

Summative: Matter and Energy & Earth and Space Systems

Pure Substances and Mixtures & Heat in the Environment

Overall Expectation(s): Demonstrate an understanding of the properties of pure substances and mixtures, and describe these characteristics using the particle theory (7s41); *Demonstrate an understanding of heat as a form of energy that is associated with the movement of particles and is essential to many processes within the earth's systems (7s62).*

Option 1: Insulation Chamber

Goal: To design a working model of an Insulation Chamber. (Keeping Cold in – Keeping Hot Out)

You are required to design and build a container which will keep an ice cube from melting for the longest time.

Insulation Chamber Components:

- Model chamber will be used to keep an ice cube from melting, which will be given to you on the test day.
- Success will be measured by the degree to which the ice cube is prevented from melting.

Option 2: A Solar Cooker - Can you cook a marshmallow just using the power of the Sun.

(<http://www.solarcooking.org/plans/>)

Goal: To design and construct a working model of a Solar Cooking Device that will cook a marshmallow.

Solar Cooker Components:

- Model cooker will be used to cook a marshmallow, which will be given to you on the test day.
- No other heat source can be used to cook your marshmallow.
- Success will be measured by the degree to which the marshmallow is cooked.

Materials: Choice of materials is up to you.

Size Restrictions: Solar cooker must not exceed 50cm² base and 30cm in height.

Testing: You will be given a regular size ice cube/ marshmallow to place into your container. Its mass will be recorded. It will then be left for approximately 2 hours, opened and the mass of the remaining ice cube will be measured.

Assessment Strategy/Tool(s):

Model (60%) & Presentation (40%) - Self-Evaluation (10%), Peer-Evaluation (10%), Teacher-Evaluation (20%)

	Level 4	Level 3	Level 2	Level 1
Understanding the Insulation Chamber/Solar Cooker proposal and planning its design	demonstrates a thorough understanding of the problem - identifies and incorporates all predetermined criteria - plan demonstrates a thorough understanding of the process of heat transfer	demonstrates a general understanding of the problem - identifies and incorporates most of the predetermined criteria - plan demonstrates a good understanding of the process of heat transfer	- demonstrates a partial understanding of the problem - identifies and incorporates some of the predetermined criteria - plan demonstrates a partial understanding of the process of heat transfer	demonstrates limited understanding of the problem - identifies and incorporates a few of predetermined criteria - plan demonstrates a limited understanding of the process of heat transfer
Building the Insulation Chamber/Solar Cooker and performing testing	selects appropriate materials and adapts it to enhance performance - makes necessary modifications based on trial testing and justifies choices - records accurate results that are detailed and relevant and follows all of the given criteria	selects appropriate materials to enhance performance - makes adequate modifications based on trial testing - records results that demonstrate general accuracy and follows most of the given criteria	selects appropriate materials - makes some modifications based on trial testing - records results that demonstrate some accuracy and follows some of the given criteria	selects limited appropriate materials - makes a few modifications based on trial testing - records results with limited accuracy, following a few of the given criteria
Interpreting results and how they relate to the Insulation Chamber/Solar Cooker	choice of materials and reasoning behind choices explained with justifications in detail - interprets the results and thoroughly relates them to the effectiveness of the Insulation Chamber/A Solar Cooker - result tables/graphs demonstrate precision, accuracy & clarity and are well organized	choice of materials and reasoning behind choices explained with general justifications - interprets most of the results and how they relate to the effectiveness of the Insulation Chamber/A Solar Cooker - result tables/graphs demonstrate general accuracy & clarity	choice of materials and reasoning behind choices explained with general justifications - interprets most of the results and how they relate to the effectiveness of the Insulation Chamber/A Solar Cooker - result tables/graphs demonstrate general accuracy & clarity	choice of materials and reasoning behind choices explained without justifications - interprets a few results and how they relate to the effectiveness of Insulation Chamber/A Solar Cooker - result tables/graphs demonstrate limited accuracy & clarity
Presentation of the Insulation Chamber/Solar Cooker	identifies and convincingly explains factors that make their product marketable - written proposal including journal entries and oral presentation, including responses to questions, demonstrates thoroughness and clarity with detailed supporting evidence of the process	identifies and explains most factors that make their product marketable - written proposal including journal entries and oral presentation, including responses to questions, demonstrates clarity and most of the supporting evidence of the process is presented	identifies and explains some factors that make their product marketable - written proposal including journal entries and oral presentation, including responses to questions, demonstrates some clarity and some supporting evidence of process is presented	identifies and explains a few factors that make their product marketable - written proposal including journal entries and oral presentation, including responses to questions, demonstrates limited clarity and supporting evidence