SCIENCE **Sound & Light** **Solar Cooker Guidelines** (4/19)

What: Solar Cookers (See video on Light page of my website for past designs.)

Who: All Monsoons (alone, in pairs, or in trios)

When: Work is to be completed at home. Cookers will be due in late May or early June. **Exact date is dependent on weather.** There is no room in our classroom for student cookers. **You may bring them in to test them, but must take them home the same day!**

Why: This is the central activity for our Sound & Light unit. Students must **apply their knowledge** of energy transfer to build a successful cooker. The cooker (product) is only one part of this performance assessment. **The main objective is being able to explain how a solar cooker works**, even if yours does not heat up that much.

Details: The goal is to heat up a space as much as possible. Cookers will be placed outside in the sun before A period. Students will cook s'mores at the end of that day! Infrared (IR) thermometers will measure the temperatures in the cooking space of all cookers. Temperatures will be recorded by students during each science period. The cooking space needs to be at least 10 cm x 10 cm x 5 cm (deep) to hold the s'mores. The IR thermometers give ***inaccurate readings off shiny materials***, so keep that in mind when designing your cooking space.

Design Logs: Each student (group) is expected to build and test **at least 2** different cooker designs between now and the due date. Students must complete **two design** logs. (I give out the logs in class, but extras may be printed from the Light page of my website.)

Initial Design Log (all individual): Students will have one week (with a weekend) to turn in.

Re-Design Log (individual or with partners): Students will have another week (with weekend) to turn in.

Note: Teachers will point out to students the weather and which days look most conducive for collecting data. Due dates can be changed if weather does not cooperate.

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Judging quality of cooker: Students should use some method to measure the effectiveness of their cookers. Examples could be a thermometer, ice cube melting rate, or Hershey Kiss softening/melting time. You should find a measurement method **not** based on your opinion.

Safety considerations: Magnifying glasses and concave mirrors (shaped like bowl) can focus sunlight, causing fires. For this reason, **magnifying glasses and concave mirrors may not** be part of the solar cooker design. In addition, solar cookers **should be placed on non-flammable surfaces** during testing (i.e. paved driveway rather than grass).

Jobs to do.

1. Arrange partners (or work alone)

2. Decide what cooker will be made of. Try using recycled materials/containers (i.e. about to be thrown away). You need not spend any money on this project.

3. Build and test your cookers, and fill out your initial and your re-design logs. **Due dates for these logs are to be determined.**

4. Decide on final cooker design. Bring cooker to class by due date (**to be determined**).

Suggestions:

Your initial design log may be one small part of the cooker—perhaps just the cooking space. See how fast you can melt an ice cube. Change ONE variable and see if this improves your design. Better yet, ask your parents to buy you some Hershey's kisses. At room temperature they are too solid to stick a toothpick into. Place a kiss in your cooker for a specific amount of time, and see if you can stick a toothpick into it. Compare different designs. **Your re-design log must be for a complete cooker.**

Do an internet search for solar cookers. In addition to researching building plans, search for "how solar cookers work". You need to know HOW a solar cooker

works. There is no shortage of information on-line. Try different sites, some are much clearer than others. **(If you have trouble accessing the internet at home, you may go to the library before or after school or use my computer at lunch.)**

Question: When you first try your cookers outside in the sun, you will likely encounter two problems. Hint: If you never account for one of the problems, your cooker will probably interfere with others on the final outdoor "test" day. **Pay attention to the weather forecast and take advantage of any warm sunny days!**

Competencies and Transfer Goals:

- **Properties of Energy:** Identify specific types of energy in everyday situations and explain that energy can change forms.
- **Process Skills and Practices:** Students can analyze and interpret data.

Additional Knowledge and Skills:

- Students can control variables in an experiment and can measure accurately.
- Students can recognize variables beyond their control and apply that information to their project.

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Specific content and skills on which students will be evaluated:

- Student can explain **energy transfer** in Solar Cooker
- Student can explain how light is **reflected** and what materials allow this in their Solar Cooker
- Students can explain how light is **absorbed** and what materials allow this in their Solar Cooker
- Students can explain how light is **transmitted** and what materials allow this in their Solar Cooker
- Students can **analyze** and **interpret** data

Scoring Rubric 1-3

1: Students show no understanding.

2. Students show some understanding, but not completely, consistently or independently.

3. Students show complete, consistent understanding independently.