



PROJECT Nº3

Air, Fluids & Density



AUTHORIZED AMA
STE(A)M PROGRAM

AGE GROUP: 5-13 ADVANCED





PROJECT Nº3

SUPPLIES NEEDED

An empty plastic bottle (can be from 8-16.9 oz in size)

1 oz of vinegar

1 teaspoon/7 grams of baking soda

12-in or 10-in balloon

Funnel

Balloon

Bowl of very cold water

Bowl of very hot water (adult supervision required)

OBJECTIVES

Learn what molecules are, and how they help us understand gases (like air)

Learn what fluids are and how they behave

Learn what density is, and what it has to do with molecules and fluids

Learn how density can be changed by adjusting other factors

INSTRUCTIONS, PART 1

1. Add the vinegar to the bottle, using the funnel if needed.



2. Fit the opening of the balloon over the narrow end of the funnel and turn it so the wide end of the funnel is up in the air.



3. As you hold the balloon and funnel securely together, pour the baking soda into the funnel so that it goes down into the balloon.



4. Remove the funnel from the balloon and set the funnel aside.

5. Keeping the bottom of the balloon level so the baking soda stays trapped inside, stretch balloon opening over the opening of the plastic bottle until a seal is formed.



6. Once the balloon is attached to bottle, tip the balloon up to empty the baking soda into the bottle.



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BACKGROUND INFORMATION, PART 1

The reaction of vinegar and baking soda combining produces a gas called carbon dioxide (CO₂). The balloon inflates because the gas needs more space than what is available in the bottle, so it starts to fill the balloon as well. Gasses, like CO₂ and air, take up space.



In the AMA Jr. Camp video that accompanies this activity, you will see another demonstration using CO₂ gas, like the gas you created inside the bottle and balloon. The demonstration will show that gasses like air and CO₂ are fluids, which is important for understanding how aircraft fly through the air.

INSTRUCTIONS, PART 2

1. Remove the bottle cap (if necessary) and stretch the empty balloon over the opening of the bottle to form a seal, as you did in Part 1.

2. Immerse the bottom of the bottle in the bowl of cold water. What happens? Nothing! The air molecules are condensing (moving closer together) because of the cold.



3. Now immerse the bottom of the bottle carefully in the bowl of hot water. What happens? The balloon should start to inflate. The air molecules are spreading out, taking up more space because of the heat.



4. Return the bottle to the bowl of cold water. What happens? The balloon should deflate a bit, because the molecules are condensing back together again due to the cold.



BACKGROUND INFORMATION, PART 2

The amount of air in the bottle is always the same, because it is sealed by the balloon. The air is changing density, or the amount of space its molecules take up. Cold air takes up less space (is more dense) because the molecules are closer together. Warm air takes up more space (is less dense) because the molecules are more spread out.

HAVE MORE FUN
LEARNING AT HOME!



QUICK PROJECTS

A collage of various 'Quick Project' cards from the AMA Flight School. The cards include projects like 'Paper Plane Launcher', 'Recycled Materials Hovercraft', 'Coffee Filter Paratrooper', 'Paper Model Planes Zero', and 'Paratroopers'. A circular inset shows a young boy in a dark shirt using scissors to cut out a paper plane. A speech bubble from a cartoon character says 'LET YOUR MIND SOAR WITH THESE FREE PROJECTS!'. The background is blue with faint technical drawings and text like 'WARNING! DO NOT FOLD TABS IN FRONT OF FUSELAGE!' and 'WHEN GLUE IS SET, CUT OFF TABS A, B, C, D, E, F AND G.'.

QUICK PROJECT PAPER

QUICK PROJECT COFFEE FILTER PARATROOPER

QUICK PROJECT RECYCLED MATERIALS HOVERCRAFT

QUICK PROJECT PAPER PLANE LAUNCHER

QUICK PROJECT PARATROOPERS

QUICK PROJECT PAPER MODEL PLANES ZERO

QUICK PROJECT PAPER MODEL PLANES

LET YOUR MIND SOAR WITH THESE FREE PROJECTS!

FIND INSTRUCTIONS, PRINTOUTS, AND VIDEOS AT

AMAFLIGHTSCHOOL.ORG/QUICKPROJECTS