**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
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| 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)
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| 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
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