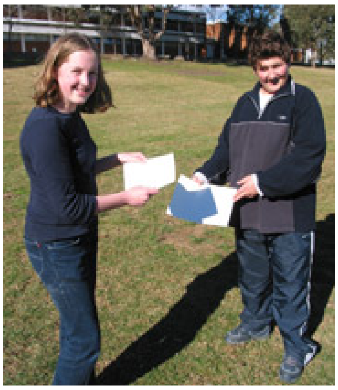
Saulės žiūronai

Reikia:
1. 2 balti lapai/kortelės
2. aliuminio folija
3. adatėlė
4. žiūronai arba teleskopas (nebūtina)

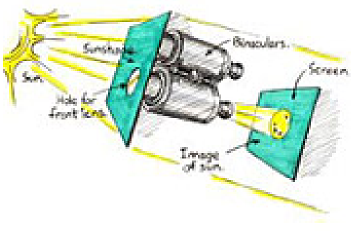


Kaip daryti:
1. iškirpti 5 cm kvadratą vienos kortelės centre
2. skylę uždengti aliuminio folija, ją priklijuoti. Išdurti skylutę adatėle viduryje.
3. stovėti nugara į saulę ir laikyti kortelę virš peties arba iš šono, saulės kryptimi. su kita kortele “sugauti” saulę, kad ji eitų per skylutę aliuminio folijoje.
4. keičiant atstumą, keičiamas saulės paveikslo šviesumas. Geriausiai pavyksta laikant plokšteles per metrą.

1. Cut a five centimetre square in the centre of one piece of card.
2. Use a piece of aluminium foil to cover the square hole and tape to the card. Pierce a small hole in the centre of the foil using a pin or the sharp end of a pencil.
3. Stand with your back to the Sun and hold the card with aluminium foil above your shoulder or to your side, in the direction of the Sun. Use the other piece of cardboard to show the light passing through the hole in the aluminium foil.
4. By changing the distance between the two pieces of card you can change the size and brightness of the Sun's image.
5. Holding the two pieces of card approximately one metre apart works best.

An alternative

An alternative is to use a telescope or pair of binoculars to project an image of the Sun.



How you can use binoculars to produce a projected image of the Sun.
At no time should you look through the binoculars or telescope to view the Sun.
If you use binoculars attach them to a tripod and cover one lens with a piece of card.
Aim the binoculars or telescope at the Sun and project the image on to a screen or wall.

To protect the binoculars or telescope from becoming hot and overheating, turn it away from the Sun every minute or so.

PROJECT #1 HOW DOES A SOLAR BOX COOKER WORK?

Materials You will need 2 large corrugated cardboard boxes with flaps -one fitting inside the other with about 5 cm between them on all sides and bottoms (inner box should be at least 46 x 56 cm); a flat piece of cardboard about 20 cm longer and wider than the larger box, a light piece of glass or Plexiglas about 50 x 60 cm, a thin metal tray painted black about 42 x 52 cm, dark cooking pots, aluminum foil, water- based glue, lots of newspaper for insulation, string (1 foot long), a stick (about 1 foot in length).

Procedure Build the solar box cooker by the directions in Appendix 1.

Ideas to Study

1. Investigate various kinds of insulation in your solar cooker.

2. Investigate the cooker at different times during the school year to determine when it takes the longest or shortest time to cook.

3. Design, build and test your solar box cooker.

Solar Box Cooker: Guidelines for Cooking Food – Teacher Information

1. Put your food in covered black pots in the solar box cooker with the lid on.

2 Aim the box so the shiny side of the lid reflector faces where the sun will be in late morning (lunch) or early afternoon (supper). Tie the prop to hold the lid reflector where it shines the most sunlight into the box.

3. Warning: Temperatures inside the cooker can reach 275 degrees Fahrenheit. Do not leave cooker unattended in a place where it could be disturbed by other students.

4. Food cooks better:

- on a warm, sunny day in late spring, summer, or early fall
- if you put it towards the back of the box
- if you adjust the cooker often so that its shadow lies directly behind it
- if you divide the food up into small pots

5. You need not stir the food while it is cooking. *H* you open the .box during cooking, be careful of the high temperatures inside.

6. Most of all, put the food in early, and don't worry about overcooking-solar cookers seldom overcook. Cooking times for recommended foods are:

1-2 hours: rice, fruit, above-ground vegetables, pretzels
3-4 hours: potatoes, root vegetables, some beans (including lentils), most bread
5-8 hours: most dried beans

(čia šiltnamio alternatyva. Man patinka)

PROJECT #3 WHAT ARE SOLAR CONCENTRATORS AND HOW DO THEY WORK?

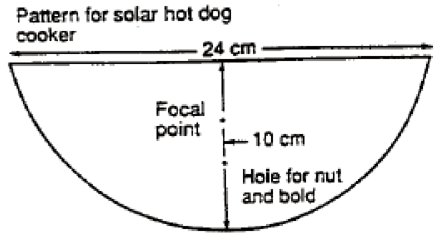
Resources Norton. T.W., D.C. Hunter and R.J. Cheng,1977. *Solar Energy Experiments for High* School and *College Students*. Emmaus, PA: Rodale Press.
Solar Energy Industries Association. 777 N. Capitol Street NE, Washlngton, DC 20002, (202) 408-0660.

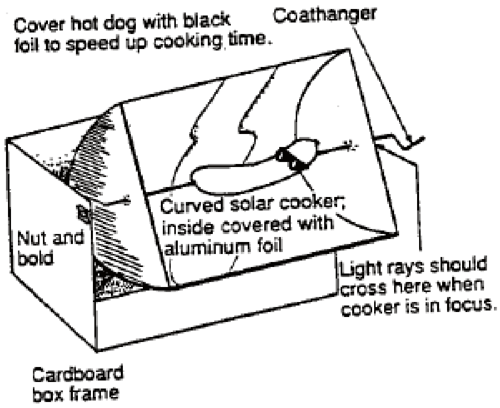
Ideas to Study

1. Design and construct a parabolic reflector. This project requires a knowledge of algebra. Draw 3 parabolic curves using equation of a parabola [y=nx2]. Let n = -10, 1, and 1/2. Calculate x and y for at least 6 data points. Discuss what happens to the focal length [f = x2/4y] as the curve flattens out (that is, as n approaches zero). How does the shape of the parabola aI)d its focal point determine the area in which the reflected light reaches maximum concentration.

2. Design a parabola of reasonable size (no longer than you can build or carry) using the equations y = nx2 and F = x2/4y. Graph the parabola on regular graph paper until you are sure of your design. Transfer the design onto a large piece of sturdy corrugated cardboard. Cut out the parabola. To make the reflector, glue aluminum foil to flexible tagboard and smooth it with a squeegee until it is mirror-like. Attach the reflector to the cardboard parabola securely. Test the parabolic reflector in the sun. Locate the focal point with your hand. Be careful not to get burned. Do not look at the sun. Measure the focal length and see if it agrees with your calculations. Analyze the effect of tracking the sun on cooking time. If you do not want to spend time designing a solar concentrator you can use the design shown below and test its effectiveness in cooking a hot dog. Make the parabolic trough out of cardboard, poster board, aluminum foil, unpainted coat hanger two boxes (one for the concentrator and one for a stand), nuts and bolts.

Spec1flc Resources: Wlll!ams, J-. 1981, "Building Solar Furnaces-An Example of Science in a Primary School," School Science *Review*. Vol. 63, No.223. pp. 267-76.





3. Investigate the advantage of a collector that tracks the sun. You will need any movable solar collector or concentrator, thermometer or thermocouple. Determine the temperature in the center of a piece of black construction paper when it is flat (perpendicular) to the sun's rays and when it is tipped at an angle to the sun. Determine the performance of a higher performing collector when it is oriented toward the sun. How much energy is collected during the day if the collector is laid flat on the ground, tipped up at various angles, or continuously pointed at the sun?

4. Investigate what materials are best for absorbing sunlight and converting it to heat? You will need materials made of steel, copper, plastic, color, and thermometer. Place different types and colors of materials on the ground in sunlight. Place thermometers on each one. Be careful to cover the bulb of the thermometer with the same color or type of material, can carefully tape the thermometer to the sample. Record temperature versus time. What effect does insulation or glazing or both have on results? Is a smooth surface better than a glossy surface? What about different kinds of paint? Try putting food coloring into ice cubes and timing the rate of melting in sunlight.

Specific Resources: Davis. D.. 1979. Solar *Energy Laboratory Manual*. Aspen. CO: Crystal Productions Company.

5. Investigate the effect of size on the amount of heat a flat plate collector can absorb? Paint aluminum pie pans of different sizes with flat black paint. Add 100 mL of water to each pan. Measure water temperatures at the start and every 15 minutes. What effect is caused by covering the pans with plastic wrap? Try heating the water to the same temperature using a candle and compare the time and cost.
Specific Resources: Ely. J. and K. Ford. October 1989. "Sizing Up Solar Energy." Science and *Children*. pp. 14-15.

6. Build a flat plate solar water heater. You will need 112 in or 318 in copper tubing (50 cm), plastic tubing or hose that will fit over the end of the copper tubing, cardboard box, plastic cover, thermometer, two buckets, and a clothespin. Bend the tubing into an *"S"* shape, being careful not to kink it (a tube bender helps but is not necessary). Paint the tubing with flat black paint and place it in a cardboard box with the ends extending through holes in the box. Create a siphon by placing one end of one piece of the plastic tubing over one end of the copper and the other end in a bucket of water. Use the other piece of plastic tubing to connect the outlet of the copper to another bucket. Use a clothespin to control flow.

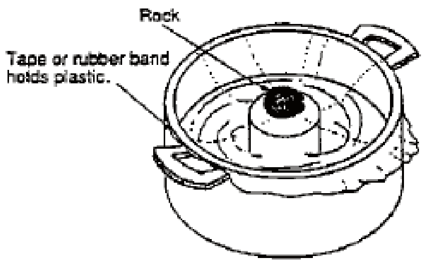
Cover the box with plastic and set it in the sun. Measure the inlet and outlet water temperatures. Study the number of turns of copper tubing.

7. Investigate what collector (non-concentrating) designs work best for heating air .You will need thermometers, fan, empty aluminum or steel cans, wood or cardboard box. Make a simple air heater from a cardboard box. Paint the inside black and cover with plastic. Make two holes diagonally (at opposite comers). Use a small fan to blow air through the collector or just let the warm air flow out of the upper hole. Measure air temperatures at the inlet and outlet. You can also measure the airflow rate. Cut cans in half, paint them black, and attach them to the bottom of the box to improve heat transfer to the air . Try insulation. Balance the cost of materials, construction time, and durability against performance.

8. Investigate how a solar still works. You will need a large pan or tub, clear plastic food wrap, rock, masking tape or rubber bands, drinking cup or glass. Make some muddy water and measure enough into a pan to fill it about half way. place the drinking cup in the middle. Cover the pan with plastic wrap and seal the edges carefully. Put a rock on the plastic wrap to make it sag in the middle (but don't let the plastic touch the cup). As the water evaporates, notice the tiny drops that condense on the cool plastic. How much water collected in the glass? How much water was lost from the pan? You can also study using salt water instead of muddy water. Try insulting the pan or blowing a fan over the top of the plastic. Calculate how large a still would be needed for all the water you drink during the day. Design a more efficient still.

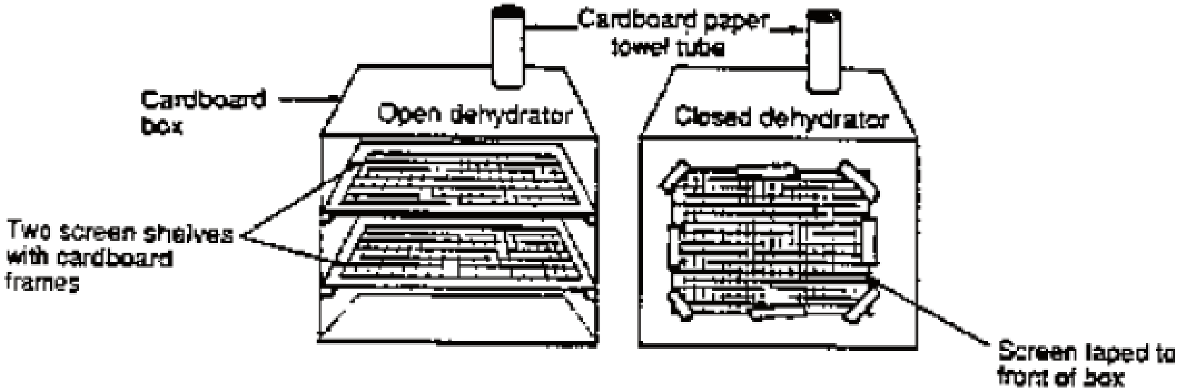
Specific Resources: (1) *How* to *Make a* Solar still Plastic *Covered).* 1973. "Do-It-Yourself' leaflet L-1. Available from Brace Research Institute. MacDonald College of McGill University .Ste. Anne De Bellevue. Quebec. Canada 49X 3M1. $1. (2) Talbert. S.G., J.B. Etbling. and G.O.G. LOr. 1970. Manual on Solar *Distillation of* Saline *Water.* Available from U.S. Government Printing Office.

Superintendent of Documents. Washington, DC 20402. (3) *Simple Solar Still for Production of Distilled Water.* Technical Report No. T17. Available from Brace Research Institute (address above). $1.



You may have to put a weight in the cup to keep it from floating.

9.Make a solar dehydrator. You will need grapes, plastic window screen, cardboard, masking tape, string, food scale. Make a drying rack by taping plastic screen over a 15 cm X 15 cm hole cut into a piece of cardboard and using string to hang the rack in the sunshine. Or build an oven like the one in the drawing. Remove about 12 grapes from a bunch, weigh them, and spread them on the screen. Cover with a second layer of screen and hang the dehydrator in the sun. When the grapes look like raisins, take them off the rack and weight them again. Try drying other fruits such as peaches, apples, and bananas. Compare the cost of fruit brought fresh and dried in the sun to the cost of dried fruit. make a dehydrator that has two or more shelves and uses solar heat.



Solar:

1) Solar energy creates electricity using solar cells. A solar calculator provides an example of this. Using the calculator, make a simple calculation. Then find the solar cells and cover them with your finger for 30 seconds. Keep your finger on the solar cells and try to make the calculation again. What happens? ____

2) Set out an unpainted aluminum pie tin and a second tin, painted with black paint, in the sun. Fill both pans with exactly the same amount of water. After ten minutes, check the temperature of both pans. What are the differences? Why did this occur?

(antras paprastas, bet galima padaryti). Kas turi tokį kalkuliatorių? Paieškom...

Doing the Experiment

1 Place the solar cooker so the mirrored trough faces the sun.

2 Adjust the trough up and down until the mirrored surface focuses the sun on the hotdog.

3 Cook the hot dog.

WHAT DID YOU SEE?

How long did it take to cook the hot dog?

Did you have to move the cooker to keep the sun focused on the hotdog?

HOW PARABOLIC COLLECTORS WORK

A parabolic collector is made up of a trough and a tube running down the center of the trough. The trough is a long rectangular mirror formed in a U-shape. The mirror is tilted toward the sun to focus the sunlight on the tube. The paraboloid shape is perfect for focusing the sunlight on the tube. The tube carries the fluid to be heated. A tracking device keeps the mirrors pointed toward the sun as it moves across the sky.

Parabolic collectors are used mostly to provide hot water for use in industry and sometimes in homes. They are also used to produce electricity.

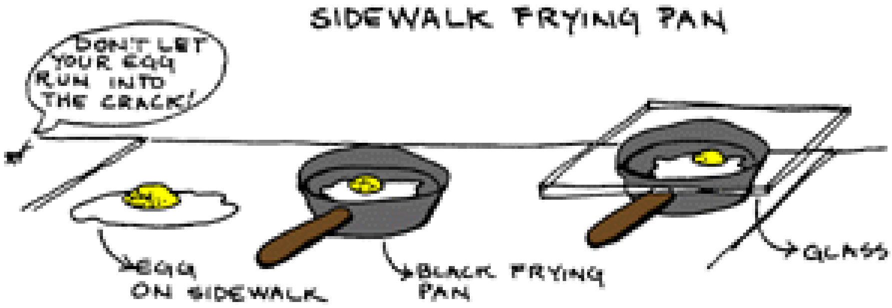
http://www.energyquest.ca.gov/projects/solardogs.html (išsami gamybos schema)

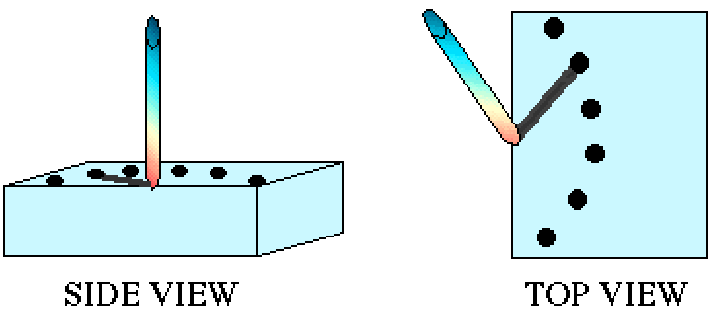
Hot Enough to Fry an Egg

You can also use the heat of the sun on a sidewalk or on black asphalt.

Take three eggs, two black/cast iron frying pans, and one piece of thick glass to cover one of the frying pans.

Put one egg directly on the sidewalk, one in the pan without the glass cover, and one in the pan with the cover. Which one do you think will fry the quickest. Make sure you clean up afterwards!





Setting up your shadow plot

It is best to set up your shadow plot in the morning, around 9:00.

Once you have found a flat location, clear from shadows, push the ball of clay onto the ground. Insert the wooden dowel into the ball of clay so that it stands vertically. The dowel will need to stand in this exact location for the entire day, or for several weeks, so make sure it is secure. You may need to wrap some duct tape around the base of the dowel and further secure it to the ground in this manner or be creative and find a way to secure the dowel so that it remains perfectly vertical.

Once your dowel is in place look for its shadow. If it is morning, the dowel's shadow should be pointing west. Lie your piece of paper down on the north side of the dowel with the middle of the long edge up against the base of the dowel support. (You can figure out which general direction is north since you know the Sun is in the east and the dowel shadow is facing west.)

The image above will help you set up your materials correctly.
Secure the piece of paper with several rocks. Place the rocks, or other heavy objects, around the edge of the paper so they do not obscure the middle where you will be making your plot.

You are now ready to start making your measurements.
The shadow from the dowel should be on your piece of paper. If it is not wait about an hour and return once the shadow is cast onto the paper. When you have the shadow on the paper, use your permanent marker to make a mark at the very end of the shadow.

Return to your shadow plot about once every half hour and make a mark at the end of the shadow each time. If you begin your plot at 9:00 a.m. you should have enough markings by 3:00 p.m. When you are finished with one day of measurements you plot should look like the one above.

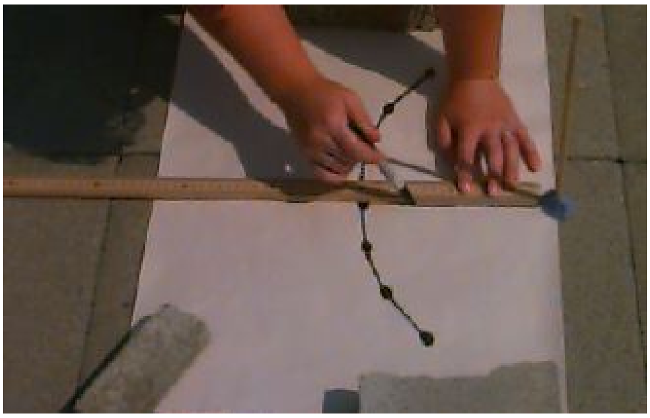
You are now ready to use this plot to find Geographic North.

Using a Shadowplot to find the North-South line

After one day of shadow measurements you are ready to draw the North-South line. On your completed shadow plot draw a smooth curve through all of the marks that you have made, without moving the paper. The more often you have taken your measurements, the easier it will be to draw this curve accurately.

Once you have drawn a smooth curve through the markings, you want to find the shortest distance between the dowel base and this curve. To do this place a meter stick so that one end is at the dowel base and the curve crosses the meter stick at some other point. Pivot the meter stick about the end at the dowel base until the find the location on the curve that is the shortest distance from the dowel base.

Draw a line from the dowel base to this point as in the image below.

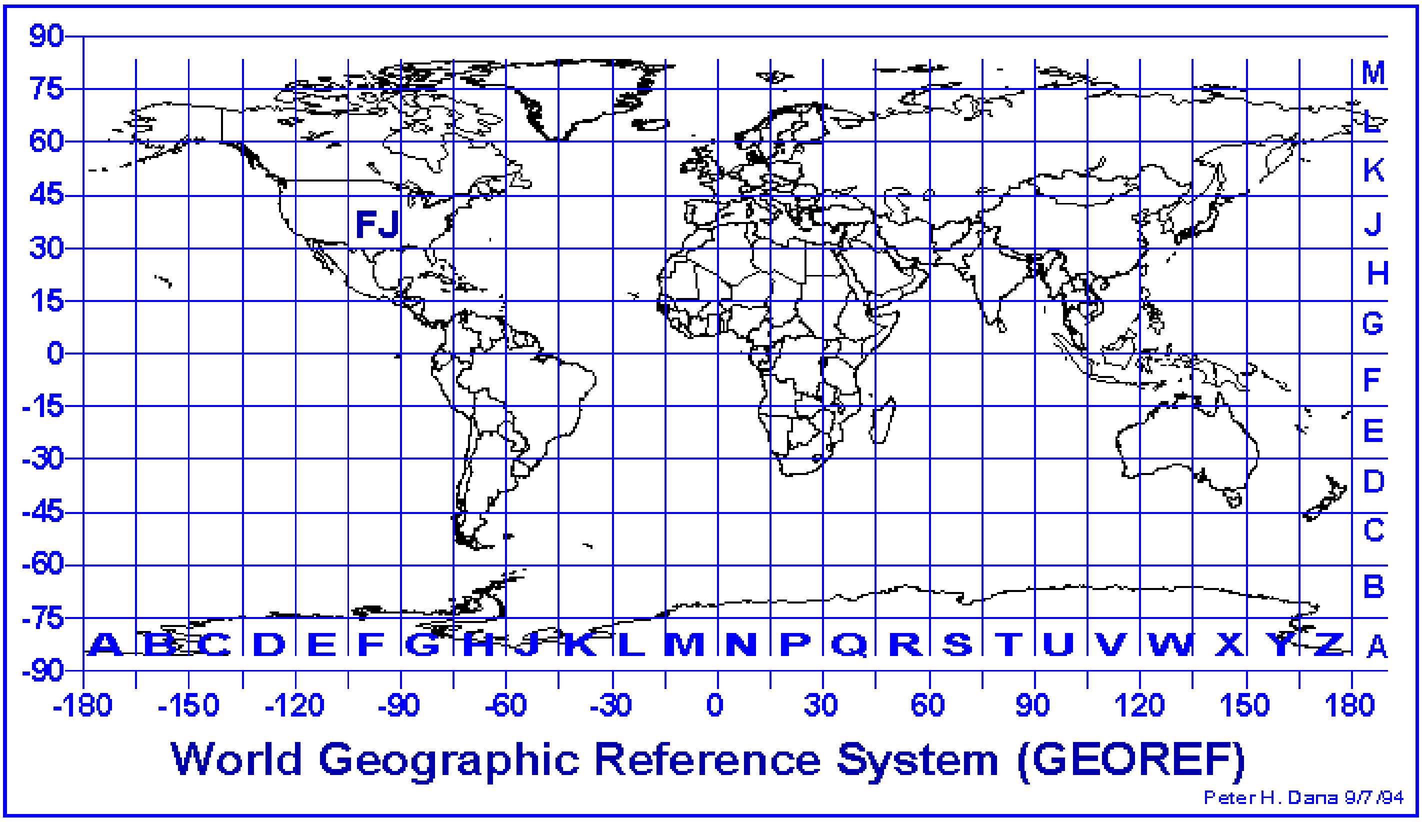


This line you have just drawn is called a North-South line. It is the line along which the Sun will cast a shadow at local noon. (Your local noon may not be exactly when the clock says noon depending on where you are in your timezone.)

This North-South line points exactly North and South. A line drawn perpendicular to this line will point East and West. You will need to know the exact direction of North to use your horizontal sundial.

In addition to finding the direction of north you will need to know the latitude of the town or city where you intend to use your sundial in order to build it accurately. If you do not know the latitude of a particular part of the world you can figure it out by looking on a globe or a map that has the latitude lines marked. Latitude is measured in degrees from the equator. The equator is zero degrees latitude, the north and south poles are ninety degrees latitude. Here is a latitude grid of the world.

Use the grid below to find the latitude of the location where your sundial will be used.



(šitą galima padaryti, bet geriau vizualaus kažką, kad iš karto matytųsi)

Powering the ISS - Collecting Energy from the Sun
Build a Solar Energy Trap

This is a simple experiment to measure the power of sunlight received by the Earth (at the time and place of the experiment). Excellent results can be obtained in a very short time by simply letting the Sun heat up 500mL of water in an open pan. Refer to the Powering the ISS - Collecting Energy from the Sun task for information regarding calculating the size of a solar panel array for space applications.

For convenience the mathematics has been reduced to a set of simple graphs so that students can focus on the physical **concepts** involved rather than the mathematical details of this exercise. Students need only follow the procedure outlined here and then read simple measurements from the graphs included.

Suggested enhancements to the experiment:

- Results can be taken and compared at various times of the year.
- Results of the experiment taken by schools having different latitudes can be shared and compared.(For example a school in Florida, a school in Kansas and a school in Manitoba might wish to perform this experiment during the same month and share their results.)

Important science concepts to discuss with your class:

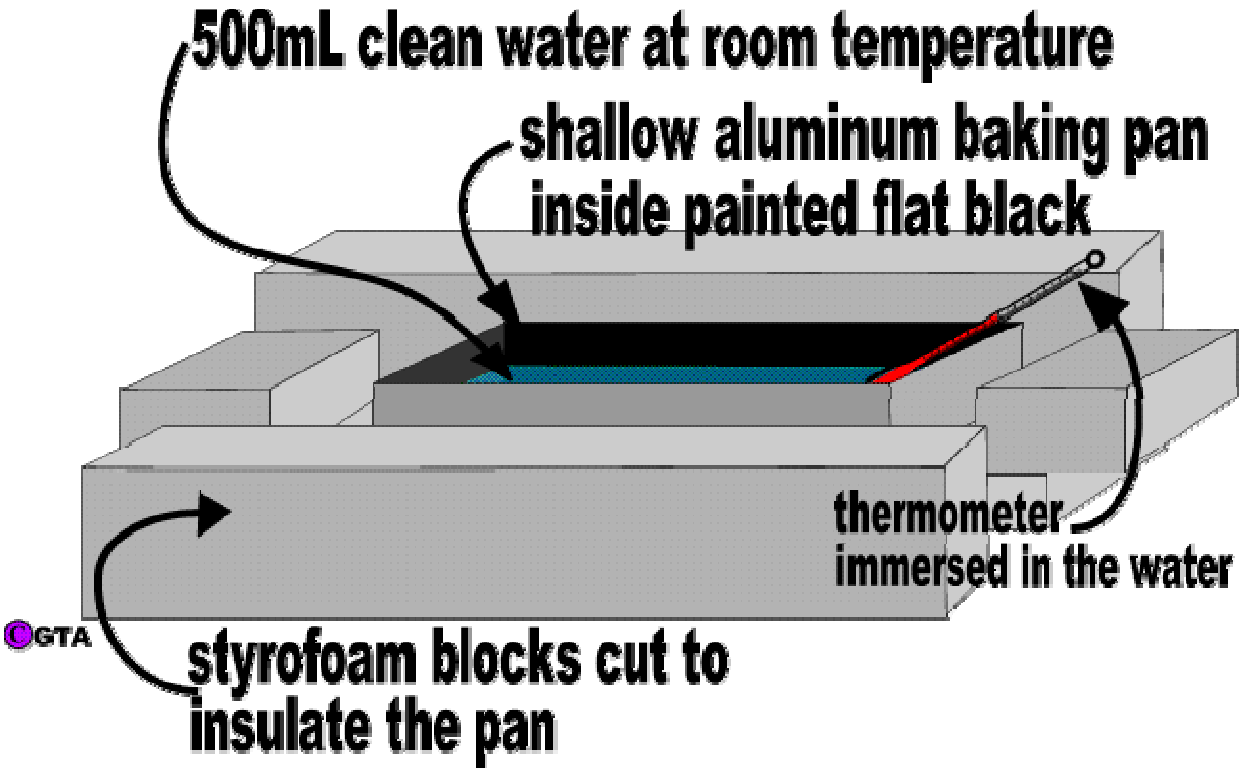
1. All weather events, on all scales, are driven by **energy from the Sun.**
2. All weather events occur in a layer of the atmosphere called the **troposphere.**
3. All agriculture (and hence human survival) is dependant upon the weather.
4. Without some method of distributing the Sun's energy over the Earth's surface it would be un inhabitable, *i.e.* The equatorial regions would exceed the boiling point of water and the poles would be cold enough the liquefy the atmosphere.
5. A moderate **greenhouse effect** and **atmospheric convection** are responsible for making the Earth's atmosphere habitable.

For best results...

- The initial and final temperature of the water should "bracket" the ambient environmental temperature. The helps minimize errors since the environmental heat absorbed during the beginning of the experiment in roughly canceled by energy lost to the environment near the end of the heating process.
- Place the thermometer through a hole in the plastic-wrap cover or under the edge of the plastic-wrap. Keep the thermometer bulb immersed in the water at all times and continually stir the water (gently).
- At high latitudes (especially in the winter) this experiment can be performed indoors where full sunlight shines through a window. Allowance for the absorbing and reflecting effect the glass should be taken into account.
- Large shallow pans with a large surface area work best. Deep pans have too small a collecting surface and also suffer from "side-shadows".
- To reduce the effects of atmospheric absorption the experiment should be done as close to local noon (12 oclock noon) as possible.

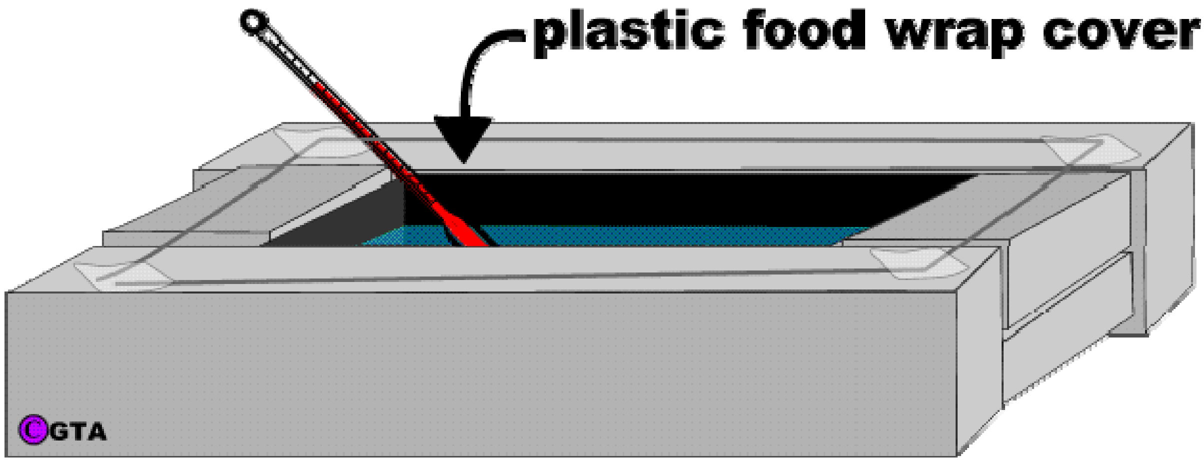
Components

- The experiment is designed to capture solar energy, and to measure the total amount of energy that the earth receives from the Sun.
- An aluminum baking pan makes an excellent container. It should be painted flat black on the inside.
- Styrofoam pieces can be collected from a variety of sources, especially from vendors of electronic equipment.
- You may substitute a bed of foam chips in a large box to surround the aluminum pan.



Procedure

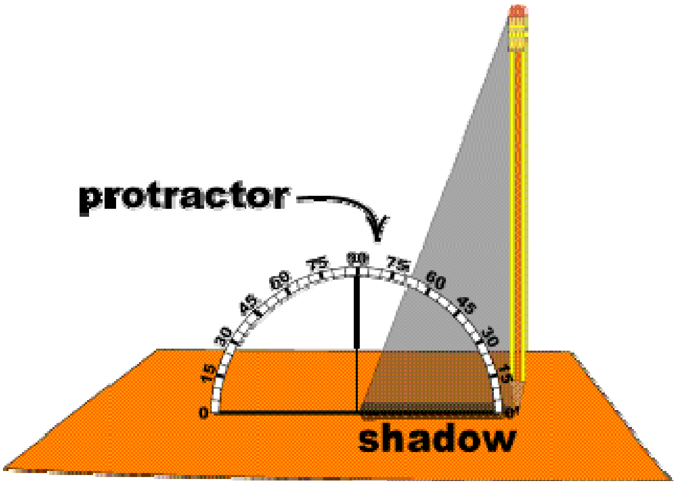
- Surround the pan with insulating material.
- Add 500mL of water to the aluminum pan. Try to have the water a several degrees cooler than the environmental temperature.
- Keep the system shaded until the experiment begins.
- Cover the pan with a thin layer of clear food wrap and fasten it down with tape.
- Place the container in direct sunlight and record the temperature of the water.
- Wait 10 minutes and record the temperature of the water once again.



Solar Angle

- During the experiment you will need to determine the overhead angle of the Sun.
- A simple method is to stand a thin object, such a pencil, upright on a flat surface. Using a protractor one simply measures the angle that the shadow from the top of the object makes with the flat surface as shown in the figure to the left.

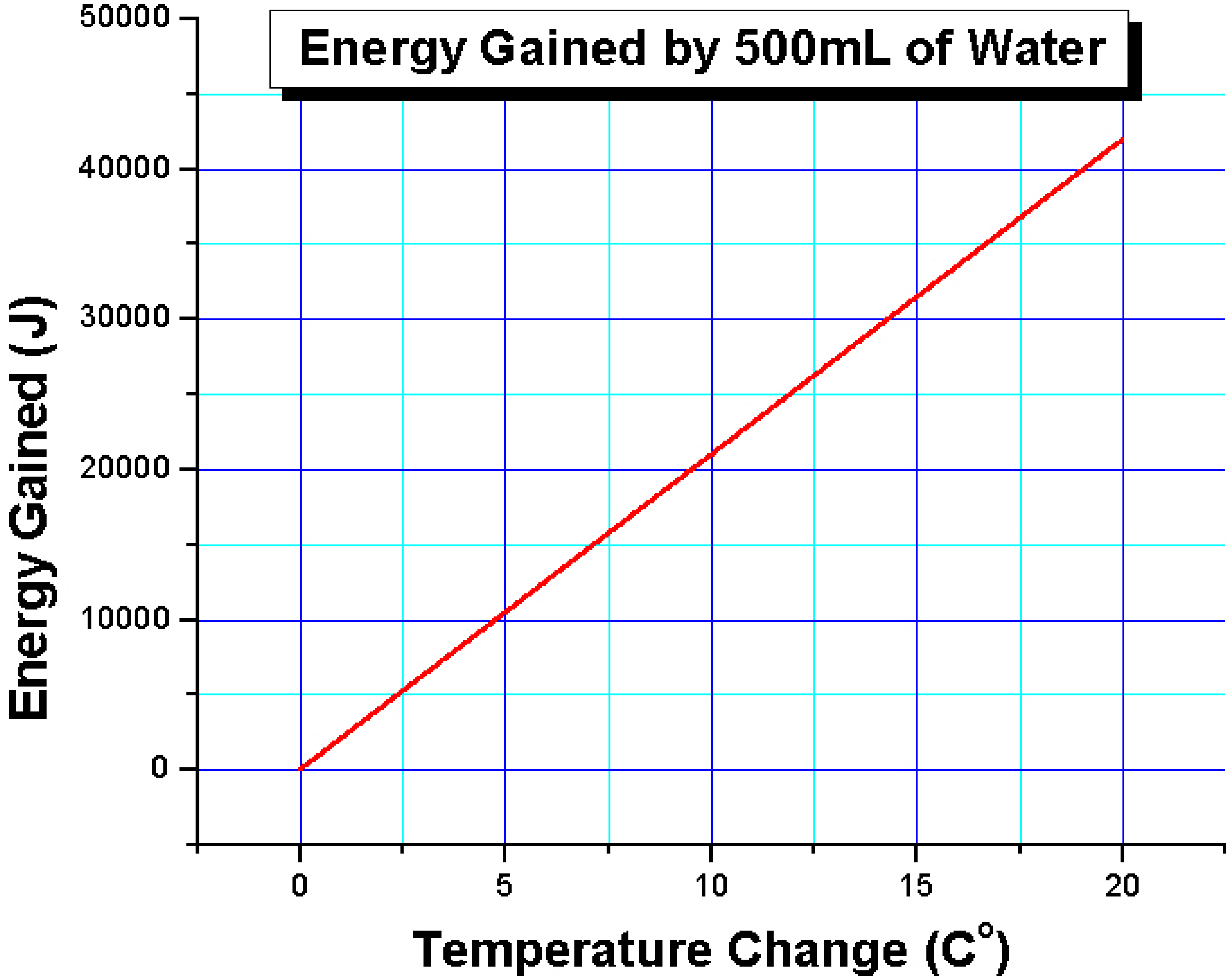
- Hint: A piece of string from the top of the object to the tip of the shadow on the flat surface will help in the measurement of the angle.



Analysis

Step 1

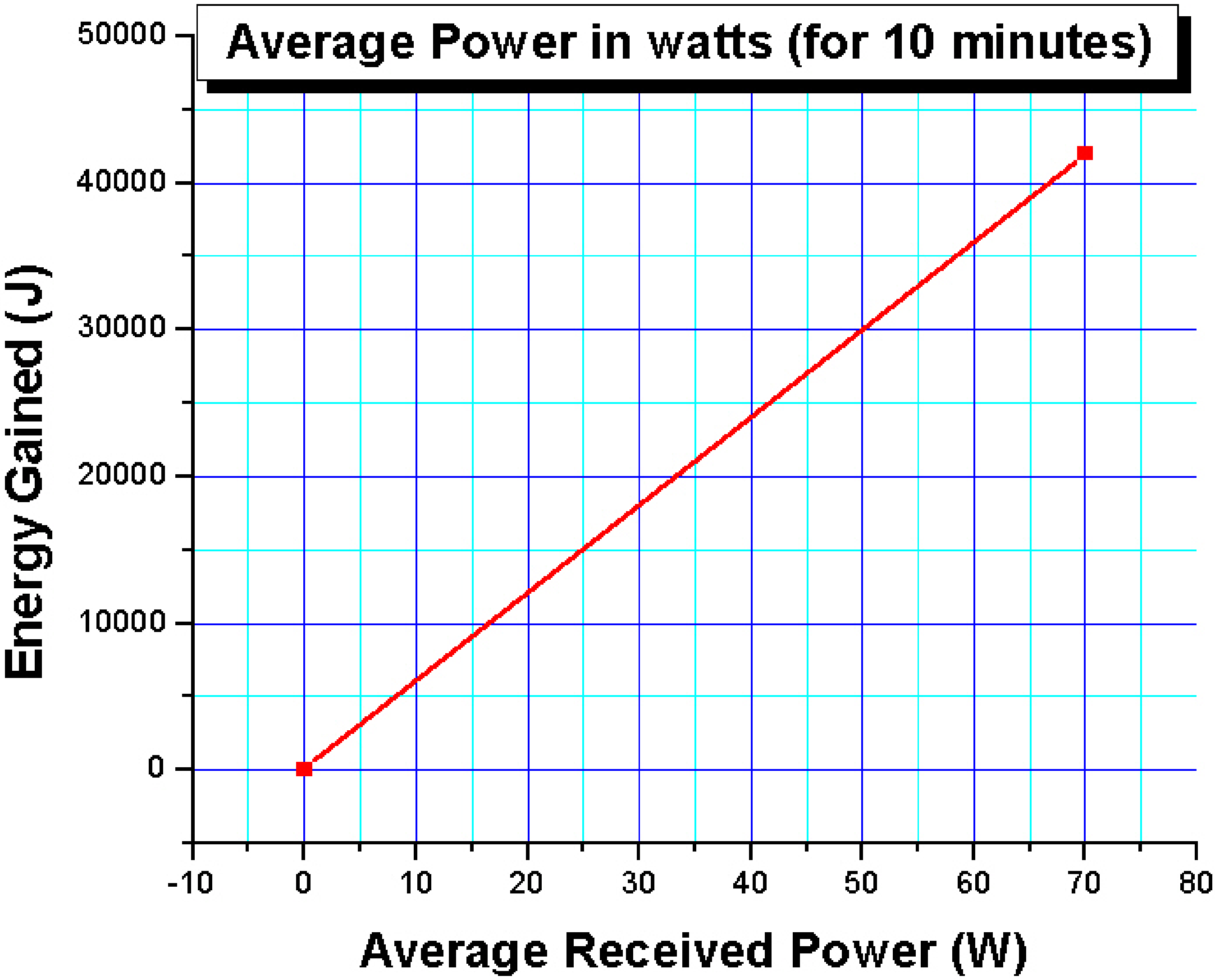
- After exactly 10 minutes, record the final temperature of the 500mL water sample.
- Subtract this from the initial temperature to determine the **temperature change.**
- Using **Graph 1** to below, determine the total amount of energy absorbed by the water in joules.



Graph 1

Step 2

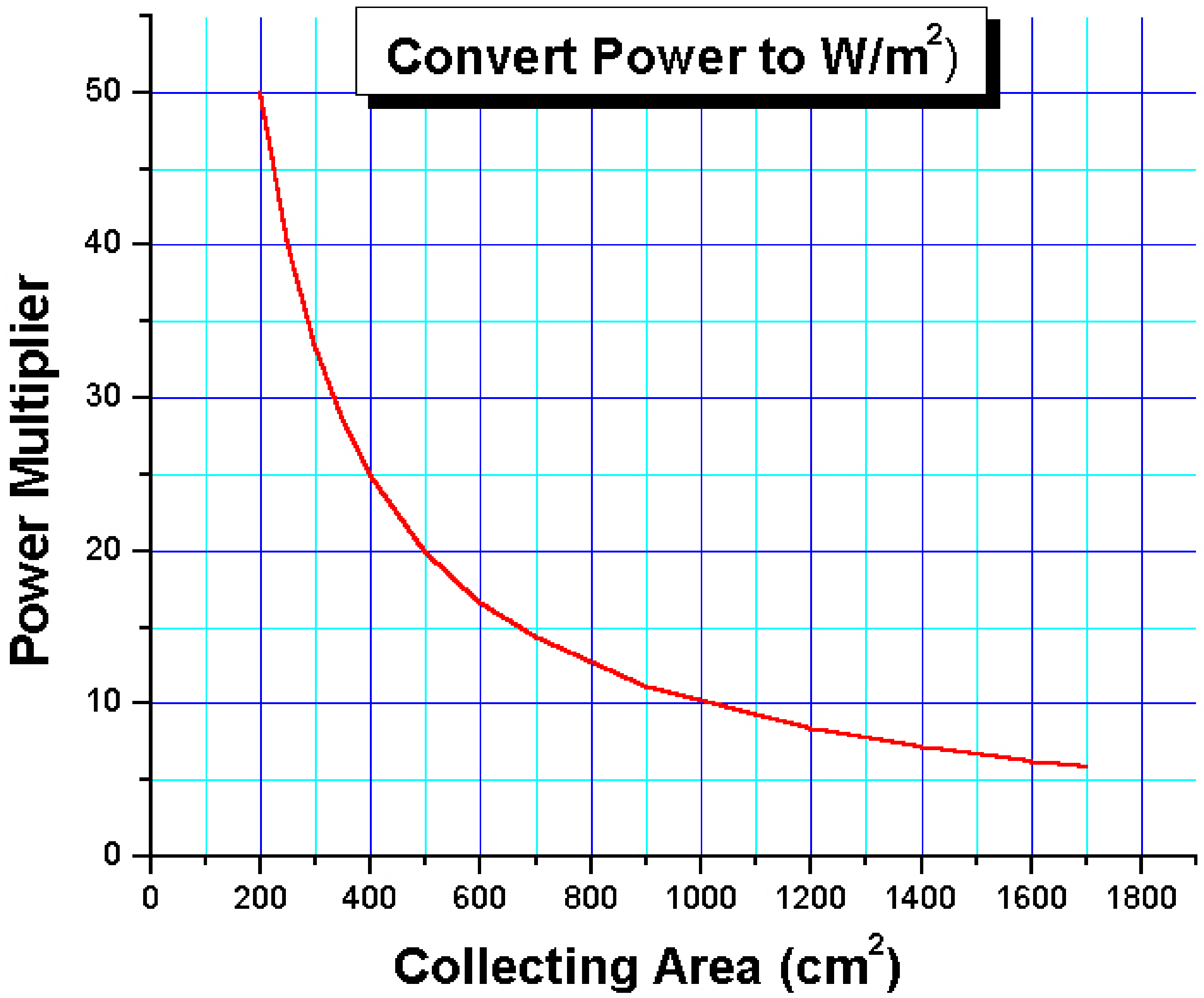
- The energy heating the water has been absorbed over a ten minute interval. Power however is the *rate* at which energy is absorbed, radiated, or transferred. In other words, power = energy/time **(P=E/t)** (one watt is equal to one joule per second).
- **Graph 2** below converts the energy absorbed (from graph 1) in ten minutes to absorbed power in watts **(W)**.
- Using **Graph 2** determine the heating power which corresponds to your observations.



Graph 2

Step 3

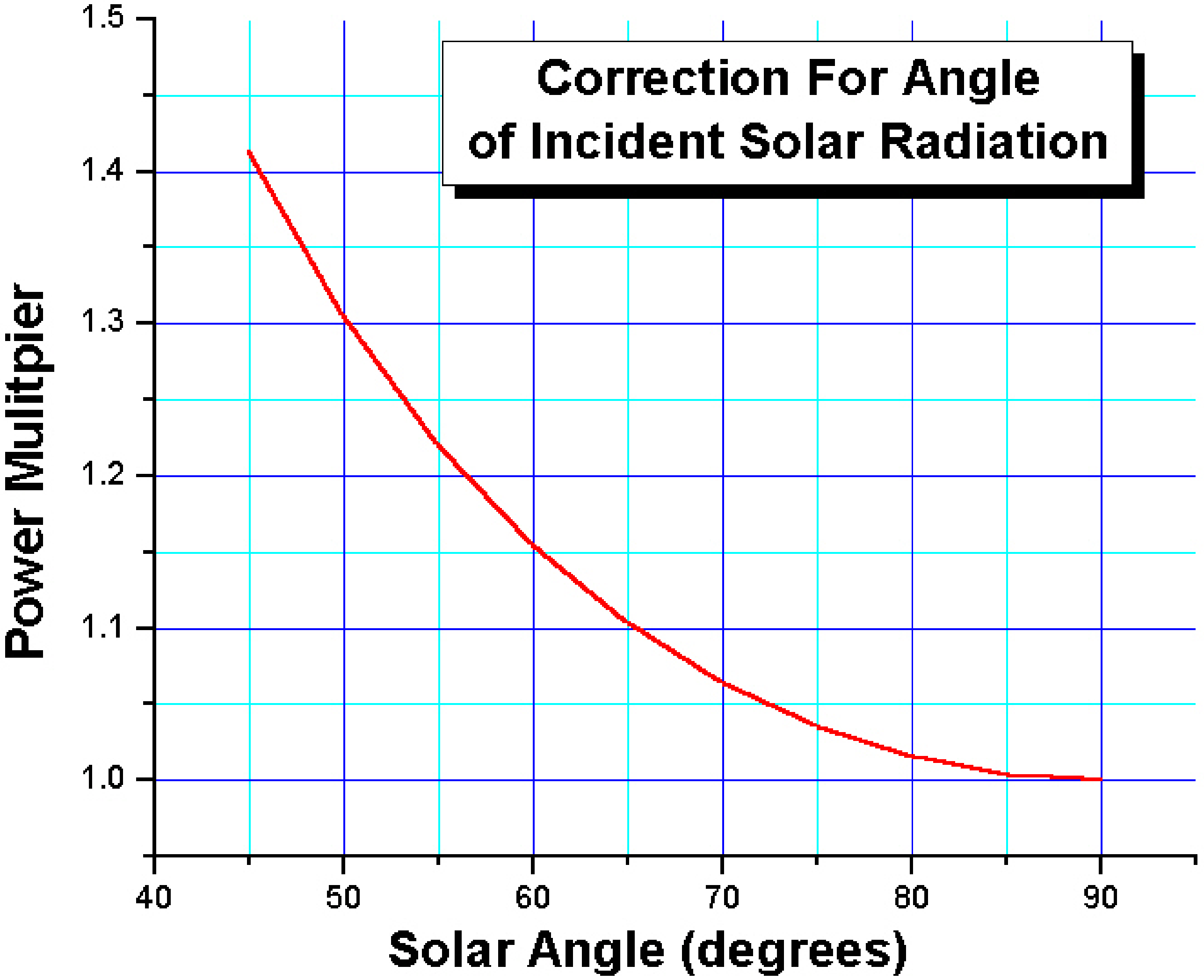
- The observed power is distributed over the *surface area* of the water. For comparative purposes one must covert this to the amount of power that is absorbed per square metre**(m^{-2})**
- **Graph 3** below is used to determine the power that *would have been* received, per square metre, based on the surface area of the water in your experiment.



Graph 3

Step 4

- To be accurate one must also compensate for the fact that the Sun may not be illuminating the surface of the water from directly overhead, but rather the Sun's radiation is falling at an angle on the water's surface.
- As a last step use **Graph 4** below to calculate your experimental determination of the **solar constant** at the Earth's surface.
- You may assume that the Earth's atmosphere filters out about 25% of the incident solar radiation. From this fact, calculate the absolute value of the solar constant above the Earth's atmosphere.



Graph 4

Blog It!

Write a new blog entry describing the solar energy trap you built. Describe the materials, procedure, observations and analysis. Discuss one or more of the "what ifs" below.

What if...?

1. The **solar constant** is really the total power output of the sun received by one square metre of a perfect absorbing surface *above* the Earth's atmosphere.
   - What is the effect of making your measurement "below" the Earth's atmosphere?
   - What is the effect of having the sunlight fall on your solar collector at an angle? (*i.e.* when the sun is not directly overhead.)
2. What if the **solar constant** were to decrease? What affect might this have on the Earth's climate?
3. If the **solar constant** were to decrease, what might one infer about the energy output of the sun?

4. Astronomers have long known that many stars are variable. This means that they vary dramatically in their brightness and hence in their energy output. If there were beings living on planets orbiting around these stars, what would they notice about *their* "solar constant"?

15 +

<u>Namų darbo galvaniniai aparatai.</u>

Tikslas. Priversti tekėti elektronus, kurie sukeltų rudijimą.

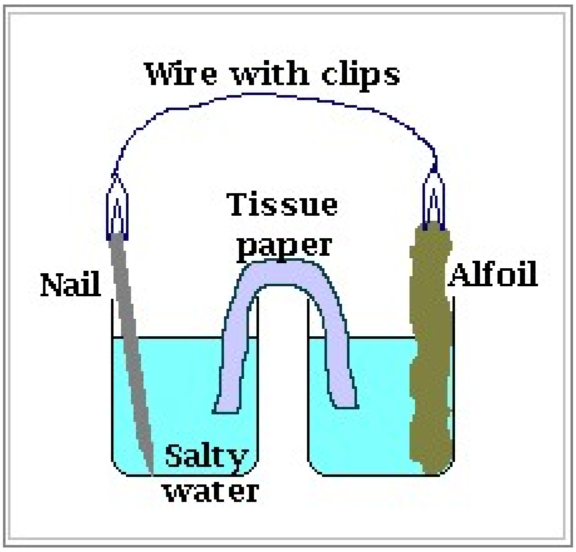
Medžiagos.

- Dvi stiklinės.
- Druska
- Viena didelė geležinė vinis
- Šiek tiek aliuminio folijos
- Šiek tiek varinės vielutės
- Servetėlių (tissue paper)
- Elektrinių laidų, geriausia su krokodilais galuose.

Darbo eiga.

Nuvalomi metalai naudojami eksperimente (iki blizgesio). Tai užtikrina, kad rezultatų nelemia purvas ir nešvarumai esantys ant metalų.

Geležis ir aliuminis: Į kiekvieną stiklinę įdedamas šaukštas druskos ir užpilamas vandeniu. Druska išmaišoma. Popierius susukamas vamzdeliu ir įmerkiamas į stiklines. Tas pats padaroma su aliuminio folija. Surinktas įrengimas atrodo šitaip:



Jei turite elektros laido be gnybtų, užsitikrinkit, kad jis tvirtai prijungtas prie vinies ir prie folijos. Palikite įrengimą kur nors kelioms dienoms. Papildykite skysčio, jei reikia. Popierius turi būti šlapias ir siekti vandenį abiejose stiklinėse.

Kas nutiks?

Šiame eksperimente aliuminis atiduoda elektronus geležiai ir geležis nekoroduoja, o koroduoja aliuminis. Per laidą elektronai keliauja iki geležinės vinies. Tai yra efektyvi, labai paprasta, mažo voltažo baterija. Jei turite mažo voltažo voltmetra, galite užfiksuoti per laidą tekančia srovę.

OTHER COMBINATIONS: This same experiment can also be done with iron / copper and also copper / aluminium. From doing all three of these you will see, as in the Preferential Rusting, that copper is the least likely to rust, then iron, with aluminium as the most reactive metal.

NOTE: The tissue paper is called a "Salt Bridge" and acts to balance out the charges in each glass of water by allowing ion flow from one to the other. It effectively completes the circuit. If it is not present or its ends are not immersed in each glass the circuit will not work and both metals will rust in the salty water.

Šviesos sugerties vaizdavimas grafiku.

Tikslas. Nustatyti ir grafiku pavaizduoti temperatūros pakyčius metalinėje skardinėje padėtoje saulės šviesoje.

Medžiagos:

- Dvi aliumininės gėrimų skardinės. (pvz. Coca cola'os ar pan.)
- Du termometrai
- Balti ir juodi dažai, teptukas
- Kompiuterinė programa, pvz Excel'is

Darbo eiga.

Viena skardinė nudažoma baltai, kita juodai, taip pat ir skardinės viršus. Skardinės paliekamos, kol dažai išdžius. Abi skardinės pripildomos vandeniu, kol lieka 1 cm nuo viršaus. Į kiekvieną skardinę įstatomas termometras.

Po 30 sekundžių matuojama abiejų skardinių temperatūra. Tai pradinė temperatūra. Abi skardinės pastatomos saulės šviesoje ir temperatūra registruojama kas 15 minučių. Duomenys surašomi į tokią ar panašią lentelę:

Time (mins)	Temp of Black Can (°C)	Temp of White Can (°C)
0		
15		
30		
45		
60		
75		
90		

90 minučių duomenų turėtų užtekti. Žinoma, eksperimentą galima tęsti praplečiant lentelę.

Kas nutiks?

Bus gauti dviejų skardinių temperatūrų rezultatai. Juodoji skardinė bus sugėrusi daugiau šilumos negu baltoji, todėl temperatūra juodoje skardinėje turėtų kilti greičiau negu baltoje. Kad būtų ryškiau matomas temperatūros kitimo greičio skirtumas, nubrėžiami grafikai.

12+ metų vaikams

Rūdijimas

Tikslas. Eksperimentas parodo sąlyginį skirtingų metalų rūdijimą.

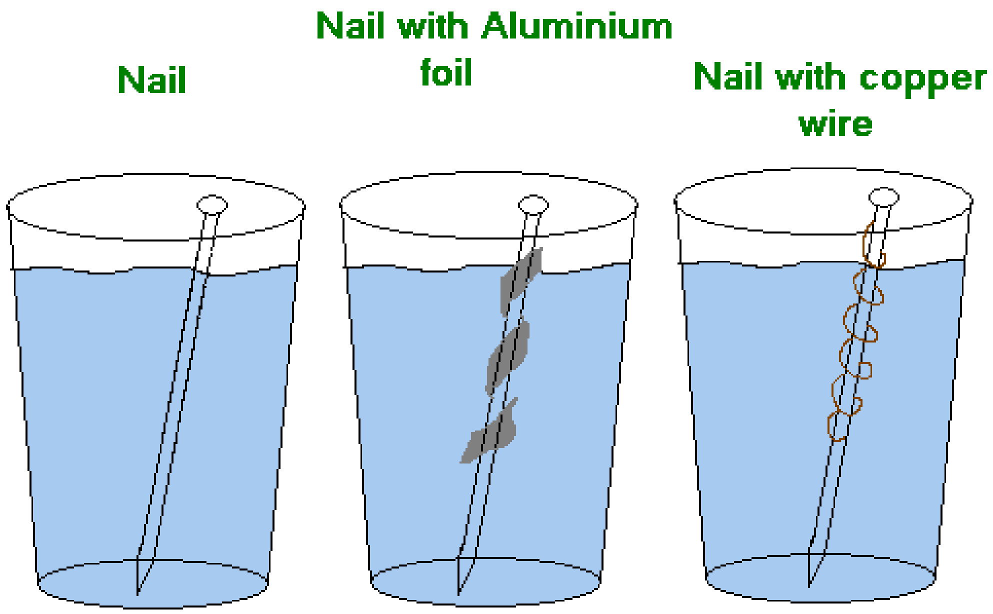
Medžiagos.

- 3 stiklinės
- druska
- 3 didelės gelžinės vinys
- šiek tiek aliuminio folijos
- šiek tiek varinės vielutės

Darbo eiga.

Prieš pradedant eksperimentą reikia įsitikinti, kad vinys yra švarios ir blizgančios. Tai padės užtikrinti, kad rezultatus lemia ne prieš tai buvęs purvas. Į kiekvieną stiklinę reikia įdėti šaukštą druskos ir užpilti ją vandeniu. Maišyti tol, kol druska ištirps.

Į pirmąją stiklinę įdėti paprastą geležinę vinį. Tai bus kontrolė, ji parodys, kas nutiktų viniai, kai jos niekas papildomai neveikia. Į antrąją stiklinę reikia įdėti plieninę vinį apvyniota aliuminio folija. Į trečią stiklinę reikia įdėti vinį apvyniotą varine vielute. Štai taip viskas turėtų atrodyti :



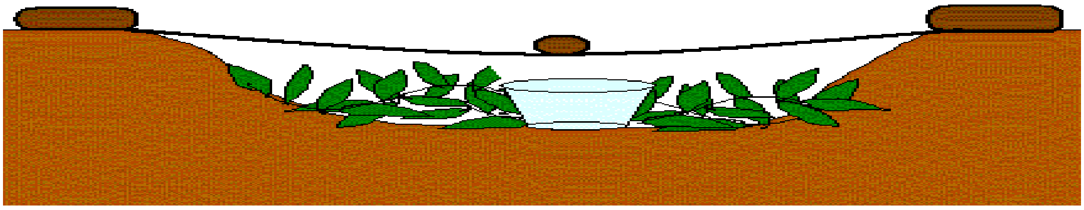
Kas nutiks?
Skirtingi metalai reaguoja su sūriu vandeniu skirtingais greičiais. Kairiausios stiklinėj geležis rūdija normaliu greičiu. Vidurinėje stiklinėje aliuminis reaguoja greičiausiai, todėl jis rūdys vietoj geležies. Proceso metu jis išskiria geležiai papildomų elektronų, kurie apsaugo ją nuo rūdijimo, tai vadinama “sacrificial” anodu. Dešiniausioj stiklinėj geležis reaguoja greičiau negu varis. Ji elgiasi panašiai kaip aliuminis vidurinėj stiklinėj, ji reaguoja taip apsaugodama varį.

<u>Vanduo iš augalų</u>

Tikslas. Išskirti vandenį iš augalų panaudojant saulės energiją.

Medžiagos.
- Kastuvėlis
- Švarus plastiko lakštas mažiausiai 75cm x75cm
- Švarus stiklainis
- 10-15 sunkių akmenų
- akmenėlis
- bet kokia žaluma (augalai)

Darbo eiga.
Iškasama 30 cm gylio ir 60 cm skersmens duobė. Į duobę pridedama aplink augančios žalumos. Piktžolės ar pievos nuopjovos yra idealios medžiagos urbanistinėje aplinkoje.
Duobės centre pastatomas stiklainis, jis patikimai įtvirtinamas. Jis pastatomas ant žemės, o ne ant augalų. Duobė uždengiama plastmasės lakštu. Bet kokios spalvos plėvelė yra tinkama, bet su permatoma galima matyti, kas vyksta. Akmenimis pritvirtinami plėvelės kraštai. Akmenukas padedamas plėvelės centre, taip, kad susidaranti duobutė (įlinkimas) būtų tiksliai virš stiklainio esančio duobėje.
Štai kaip viskas turi atrodyt:



Kas nutiks?
Saulės skleidžiama šiluma plastikine plėvele yra įkalinama duobėje. Tai kelia duobės tempereatūrą. Tai džiovina augalus. Vandens garai pasiekia plastikinę plėvelę (kadangi šiltas oras kyla), kur jie kondensuojasi suformuodami vandenį. Tuomet jis suteka nuo plėvelės iki taško, kur padėtas akmenukas ir laša į stiklainį.
Svarbu.
Kadangi tai yra geras eksperimentas ir turi išliekamąją vertę**,** rekomenduojama NEGERTI VANDENS. Jis gali turėti toksinų dėl herbicidų ar kitų šaltinių.

Lašantis čiaupas.
Tikslas. Grafiku pavaizduoti lašančiu čiaupu prarandamo vandens kiekį.
Medžiagos.

- Lašantis čiaupas
- Matavimo puodelis
- Duomenų apdorojimo programa, pvz Excel

Darbo eiga.
Po lašančiu čiaupu padedamas matavimo puodelis. Po valandos žiūrima, kiek vandens prilašėjo.
Veiksmas kartojamas kas kelias valandas (Geriausia atlikti bent 4 kartus ir daugiau)
Duomenys pateikiami tokioje ar panšioje lentelėje:

Time (hours)	Volume of water lost (ml)

Kai turimi rezultatai, jie suvedami į programą ir nubrėžiamas grafikas. Taip matomas bendras prarandamo vandens kiekis.
Kas nutiks?
Vandens praradimo greitis gali būti panaudojamas šiems ir panašiems skaičiavimams:

- Vandens kiekio praradimas per dieną, savaitę, metus.
- Vandens kiekio praradimas visoje gatvėje per diena, savaitę, metus, teigiant, kad kiekvienas namas turi vieną lašantį čiaupą.

Šio ekspereimento tikslas atkreipti dėmesį į tai, kaip net ir maži skirtumai susideda iki didelių.
Pastaba. Aplinkai padaroma didesnė įtaka, jei prarandamas karštas lašantis vanduo. Kadangi jam lašant prarandamas šildytas vanduo iš sistemų, kuriam pakeisti reikia naujo vandens, kurį reikia šildyti.