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**Knowledge Rich Curriculum Plan**

SCIENCE- Physics Year 10

| **Lesson/Learning Sequence**  | **Intended Knowledge:***Students will know that…* | **Prior Knowledge:***In order to know this, students need to already know that…* | **Working Scientifically** | **Tiered Vocabulary and Reading Activity** |
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| **Lesson:** **Density** | * Students will know that density is defined by the equation:

density = mass ÷ volume* Students will know that the units of density are kilograms per metre cubed
* Students will know how to recognise/ draw particle diagrams for solids, liquids and gases
* Students will know that generally solids are more dense than liquids, which are more dense than gases
* Students will know how to explain the differences in density of substances using the particle model

Students will know how to explain the differences in density between different states of matters in terms of the arrangement of atoms or molecules. | * ***Students need to already know that density is a measure of how the amount of mass a substance has in a given volume***
* ***Students need to already know that the units of volume are metres cubed***
* ***Students need to already know that particle diagrams can be used to represent solids, liquids and gases***

***Students need to already know that the units of mass are kilograms*** |  | Tier 2Tier 3 Density: a measurement of mass per unit volume |
| **Lesson:** **Density required practical** | * Students will know how to practically measure the density of a regular shape

Students will know how to practically measure the density of an irregular shape | * ***Students need to already know that a balance is used to measure mass***
* ***Students need to already know how to calculate volume of shapes***

***Students need to already know how to measure volumes of liquids*** | Measuring mass and volumeRecording data accurately. | Tier 2Tier 3Density: a measurement of mass per unit volume |
| **Lesson:** **Changes of State** | * Students will know that when a substance changes state, mass is conserved
* Students will know that changes of state are physical changes, which differ from chemical changes because the material recovers its original properties if the change is reversed
* Students will know that the energy is stored inside a system by the particles, and that this energy is called internal energy
* Students will know that internal energy is the total kinetic energy and potential energy of all the particles that make up a system

Students will know that heating changes the energy stored within the system by increasing the energy of the particles that make up the system. This change will either raise the temperature of the system or produce a change of state | * ***Students need to already know that:***
* ***melting: solid --> liquid***
* ***freezing: liquid --> solid***
* ***Evaporate: liquid --> gas***
* ***Condense: gas --> liquid***

***Sublimate: solid --> gas*** |  | Tier 2**Volume:** The amount of space that a substance or object occupies measured in mm3, cm3 or m3.Tier 3**Mass:** The sum total of all the particles within an object or substance measured in g or kg.**Density:** a measurement of mass per unit volume |
| **Lesson:** **Temperature changes in a system** | * Students will know that the increase in temperature within a system depends on the mass of the substance heated and the type of material
* Students will know how to use the equation:
* change in thermal energy = mass x specific heat capacity x temperature change
* Students will know that the unit of specific heat capacity is J/ kg degrees celsius
* Students will know that the symbol for specific heat capacity is c
* Students will know that the symbol for temperature change is Δθ
* Students will know that the symbol for change in thermal energy is ΔE
* Students will know how specific heat capacity can be practically determined for both solids and liquids
* Students will know that the specific heat capacity of a substance is the amount of energy required to raise the temperature of one kilogram of the substance by one degree Celsius

Students will know how to use the change in thermal energy equation | * ***Students need to already know that the unit of energy is joules, J***

***Students need to already know that the unit of mass is kilograms, kg*** |  | Tier 2Tier 3 |
| **Lesson:** **Changes of state and specific latent heat** | * Students will know that the energy needed for a substance to change state without increasing the temperature is called the "latent heat"
* Students will know that the specific latent heat of a substance is the amount of energy required to change the state of one kilogram of the substance without changing the temperature
* Students will know that the symbol for specific latent heat is L
* Students will know that the unit for specific latent heat is joules per kilogram, J/kg
* Students will know that specific latent heat of fusion refers to the change of state from solid to liquid
* Students will know that the specific latent heat of vaporisation refers to the change of state from liquid to vapour.
* Students will know how to use the equation:

Energy for a change of state = mass x specific latent heatE = m L* Students will know how to interpret heating and cooling graphs that include changes of state

Students will know how to distinguish between specific heat capacity and specific latent heat | * ***Students need to already know that energy is measured in joules, J***

***Students need to already know that mass is measured in kilograms, kg*** |  | Tier 2Compressed: squashedTier 3**Internal Energy:** The energy stored within a system by the particles. Internal energy = kinetic energy + potential energy**System:** a portion of the Universe that is being studied for the changes that take place within it. |
| **Lesson:** **Particle Motion in Gases** | * Students will know that the molecules of a gas are in constant random motion
* Students will know that the temperature of a gas is related to the average kinetic energy of the molecules of the gas.
* Students will know that changing the temperature of a gas at constant volume will change the pressure exerted by the gas.
* Students will know how to explain the motion of the molecules in a gas relating it to the temperature and the pressure

Students will know how to explain qualitatively the relation between temperature and pressure (at constant volume) | ***Students need to already know that the particles in a gas are able to move freely within their container.*** |  | Tier 2**Random**: Happening without method or conscious decisionTier 3**Pressure:** continuous physical force exerted on or against an object by something in contact with it |
| **Lesson:** **Pressure in gases (Triple only)** | * Students will know that gases can be compressed or expanded by pressure changes.
* Students will know that gas pressure produces a net force at right angles to the wall of the container.
* Students will know how to use the particle model to explain how increasing the volume (at constant temperature) can decrease the pressure.
* Students will know that for a mixed mass of gas at constant **temperature**:

pressure x volume = constantp V = constant* Students will know that the unit for pressure is pascals, Pa
* Students will know that work is the transfer of energy by a force
* Students will know that doing work on a gas increases the internal energy of the gas, leading to an increase in the temperature of the gas
* Students will know how to use the equation:

pressure x volume = constant | ***Students need to already know that the particles in a gas are able to move freely within their container.*** |  | Tier 2Tier 3**Pressure:** continuous physical force exerted on or against an object by something in contact with it |