Stage 1 Chemistry NAME_____

Practical Investigation: Heat energy from fuels

Phase 1: Design

Design an experiment to compare and calculate the heat energy released per gram for any four of the following fuels: almonds, walnuts, peanuts, macadamias, pistachios, kerosene, a tea candle, and methylated spirits. The kerosene and methylated spirits are in spirit burners.

The design should include the following sections:

- Aim
- Equipment
- Method (including diagrams)
- Results (an empty results table)

The design must be handed in for checking.

Phase 2: Report

After performing the experiment, you will need to write up the rest of the report:

- Results and Calculations (including graphs comparing the heat energy released per gram of each fuel)
- Manipulation and Collaboration (including care and safety precautions taken, and working together)
- Discussion (including any observations made during the experiment, discussions of possible sources of error, evaluation of the method and suggestions for improvements)
- Conclusion (including a decision about which fuels are 'better' and why)

Phase 3: Problem Solving

Two of the most prominent concerns about burning fuels for energy in society today are its cost and its effect on the environment (particularly carbon dioxide released). Consider the table of information below about ethanol and octane, two common fuels used in cars:

Fuel	**Density ($g\ L^{-1}$)**	**Energy per gram ($kJ\ g^{-1}$)**	**Energy per litre ($kJ\ L^{-1}$)**	**Molar mass ($g\ mol^{-1}$)**
Ethanol	785	29.5		46.068
Octane	698	47.9	33400	114.22

A. Using this information, show that the energy per litre of ethanol is approximately 23200 $kJ\ L^{-1}$

B. Explain which of the two fuels would be more economical if both sold for the same price per litre.

C. If each mole of ethanol burnt produces 2 moles of carbon dioxide, calculate the mass of carbon dioxide that would be produced from burning 10 g of ethanol.