

LANCASTER

# SCIENCE FACTORY



## Scientific Achievement Pin

Activity Packet for Girl Scout Juniors

### To get your Lancaster Science Factory pin:

Complete all 5 required experiments at these exhibits:

1. Leverage Learning
2. Period Pendulums
3. Whisper Dishes/Whisper Tubes
4. Minimal Surfaces
5. The Truss Bridge

Plus complete 4 out of the 7 experiments at these exhibits:

1. Light It Up
2. Scope on a Rope
3. Airplay
4. Conductors & Insulators
5. Giant Arch
6. Identical Tracks
7. Rockin' Radiation

**At each exhibit: complete the experiment, answer the questions, and get a signature from your troop leader.**

Turn the page and read on to find out what you have to do!



# REQUIRED EXPERIMENTS



## 1. Leverage Learning

What are the 3 main parts of a lever?

Try lifting the weight with the rope then lift the other weights by pushing down on the lever handles. What do you notice about the levers that are easier to lift?

Mechanical Advantage is a number that tells you how the machine you are using is changing the amount of force that you are putting into it. The higher the number, the less effort you have to apply to use the machine. For example, a lever with a Mechanical Advantage of 5 is five times easier to lift.

What two measurements (lengths) do you need to calculate Mechanical Advantage?

Leader's Initials \_\_\_\_\_

## 2. Period Pendulums

You will do three experiments to see how we can change a pendulum to affect its period.

What is a pendulum period?

Try the first one (on the left). Pull the pendulums towards you but pull one closer to you than the other. Now let them go at the same time so they can swing.

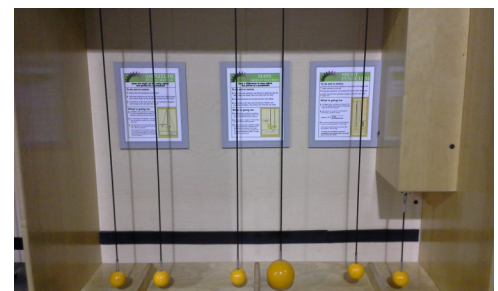
Did one pendulum swing slower than another?

This one measured amplitude. What is amplitude?

Try the same experiment with the other two experiments (except make sure that both pendulums are pulled back just as far). Make sure you release the pendulums at the same time.

Which one worked? In other words, what variable can change on a pendulum to affect it's swing?

Leader's Initials \_\_\_\_\_



# REQUIRED EXPERIMENTS



## **3. Whisper Dishes vs. Whisper Tubes**

There are two ends to the giant Whisper Tube. Stand at one end and have a friend stand at the other. Whisper something to her. Whisper something back.

Did she hear you and did it take a long time for her to get the message (you can probably tell if you watch each other's lips move)?

Look up and see how long the Whisper Tube really is: 130 feet! Think about how quickly your whisper got to your friend in that distance. How long do you think our tube would have to be if we wanted it to take a full second for her to hear you?

Now head over the Whisper Dishes and do the same thing.

Instead of trapping the sound in a tube, now we are reflecting the sound with the dishes. What is about the dishes that causes that to happen?

Leader's Initials \_\_\_\_\_

## **4. Minimal Surfaces**

As you play with the bubbles, notice they are thin elastic films. What does that mean in your own words?

Why do bubbles tend to form spheres?

Play with the bubbles on the other side too (the one with the strangely-shaped wands). What do we mean by "minimal surfaces" in the bubble description?

Leader's Initials \_\_\_\_\_

## **5. The Truss Bridge**

Build the bridge as shown in the diagrams.

What is the name of the red pieces that hold the long pieces together?

What are the long horizontal and vertical pieces called?

A truss bridge is based on what simple shape?

Try different designs! Experiment to see which one is the strongest.

Leader's Initials \_\_\_\_\_

# ELECTIVE EXPERIMENTS



## 1. Light It Up

Press the buttons to light up the different types of light bulbs.

Which bulb is the brightest?

How do we measure the amount of electricity a bulb uses?

Which bulb is the most expensive?

How is light energy wasted in some of these bulbs?

Leader's Initials \_\_\_\_\_

## 2. Scope on a Rope

Use the scope to magnify samples on the wall, at the carpet or even your clothes and skin. Try looking at money, writing utensils, pieces of paper, or whatever else you have in your pockets.

Turn it into a game- see if the others in your group can tell what they are looking at when you hold it under the scope. Were they able to guess what it was when you held it under the greater magnification?

What's the smallest thing that you can see with just your eyes?

Leader's Initials \_\_\_\_\_

## 3. Airplay

How does air pressure balance around the ball to cause it float?

What is wrong with the air flow in the first tube?

Try floating balls in each of the tubes at the same time.

Is the ball in the first tube being sucked down? Why or why not?

Leader's Initials \_\_\_\_\_

## 4. Conductors & Insulators

How is a conductor different from an insulator?

What flows through an electrical circuit?

Try putting each of the four different bars inside the slot.

Which ones are conductors?

Leader's Initials \_\_\_\_\_

# ELECTIVE EXPERIMENTS



## **5. Giant Arch**

You need a lot of people to do this one and you must work as a team!

Place the arch foundation blocks in the taped sections and start putting the pieces on top of each other, starting with number 1 and continuing in order on each side.

Which piece or pieces were the hardest to place?

How many people did it take to assemble a self-standing arch?

What force is holding these blocks in place?

What force is fighting to pull them apart?

Leader's Initials \_\_\_\_\_

## **6. Identical Tracks**

Which letter position along the tracks do you think will get a rolling ball to the bottom of the track the fastest?

Test your guess by rolling the ball from each letter. Then to make it easier, try releasing a ball from each track at the same time, but at different letter spots.

Which letter position is fastest?

When a ball is higher on the track, it has more what?

What does that transform into as it rolls down the track?

Leader's Initials \_\_\_\_\_

## **7. Rockin' Radiation**

Where does radiation come from (in a few words)?

What is a Geiger Counter?

Use the Geiger Counter on the objects in front of you. Which one has the most radiation? Which one has the least?

Are you ever exposed to radiation?

Leader's Initials \_\_\_\_\_

# BONUS QUESTIONS!



**1. What was your favorite exhibit or experiment? Why?**

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**2. Which exhibit or experiment was the most difficult? Why?**

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