

# THE CURIOUS WORLD OF KITCHEN SCIENCE

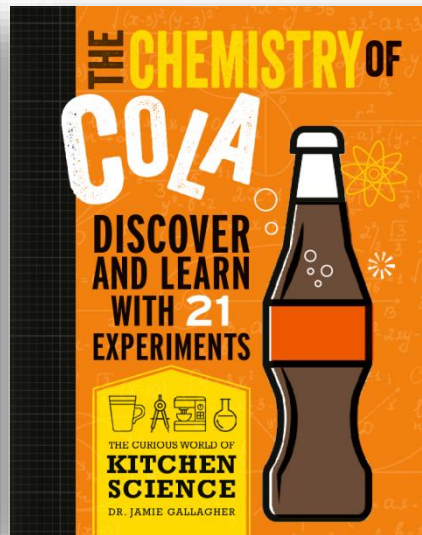
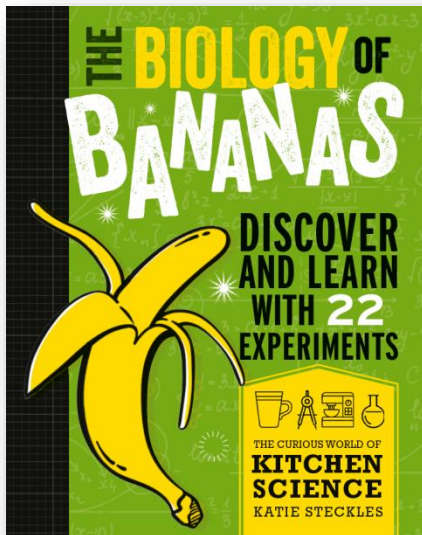
## THE BIOLOGY OF BANANAS \* Katie Steckles

## THE CHEMISTRY OF COLA \* Jamie Gallagher

Nonfiction | Ages 12+ | Paperback | 6 x 8 | 160pp | \$14.99

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Explore the key principles and practice of everyday science by using analogies, experiments and research with food and drink in your home kitchen!



- Discover, Learn About and Experiment.
- 60 illustrations; four-color throughout.
- Hands-on, applied science.
- Unique, fun and interactive approach.

32 PLANTS

### DISCOVER: HOW DO PLANTS MAKE DINNER?

All biological organisms need energy to live, and they get this energy from sugars, such as glucose. A process called respiration takes place inside cells, and produces the energy an organism needs to live.

**RESPIRATION**  
The most type of respiration is called aerobic respiration, so called because it uses oxygen. The chemical reaction is:

$$C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O + \text{Energy}$$

Cells use brought oxygen and glucose by the organism's transportation systems—in humans and animals, this is the bloodstream. The respiring cells produce carbon dioxide and water as waste products, and the energy is released to allow cells to function.

**RESPIRATION** happens in both plants and animals, but it isn't there's a second process, which means they don't need to eat to get glucose molecules. They can produce their own sugar using energy from the sun.

**PHOTOSYNTHESIS**  
Photosynthesis, which happens in all green plants, is the reverse process of respiration. It uses water and carbon dioxide, and produce glucose and oxygen. The chloroplasts in the cell (see page 12-13) contain a green pigment called chlorophyll, which allows the plant to absorb light from the sun. The energy from sunlight allows the photosynthesis reaction to take place.

$$6CO_2 + 6H_2O + \text{Energy} \rightarrow C_6H_{12}O_6 + 6O_2$$

Oxygen is released from the plant into the air, and the glucose is used by the plant's cells for respiration. This is why plants need water and plenty of sunlight to live.

**SUNLIGHT OR LAMPLIGHT?**  
Plants need light to complete photosynthesis, and even though most plants live outside in the sun, they can still survive in a pot indoors (as long as you don't forget to water them). Plants on the window ledge will survive better than ones in rooms with no windows, so does this mean that sunlight is better?  
Sunlight is different from artificial light. Most lamps don't emit as much energy in the red and blue region of the light spectrum as the sun does, and plants have evolved to use all the different wavelengths of light, so they will struggle to live. Light from the sun is also generally more intense than artificial light. It's true because it doesn't take any electricity to produce it!

32 STATES OF MATTER

### EXPERIMENT: UNDER PRESSURE

For soft drinks to be filled with fizz, they have to be kept under pressure, but nature doesn't really like differences in pressure. Areas of different pressure will equalize whenever they can: balloons deflate, bike tires need to be pumped up, and ears might pop on a plane.

As you open a bottle of cola and hear that distinctive hiss, the pressure in the bottle has already been balanced with the air pressure in the room. An unopened bottle of cola is very difficult to crush because of the pressure that is sealed inside; it becomes a lot easier as soon as you open it.

In this experiment you'll crush a plastic soft drink bottle, using only the air pressure of the room.

**WHAT TO DO:**

- Stand the empty plastic bottle upright in the bowl and put the funnel in the top. Pour half a cup of hot water through the funnel and into the bottle, forming a layer of water around 2.5 cm (1 in.) deep.
- Leave the bottle for a couple of minutes, so that the hot water warms the air in the bottle and the pressure inside and outside the bottle equalizes, and then screw the cap on the bottle.
- Put a layer of ice cubes in the bowl.
- Put the bottle down in the bowl and cover it with more ice cubes. Then, pour a pitcher of ice water over it.

**WHAT HAPPENS?**  
The bottle should quickly collapse. The ice and cold water cool the warm air inside the bottle, causing the particles of air in the air to bounce around less vigorously, reducing the pressure they exert on the walls of the bottle. The pressure of the air outside the bottle is now stronger than the pressure inside, and this pressure difference is enough to crush the bottle.

**YOU WILL NEED:**

- Empty plastic soft drink bottle
- Funnel
- Large plastic bowl
- Ice cubes
- Half a cup of hot (though not boiling) water
- Pitcher of ice water