

LANCASTER

# SCIENCE FACTORY

# Scientific Achievement Pin

Activity Packet for Girl Scout Brownies

**To get your Lancaster Science Factory pin:**

Complete all 5 required experiments  
at these exhibits:

1. Leverage Learning
2. Period Pendulums
3. Whisper Dishes
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. Catenary 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

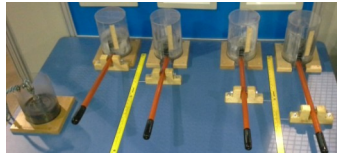
A lever is a seesaw in a playground. It moves up and down or back and forth because it is attached in one spot called:

Circle the right answer:

- A. An arm            B. A Fulcrum            C. A Load

Try lifting the weight with the rope then lift the other weights by pushing down on the lever handles.

Draw an arrow to the one that was easiest to lift in the picture below:



To make lifting easy is it better to have a lever with a long or short handle? Circle the right answer.

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

## 2. Period Pendulums

A pendulum is a rod or string with a weight hanging from the end. Do three experiments to see how we can change a pendulum to change how long it takes to complete a full swing.

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? Circle one: yes or no.

Try the second one (in the middle). Pull back the big weight and the small weight (both just as far) and let them go at the same time.

Did one pendulum swing slower than another? Circle one: yes or no.

Try the last one (on the right). Pull back the long pendulum and the short pendulum (both just as far) and let them go at the same time.

Did one pendulum swing slower than another?

Circle one: yes or no.



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

# REQUIRED EXPERIMENTS



## 3. Whisper Dishes

There are two giant dishes. Whisper into the ring of one while your friend listens in the ring of the other dish.

Did she hear you? Yes or no.

Did it take a long time for her to get the message? Yes or no. Whisper something back!

Do you think sound can travel fast? Yes or no.

What is it about the dishes that makes your whisper louder so your friend can hear it?

Circle the right answer:

- A. There's a hidden microphone and speaker
- B. They're so big they trap the sound
- C. They reflect the sound because of their curved shape

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

## 4. Minimal Surfaces

What do you think we added to the water to make the bubbles: circle the correct answer:

- A. Air
- B. Soap
- C. Soda

Are bubbles liquid or solid or gas?

Go to the side with the big rings and try to make large bubbles. What happens?

- A. The bubble stretches and then unstretches like a rubber band
- B. Nothing happens
- C. The bubble becomes solid

Play with the bubbles on the other side too (the one with the odd shapes).

Is it true that bubbles always try to take up as little space as possible? Yes or no.

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

# REQUIRED EXPERIMENTS



## 5. The Truss Bridge

Build the bridge as shown in the diagrams.

Which should you build first?

- A. Horizontal pieces                      B. Vertical pieces                      C. Diagonal pieces

A truss bridge has what kind of shape?

- A. Squares                                      B. Rectangles                                      C. Triangles

Is there more than one way to make a truss bridge? Yes or no.

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

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

# ELECTIVE EXPERIMENTS



## 1. Light It Up

Which bulb is the brightest?

- A. Incandescent      B. Halogen      C. Compact Fluorescent      D. LED

Which bulb uses the most electricity?

- A. Incandescent      B. Halogen      C. Compact Fluorescent      D. LED

Which bulb lasts the longest?

- A. Incandescent      B. Halogen      C. Compact Fluorescent      D. LED

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

## 2. Scope on a Rope

Hold the scope tool right up against something you want to see up close. You can use the samples on the wall or you can look at the carpet or even your clothes and skin!

Does everything look different when held under the scope? Yes or no.

Can you see everything under our scopes? Yes or no.

Circle the magnifications that our scopes have (there are two correct answers):

- A. 10 times larger      B. 30 times      C. 50 times      D. 100 times      E. 200 times

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

## 3. Airplay

Push the white buttons by the clear tubes. Then place the yellow balls in the tubes.

The ball floats because there is a balance of pressure above and below the ball.

Is there any air pressure on the sides of the ball? Yes or no.

Which tube has the worst air flow?

- A. The first tube (closest to the center and the air pressure)  
B. The second tube  
C. The third tube (if there is one)

Try blocking some of the tubes with your hand- does that change the air flow to the other tubes?  
Yes or no.

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

# ELECTIVE EXPERIMENTS



## 4. Conductors & Insulators

What is a conductor?

- A. Something that stops electricity
- B. Something that allows electricity to flow
- C. Something that turns electricity into another type of energy

What is an insulator?

- A. Something that stops electricity
- B. Something that allows electricity to flow
- C. Something that turns electricity into another type of energy

(On the right) Try putting each of the four different bars inside the slot.

Which ones are conductors? Circle the correct answers:

- A. The wooden bar
- B. The gray plastic bar
- C. The brass bar
- D. The aluminum bar

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

## 5. Catenary Arch

Work together as a team to match up the numbers of the blocks with the numbers on the board. Now you're going to try to lift the arch! Don't forget to lift up the little wooden base.

Do you think it can stand on its own? Yes or no.

If you got the arch to stand on its own, do you think it will be strong? Yes or no.

What is the shape of an arch similar to?

A circle   B. A triangle   C. A hanging chain or rope

Can you gently tap it so that it sways but does not fall over? Yes or no.

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

# ELECTIVE EXPERIMENTS



## 6. Identical Tracks

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

Circle one: A, B, C, D, E, F, none?

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?

Circle one: A, B, C, D, E, F, none?

Does the ball move at different speeds depending on where it is on the ramp?  
Yes or no.

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

## 7. Rockin' Radiation

Radiation is a type of energy that exists in some objects.

Move the blue handle from one object to another and listen to the clicking noises. You are using something called a Geiger Counter!

What do you think the Geiger Counter does?

- A. It gives the objects energy
- B. It's heating up the objects
- C. It measures the amount of radiation energy coming out of these objects

Do some of the objects in front of you have more radiation than the others?  
Yes or no.

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

# BONUS QUESTIONS!



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

---

---

---

---

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

---

---

---

---