**SACE Stage 1 Physics Program 3 – Topics 1, 2, 3**

This program articulates with LAP 3

| **Week** | **Topic** | **Science Understanding and Activities** |
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| **Linear Motion and Forces** | | |
| 1 | Vectors and Scalars | * Compare vector and scalar quantities   + <https://phet.colorado.edu/en/simulation/legacy/maze-game> * SI units and unit conversions * Discuss different systems of measurement and issues that arise when they are mixed (SHE) |
| 1 | Constant velocity | * Speed and velocity * Calculate velocity using equations and graphical means (SIS)   + <https://phet.colorado.edu/en/simulation/legacy/moving-man>   + Motion sensors (SIS) – practise using and also discuss influence of technology advancements on measurement accuracy (SHE) * Instantaneous and average velocity |
| 2 | Acceleration | * Calculate acceleration using equations and graphical means (SIS)   + <https://phet.colorado.edu/en/simulation/legacy/moving-man>   + Motion sensors – compare accuracy of radar and laser speed guns detecting vehicle speed (SH) |
| 2-3 | Motion under constant acceleration | * Equations of motion * Acceleration due to gravity   + Determine acceleration due to gravity experimentally (SIS) * Rearranging equations |
| 4-5 | Newton’s Laws of Motion | * Introduce Newton’s Laws of Motion   + Investigate Newton’s Laws experimentally (SIS)   + <https://phet.colorado.edu/en/simulations/category/physics/motion> * Friction (SHE) * Discuss common advantages and limitations * Work out how to test different lubricants for effectiveness (SIS) |
| 6 | **SHE Task** | * Transport   Investigate development of types of transport |
| 7 | **SAT** | * Motion and forces test |
| **Electrical Circuits** | | |
| 8 | Electrical Charge | * Charge and forces between charged objects   + van der Graaff generator * Conductors and Insulators (SHE)   + Discuss changing types of home insulation over time.   + Work out an advisory pamphlet for home owners (e.g. cost, environment, effectiveness) |
| 9 | Current and Potential | * Electrical Current * Potential difference   + <https://phet.colorado.edu/en/simulations/category/physics/electricity-magnets-and-circuits> |
| 9 | Resistance | * Ohm’s Law   Discuss factors affecting resistance hence use of different conductoring materials for different purposes |
| 10 | Circuits | * Using multimeters (SIS) * Analysing series and parallel circuits   + Construct and analyse circuits (SIS)   + Work out appropriate circuit design for a floor plan * Ohmic and non-ohmic conductors |
| 11 | **Practical Investigation** | * Ohmic and non-ohmic conductors   Design investigation to determine different types of conductors |
| 12 | Power | * Power * Power and energy units   + Home energy audit kit (SHE)   + Debate compulsory power shutdowns during extremely hot weather to conserve energy |
| **Heat** | | |
| 13 | Heat Energy and Temperature | * Temperature (Particle model) * Heat Energy   + Eureka! Heat video series (available on YouTube) |
| 13 | Heat transfer | * Heat (flow and equilibrium) * Conduction   + Investigate conduction of heat through various metals (SIS/SHE) Work out how this can be done. Discuss practical applications * Convection   + Demonstrate convection using permanganate crystals (SIS)   + Work out how to demonstrate convection currents in other contexts * Radiation (SHE) * Discuss problems of radiation during space travel |
| 14 | Thermal expansion | * Thermal expansion (Particle model)   + Demonstrate thermal expansion using ball and ring apparatus * Bimetallic strips and thermostats   + Investigate various metal combinations in bimetallic strips (SIS) |
| 15 | Heat Capacity | * Heat Capacity * Electrical heating (linking Electrical Circuits and Heat topic)   + Determine heat capacity of water using electric kettle (or calorimeter) (SIS) |
| 16 | **SAT** | * Electrical Circuits and Heat Energy Test |