

Curved mirrors

Team «5th Lyceum».

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3. Invent Yourself: Curved mirrors.

Investigate the difference of the ways of heating and cooling of physical bodies with the help of curved mirrors. How to impact on the speed of heating.

AIM OF THE WORK:

Study the way of heating or cooling of objects using concave mirrors.

Tasks of the work:

- ❖ To investigate the change of the temperature near the focus of the mirror under the influence of the Sun
- ❖ To study the influence of light filters on change in the rate of heating
- ❖ To Find out the possibility of paper fire with the help of such mirrors
- ❖ To Put forward a hypothesis and prove it with the experiment
- ❖ To investigate the change of the temperature near the focus of the mirror under the influence of the cold body

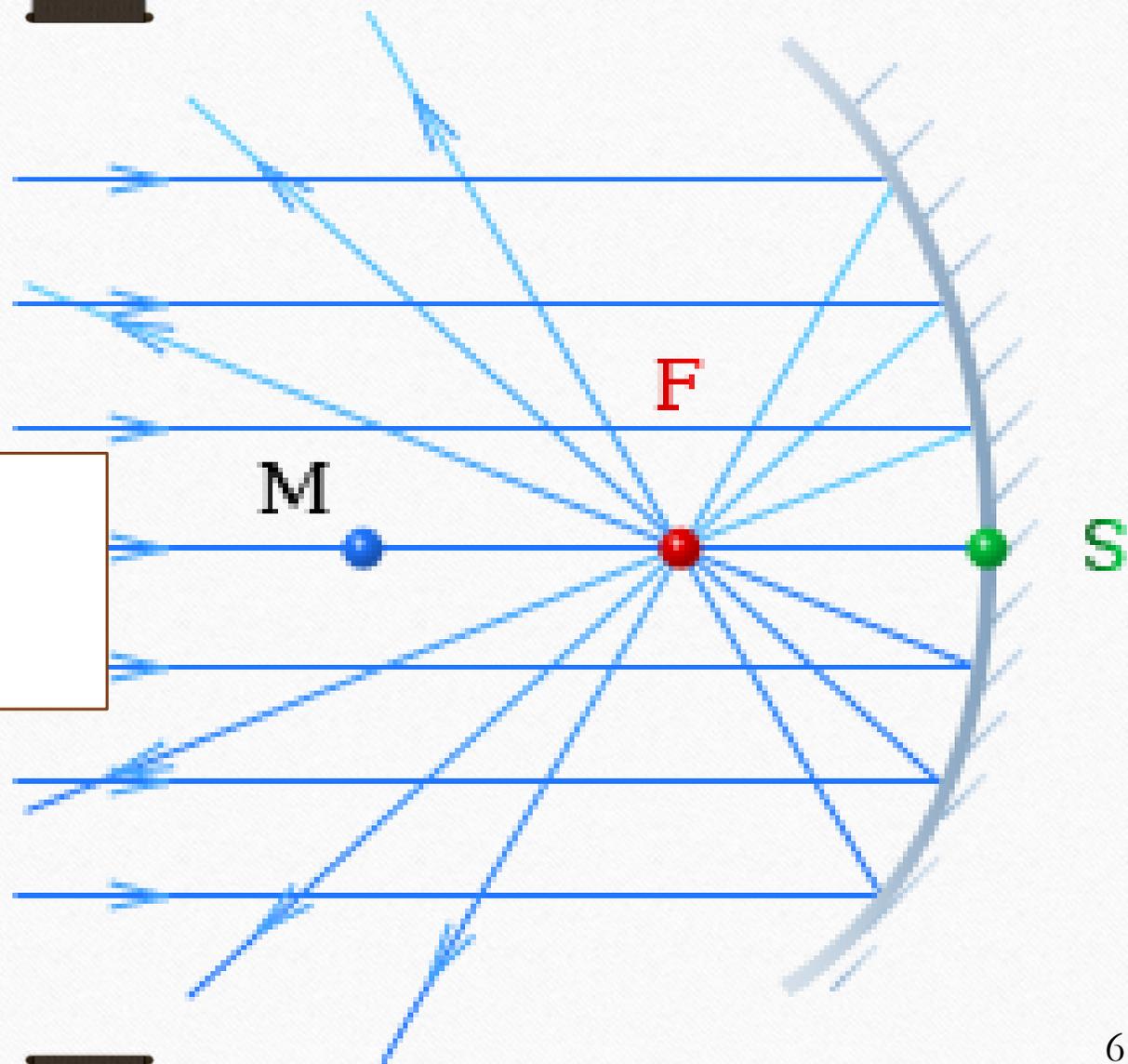
Hypothesis :

Concave mirrors can use an external power source and collect maximum its energy in the focus of Mirrors.

APPLICATION:



Scheme



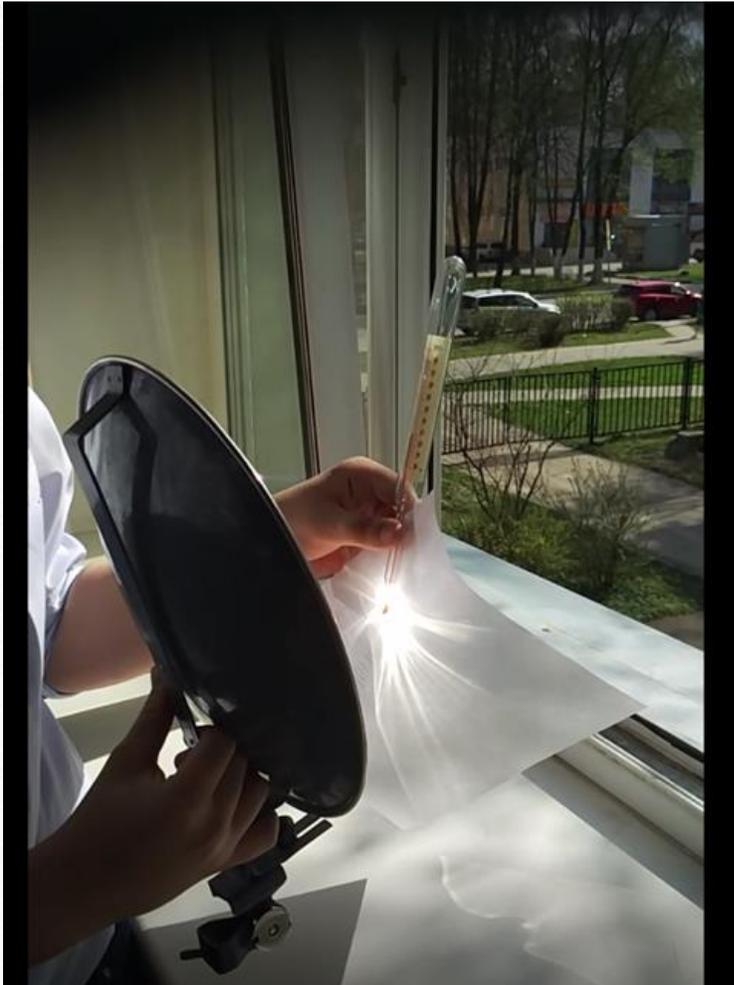


We went into the study of heating the thermometer with a concave mirror.

It was found immediately that in this weather and outside temperature the thermometer was heated in 40 seconds at 6 degrees Celsius

Therefore, the weather and the outside temperature did not change.

We decided to find out how much slower the thermometer would be heated if we used a mirror with a bigger surface area.

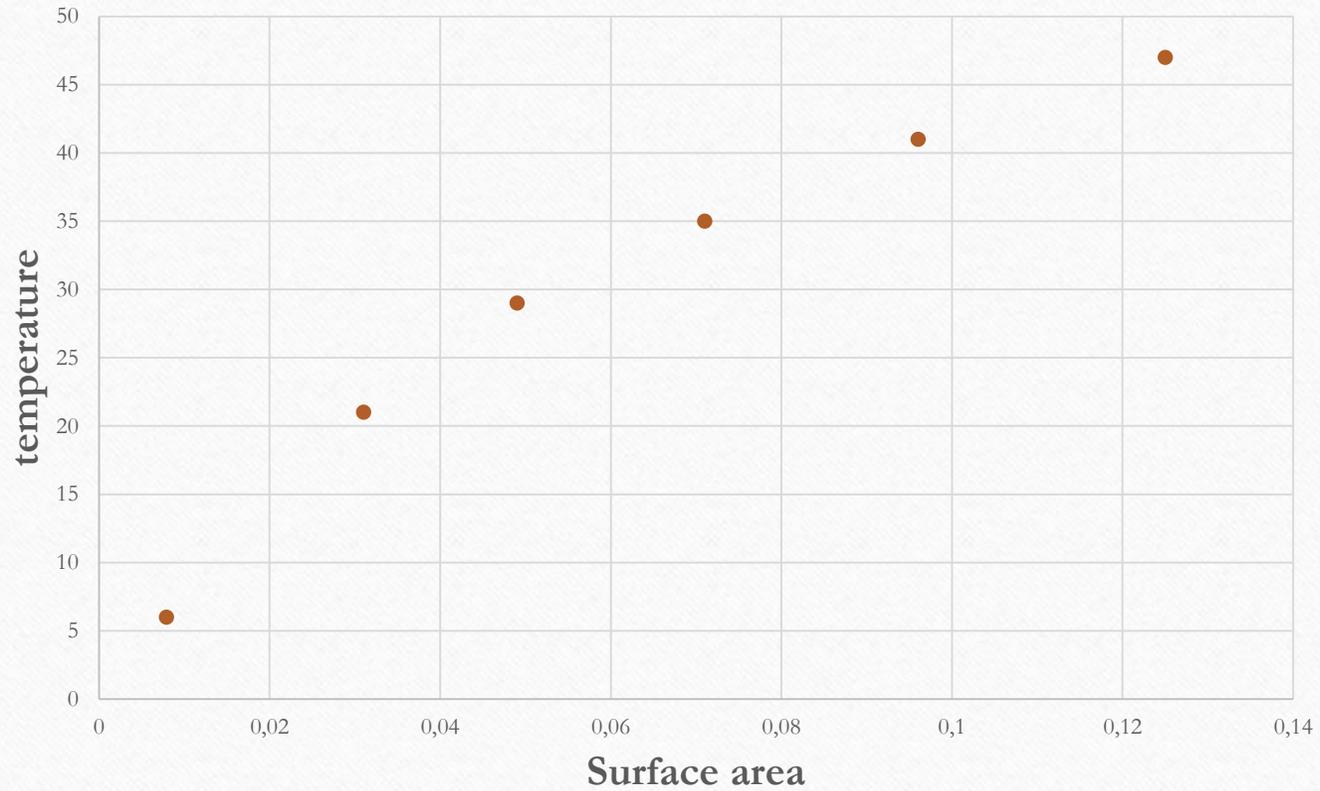


It was found that in this case the thermometer heats up faster, namely in 40 seconds - 35 degrees Celsius

This suggests that changes in the surface area are proportional to the temperature change.

Diametr (cm)	Surface area	Temperature(changing)
D 1 = 40	0,125 m ²	Dt = 47
D2 = 35	0,096 m ²	Dt = 41
D 3 = 30	0,071 m ²	Dt = 35
D 4 = 25	0,049 m ²	Dt = 29
D 5 = 20	0,031 m ²	Dt = 21
D 6 = 10	0,0079 m ²	Dt = 6

Название диаграммы



It's not a linear dependence because
If more warmth warms the body with more losses to the environment

Now we decided to check how the light filters affect the speed of heating the thermometer



It was found that:

When the red filter was substituted, the thermometer changed the reading by 16 degrees within 40 seconds.

Similarly, when the green one was substituted the temperature increased by 10 degrees.

And when we substituted the blue filter it changed by 4 degrees.

Our blue light filter allows only visible part of spectrum (Glass does not allow UV)

Green one allows green and nearly similar spectrum.

The red one allows red and IR parts of spectrum.



Explanation:

According to the corpuscular theory light is a stream of particles (corpuscles) that are emitted by a light source. These particles move in space and interact with the matter according to the laws of mechanics and can boost the energy to it.

We decided to check whether the concave mirrors can cool objects, for this reason we assembled the following setting:



Tripod, curved mirrors, clutch, thermometer, cold body.

We used liquid nitrogen as a coolant.

liquid nitrogen



We got a change in temperature in one minute



Change:
 $23 - 16 =$
 $7(\pm 1)$

Heat transfer



Transcalincy:

Objects do not
contact each other

Convection

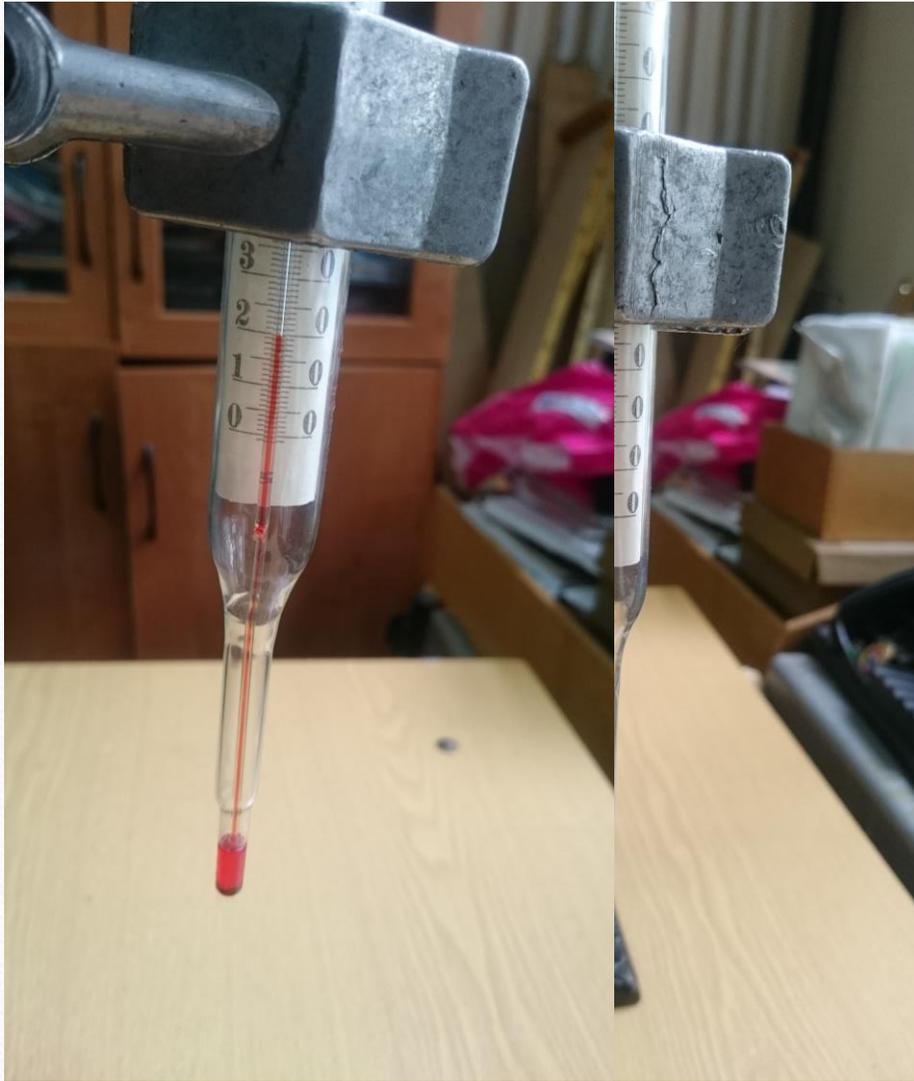
We hade done the experiment,
It had shown, that cold body
cannot cold the thermometer by
convection fast.

We had not used the curved
mirrors!

Radiation



Radiation



We assembled this setting :
Initial temperature in the room: 20
degrees C.
Final temperature in the room: 20
degrees C on two thermometers.
And Term.№3 : 19 deg.C
S1<>S2

Explanation:

When we place a cold body in the focus of the mirror the thermometer cools down because the background infrared radiation coming in here absorbs this body. Using this vessel with liquid nitrogen we reduce the energy input from the surrounding background infrared radiation.



Conclusion:

- Concave mirrors are able to use an external source of energy and communicate maximum energy to any physical body that is in the focus of this mirror.**
- With the help of light filters it is possible to influence the rate of temperature change, namely, to slow it down.**
- With the help of concave mirrors one can even set fire to paper or heat an object very strongly.**
- The hypothesis is confirmed.**
- COLD BODY CAN COOL THE THERMOMETER.**



THANK YOU FOR ATTENTION!