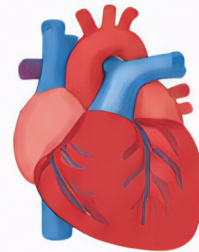


MAKING A MODEL HEART PUMP

WITH PLASTIC BOTTLES AND TUBING



GOAL:

Build a working model of the heart to observe how pumping action moves "blood" through the body.



MATERIALS:

- 4 plastic bottles (16–20 oz / 500–600 mL) with caps
- 6–8 feet (2–2.5 m) of plastic tubing (fits snugly through bottle caps)
- 4 short drinking straws: (one-way valves)
- Scissors or craft knife (adult use)
- Hole punch or heated nail (to make holes in caps)
- Silicone sealant or hot glue
- Food coloring
- Water
- Tape or marker
- Optional: cardboard or stand to support the bottles



SAFETY FIRST:

- Ask an adult for help with cutting, hole making, and hot glue.
- Do not drink the colored water.
- Clean up spills right away.

FINISHED MODEL (EXAMPLE):



HOW IT WORKS (SCIENCE BEHIND IT):

The heart has four chambers that pump blood through two circuits: to the lungs and to the rest of the body. Your model uses bottles as chambers and tubing as blood vessels. When you squeeze the "ventricles," the liquid moves through one-way valves (straws) just like in a real heart.



PROCEDURE:

- 1 Make Holes:** Make 2 holes in each bottle cap. The holes should be just big enough for the tubing (and straws) to fit snugly.
- 2 Prepare Straws (Valves):** Cut the straws so a small flap (about 1 cm / 1/2 in) remains at one end. This flap acts as a one-way valve. The flap should open when liquid is pushed from one side, but close to stop backflow.
- 3 Build the Atria (Top Bottles):** These are the receiving chambers.
 - Top Left Bottle = Right Atrium (blue)
 - Top Right Bottle = Left Atrium (red)
- 4 Build the Ventricles (Bottom Bottles):** These are the pumping chambers.
 - Bottom Left Bottle = Right Ventricle (blue)
 - Bottom Right Bottle = Left Ventricle (red)
- 5 Connect the Heart:**
 - From Right Atrium to Right Ventricle: Use tubing with a straw valve so liquid can flow down into the ventricle.
 - From Left Atrium to Left Ventricle: Same as above.
- 6 Connect the Pulmonary Circuit (Blue):** From Right Ventricle up to Left Atrium using tubing with a straw valve so liquid flows upward.
- 7 Connect the Systemic Circuit (Red):** From Left Ventricle up to Right Atrium using tubing with a straw valve so liquid flows upward.
- 8 Seal all holes with silicone or hot glue to prevent leaks.**
- 9 Add colored water:**
 - Blue water in the right side (right atrium and right ventricle)
 - Red water in the left side (left atrium and left ventricle)
- 10 Test It:** Gently squeeze the ventricles (bottom bottles) one at a time and watch the flow. Valves should keep the liquid moving in the right direction.



OBSERVE & THINK:

1. What happened when you squeezed the right ventricle (blue)? _____
2. What happened when you squeezed the left ventricle (red)? _____
3. Why are the straws (valves) important in your model? _____
4. How is your model similar to the real heart? _____
5. How is your model different from the real heart? _____



CONCLUSION & REFLECTION:

What did you learn from this experiment?

How could you improve your model?



EXTEND YOUR LEARNING:

Research the path blood takes through the heart and body. Label your tubing with the names of the vessels. Try adding a "body" (a container at the bottom) to show where blood is delivered.