by one atom sharing, taking or giving electrons with another atom (EXTENSION) ✓ Define chemical energy as the energy stored in the chemical bonds of molecules and compounds ✓ Explain the energy transfer process of exothermic chemical reactions, including acid-metal reactions <p><i>How do I design experiments about exothermic reactions?</i></p> <ul style="list-style-type: none"> ✓ Identify the independent and dependent variables of an investigation to formulate a hypothesis. ✓ Formulate a research question from a hypothesis. ✓ Use given algorithms to process raw data <ul style="list-style-type: none"> g. Central tendency: Mean, median, mode h. Variance (precision): range, standard deviation (EXTENSION) i. Variance (accuracy): Mean absolute deviation ✓ Analyse experimental data to <ul style="list-style-type: none"> e. Describe trends, patterns and relationships f. Identify and describe inconsistencies in results

	<p>b. Identify and describe inconsistencies in results</p> <ul style="list-style-type: none"> ✓ Interpret data to draw conclusions ✓ Identify systematic and random errors. ✓ Use identification of systematic and random errors, to suggest ways improvement the experiment to collect more precise and accurate data. 	<p>d. Identify and describe inconsistencies in results</p> <ul style="list-style-type: none"> ✓ Interpret data to draw conclusions ✓ Identify systematic and random errors. ✓ Use identification of systematic and random errors, to suggest ways improvement the experiment to collect more precise and accurate data. 	<ul style="list-style-type: none"> ✓ Interpret data to draw conclusions ✓ Identify systematic and random errors. ✓ Use identification of systematic and random errors, to suggest ways improvement the experiment to collect more precise and accurate data.
	<p>Learning through Doing Learning through Data</p>		
7 EXPERIMENT HANDOUT	<p>Assessment – Day 1 Student Experimental Report</p>	<p>Assessment – Day 2 Student Experimental Report</p>	<p>Assessment – Day 3 Student Experimental Report</p>
8 DRAFT	<p>Assessment – Day 4 Student Experimental Report</p> <p>Drafting of rational, research question, modifications and extensions due</p>	<p>Assessment – Day 5 Student Experimental Report</p>	<p>Assessment – Day Student Experimental Report</p> <p>Draft due (data analysis and interpretation, evaluation, conclusion & referencing)</p>
9	<p>Assessment – Day 6</p>	<p>Assessment – Day 7</p>	<p>Assessment – Day 8</p>

	Student Experimental Report	Student Experimental Report	Student Experimental Report
10 EXPERI MENT DUE	Assessment – Day 10 Student Experimental Report Submission	Radioactivity SHE	Radioactivity SHE

Chemical process that we will focus on are:

C-level

Atoms are the results of the attraction of negative electrons and positive protons

Atoms (of elements) can bond together to form new substance

Chemical reactions involves the breaking of bonds of molecules and compounds, rearranging atoms, and forming new molecules and compounds.

A-level (EXTENSION)

Electrons are arranged in shells around the nucleus of an atom (2, 8, 8)

Atoms can share or give and take electrons to form bonds to create a new substance

Chemical reactions follow the Law of Conservation of Mass

Resources:

- <https://learningplace.eq.edu.au/cx/resources/items/e69b5750-3d2f-2b6f-e8dc-6610d4d0a83a/4/ViewIMS.jsp>
- <https://learningplace.eq.edu.au/cx/resources/items/f9c58e38-da5c-43e8-b125-caccb284c2c6/3/viewIMS.jsp>
- <https://www.youtube.com/watch?v=Uy0m7jnyv6U> <https://www.youtube.com/watch?v=zUDDiWtFtEM>
- <https://www.youtube.com/watch?v=fPnwBITSmgU>
- <http://periodictable.com/index.html>
- <http://www.rsc.org/education/teachers/resources/ptdata/games/findelement.htm>
- https://learningplace.eq.edu.au/cx/resources/items/168c79e2-a81a-49aa-8d5d-399c09a65813/0/Sci_Y09_U7_SS_ChemicalFormulas.pptx
- https://learningplace.eq.edu.au/cx/resources/items/8aabdacf6-98fa-445a-9152-60e4355786d6/0/Sci_Y09_U7_SS_ChemicalReactionsandWordEquations.pptx
- https://learningplace.eq.edu.au/cx/resources/logon.do?.page=https://learningplace.eq.edu.au/cx/resources/items/b1431dae-235b-41b1-ac94-45494af09a7c/0/Sci_Y09_U7_ILM_SS_ChemicalFormulae.ppsx
- <https://learningplace.eq.edu.au/cx/resources/items/5003c030-5d24-8792-c477-c011d30a411c/1/viewIMS.jsp> <http://www.wikihow.com/Write-a-Chemical-Equation>
- <http://education.jlab.org/elementbalancing/>
- <https://learningplace.eq.edu.au/cx/resources/items/3d28707a-5c65-4e51-a6fd-55ce9fa84f65/8/viewIMS.jsp>
- <https://learningplace.eq.edu.au/cx/resources/items/47861f28-84ce-e057-3be7-d9e67a4b4d5f/8/viewIMS.jsp>
- <https://learningplace.eq.edu.au/cx/resources/items/5626ed94-805d-8cae-9d48-57a86e7c3e4b/2/viewIMS.jsp>
- <https://learningplace.eq.edu.au/cx/resources/items/e943f44a-efe1-d163-62fb-03665e07ceed/2/viewIMS.jsp>
- https://learningplace.eq.edu.au/cx/resources/items/fadc6b82-490a-44b3-a1e5-4fc2f3295322/0/Sci_Y09_U7_SS_AcidsBasespHScale.pptx
- <https://www.youtube.com/watch?v=ANi709MYnWg>
- <https://www.youtube.com/watch?v=liu5mcAA8pU>