**Presentation Equipment**

For the 3 day camp, you will need the following for presentation of teaching materials and videos:

* A computer with internet connection, projection connection and external speakers for use during group work.
* For simulation software or websites, need a computer lab with enough computers for no more than 2 students per computer. Optimal would be that each student has a computer. Pre-load any software or set up requirement and test before camp.

**Day 1**

**STEM Career Game**

* Foam board
* Name badge holders with 2-hole punch in top
* Brads
* Copies of “shopping” pictures and handouts

**Potential-Kinetic Energy** Experiments (if teach lead rather than at a university/college lab)

**For each student or team for each experiment**

**Mentos geyser**

* 2 qt bottles of DIET Coke
* Mentos
* Paper to make a funnel

**Paint stick boomerang**

* 2 paint stir sticks or equivalent pieces of wood
* 2 rubber bands
* File or sandpaper for rounding corners

**Ball Drop**

* Yard or meter stick
* Golf Ball
* Tennis ball
* Rubber ball like a racquet ball or even a dodge ball (the idea is to have very different materials that react differently)

There are **many other experiments** in teacher’s guides provided in this section. **Review materials** requirement within any of those experiments if you plan to use them.

ALT ACTIVITY: Computer simulation

**If using** **simulation activities** for this section: You will need a computer lab with enough computers for no more than 2 students per computer. **Note:** You should prepare the computers before the camp with any software downloads required and links.

**CD rubberband car** (1 set per student or team):

* 2 CDs (regular size not minis)
* Empty toilet paper roll
* 2 rubber bands
* 1 large paper clip
* Pencil
* Duct tape
* Copies of student handouts

**Electrical Energy Theory**

Student handouts

**Demonstrate lines of flux**

Materials per student or team:

A clear plastic bottle like a dish soap or straight-sided water bottle (cleaned out all traces of soap or any other liquid)

Iron filings (or steel end cuts from a stapler in a copier machine – can be found in a catch tray inside copier).

6-12 Neodymium or rare earth magnets for each demo bottle (these can beused again later in other experiments)

Clear 3” packing tape

**Conductor – Insulator Activity**

Materials per team:

D cell Battery and holder with wire leads

3 alligator clips

LED light bulb with wire leads (holder optional)

Assorted materials like string/twine, coin, toothpick, aluminum foil, paper clip,dollar bill, plastic, etc.

**Electrical Circuits**

Student Handouts

**Electrical Circuits Activity**

Snap Circuit kits by Elenco (1 for each 1-4 students) May be ordered thru Amazon.

Suggested optimal kits include: SC-300 kit and the Green Alternative Energy kit

ALT ACTIVITY: Computer Simulation

**If using** **simulation activities** that may be used for this section. You will need a computer lab with enough computers for no more than 2 students per computer. Note: You should prepare the computers before the camp with any software downloads required and links.

**Day 2**

**Day 2 Opening Activity**

2 large empty boxes (2 ft x 2 ft x 2 ft) or empty printer paper boxes will work

2 large bags of popcorn or leaves (13 gal) **NOTE:** Popcorn may be available from a local theater – if you tell them what it will be used for, they may save several days “end of day” leftovers for you free.

**AC/DC Theory**

* Copies of student handouts
* Computer with internet, projection and speakers

**DC Battery – There are 3 options. Only need materials for the experiment you choose to do.**

Materials needed per student or team. Each team will also need a Handout of instructions.

|  |  |  |
| --- | --- | --- |
| **Option A -** **Fruit power plant experiment** | **Option B: How to Charge an iPod with fruits** | **Option C: Potato power** |
| 4 lemons | 3 fruits: apple, banana, tangerine | 3 potatoes |
| 4 pennies | 2 ea -8 inches insulated copper wire | 3 copper pennies (or copper strips) |
| 5 zinc galvanized nails | 2 ea -3” nails | 3 zinc galvanized nails |
| 5 sets of alligator clips | Wire strippers | 5 sets of alligator clips |
| LED light | USB charging cable | 1 LED (1.5V) light or clock |
| Kitchen knife | Chargeable device (i.e.) IPod | Make a Battery Worksheet |
|  |  |  |

**Build a Simple Motor**

Computer with internet, projection and speakers. Materials list per student or team:

* D-Cell battery
* Battery holder
* Rubber Bands (2 per)
* Plastic cup
* 8” bare wire (2 per)
* 2 each Lead wires with Alligator clip on each end
* 40” enameled magnetic wire
* Flat magnet: 1’ x ¾” x 3/16” with 3”16” hole in center
* Sandpaper
* Pencil
* Sections of ¾ inch diameter copper pipe
* Scotch tape
* Student Handout

There are **other experiments** in teacher’s guides provided in this section. **Review materials** requirement within any of those experiments if you plan to use them.

**Renewable Energy Intro**

Computer with internet, projection and speakers for video segments.

**Computer simulation game**

**If using** **simulation activities** for this section: You will need a computer lab with enough computers for no more than 2 students per computer. **Note:** You should prepare the computers before the camp with any software downloads required and links.

**ALTERNATIVE SOLAR ACTIVITY** if no computer lab available:

Materials: PV cells, alligator clips and voltmeter

1. Have pairs or groups put cells together in series, parallel, full sun, partial sun, shade.
2. Record results.
3. Report out.

**Renewable Energy – Wind Turbine Design/Build/Test**

Student Handout – Test Data Sheet – 1 per student or team

For Wind Turbine Design/Build/Test materials list per student or team:

**TBD**

**Test Station Set up**

Set up one or more test stations with **tower and nacelle assembly, wire leads, alligator clips, voltmeter, LED light assembly and a battery and holder assembly**.

With these set up, students can test voltage output, determine if there is enough voltage output to light the bulb dimly, brightly or at all.

The battery assembly can be used to demonstrate the reverse flow when the turbine becomes fan motor when a power source is present. Does the propeller assembly turn slowly or fast?

Create a matrix on a white board or flipchart to track the test results of each design. Example:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Student/team name** | **Test 1** | **Test 2** | **Test 3** | **Test 4** | **Final Test** |
|  |  |  |  |  |  |
|  |  |  |  |  |  |

**Day 3**

**Day 3 OPTION A: Field Trips**

* + Roster with emergency contact info
  + Water and Snacks
  + PPE: Safety Glasses (which students may keep) and Hard Hats (which return to Tech Training)
  + Bus with correct location info
  + Students must have appropriate clothing: Long sleeve shirts, long pants and shoe that cover the whole foot preferably leather uppers and no conductive soles like rubber or leather.
  + Rules of conduct
  + Pre-order lunch (i.e. pizza/chicken) and have drinks and cookies available at the location
  + Coordinate with each facility contact and presenter
    - CONTACT EACH PERSON MULTIPLE TIMES: 90 days, 30 days, 1 week and the day before as reminders. Circumstances change quickly and people or facilities may not be available because of weather, restoration or mutual assistance activities. Send letter of recognition and thanks afterwards.
    - Contact the Manager of facility to schedule the field trip and any of the employees needed to provide tours or presentations
    - For those employees (i.e. lineman) being requested from other facilities, contact the supervisor AND the lineworker to coordinate their participation as well as the trucks, tools and any other equipment needed.
    - If using the Safety Trailer, schedule as soon as you have the date of the camp field trips. The schedule for the trailer fills up fast and they must check for ability to connect to the system for the demonstration location.
  + If you are planning on visiting the Project Living Proof Demo House, contact Metropolitan Energy Center
  + If you are NOT going to PLP Demo House, return to location and conduct Energy Efficiency activities.
    - Multiple activities are available in the teaching guides provided or activities outlined.
    - Materials required will vary depending on which of the activities you choose to do. Material lists and sources are included the Energy Efficiency section.

**Day 3 Field Trip Option Wrap up**

* Student Handout
* Survey
* Certificates

**Day 3 OPTION B: NO Field Trips**

NOTE: Alternative Energy Wrap up – Hydro Power. Alternative activity if Wind Turbine concluded on Day 2 (This can be used as part of the Mix-up activity if not used here.)

**Hydro Power**

* Half gallon paper milk carton (empty and washed out)
* Gallon of water
* Awl or 10 penny nail
* Masking tape
* Ruler
* Magic marker
* Pair of scissors
* Pad of paper and pencil to make notes

**Solar Oven Build/Cook**

Materials needed for solar oven construction:

* Cardboard box with attached lid
* Aluminum foil, Clear plastic wrap
* Glue stick
* Tape
* 1 foot long Stick
* Ruler or straight-edge
* Box cutter or Xacto knife
* Aluminum pie pan

***NOTE: If it is a cloud &/or cool day, have infra-red or large wattage bulbs and fixtures available.***

Materials needed for S’mores (for other dessert, snacks or lunch items - **see provided recipes**)

* Graham crackers
* Large marshmallows
* Plain chocolate bars (thin)
* Napkins!

**Solar Car Build/Race**

Use SunEzoon kit or equivalent – all materials are provided in kit. [www.pitsco.com/store/detail.aspx?ID=2209&bhcp=1](http://www.pitsco.com/store/detail.aspx?ID=2209&bhcp=1)

Kits run $15 or less per student – this is a nice take home experiment.

Construction requires:

* Scissors
* Hobby knife
* Sandpaper

***NOTE: If it is a cloud &/or cool day, have infra-red or large wattage bulbs and fixtures available.***

**Energy Mix up**

There are multiple activities/experiments provided in Day 3 Section 7. It is suggested that you have multiple 4-5 activity “stations” set up and let student in small groups rotate thru. However many stations will determine how many activities and material requirements.

Some suggested activities – Materials are listed in each project outline that is provided:

**Nuclear Chain Reaction**

* + Bunch of dominos
  + Ruler
  + Flat table that doesn't shake

**Amazing Liquid Light**

* + Tall skinny jar with screw-on lid
  + Newspaper
  + Flashlight
  + Hammer
  + Large nail and small nail
  + Sink or container (or outdoors where pouring water on the ground is not a problem)
  + Duct tape

**H2O Electrolysis**

* + A 9 volt battery
  + Two regular number 2 pencils (remove eraser and metal part on the ends)
  + Salt
  + Thin cardboard
  + Electrical wire
  + Small glass
  + Water

**Make your own lightning – Use one or other method**

* + **Method 1**
    - A large iron or steel pot (not aluminum) with a plastic handle.
    - Rubber gloves.
    - An iron or steel fork.
    - A plastic sheet (a dry-cleaner garment bag is good source).
  + **Method 2**
    - Inflated balloons.
    - Wool clothing - like a wool sweater - or a piece of real fur
    - A metal surface like a filing cabinet or a metal door knob.

**Make a Thermometer**

* + Tap water
  + Rubbing alcohol
  + Clear, narrow-necked plastic bottle (11-ounce water bottles work well)
  + Food coloring
  + Clear plastic drinking straw
  + Modeling clay

**Electromagnet**

* + Thin wire
  + A long nail = 10p is a good size (10P = 10-penny - 3-inches, the size of the nail \*)
  + Two 1.5 volt D-cell batteries, **AND/OR** a 12-volt lantern battery
  + Wire cutter
  + Masking tape
  + A "knife" switch – you should be able to find this in a hobby shop, electronic supply or a hardware store. Get a DC (direct current) switch \*\*
  + Electrical tape
  + Some paper clips

**Stored Energy**

* Long elastic rubber band
* String
* Small weight
* Clear plastic cylinder (optional)
* Large metal coffee can with a lid that clips into the top
* Electric drill
  + **OR**
* Use a cardboard oatmeal canister,
* Pen to poke holes in the bottom and the lid

You may find other activities and experiments in the additional materials provided, other websites and experiments or activities you have used in other venues. You will need to provide material list for those activities and order accordingly.

**Day 3 No Field Trip Option Wrap up**

* Student Handout
* Survey
* Certificates

**Other materials**

Book- Understanding: Electricity and Magnetism

Source: Usborne Children’s Books – Printed on demand – Long lead time – Order thru Amazon

Light Bulb Flash Drives

Source: Tmart.com Long lead time Ships from China

T-shirts for campers – Get Into Energy, UMKC, KCP&L, KC STEM logos on front

Source: Tees and printing River City Ts

[chris@rivercityts.com](mailto:chris@rivercityts.com) (816) 472-7900 (816) 472-7902 Fax 1436 Burlington N. Kansas City, MO. 64116

Polo shirts for adults – Get Into Energy, UMKC, KCP&L, KC STEM logos on back

Source: Shirts for KCP&L store, Printing River City Ts

Food & Drinks – breakfast snacks, lunches, afternoon snacks Walmart, Costco, Target