

Oh, to not have an atmosphere!

There is no atmosphere on the Moon, so temperatures fluctuate through a very wide range. In the shadowed areas of the moon, the temperature can be as low as -180°C (or -300°F), and in the sunlit areas, it is about 100°C (or 212°F), which is the boiling point for water! These are serious extremes for human beings! Furthermore, there are spots on the Moon that are permanently exposed to the Sun, and others permanently in shadow. It is in the permanently shadowed areas of some craters that scientists believe water ice may exist.

Protecting Ourselves

Anyone living on the Moon - even for a short while - will have to deal with this temperature variation and be protected properly from its damaging effects. Just think about the number of layers you wear when going outside on a very cold winter's day. The goal in designing a space suit is to create protective layers to keep a human body at a fairly constant temperature. Therefore, we must understand how heat moves. We need to design protective wear to prevent heat from being transferred to, or transferred away, from our bodies. How could we **insulate** ourselves from the wide variations of temperature in the lunar environment?

THE CHALLENGE:

Your mission is to design a “Lunar Thermos” – a protective insulator for a cup of warm water. You must also conduct an experiment to compare your insulated cups to unprotected cups set up by your teacher. The design constraints are:

- 1. Use any combination of materials available to you to create a protective insulating layer to keep 100 ml of warm tap water at a relatively constant temperature.*
- 2. Your “Lunar Thermos” temperatures should change by no more than 3 °C over 5 minutes.*

DESIGN challenge

To design an insulator for a cup of warm water to maintain water temperature relatively constant. To apply the understanding of how things get warmer and cooler heat transfer.

Design
a Lunar Thermos
Student page

ASK IMAGINE & PLAN

Draw a picture of a warm human standing on the Moon in the cold, lunar night. In your picture, show how heat moves between the human and the air around him or her. Make sure to label the arrows warm and cool.



Now imagine that the sun comes up, and the human is standing on the hot lunar surface. Draw a picture showing how heat moves between the human and the air around him or her. Make sure to label the arrows warm and cool.



lunar thermos

Draw and label the materials you will use to build your Lunar Thermos.



lunar thermos

Approved by: _____

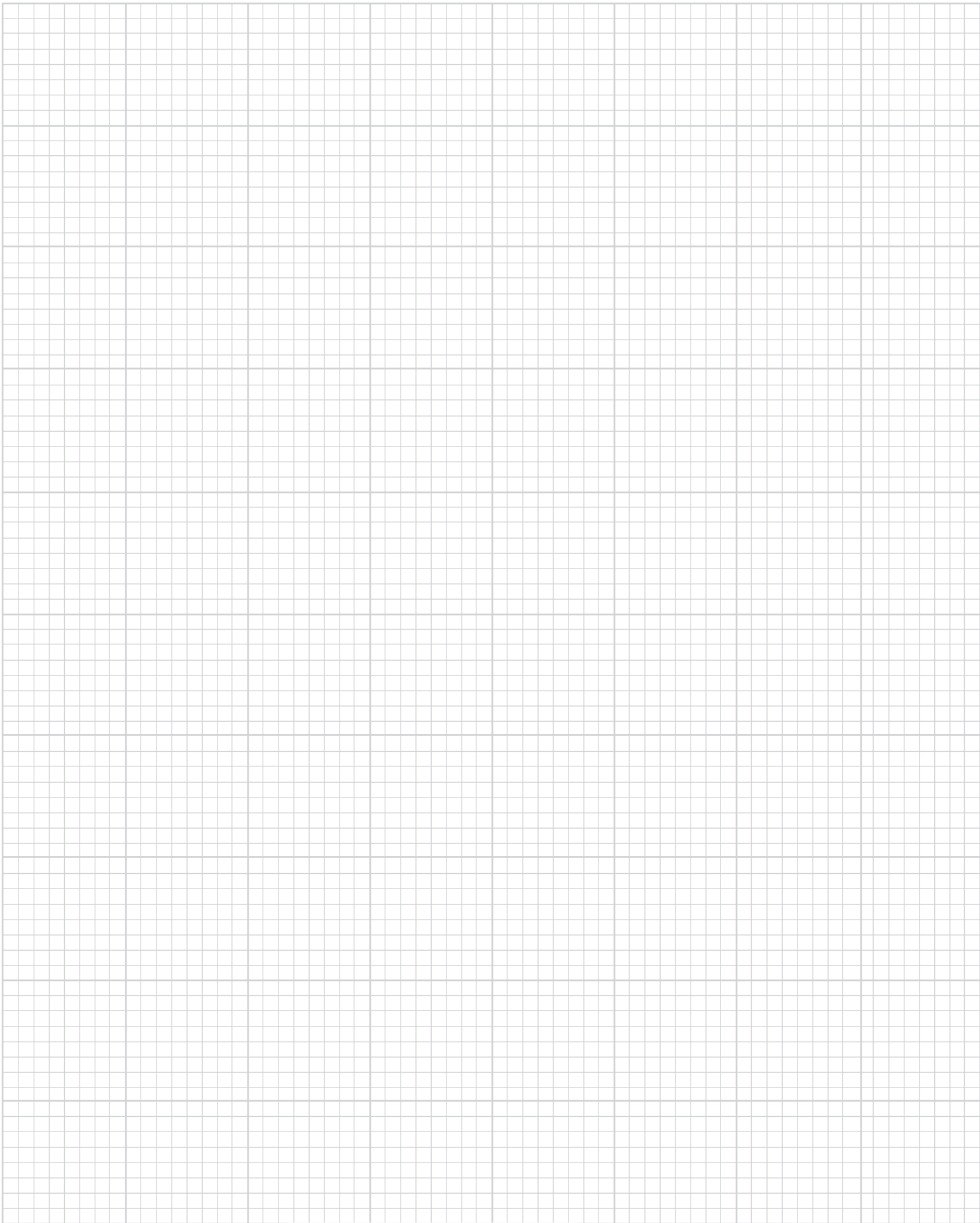
Experiment & Record

- 1. Collect necessary materials and create your Lunar Thermos.**
- 2. Using a graduated cylinder, collect 100 mL of warm tap water and pour it into your insulated plastic cup.**
- 3. Use a stopwatch to measure 30 seconds. Record the temperature of the water. Repeat until you reach 5 minutes total.**

Lunar Thermos Data Table

Time (Min:sec)	Water Temperature (°C)
0:00	
0:30	
1:00	
1:30	
2:00	
2:30	
3:00	
3:30	
4:00	
4:30	
5:00	

lunar thermos





Summer thermos

