



THE

# SPOOKY STEAM LAB

13 Halloween experiments, codes, builds, crafts and math puzzles  
for kids ages 5 to 11



S

science

T

tech

E

engineering

A

art

M

math

HALLOWEEN ACTIVITY PACK



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# WELCOME, JUNIOR MAD SCIENTISTS!



This lab pack has 13 Halloween activities, two or three for each letter of STEAM. Each one takes 15 to 45 minutes and uses things you can find at home or at a school supply store.

## WHO IS IT FOR?

Ages **5 to 11**. Younger kids do the main steps. Older kids try the **BIG MONSTERS** level-up challenges.

## HOW EACH ACTIVITY WORKS

**1 WONDER** **2 GUESS** **3 TRY IT** **4 EXPLAIN**

Read the spooky question, guess what will happen, follow the steps, then read the box that explains why.

## LAB SAFETY RULES

- A grown-up helper is on duty for vinegar, hot water, scissors and small batteries.
- Never taste your experiments, even when they look like candy!
- Wear old clothes or a “lab coat” (a big old T-shirt works great).
- Coin batteries are dangerous if swallowed. Keep them away from little kids and pets.
- Clean up your lab when you finish. Real scientists do!

## MASTER MATERIALS LIST

### KITCHEN

Baking soda, vinegar, dish soap, food coloring, salt, candy corn, sparkling water, small pumpkins, empty plastic bottles, clear cups

### CRAFT

Black and orange paper, white glue, watercolors, paintbrushes, markers, scissors, tape, yarn, pipe cleaners, googly eyes

### BUILDING

Popsicle sticks, rubber bands, plastic spoons, toothpicks, gummy candies or mini marshmallows, cotton balls, pompoms

### TECH

3V coin battery (CR2032), LED lights, copper tape, cardstock, a binder clip

### MEASURING

Tape measure, string, kitchen scale, ruler, pencil and paper



## 1 THE GHOST IN THE BOTTLE



"Can a ghost blow up a balloon all by itself?"

**you need** 1 empty plastic bottle • 1 white balloon • 3 tablespoons baking soda • 1/2 cup vinegar • a funnel • a black marker

- 1 Draw a ghost face on the balloon with the marker.
- 2 Use the funnel to put the baking soda inside the balloon.
- 3 Pour the vinegar into the bottle.
- 4 Stretch the balloon over the bottle's mouth, keeping the baking soda hanging to the side.
- 5 Lift the balloon so the baking soda falls in. Watch your ghost rise!

**WHY IT WORKS** Baking soda (a base) and vinegar (an acid) react and make a gas called **carbon dioxide**. The gas needs space, so it pushes the balloon up.

**BIG MONSTERS LEVEL-UP:** Test 1, 2 and 3 tablespoons of baking soda. Measure each balloon with a string. Which ghost grows biggest?

## 2 BUBBLING WITCH'S BREW



"How do witches make their potions foam and bubble?"

**you need** A clear cup on a tray • 2 tablespoons baking soda • a squirt of dish soap • green and purple food coloring • 1/2 cup vinegar • toy spiders (optional)

- 1 Put the baking soda, dish soap and a few drops of coloring in the cup.
- 2 Add toy spiders on top for extra spookiness.
- 3 Say your magic words and pour in the vinegar!
- 4 Try mixing two colors to discover new potion shades.

**WHY IT WORKS** It is the same gas as the ghost balloon! The soap traps it in thousands of tiny bubbles that overflow like a cauldron.

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## DANCING CANDY CORN



"Can candy corn dance like a skeleton?"

**you need** A tall clear glass • sparkling water • 5 pieces of candy corn or raisins

- 1 Fill the glass with sparkling water.
- 2 Drop in the candies one at a time.
- 3 Wait 1 minute and watch them bob up and down.

**WHY IT WORKS** Bubbles stick to the candy and lift it like tiny balloons. At the top the bubbles pop, the candy sinks, and it starts all over again.

**THINK ABOUT IT:** Does plain tap water make them dance? Why not?

## MY POTION LAB RESULTS

| EXPERIMENT          | I GUESSED... | WHAT REALLY HAPPENED... |
|---------------------|--------------|-------------------------|
| Ghost in the Bottle |              |                         |
| Witch's Brew        |              |                         |
| Dancing Candy Corn  |              |                         |

## SCIENTIST SKETCH

Draw what your bubbling brew looked like!



is for

# TECHNOLOGY

Secret codes and glowing circuits



4

## THE SECRET MONSTER CODE



"How can monsters send secret messages that humans can't read?"

Computers turn letters into numbers. Use the **Monster Code** to crack the messages!

|    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|
| A  | B  | C  | D  | E  | F  | G  | H  | I  | J  | K  | L  | M  |
| 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 | 13 |
| N  | O  | P  | Q  | R  | S  | T  | U  | V  | W  | X  | Y  | Z  |
| 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 |

- 1 2 · 15 · 15 \_\_\_\_\_
- 2 2 · 1 · 20 \_\_\_\_\_
- 3 3 · 1 · 14 · 4 · 25 \_\_\_\_\_
- 4 20 · 18 · 9 · 3 · 11 15 · 18 20 · 18 · 5 · 1 · 20 \_\_\_\_\_

Answers: 1) BOO 2) BAT 3) CANDY 4) TRICK OR TREAT

**YOUR TURN:** Write a secret message to a friend and let them decode it.

**BIG MONSTERS LEVEL-UP:** Invent a **shift code**: move every letter 3 places forward (A becomes D, B becomes E). This is the Caesar cipher, one of the oldest secret codes in history!

## 5 GLOWING PUMPKIN CIRCUIT



"How can we make a paper pumpkin's eyes light up?"

**YOU NEED** Orange cardstock • 1 LED • 1 CR2032 coin battery (grown-up handles it) • copper tape • a binder clip • tape

- 1 Draw a big jack-o'-lantern and poke a tiny hole in one eye.
- 2 Push the LED legs through the hole from the front so the light shows.
- 3 On the back, stick two copper tape paths: one from the **long** LED leg, one from the **short** leg.
- 4 Lead both paths to a corner. The battery's **+** side touches the long-leg path, the **-** side touches the short-leg path.
- 5 Fold the corner over the battery and hold it with the binder clip. Your pumpkin glows!

**WHY IT WORKS** Electricity only flows in a closed loop called a **circuit**. The copper tape is the road, the battery is the push, and the LED lights up when the road is complete.

**THINK ABOUT IT:** What happens if you flip the battery over? The LED stays dark, because LEDs only let electricity go one way!

### DESIGN A GLOWING MONSTER

Where would you put the lights? Draw the copper tape paths too!

# E is for **ENGINEERING**

Build it spooky, build it strong



THE ENGINEER'S DESIGN CYCLE: **ASK** **IMAGINE** **PLAN** **BUILD** **TEST** **IMPROVE**

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## CANDY PUMPKIN TOWER



"How tall a tower can you build to hold a pumpkin on top?"

**you need** 30 toothpicks • 20 gummy candies or mini marshmallows • 1 mini pumpkin (or an orange ball)  
• a timer

- 1 Set the timer for 10 minutes.
- 2 Build a tower by joining toothpicks with the candies.
- 3 When time is up, place the pumpkin on top. Does it stand for 10 seconds?
- 4 Measure your tower and write the height here: \_\_\_\_\_ cm

**ENGINEER'S SECRET** **Triangles** are the strongest shape. Towers made of triangles wobble less than towers made of squares.

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## SPIDER WEB Rescue



"Can you build a web strong enough to catch 10 flies?"

**you need** A chair or doorway • yarn or string • tape • 10 cotton balls (the flies)

- 1 Tape yarn across the chair legs or doorway to make the spokes of a web.
- 2 Weave more yarn in a spiral from the middle outward.
- 3 Stand 1 big step back and toss the cotton balls one by one.
- 4 Count the flies you catch: \_\_\_\_ / 10. Then improve your web and try again!

**WHY IT MATTERS** Real spiders build webs with sticky spirals and strong spokes. Scientists study spider silk because it is incredibly strong for how thin it is.



"How far can you launch an eyeball?"

**you need** 7 popsicle sticks • 4 rubber bands • 1 plastic spoon • pompoms or ping-pong balls with eyes drawn on • a tape measure

- 1 Stack 5 sticks and wrap rubber bands around both ends.
- 2 Put 2 sticks together and band them at one end only.
- 3 Slide the stack of 5 between the 2 sticks, making a V shape.
- 4 Band the spoon to the top stick.
- 5 Put an eyeball in the spoon, press down and let go!
- 6 Launch 3 times: \_\_\_\_ cm, \_\_\_\_ cm, \_\_\_\_ cm. Circle your best!

**WHY IT WORKS** Pressing the spoon stores **energy** in the bent stick. When you let go, that energy turns into motion and sends the eyeball flying.

**SAFETY:** Aim at a target on the floor, never at people or pets.

### INVENT A SPOOKY MACHINE

Draw a machine that could deliver candy to your door. Label its parts!

# A is for ART

Creepy, colorful creations



## 9 SYMMETRY BATS



"Why do both sides of a bat look the same?"

**you need** Black or white paper • paint in 2 or 3 colors • a paintbrush • googly eyes • scissors

- 1 Fold the paper in half, then open it again.
- 2 Paint half a bat on ONE side only: half a body, one wing, one ear. Paint thickly!
- 3 Fold the paper closed and press all over with your hand.
- 4 Open it slowly. Surprise: a whole bat!
- 5 When dry, cut it out and add googly eyes.

**ART + MATH** The fold is called a **line of symmetry**. Butterflies, leaves and even your face have symmetry. Find 3 symmetrical things in your house!

## 10 MAGIC SALT SPIDERWEBS



"Can salt make paint sparkle and spread like magic?"

**you need** Thick paper • white glue in a squeeze bottle • table salt • watercolor paints • a brush • a tray

- 1 Draw a spiderweb with glue: lines from the center, then a spiral.
- 2 Pour salt over the glue until it is covered. Shake the extra into the tray.
- 3 Dip your brush in watery paint and gently touch it to the salty lines.
- 4 Watch the color race along the web! Try orange, purple and green.
- 5 Let it dry flat for a few hours.

**WHY IT WORKS** Salt soaks up water. This is called **absorption**, and it pulls the colored water along the salty lines.

**BIG MONSTERS LEVEL-UP:** Add a spider made from a black pipe cleaner. How many legs does a real spider have? Give yours the right number!



is for  
**MATH**

Monster numbers and pumpkin puzzles



11

## PUMPKIN INVESTIGATION



"Will a big pumpkin sink or float? How many seeds are inside?"

**You need** 1 or 2 small pumpkins • string • a ruler • a kitchen scale • a big bowl of water (a grown-up cuts the pumpkin open)

Guess first, then measure!

| QUESTION                                           | MY GUESS | REAL ANSWER |
|----------------------------------------------------|----------|-------------|
| How big around is it? (wrap string, measure in cm) |          |             |
| How heavy is it? (grams or kg)                     |          |             |
| How many lines (ribs) does it have?                |          |             |
| Will it sink or float?                             |          |             |
| How many seeds? (count in groups of 10)            |          |             |

**SURPRISE ANSWER:** Pumpkins float, even huge ones! They are hollow and full of air.

## DRAW YOUR PUMPKIN

Draw it from the side and count its ribs!

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## CANDY SORT AND GRAPH



"Which candy color is the most common in your bag?"

**you need** A handful of small colored candies (or colored buttons for a no-sugar version) • crayons

- Sort the candies into groups by color.
- Color one box in the graph for each candy.
- Write the total at the end of each row.

|                      |                          |                          |                          |                          |                          |                          |                          |                          |                          |                          |                          |                          |                      |
|----------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|----------------------|
| Orange               | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | =                    |
| Purple               | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | =                    |
| Green                | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | =                    |
| Yellow               | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | =                    |
| Other                | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | =                    |
| <input type="text"/> | 1                        | 2                        | 3                        | 4                        | 5                        | 6                        | 7                        | 8                        | 9                        | 10                       | 11                       | 12                       | <input type="text"/> |

**TALK ABOUT IT:** Which color has the most? The fewest? How many more orange than green?

13

## MONSTER MATH RIDDLES



"Can you solve all 6 monster riddles?"

Draw a picture if it helps!

- 1** One spider has 8 legs. How many legs do **3 spiders** have?

= \_\_\_\_\_

- 2** A witch has 20 candies. She gives 7 to a ghost. How many are left?

= \_\_\_\_\_

- 3** 4 bats fly past the moon. Each bat has 2 wings. How many wings in total?

= \_\_\_\_\_

- 4** A pumpkin patch has 5 rows with 6 pumpkins in each row. How many pumpkins?

= \_\_\_\_\_

- 5** A vampire sleeps 12 hours every day. A day has 24 hours. How many hours is he awake?

= \_\_\_\_\_

- 6** **BIG MONSTERS** A mummy needs 3 meters of bandage for each arm and 4 meters for each leg. How many meters for the whole mummy?

= \_\_\_\_\_

Answers: 1) 24 legs 2) 13 candies 3) 8 wings 4) 30 pumpkins 5) 12 hours 6) 14 meters

# MAD SCIENTIST CHALLENGE CARD



Color a pumpkin for each activity you finish. Complete all 13 to earn your certificate!

|                                                                                                                   |                                                                                                                    |                                                                                                                    |
|-------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|
|  <b>1</b> Ghost in the Bottle    |  <b>2</b> Bubbling Witch's Brew   |  <b>3</b> Dancing Candy Corn    |
|  <b>4</b> Secret Monster Code    |  <b>5</b> Glowing Pumpkin Circuit |  <b>6</b> Candy Pumpkin Tower   |
|  <b>7</b> Spider Web Rescue      |  <b>8</b> Flying Eyeball Catapult |  <b>9</b> Symmetry Bats         |
|  <b>10</b> Magic Salt Spiderwebs |  <b>11</b> Pumpkin Investigation  |  <b>12</b> Candy Sort and Graph |
|  <b>13</b> Monster Math Riddles  |                                                                                                                    |                                                                                                                    |

## MY LAB NOTEBOOK

My favorite experiment was...

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The most surprising thing I learned...

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Something that did not work at first, and how I fixed it...

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A new spooky experiment I want to invent...

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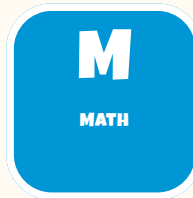
**OFFICIAL**

# SPOOKY STEAM SCIENTIST

This certifies that

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has bravely completed the Spooky STEAM Lab: mixing potions,  
cracking codes, building towers, painting bats and solving monster  
math!



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Head Mad Scientist

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Date

