**Stage 1 Chemistry Teaching and Learning Program 3**

Semester One Articulates with LAP 03

**Environmental Resources**

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| Week | Understandings | Teaching Strategies | Assessment |
| 1 – 2 | * 1. Properties and uses of materials | What type of materials do we extract from the environment?  **Metals, Salt, Sand, Gemstones, Water, Petroleum**  For each discuss the properties of the material and how they relate to its uses.  **SIS – Design practical activity**:  Investigate the most effective material from which to make coffee cups.  Compare the size of atoms with nanoparticles.  **SHE**  How do silver nanoparticles acts as antimicrobial agents?  <https://australianmining.com.au/news/silver-nanoparticles-could-pose-future-environmental-threat-2/> <https://australianmining.com.au/features/silver-in-technology-infographic/> <http://iopscience.iop.org/article/10.1088/2043-6262/4/3/033001> <http://www.rsc.org/chemistryworld/2016/04/smart-bandage-press-antibacterial-antibiotic>  What are the benefits and risks of using silver nanoparticles rather than larger particles in medical applications?  Discuss the monitoring and assessment carried out by scientists and evaluate the risk posed by using nanoparticles. | Formative design task  Formative SHE task |
| 3 | * 1. Atomic Structure   1.4 The Periodic Table | Examine the structure of atoms and their electrons, and the relationship between electronic configuration and position in PT.  **SHE** Discuss the evidence that has led to the development of our current understanding of atomic structure.  **SIS** Use flame tests to identify metallic elements.  Note trends in elements down groups and across periods.  Observe the trend in reactivity of group I metals:  <https://www.youtube.com/watch?v=HvVUtpdK7xw>  Discuss the adequacy of the safety precautions shown in this demonstration:  <https://www.youtube.com/watch?v=RAFcZo8dTcU>  Radioisotopes have a variety of applications.  Uses of radioisotopes in mining <http://www.ansto.gov.au/NuclearFacts/BenefitsofNuclearScience/MiningandMinerals/>  **SHE** Should South Australia have a nuclear waste storage site? | Formative exercises on atomic structure, electronic configuration, PT |
| 4 | * 1. Quantities of atoms | **How do we use chemicals from the environment?**  Atomic mass, moles, mass calculations.  Calculate the mass in g and the number of moles of Na reacting in this demonstration: <https://www.youtube.com/watch?v=MTcgo46nxNE>  The question natural vs synthetic compounds.  What type of salt is best? <http://www.theecologist.org/green_green_living/health_and_beauty/270993/what_type_of_salt_is_best.html>  The case of dihydrogen monoxide  Can any chemical be poisonous? Discuss LD50 for different substances.  <http://whs.rocklinusd.org/documents/Science/Lethal_Dose_Table.pdf> | Formative calculations of moles,  Formative class presentation on findings. |
| 5 – 6 | 2.1: Types of materials | **SIS** Test the electrical conductivity of various substances to classify them as metallic, ionic, covalent network, or molecular.  Relate properties of materials to structure type.  Use of sodium and potassium ions in conducting nervous impulses in the body.  Use of copper in electrical wires and aluminium in saucepans.  Use of molecular liquids in as fuels.  Use of diamond in jewellery and drill bits.  Uses of silica <http://www.crystallinesilica.eu/13-what-are-main-uses-silica>  Why is silica gel often coloured pink? **SIS** Investigate water of crystallisation | **SHE**  Investigate the development of widespread uses of silica gel since World War I. |
| 6 – 7 | 2.2 Bonding between atoms  1.1 Discuss separation of substances on the basis of evaporation. | **Salt**  Why is salt crystalline?  **SIS** Practical activity – Make plasticine models of ionic lattices.  How is salt produced from seawater?  Other salts: | Formative exercises: writing electronic configuration of ions, ionic formulae, determining structure from properties |
| 8 | 2.3 Quantities of molecules and ions | Demonstration – fill measuring cylinders with one mole of a substance eg salt, zinc, glucose, sulfur,  Calculate moles of water, salt, glucose. | Formative calculations of moles, percentage composition by mass |
| 8 – 9 | 2.2 Bonding between atoms | **Metals**  Why are metals malleable and ductile?  **SIS** Practical activity – Use a bubble-raft or ball bearings to model a metallic lattice.  Investigate alloys, for example in F1 car wheels.  Investigate why carbon fibre has replaced metal in the construction of F1 cars: formula1.about.com/od/car1/a/carbon\_fiber.htm | Formative revision questions on topics 1 and 2 |
| 10 – 11 | 2.2 Bonding between atoms  3.1 Molecule polarity | **Water**  Why is water so important for the functioning of our bodies?  Discuss molecular shape and polarity.  Practical demonstration – detection of charged particles in streams of water, hexane and methanol from burettes.  **SIS** Practical activity – make 3D models of molecules using different types/colours of lollies to represent atoms and toothpicks. | **SAT**  Short answer questions on concepts from topics 1 and 2, including a practical component on structure types, under teacher supervision. |
| 11 – 12 | 3.2 Interactions between molecules | Why does water have a relatively high boiling point for its size?  The physical properties of molecular substances can be explained by considering the nature and strength of the forces of attraction between the molecules.  Compare the boiling points of water, ammonia and methane. | Formative questions on molecular shape and polarity.  Formative investigation: why does water expand when cooled below 4°C. |
| 12 | 4.3: Quantities in reactions | Calculate concentration of aqueous solutions in g L-1 and mol l-1 | Formative concentration calculations |
| 13 – 14 | 4.1 Highly polar molecular substances are more soluble in water than nonpolar molecules of a similar size. | Why does ethanol dissolve in water but petrol does not?  Discuss miscibility of polar and non-polar substances  Practical activity: make a sample of cold cream. | **Design practical investigation**  Is cold cream a more effective cleanser than soap? |
| 14 | 1.1 Discuss separation of substances on the basis of polarity | **Extraction of resources**  **SHE** Discuss how the use of new technology in the mining industry, hydrophilic and hydrophobic nanoparticles for froth flotation, has improved the efficiency of metal extraction from ores:  <http://www.mining.com/scientists-discover-new-flotation-method-using-nanoparticles/> |  |
| 15 – 16 | 3.3 Hydrocarbons | Structure and naming of hydrocarbons.  Practical demonstration – fractional distillation of petroleum and testing of fractions for odour, viscosity and flammability.  Combustion reactions of hydrocarbons. Combustion of glucose in respiration.  **SIS** Investigate factors affecting the rate of photosynthesis. Design an experiment to test one independent variable. Comment on how  **SIS** Produce a sample of ethanol using fermentation and distillation.  Discuss properties and uses of petroleum products.  Other organic compounds. | Formative exercises on naming, structural formulae of hydrocarbons and writing combustion equations.  Formative investigation –produce an annotated photographic display explaining the effect of changing one variable on the rate of photosynthesis. |
| 17 – 18 | 3.4 Polymers | Why are plastics used for many consumer products often very flexible?  Addition polymers such as polyethene, PVC and Perspex.  **SIS** Practical activity – use model kits to join ethene monomers to form 2 long chains of polyethene. Demonstrate intertwined chains.  **SHE**  Discuss the economic, social and environmental considerations for producing polymers, for packaging materials, from renewable materials. | **SAT -**  Chemical structure, properties and uses of one or more polymers.  Evaluation of advantages and disadvantages of using petroleum products to manufacture polymer materials. |