**Course Structure in S1 Science**

After an initial introduction to science, S1 learners will follow three 10 week rotations (Biology, Chemistry and Physics). During this time learners will be involved in a range of activities designed to help them explore the outcomes below.

Learners will have the opportunity to sit 2 problem solving tests (no studying required as this is skills based), 1 investigation relating to the topic and 1 end of topic test. Learners should be encouraged to study regularly in preparation for the end of topic test which will occur in week 10 of any rotation.

Towards the end of S1 learners will have an S1 exam. This covers all core knowledge listed below.

**S1 Biology**

**Core Outcomes Level 3**

**I have explored the structure and function of organs and organ systems and can relate this to the basic biological processes required to sustain life. SCN 3-12a**

**Explores and explains the structure and function of at least three of the major organ systems, for example, Respiratory, Circulatory, Digestive, Excretory, Reproductive and Skeletal, and relates this to the basic biological processes required to sustain life.**

Circulatory system

* The heart pumps blood around the body
* The left side of the heart pumps blood with oxygen to the body cells
* The right side of the heart pumps blood without oxygen to the lungs
* Arteries carry blood containing oxygen away from the heart (one exception to this is the pulmonary artery, but this does not need to be mentioned at this stage)
* Veins carry blood containing carbon dioxide and no oxygen to the heart (one exception to this is the pulmonary vein, but this does not need to be mentioned at this stage)
* Capillaries connect arteries to veins and allow exchange of gases between the blood and our body cells
* The blood drops off CO2 and picks up O2 at the lungs
* The blood drops off O2 and picks up CO2 at the body cells
* Our pulse rate increase with exercise – this is so that the blood travels faster to the lungs to pick up oxygen and drop off CO2 and to the body cells to drop off oxygen and pick up CO2
* Only our arteries have a pulse
* The blood drops off urea at the kidneys
* The blood picks up digested food at the small intestine

Respiritory System

* Label parts of breathing system - windpipe, lungs, diaphragm, ribs
* State functions of:
  + windpipe – to bring air to the lungs,
  + lungs - bring oxygen into our blood and take carbon dioxide out of our blood.
  + diaphragm - when we breathe in our diaphragm moves down and our rib cage moves up and out. This draws the air into our lungs. when we breathe out our diaphragm moves up and the rib cage moves down and in, forcing air out of the lungs.
  + ribs – protect our lungs and heart
  + air sacs – to increase the surface area of lungs and so aid gas exchange
* Exercise increases our breathing rate and depth – this brings more oxygen into our blood to be carried to the body cells that need it, and gets rid of CO2 that is released by our body cells.
* Label additional parts - bronchi, bronchioles

Digestive system

* The following organs aid digestion: mouth, oesophagus (gullet), stomach, small intestine, large intestine, rectum, and anus.
* Digestion is needed to break down large food molecules into smaller molecules that can be absorbed by the gut wall and dissolve in the blood.
* Enzymes are chemicals produced by our bodies which help break down food, e.g. the enzyme salivary amylase is produced by the salivary glands in the mouth.

**SCN I have explored the role of technology in monitoring health and improving the quality of life 3-12b**

* Name technology used to monitor temperature, heart rate, blood pressure, peak flow & body fat
* Identify advantages and disadvantages for both types of technology
* Explain how monitoring aspects of health can improve quality of life

Reproductive System

* The female sex cell is the egg
* The male sex cell as the sperm
* fertilisation takes place when the nuclei of the egg and sperm fuse
* internal takes place inside the body of the female, and external fertilisation takes place outside the body of the female
* fertilisation takes place in the oviduct of the female
* the fertilised egg cells multiply resulting in an embryo
* label a diagram and describe the functions of the following parts of the female reproductive system - ovary, oviduct, uterus, cervix, vagina
* label a diagram and describe the functions of the following parts of the male reproductive system penis, sperm duct, testis, prostate gland
* Be able to say that the gestation (pregnancy) period for a human is 40 weeks
* State that the placenta allows oxygen and glucose to pass from the mother to the foetus
* State that the placenta allows wastes and carbon dioxide to pass from the foetus to the mother
* Know that the foetus is attached to the placenta by the umbilical cord
* State that the blood supply of the mother and foetus never mix
* the amnion protects the developing baby again bumps
* Identify the foetus, amniotic sac, placenta, umbilical cord
* Identify possible risks to the developing embryo and ways to avoid them
* I can research a named risk and describe its impact on embryonic development.
* substances cross the placenta from the mother to the foetus

**SCN I have extracted DNA and understand its function. I can express an informed view of the risks and benefits of DNA profiling.**

* Extract DNA
* Explain the function of DNA
* Describe DNA profiling
* Express an informed opinion on the benefits of DNA profiling

**S1 Chemistry**

**Matter**

***By contributing to experiments and investigations, I can develop my understanding of models   
of matter and can apply this to changes of state and the energy involved as they occur in nature. SCN 3-05a***

* ***Describes, using particle models and diagrams, the properties of solids, liquids and gases and applies this knowledge to identify and classify unknown substances.***
* ***Applies understanding of models of matter to explain changes of state in terms of energy being gained or lost by a substance.***

Pupils should be able to -

* Draw particle arrangements for solids, liquids and gases
* Explain particle movement in solids, liquids and gases.
* Explain how the arrangement and movement of particles gives rise to the shape and volume of substances.
* Explain change in state in terms of energy change.
* Apply this knowledge to identify and classify unknown substances.

**Atoms, Elements and The Periodic Table**

**I have developed my knowledge of the Periodic Table by considering the properties and uses of a variety of elements relative to their positions.**

**SCN 3-15a**

* **Investigates and describes properties of metals and non-metals, for example, appearance, conductivity of electricity, position in the Periodic Table and their uses linked to their properties.**
* **Knows that elements are organised in the Periodic Table by atomic number, each with its own unique symbol, and that elements with similar chemical properties are placed together in vertical groups.**
* **Identifies and names the groups ‘alkali metals’, ‘halogens’ and ‘noble gases’ and describes their reactivity.**

**Atoms & The Periodic Table**

* Identify atoms as the smallest particles.
* State that elements are made up of only one type of atom
* Identify a diagram of an element from a number of options.
* Explain that all elements are listed in the Periodic Table by atomic number.
* Know that each element has its own unique symbol.
* Define the terms groups and periods.
* Recognise that elements in the same group have similar chemical properties.
* Classify elements as metals and non-metals
* Describe properties of metals and non-metals.
* Name groups 1 (alkali metals), 7 (halogens) and 8 (noble gases)

***Chemical Reactions***

**Through experimentation, I can identify indicators of chemical reactions having occurred. (S2 - I can describe ways of controlling the rate of reactions and can relate my findings to the world around me.) SCN 3-19a**

* **Identifies indicators of chemical reactions such as colour change, precipitate formation, release of gas, and/or a detectable energy change.**

Learners need to be able to:

* recognise that a chemical reaction has taken place
* understand the difference between chemical and physical changes
* describe a chemical reaction using word equations

***Compounds***

**Having contributed to a variety of practical activities to make and break down compounds, I can describe examples of how the properties of compounds are different from their constituent elements. SCN 3-15b**

**• Investigates and describes at least two examples of compounds with properties that are different from their constituent elements, for example, hydrogen explosion and electrolysis of water.**

**• Constructs names of two-element compounds which are derived from the names of the elements, from which it is formed, with a suffix of-ide.**

**• Constructs word equations for simple reactions, for example, carbon reacting with oxygen:**

**carbon + oxygen 🡪 carbon dioxide.**

Learners need to be able to:

* State that the properties of a compound are different from those of the elements that are in it.
* Give examples of compounds having different properties to the elements that are in it.
* The elements in a compound are hard to separate

***Mixtures***

**I can differentiate between pure substances and mixtures in common use and can select appropriate physical methods for separating mixtures into their components. SCN 3-16a**

**• Identifies elements present from simple molecular formulae.**

**• Gives examples of pure substances and mixtures from everyday life.**

**• Selects appropriate physical methods to separate mixtures into their components, for example, distillation, filtration and chromatography and justifies their choices.**

Learners need to be able to:

* Identify the properties of a mixture and a pure substance.
* State that the properties of a mixture are different from those of a pure substance
* Understand or reinforce the difference between a pure substance and a mixture
* State by example how mixtures can be separated e.g. filtration, distillation, and chromatography.
* Describe how solids of different sizes can be separated.

***Solutions***

**I have taken part in practical investigations into solubility using different solvents and can apply what I have learned to solve every-day practical problems. SCN 3-16b**

**• Investigates and describes the solubility of substances in different solvents, for example, water and acetone/propanone.**

**• Explains the link between the relative quantity of solute or solvent and changes in the concentration of a solution.**

Learners need to be able to:

* Define the terms soluble, insoluble, solute, solvent and solution.
* Recognise when a solute has dissolved, this should include coloured compounds.
* Define the term ‘saturated solution’
* Explain how relative changes in quantity of solute or solvent changes concentration, define a measure of concentration as g/cm3
* Use knowledge of solvents to solve every-day practical problems
* Show by investigation how temperature affects solubility. (choice for investigation work)

**S1 Physics**

**Light**

**By exploring the refraction of light when passed through different materials, lenses and prisms, I can explain how light can be used in a variety of applications**. **SCN 3-11a**

**• Demonstrates through practical investigation how refraction can cause a change of direction of light as it passes from one**

**material to another.**

**• Describes the practical applications of refraction in everyday situations, for example, in corrective lenses in glasses, and in**

**magnifying glasses and optical instruments.**

**• Explains how a visible spectrum is produced as light passes through a prism.**

Learners need to be able to:

* Correctly apply appropriate vocabulary to descriptions of **reflection** of light
* State that the line drawn at 90 degrees to the reflecting surface is called the *normal* line.
* State that when light is reflected from a flat (plane) surface then the *angle of incidence* is equal to the *angle of reflection*.
* Describe practical applications of **refraction.**
* Explain that light **refracts** (bends) when it enters a denser medium *because the light slows down*.
* State that this results in the light bending towards the normal going from air to glass and away from the normal going from glass to air.
* Label on a diagram the normal, angle of incidence and angle of refraction.
* Explain and trace the path of light through a rectangular glass block.
* State that white light is dispersed into colours as it refracts through a prism and trace this path giving the correct order of the colours.
* State that a convex lens converges parallel rays, whereas a concave lens diverges parallel rays.
* Trace rays of light through convex and concave lenses including thick and thin convex lenses.
* Explain various applications of refraction of light.

**Electromagnetic Spectrum**

**By exploring radiations beyond the visible, I can describe a selected application, discussing the advantages and limitations.**

**SCN 3-11b**

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| **• Describes the electromagnetic spectrum as a family of waves including Gamma Rays, X-Rays, Ultraviolet, Visible Light,**  **Infrared, Microwaves, Television and Radio.**  **• Researches at least one application of an electromagnetic wave beyond the visible in everyday life, giving advantages and**  **limitations of that application.** |

Learners need to be able to:

* List the regions of the electromagnetic spectrum in order.
* List the colours of visible light in order.
* Know that equipment exists that allows us to detect these radiations and give details for at least one named radiation.
* Give an example of a use for chosen radiation/s.

In addition to this they should know:

**Infrared**

* State that infrared radiation comes from warm objects.

**Microwaves**

* State that microwave radiation is used for communication by mobile phone networks.
* Correctly identify materials that would absorb microwaves.

**Radio**

* State that radio waves are used in communication and are made as a result of electrical activity.
* State that radio waves can only be detected by radio receivers with aerials.
* State that radio waves cannot pass through metal.

**Ultraviolet**

* State that ultraviolet radiation is itself invisible, but can make certain chemicals fluoresce (glow).
* Explain why overexposure to ultraviolet radiation from the sun can be harmful, and suggest steps to take to prevent damage occurring.

**X-rays**

* State that X-rays are invisible and can be detected using photographic film.
* Explain how an X-ray picture is formed in a medical situation.
* State that X-rays can damage our bodies.

**Gamma radiation**

* State that gamma radiation is invisible and can be detected using a Geiger-Muller tube (Geiger counter).
* Explain why care must be taken in the building and siting of nuclear power stations.