

# Materials List

## Chapter 1

### **Measuring the Invisible: A Metric and Density Challenge**

Ruler and/or measuring tape

Measuring cups and spoons

Electric kitchen scale \*

Calculator

U.S. nickel coin

*\* There is no need to break the bank for this item! Digital pocket scales will work fine. Most are around \$15 at the time of this writing and can be found in most large retail stores and online. There will be many uses for this device throughout the book!*

## Chapter 2

### **ESP: The Effect of Density on Buoyancy**

2 clear glass containers 500mL (2cup volume)

2 raw eggs

Table salt ~100g (~7Tbs)

Water (room temperature)

Electronic scale

Spoon for stirring

Measuring cup/spoons

## Chapter 3

### **Instant Ice: Supercooling Water**

Large bowl or container for ice bath

Crushed ice (enough to surround bottles)

Table salt ~0.5cup (150g)

Spoon (for mixing and tapping)

Thermometer (optional)

Timer or clock

Paper towels or tray for clean-up

Three unopened bottles of purified water (not distilled)

## Chapter 4

### Atomic Identity Shuffle

~20 Red beads (protons)

~20 White beads (neutrons)

~20 Blue beads (electrons)

Two small cups/containers

Six-sided die or online simulator

Markers or writing utensils

## Chapter 5

### Periodic Pasta Table

Printed periodic table

Glue stick

Two pieces of corrugated cardboard and scrap paper (8.5"x11")

Geometry compass or nail (to poke holes)

Dry spaghetti (uncooked)

Metric ruler

Transparent tape (optional)

Calculator (optional)

## Chapter 6

### Flames of Color - Chemistry in Fire

Candle

Lighter

Four small cups

5-10 popsicle sticks/Bamboo skewers

Container to hold sticks/skewers

Powdered coffee creamer

Epsom salts

Borax

Table salt

Crushed Tums or Roloids

Safety equipment (goggles, gloves, closed-toe shoes, hair-ties, fire extinguisher, etc.)

Outdoor area and ADULT SUPERVISION

## Chapter 7

### **Solubility Sleuths: Identifying Polarity**

200mL (~1cup) distilled water

100mL (~0.5cup) vegetable oil

100mL (~0.5cup) isopropyl (rubbing) alcohol

Salt

Food coloring

Clear cups or jars (10)

Stirring rods

Measuring spoons

Dropper

Safety goggles

Paper towels

## Chapter 8

### **ESP: Foaming Reactions**

1-6 identical clear glass or plastic tubes\*

1 cup tap water

1/2 cup dishwashing liquid

1 cup 3% hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>)

1 package dried yeast

5 small cups

Measuring spoons

Spoons or spatula

Metric ruler

Timer

Calculator

Safety goggles

*\* Pill bottles and disposable plastic shot cups work great!*

## Chapter 9

### ESP: Mass Matters

2 clear plastic cups

Epsom salt (magnesium sulfate,  $MgSO_4$ )

Baking soda (sodium bicarbonate,  $NaHCO_3$ )

Water

Teaspoon

Electronic scale

Three small zip-top bag or plastic containers with lid (for sealed reaction)

Measuring spoons

Stirring sticks or spoons

Safety goggles and gloves

## Chapter 10

### Modeling Isotopes with Beans

Zip-lock bags (3)

Lima beans (~5-10)\*

Kidney beans (~10-15)\*

Navy beans (~15-20)\*

Electronic scale

Small cups or jars (4)

Marker or pen for labeling

Calculator (optional)

## Chapter 11

### Popcorn Stoichiometry

$\frac{1}{2}$  cup of popcorn kernels (~100 g)

Stovetop non-stick pot with lid

Stovetop burner

Electronic scale

Large bowl (for catching popcorn)

Container for unpopped kernels

Calculator

## Chapter 12

### **Mass to Gas: A Stoichiometry Story**

Baking powder (sodium bicarbonate)

Aluminum foil

Oven

Cookie/baking sheet

Small beaker

Measuring spoon

Electronic scale

Safety goggles

Timer or stopwatch

Tongs

Graduated cylinder

Water

## Chap13

### **Homemade Litmus: Using Cabbage to Measure pH**

1 head of red cabbage

Knife and a stove (and an adult to help you)

Distilled water

Large pot

Strainer

Coffee filters or paper towels

Cardboard scrap or paper plate

Scissors

Clear cups or jars (8)

Measuring spoons

Baking soda

30mL (2Tbs) of the following: Lemon juice, Vinegar, Apple or orange juice, Black coffee, and

Milk

Plastic dropper or syringe

Paper towels

Safety goggles

## Chap14

### **Milk of Magnesia Color Show**

100mL (~1/2cup) milk of magnesia\*

200 mL (3/4cup) distilled water

30-60mL (~2-4Tbs) white vinegar

Large clear cup or glass (500mL or 2cups)

Spoon or stir stick

10-15mL (~2-3tsp) red cabbage indicator (from Chapter 13's lab)

\*Make certain magnesium hydroxide is an active ingredient.

## Chap15

### **Lemonade Logic: Balancing Chemistry and Taste**

Frozen lemon juice concentrate

Water

Sugar

Measuring cups and spoons

Drinking glasses or coffee cups (4)

pH strips from Chapter 14 lab

## Chap16

### **ESP: Brining Chicken and Osmosis**

3 chicken breast halves (boneless, skinless)

Salt (kosher or sea salt)

Measuring cups/spoons

Electronic scale

Large mixing bowl and spoon

Digital thermometer (optional)

Plastic zip-top bags (3)

Oven

Baking sheet or wire rack

Marker

Gloves(optional)

Adult supervision

## Chap17

### **Measuring Displacement Through Vector Drawing**

Ruler

Tape measure (optional)

Colored pencils or markers (optional)

Calculator

## Chap18

### **Coin Drop Inertia**

Wooden or plastic ruler

Cardboard box

Pushpin or thumbtack

Two metal washers or coins of similar mass

Flat table

Measuring tape or ruler

Stopwatch (optional)

*\*The ruler must have 1+ holes along its length.*

## Chap19

### **ESP: Falling Fast - Exploring Terminal Velocity**

10 flat-bottomed paper coffee filters

Meter stick or tape measure

Stopwatch or slow-motion camera

Electronic scale

Tape

Access to balcony or elevated drop zone

## Chap20

### **Magnetism in a Tube**

1 AA or D-cell battery

60cm+ (2+ft) of insulated copper wire

Wire stripper, scissors, or sandpaper

Tape (electrical or masking tape)

Paperclips

1 empty plastic pen tube (remove the ink and endcap from a disposable pen)

1 medium-sized iron nail (that can fit loosely inside the tube)

## Chap21

### **Work and the Direction of Force and Motion**

1 small object (water bottle, small cup, etc.)

Ruler or meter stick

Electronic scale

Stopwatch (optional, for timing lifts)

Calculator

String 1m (3ft)

## Chap22

### **Energy Transformations in a Roller Coaster**

Foam pipe insulation (cut lengthwise)

Marble or small steel ball

Meter stick

Masking tape

Digital scale

Stopwatch

Ruler

Data recording sheet

Calculator

Books or boxes (for building hills)

## Chapter 23

### **Bounce Back: Investigating Energy Loss**

Small bouncy ball (rubber or superball)

Flat hard surface (tile or concrete floor)

Electric scale

Meter stick or measuring tape

Stopwatch or smartphone camera

Calculator

Masking tape (to mark heights)

## Chapter 24

### **ESP: Torque Bar and Levers**

PVC pipe, 1 meter long (3/4" or 1" diameter)

PVC T-fitting (same diameter as the pipe)

Saw

4 small round eye screws

Drill

Empty soda can or bottle

Paper clip or string 15cm (6in)

Ruler or tape measure

Goggles

## Chapter 25

### **Slinky Waves**

1 metal or plastic slinky

3 meters of 20+ pound fishing line (optional)

2 chairs (optional)

Masking tape

Stopwatch (or phone timer)

Measuring tape or ruler (at least 1 meter)

## Chapter 26

### **Ripple Tank Lab: Visualizing Wave Behavior**

Shallow tray (glass baking dish, clear plastic lid from a shoebox, etc.)

Water

4-6 books of equal size

Desk light (flashlights will work too)

Straw, spoon, or finger to create waves

Small barrier objects (plastic strips, cardboard, coins)

Small square/rectangular block (must fit within the tray)

## Chapter 27

### **DIY Membrane Flute**

Rubber or latex glove, powder free

2-3 cardboard tubes (e.g. paper towel tubes, toilet paper, etc.)

Plastic straw

Rubber band

Tape

Scissors

## Chapter 28

### **ESP: Measuring Distance with Sound Waves**

Two metal spoons (or hands for clapping)

Stopwatch or smartphone timer

Measuring tape

Flat wall (brick or concrete preferred)

## Chapter 29

### **Light Trap: Exploring Total Internal Reflection**

Clear rectangular container (aquarium or plastic food tub)

Water

Non-fat dry milk (or liquid milk)

Protractor (provided)

Flashlight (with narrow beam) or laser pointer

Spoon or stick for stirring

## Chapter 30

### **The Double-Slit Interference Experiment**

Laser pointer (red)

0.5mm-0.7mm Mechanical pencil lead (2)

Large and medium binder clips

Black tape

White screen (index card or white wall)

Ruler or measuring tape

## Chapter 31

### **Rotating Light: Investigating Polarization**

Clear plastic or glass cylinder

Karo or other light-colored corn syrup

Two polarizing filters\*

Flashlight

Tape

Optional: red and blue color filters

*\*Precut polarized film sheets can be found online or lenses from cheap polarized sunglasses work too.*

## Chapter 32

### **ESP: Invisible Commands: Exploring IR Range**

TV remote control (or similar IR device)

Electronic device with IR receiver (TV, speaker, etc.)

Measuring tape

Various transparent, opaque, and metallic objects such as: Glass sheet, White paper, Cloth, Black trash bag, Metal pan, Water-filled baggie, etc.

Protractor (paper copy provided)