

# Student's Learning Activities (Mouchot and solar cooker)

## Activity 1

You will watch a video with narration or listen to a story from your teacher about Augustin Mouchot and his work on the development of the solar ovens and the solar steam engines. Please write down the main points of the story, in your view, and discuss about them in your group. (Indicative important points of the story: the description of Mouchot's device for the exploitation of solar energy in order to solve his everyday needs for warm water, the description of Mouchot's solar steam engine for which he won the first prize in the 1878 Paris exhibition, the reasons that the French Government firstly started financing and then stopped financing the research of Mouchot, the way of Mouchot's life, his end,)
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1. Based on the story you heard from the narrator please record two reasons that led Mouchot to
search for devices utilizing solar energy.
2. Please discuss in your group the reasons for which the French Government firstly started financing and then stopped financing the research of Mouchot. Please write one reason for each case.

3.Please describe the device was built from Mouchot in order to solve his everyday needs for warm water.
4. Please describe the device built from Mouchot for which he won the first prize in the 1878 Paris exhibition. You have at your disposal the image from the following website from which you can get more information: <a href="http://landartgenerator.org/blagi/archives/2004">http://landartgenerator.org/blagi/archives/2004</a>





5. Pease discuss in your group about the advancement of science and the social, cultural and economic circumstances that prevail at that time. Please write down the view of your group.

## Activity 2

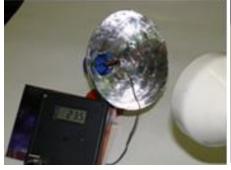
In this activity you are invited to experiment on the absorption of solar radiation. Let us try, to implement an experiment similar to that Mouchot implemented in his research. Because we are indoors, instead of solar radiation we will use the radiation of an electric bulb.

#### Materials:

- A heat sensor with a glass cover and a digital thermometer or, if there is not any, we can use a metallic thermometer.
- A radiation collector in the form of concave mirror made of aluminum.
- •An electric bulb.

#### Experimental procedure:

- a) Please place the tip of the thermometer at the focus of the concave mirror.
- b) Place the electric bulb at 20 cm distance from the tip of the thermometer.
- c) Set the electric bulb to radiate for 10 minutes.
- d) Record temperature changes in Table 1.



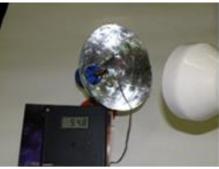


Table 1

Take the temperature every 2 minutes





Time (min)	Temperature (in ° C)
0	
2	
4	
6	
8	
10	

1.Please explain:
a. the raise of the temperature at the focal point.
b. the placement of the tip of the thermometer at the focal point of the concave mirror.
2. Make a graph: temperature against time and from that find the raise of the temperature for the time interval $6^{th}$ min $8^{th}$ min.
3. Based on the images below (these are solar ovens of modern technology)





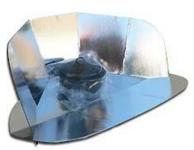








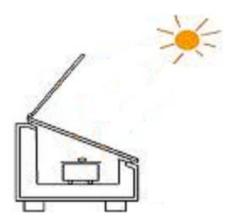








5. In the diagram below draw the angle of incidence and the angle of reflection. This will enable you to explain the principles of operation of the solar oven.



### Activity 3

The experimentations so far will help you understand the operation of Mouchot's steam engine.

1. Please watch the video in the following link for solar steam engine:

http://www.youtube.com/watch?v=jTvAL7ty53M&feature=player\_embedded#at=23 Based on your observations please compare the operating principles of solar steam engine with those of solar ovens.

Write the further principles of function for the solar ovens and the solar steam engines.

Activity 4





1. Please discuss in your group the difference between a renewable source of energy and a conventional one and indicate two sources of energy from each category.
2.Please argue in your group about the reasons for which the future of our society depends on the renewable energy sources and not on the conventional ones. Please write a text of 1000 characters to support this statement referring to three such reasons.

## Activity 5

Using the list of ideas that describe the characteristics of science and the ways it develops, try to locate and write these ideas in the story you heard and the activities of lesson. These ideas that scientists call Nature of Science (Nature Of Science-NOS-) are:

Characteristics of Nature of Science (NOS)

- **1.** Science demands and relies on empirical evidence
- **2.** Knowledge production in science includes many common features and shared habits of mind.
- **3.** Scientific knowledge is tentative but durable.





- **4.** Laws and theories are related but distinct kinds of scientific knowledge.
- **5.** Science is a highly creative endeavor.
- **6.** Science has a subjective element.
- 7. There are historical, cultural, and social influences on science.
- **8.** Science and technology impact each other, but they are not the same.
- **9.** Science and its methods cannot answer all questions.

Scientists argue that in order to learn science one must first understand what exactly science is Because it is difficult to define science, scientists give a list of its characteristics.		

#### Activity 6

Constructing solar ovens using the project approach.

- A) The Students of the class form groups, following criteria on which they have agreed upon in advance. In order to construct solar ovens using different patterns and simple materials, they collect information from different sources, such as, photos, texts, newspapers, websites, etc. The solar ovens will be used for their families' summer camping holidays.
- B) They look for ways to compare measure of efficiency of their constructions (e.g. use thermometers to measure the temperature inside the ovens, to measure the time needed to heat of a certain quantity of water to a certain temperature, melting a block of ice, etc.).
- C) A time period of 5-6 weeks is necessary for the implementation of the project.
- D) Students argue about the differences of efficiency of their solar ovens. An organization of an exhibition with the solar ovens will be a very good motivation event.



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