Overall Expectations:

SIV.01 demonstrate scientific investigation skills (related to both inquiry and research) in the four areas of skills (initiating and planning, performing and recording, analysing and interpreting, and communicating);
ESV.01 analyse technologies that apply principles of and concepts related to energy transformations, and assess the technologies' social and environmental impact;
ESV.02 investigate energy transformations and the law of conservation of energy, and solve related problems;
ESV.03 demonstrate an understanding of work, efficiency, power, gravitational potential energy, kinetic energy, nuclear energy, and thermal energy and its transfer (heat).

Specific Expectations:

SI1.02 select appropriate instruments (e.g., probeware, calorimeters, pendulums, solenoids) and materials (e.g., drag sleds, electric bells, balls, ramps), and identify appropriate methods, techniques, and procedures, for each inquiry;
SI1.04 apply knowledge and understanding of safe laboratory practices and procedures when planning investigations by correctly interpreting Workplace Hazardous Materials Information System (WHMIS) symbols; by using appropriate techniques for handling and storing laboratory equipment and materials and disposing of laboratory materials; and by using appropriate personal protection;
SI1.05 conduct inquiries, controlling relevant variables, adapting or extending procedures as required, and using appropriate materials and equipment safely, accurately, and effectively, to collect observations and data;
SI1.06 compile accurate data from laboratory and other sources, and organize and record the data, using appropriate formats, including tables, flow charts, graphs, and/or diagrams;
SI1.08 synthesize, analyse, interpret, and evaluate qualitative and/or quantitative data; solve problems involving quantitative data; determine whether the evidence supports or refutes the initial prediction or hypothesis and whether it is consistent with scientific theory; identify sources of bias and/or error; and suggest improvements to the inquiry to reduce the likelihood of error;
SI1.11 communicate ideas, plans, procedures, results, and conclusions orally, in writing, and/or in electronic presentations, using appropriate language and a variety of formats (e.g., data tables, laboratory reports, presentations, debates, simulations, models);
SI1.12 use appropriate numeric (e.g., SI and imperial units), symbolic, and graphic modes of representation for qualitative and quantitative data (e.g., vector diagrams, free-body diagrams, algebraic equations);
SI1.13 express the results of any calculations involving data accurately and precisely, to the appropriate number of decimal places or significant figures;
ES1.01 analyse, using the principles of energy transformations, a technology that involves the transfer and transformation of thermal energy (e.g., a power station, an air conditioner, a fuel cell, a laser printer) [AI, C];
ES1.02 assess, on the basis of research, how technologies related to nuclear, thermal, or geothermal energy affect society and the environment (e.g., thermal regulating units,

radiopharmaceuticals, dry-steam power plants, ground-source heat pumps) [IP, PR, AI, C];
ES2.01 use appropriate terminology related to energy transformations, including, but not limited to: *mechanical energy*, *gravitational potential energy*, *kinetic energy*, *work*, *power*, *fission*, *fusion*, *heat*, *heat capacity*, *temperature*, and *latent heat* [C];
ES2.03 use the law of conservation of energy to solve problems in simple situations involving work, gravitational potential energy, kinetic energy, and thermal energy and its transfer (heat) [AI];
ES2.09 conduct an inquiry to determine the specific heat capacity of a single substance (e.g., aluminum, iron, brass) and of two substances when they are mixed together (e.g., the heat lost by a sample of hot water and the heat gained by a sample of cold water when the two samples are mixed together) [PR];
ES2.10 solve problems involving changes in temperature and changes of state, using algebraic equations (e.g., $Q = mc\Delta T$, $Q = mL_f$, $Q = mL_v$) [AI, C];
ES2.11 draw and analyse heating and cooling curves that show temperature changes and changes of state for various substances [AI, C];
ES3.03 explain the following concepts, giving examples of each, and identify their related units: *thermal energy*, *kinetic energy*, *gravitational potential energy*, *heat*, *specific heat capacity*, *specific latent heat*, *power*, and *efficiency*;
ES3.04 identify, qualitatively, the relationship between efficiency and thermal energy transfer;
ES3.07 explain, using the kinetic molecular theory, the energy transfer that occurs during changes of state;
ES3.08 distinguish between and provide examples of conduction, convection, and radiation.