

Energy Activity Centers

Record all observations and data on the reflection sheet

ACTIVITIES

1. Observe the effects of different types of energy at the following stations:

Light bulb – heat and light

Black light – UV radiation – beads that change colors in the presence of UV

IR – Bounce the beam off of a mirror to turn on a TV

Laser – Bounce the beam between two mirrors

Candle burning – combustion of wax – wax made from tallow or by bees is a biofuel but commercial paraffin is made from petroleum.

Lever – mechanical energy – what is supplying the energy?

2. Temperature (4 Lab Tables)

Each group will heat 150 mls of water in 250 ml beakers on a hot plate at medium high setting. All groups should use the same temperature setting. (Settings may vary with the type of equipment used and this should be discussed as a possible source of error in the final discussion.)

Using computer-based probes, each group will generate a graph showing the increasing temperature of the solution over time. Set the collection intervals for 1-minute readings. Set the experiment length for 15 minutes.

OR

Standard hand-held thermometers may be used.

Take readings at 1-minute intervals for 15 minutes and graph the results.

Make a copy of the graph for each person.

Group T:	Group S:	Group D:	Group C:
Tap water	Salt water (approximately 25 grams of salt per 100 mls)	Distilled water	Colored water

3. **Spectrometer readings of** tap, distilled, heavily salted and deeply colored water. **Take readings of** the cuvettes provided. Record these in the reflection sheet.

4. **Spectra tubes** (DO NOT LOOK DIRECTLY AT THE SUN)

Look at various light forms through the spectra tube:

Sunlight outside

Sunlight inside

Incandescent light bulb

Fluorescent light bulb

5. **Smash a light bulb**

1. Make a drawing of what you think the inside of an incandescent light bulb looks like.

This is your **Hypothesis**.

2. Put the light bulb inside the Ziplock bag and seal it.

3. Gently break the glass: tap it on the table. Leave the bag sealed.

4. Make another drawing of the inside of the bulb.

This is your **Data**.

5. To find out what creates the light in a fluorescent bulb go to:

<http://www.howstuffworks.com/question337.htm>

Energy Reflection Sheet

1. Class Discussion Reflection

What is energy?

How is energy detected and measured?

What are the forms that energy can take?

What is the ultimate source of energy in our Solar System?

Can one form of energy be converted to another? _____

Where did the light and heat come from when the light bulb was turned on?

Hypothesis and Theory

The results that come from many experiments may lead to a predictive model. That means that the patterns in lots of results from lots of experiments could lead to an If/then model – scientific hypothesis:

“If the first event happens then the second event will follow it.”

You have probably experienced this yourself.

If you forget to do your homework **then** your teacher will give you an F on it. That means you can predict your grade based on doing your homework.

A scientific **hypothesis** is not a guess or conjecture or a belief. A scientific hypothesis is based on data.

1. People make observations and collect data.

You forget to do lots of homework and notice the F's piling up.

2. Then they analyze the data by making comparisons, looking for similarities and differences, and searching for patterns.

You observe the grades of other students and the amount of homework they turn in.

3. Then they make a prediction based on the data analysis.

If you turn in your homework you will get a good grade like the other students.

A prediction based on data is called a hypothesis.

Scientists discuss their hypotheses and share the data with other researchers. They then develop experiments to test each hypothesis.

After lots of testing, analysis, communication, retesting and reanalysis they may see enough patterns to be able to accurately predict what will happen.

When a hypothesis allows scientists to accurately predict an outcome more often than not, then the hypothesis becomes generally accepted by other scientists and it may become part of a **theory**. A theory is an explanation of a set of related observations or events based upon proven hypotheses and verified multiple times by different researchers.

2. Energy Activity Centers Reflection

Probes

A. Temperature Probes: Discuss your results with the other groups

Question: Were there differences in the heating and cooling times for the various types of water? Describe and offer an explanation.

Question: Did you do your experiment exactly the same as the other groups? _____

Is it even possible for each group to do things exactly the same way?

How might the differences influence the results of each group?

B. Spectrometer Probe

Question: Were there differences in the spectra for the various types of water? Describe and offer an explanation.

Spectra Tubes

Question: Were there differences in the spectra for the various types of light sources? Describe and offer an explanation.

Light Bulb Smash

Drawings

Hypothesis

Data

Hypothesis	Data

Questions:

What part of the incandescent light bulb apparatus creates the light?

What part of the incandescent light bulb apparatus creates the heat?

What part of the fluorescent light bulb apparatus creates the light?

Does the fluorescent light bulb create heat? Compare it to the heat produced by the incandescent light bulb.

Homework

A. Go To: <http://home.howstuffworks.com/fluorescent-lamp2.htm>

Describe in your own words how a fluorescent lamp works.

B. Internet Research:

Discuss the relative amount of incoming solar energy compared with Earth's internal energy. Cite your source and put everything in your own words.

C. Go to:

<http://www.k12albemarle.org/instruction/physics/teacher/light/home.html>

Press Play: Watch the animation.

Based on the class discussion of reflection and refraction explain, simply, what is happening in your own words.

(The explanation under INFO is way too complex so don't copy it – simplify it.)

MATERIALS NEEDED FOR ACTIVITIES AND LABS:

Light bulb

Black light

UV sensitive beads

IR TV remote

Small mirrors

Hand held laser

Candle

Matches

Lever

Hot plates

Beaker

Water (tap and distilled)

Salt

Food coloring

Temperature probes

Spectrophotometer

Cuvettes

Spectra tubes

Computer

Burned out light bulbs

Ziplock bags