CANADIAN INTERNATIONAL SCHOOL OF BEIJING 北京加拿大国际学校

Science Department

Name: …… Homeroom: ……

MYP Science 8 – How can you insulate heat most effectively?

Criteria B & C:	Inquiring & Designing Processing & Evaluating	**Maximum Total:**	8 marks
Key Concept:	Relationships	**Global Context:**	Fairness and development
Related Concepts:	Energy and Interaction		
Statement of Inquiry:	The relationship between energy and matter can be harnessed to impact human development.		

Your task:

- ★ **Goal**: your goal is to **design and evaluate an experiment** that tests a model of the **most efficient** heat insulation system (using a metal can). You must **outline** and **discuss** your experiment in a full written (typed) lab report.
- ★ **Role**: you are a scientist/engineer skilled in designing insulation systems
- ★ **Audience**: Ms. Malcolm and Can-Solair Inc. employees.

Situation: The owner of Can-Solair Inc., Ms. Malcolm, is asking for your help in improving their current heat insulator design. She believes that she is now spending too much money because her Soda Can Solar Heaters lose too much heat due to heat transfer to the air around them. Can you help her to create a more efficient way to insulate her solar heater cans? She wants a ***professional***, ***minimalist*** appearance, but still have great results! The cost is also very important to her, therefore she wants to use as few materials as possible, to keep the cost low.

Product:

Criterion B

- You must **design** an experiment to test **one factor** (your choice) that affects the efficiency of a solar heater.
  - You will test one **control group** (standard soda can) and two **experimental groups** (the factor you're testing changed in **two gradients**).
  - All groups will be heated using a heat lamp, and you will measure the amount of energy released from the can by measuring the temperature change over time.

- What **materials** and **lab equipment** do you need?
  - The options for materials are listed below. You may ask your teacher for permission to use other materials as well.

Available materials:

- Sand paper
- Scissors
- Stop watch
- Aluminum foil
- Paper
- Plastic Wrap
- Yarn/ String
- Rubber balloons
- Temperature probe / Thermometer
- You can provide your own material(s)
  - ★ You will be building your solar heater – keep this in mind when creating your *Materials and Equipment List* and *Procedure*.

- **Questions to consider while you design your heater.**
  - Which type of metal is the can made of?
  - Which style of can should we use (large/small or wide/thin)?
  - Will the original colour of the can affect the results?
  - Is the appearance of the cans reflective or non-reflective?
  - Can we cut any other holes in the can? Will that affect the outcome?
  - Should we consider using aluminum foil or another material to wrap the can?
  - If we use a material to cover the can, does it matter which side faces outwards?
  - What **other variables** may change your results and **how** will you **control** them?

DUE DATE FOR CRITERION B: _____

❑ My teacher has approved of my design in Criterion B. I can now move on to Criterion C!

Criterion C

- You will test your control group, and then build your solar heater model!
- Design a data table and conduct your experiment (control group and experimental groups) to **collect data**.
- Analyze your findings (average calculations and a graph), and write a Conclusion and an Evaluation.
- **Document** all your sources using MLA format in a Works Cited page.

★ You may use the Science Lab Write-up templates, Conclusion and Evaluation templates, and checklists on Moodle to help you.

★ You will be working **independently.**

This assessment involves scientific research within a **given context** (be sure to use the "**Situation**" description on the first page). You need to evaluate your solar heater model in relation to the expectations Ms. Malcolm and Can-Solair Inc. have of you.

DUE DATE FOR CRITERION C (Final Copy of Report): _____

Standards for success: your lab report will be assessed using Criterion B: *Inquiring and designing*, Criterion C: *processing and evaluating*, and Criterion D: *Reflecting on the Impacts of Science*

Schedule:

❑ Complete the Criterion B *design plan*: introduction and research question, hypothesis, variables, groups, materials, safety, and procedure.

❑ Build your solar heater.

❑ Conduct and evaluate the experiment: observations, analysis, conclusion, and evaluation.

❑ Proof-read your work for proper tense, voice, and structure

❑ *Document* all your sources using MLA format in a Works Cited page at the end of your report.

Please see criteria B, C, and D rubrics for more guidance