**SACE Stage 1 Physics Program 4 – Single Semester Pre-trade**

This program articulates with LAP 4

| **Week** | **Topic** | **Science Understanding and Activities** |
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| **Motion, Force and Energy** | | |
| 1 | Quantities and units | * Explore various measurement units ***(SHE)*** |
| 1 | Velocity | * Constant velocity problems * Average and instantaneous velocity   + https://phet.colorado.edu/en/simulations/category/physics/motion |
| 2 | Acceleration | * Calculate acceleration * Discuss how car manufacturers quote acceleration ***(SHE)-*** consider the limitations of these specifications |
| 3-4 | Newton’s Laws of Motion | * Introduce Newton’s Laws of Motion and apply to vehicles and vehicle safety * Friction (including air resistance)   + Investigate Newton’s Laws using motion carts and appropriate technology. ***(SIS)*** |
| 5 | Work, energy and power | * Work and energy (focus on kinetic energy) * Power (focus on units W, kW and horse power) ***(SHE)*** |
| 6 | **SHE Task** | * Transport – online magazine article looking at the physics of one mode of transport and how it has changed over time. |
| 7 | **SAT** | * Motion, force and energy **SAT** |
| **Electrical Circuits** | | |
| 8 | Electrical Charge | * Charge and forces between charged objects   + van der Graaff generator * Conductors and Insulators ***(SHE)*** * Discuss uses, costs, appropriate types in different contexts * Pose scenarios to determine which to use |
| 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 |
| 10 | Circuits | * Using multimeters * Analysing series and parallel circuits ***(SIS)***   + Construct and analyse circuits ***(SIS)***   + Investigate and deconstruct the reasons for why homes have different electrical circuits - consider the limitations and risks of different circuits, and how new technologies such as smart home technology may change circuits in the future ***(SIS, SHE)*** * Ohmic and non-ohmic conductors |
| 11 | **Practical Investigation** | * Circuit Analysis |
| 12 | Electrical Power | * Electrical Power * Power and energy units   + Relate to power costs in the home   + Discuss power saving options |
| **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)*** * Convection   + Demonstrate convection using permanganate crystals   + Students experiment with other ways of demonstrating convention currents * Radiation ***(SHE)*** |
| 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)***   + Discuss the limitations of conclusions that could be drawn from this experiment. * Test and / or construct a thermostat |
| 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** | * Home Energy Audit   + Analyse home energy usage (Home Energy Audit kits available from most public libraries) |