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| **Rossmoyne Senior High School – Year 10 Science** **Term 1, 2018 – Chemical Sciences****Science Understanding:****The atomic structure and properties of elements are used to organise them in the Periodic Table** [**(ACSSU186)**](https://k10outline.scsa.wa.edu.au/home/teaching/codes/science/year-10/acssu186)Elaborations:* Recognising that elements in the same group of the periodic table have similar properties
* Describing the structure of atoms in terms of electron shells
* Explaining how the electronic structure of an atom determines its position in the periodic table and its properties
* Investigating the chemical activity of metals

**Different types of chemical reactions are used to produce a range of products and can occur at different rates** [**(ACSSU187)**](https://k10outline.scsa.wa.edu.au/home/teaching/codes/science/year-10/acssu187)Elaborations:* Investigating how chemistry can be used to produce a range of useful substances such as fuels, metals and pharmaceuticals
* Predicting the products of different types of simple chemical reactions
* Using word or symbol equations to represent chemical reactions
* Investigating the effect of a range of factors, such as temperature and catalysts, on the rate of chemical reactions

***Science as a Human Endeavour:******Scientific understanding, including models and theories, is contestable and is refined over time through a process of review by the scientific community*** [***(ACSHE191)***](http://www.australiancurriculum.edu.au/Curriculum/ContentDescription/ACSSU185)*Elaborations:** *Investigating the development of the periodic table and how this was dependent on experimental evidence at the time*

***People use scientific knowledge to evaluate whether they accept claims, explanations or predictions, and advances in science can affect people’s lives, including generating new career opportunities*** [***(ACSHE194)***](http://www.australiancurriculum.edu.au/Curriculum/ContentDescription/ACSSU185)*Elaborations:** *Predicting future applications of aspects of nanotechnology on people’s lives*
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| **Week** | **Objectives** | **Resources** | **Assessments** |
| **1** | **Atoms and Ions:*** Compare charge and mass for protons, neutrons, and electrons
* Describe the composition of the nucleus and outer region
* Define and show an understanding of Atomic number and Mass number.
* Use  notation to compare the composition of various atoms and isotope
* Compare the structure of an atom and its ion by considering the number of subatomic particles and electronic configuration using the 2,8,8 model
* Relates electron configuration shells and valence electrons to position in the table
 | **Oxford Science 10**Chap. 3.2**Introductory Chemistry Study Guide**Chap. 1Chap. 2Labs: Oxford Online & Shared Drive |  |
| **2** | **Elements:*** describe trends in reactivity across periods and groups
* Show an understand of this idea by classifying elements as metallic or non-metallic according to their valency
* Differentiate between metals and non-metal elements:

Consider physical properties such as: appearance, conductivity, malleability, and ductility, position in the periodic table, ion charge, i.e. only metal elements form positive (exceptions H+, NH4+), non-metals atoms form negative ions* Describe the metallic bond and explain the physical properties of metals conductivity and malleability in terms of their bonding
 | **Oxford Science 10**Chap. 3.3Chap. 3.4Chap. 3.7**Introductory Chemistry Study Guide**Chap. 3Labs: Oxford Online & Shared Drive |  |
| **3** | **Ionic Compounds:*** Shows an understanding that ionic compounds consist of a combustion of metal elements (or NH4+) and non-metal elements, i.e. identify ionic compounds from their chemical formula.
* Show an understanding of the electron transfer between metal and non-metal elements during the formation of ionic compounds.
* Describe the lattice structure of ionic compounds and relate this to their properties including: hardness, strength, conductivity, melting point, and boiling point
* Show an understanding that ionic compounds will be more stable than the elements from which they form because the attraction between opposite charged ions in the ionic lattice.
* Explain in terms of ionic bonding the following properties of ionic compounds: brittle, non-conductors as solid, conductors in solution
* Draw representations of ionic compounds using electron dot diagrams *(which show negative ions in brackets with a charge and a full valence shell, and separate from the positive ions)*
* Write balanced formula for ionic compounds using the following valencies: (Students need to know these valencies).

H+, Na+, Mg2+, Al3+, K+, Ca2+, Cu2+, Zn2+, Ag+, Pb2+, Br-, I-, S2-, Cl-, O2-,F -, OH-, NO3-, CO32-, SO42-, NH4+, Fe2+, Fe3+, Ba2+, HCO3-, PO43-, CH3COO- | **Oxford Science 10**Chap. 3.5**Introductory Chemistry Study Guide**Chap. 3Chap. 4Labs: Oxford Online & Shared Drive |  |
| **4** | **Covalent molecular substances:*** Show an understanding that covalent molecular substances (elements of compounds) consist of a combination of non-metal atoms only, i.e. identify covalent molecular substances from their formula. *(at this stage students not expected to know covalent network exceptions)*
* Describe covalent bonding between a pair of atoms in terms of a sharing of electrons.
* Use electron dot diagram to represent simple singly bonded molecules
* Describe the structure of a molecule in terms of two or more non-metal atoms covalently bonded in a single entity.
* Compare the electrical conductivity of molecular solutions with ionic solutions
* Describe the structure of covalent molecular substances as consisting of a large number of molecules with very little attraction between the molecules.
* Know the names and formulas for the following covalently bonded elements and compounds:

N2, O2, F2, Cl2, Br2, I2, H2O, CO2, CO, NO2, SO2, SO3, HNO3, HCl, H2SO4, H3PO4, CH3COOH | **Oxford Science 10**Chap. 3.6**Introductory Chemistry Study Guide**Chap. 3Chap. 4 |  |
| **5** | **Solutions:*** Define the terms: soluble, insoluble, solute, solvent, and solution.
* Show an understanding of the dissolving process for a soluble ionic compound.
* Know the concentration of a solution can be expressed in mol L-1. (*the general idea of concentration – no calculations)*
* Demonstrate an awareness of the independent nature of ions in an ionic solution.
* Use a table of solubilities to predict the solubility of various ionic compounds.
* Use a table of solubilities to predict the formation of precipitate when two ionic solutions are mixed.
 | **Oxford Science 10**Chap. 4.3**Introductory Chemistry Study Guide**Chap. 6Chap. 7 |  |
| **6 + 7** | **Reactions:*** Define an acid as a substance that produces H+ ions in solution and define a base as a substance that produces OH- ions in solution.
* Know the formula and name of the acids: H2SO4, H2CO3, HNO3, HCl, H3PO4, CH3COOH.
* Know the formula and name of some common bases.
* Know the general reaction types and associated observations:

*acid + metal → salt + hydrogen gas**acid + carbonate→ salt + water + carbon dioxide gas**acid + base (metal hydroxide) → salt + water* *acid + base 🡪 salt + water**acid + hydrogen carbonate→ salt + water + carbon dioxide gas**heat**carbonate → metal oxide + carbon dioxide gas**heat**hydrogencarbonate → metal carbonate + water + carbon dioxide gas**metal + oxygen → metal oxide**non-metal + oxygen → non-metal oxide** Use coefficients to balance a partially completed equations (given formula)
* Write balanced equation and word equation.
* Predict the formula of the products or reactants for the above reaction types given either the reactant or products.

Write the balanced equations for the above reaction types given the formula and names of the reactants | **Oxford Science 10**Chap. 4.2Chap 4.4**Introductory Chemistry Study Guide**Chap. 6Chap. 7 | **Test 1****(Tues Week 6)***Assesses Weeks 1-5* |
| **8** | **Reactions:*** Describe the Collision Theory
* Describe the following factors that affect reaction rates:
	+ Nature of reactants
	+ Surface area of reactants
	+ Action of a catalyst
	+ Temperature of reactants
	+ Concentration of reactants
* Basic awareness of nanotechnology

***Investigating Skills*** | **Oxford Science 10**Chap. 4.6Chap 4.7Chap 3.8**Introductory Chemistry Study Guide**Chap. 6 | **CAT: Reactions****(Tues Week 8)** |
| **9 + 10** | **Mole:*** Define and locate (from a periodic table) the atomic mass of the elements
* Define the mole in terms of Avogadro’s number of particles
* Use the relationship No. of particles = n x 6.02 x 1023 to convert between numbers and moles
* Determine the Molar mass of a substance given its formula
* Calculate the moles of a substances from its mass using n = m / M
* Use the coefficients in a balanced chemical equation to write the mole relationship for the molar amounts of any two substances appearing in a balanced chemical equation.
* Perform calculations on equations relating the amounts of any two substances. Types of calculations:
	+ *Mole to mole*
 |  | **Investigation: Factors affecting Reaction Rates** |
| **11** | *After test begin Biology course* |  | **Test 2****(Tues Week 11)** |