



Have a Heart

How does your heart pump blood in one direction?

Description

How does your heart move blood in one direction, around in a loop? In this activity, you will make a model of one of the heart's chambers. It's best to do this activity after "Make a One-Way Valve"—this heart model builds on that valve activity.

Average Level: 10 and Up



How does your heart pump blood in one direction?

Materials

- Empty plastic soda or water bottle.
- approximately 500 mL (16 oz.).
- Ear syringe.
- 3 bendable straws.
- Hot glue gun & glue.
- Water.
- 3 large glasses or clear.
- tall containers; 3 medium balloons.
- approximately 20-30 cm in diameter if inflated.
- Scissors.
- Small knife.
- Masking tape.
- Red food coloring (optional)
- Funnel (optional).



Note

You can find ear syringes at most drug stores & pharmacies. Hot glue works best because it's thick & dries fast. Rubber cement may work too. A small, sharp knife works best for cutting holes in the bottle. The three tall glass containers should be roughly the same size. You may need to change the size or prop the glasses up, depending on your setup.

Safety

Be careful when using a hot glue gun and a sharp knife. Have an adult help you if necessary.

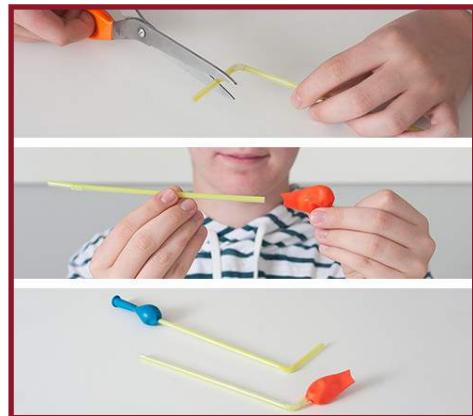
Step 1

The photos in this activity will help you through the entire setup. Start by making two one-way valves, out of two straws and two balloons. (Don't reuse the valve you made in the "Make a Heart Valve" activity). First, cut a very small slit (2-3 mm) in the closed end of each balloon. The slit should be just big enough for you to insert a straw, with the balloon making a tight seal around the straw. For the first valve, insert the short end of a bendable straw in through the first balloon's mouth and out through the slit. Only the tip of the straw should remain inside the balloon.



Step 2

For the second valve, cut off about 2 cm of the mouth of the second balloon. Then cut off approximately 2/3 of the shorter end of the second straw. Slide the straw's longer end through the slit in the second balloon, until only the tip of the shorter end is inside the balloon. You now have two one-way valves, which you will insert into holes in an empty plastic bottle.



Step 3

With an adult's help (if necessary), cut two small holes in the empty bottle, each large enough for you to insert a straw. One hole should be halfway down from the bottle's mouth. The other hole should be on the opposite side of the bottle, a third of the way up from the bottom. Tip: Don't cut either hole too big, since you need to seal the gap around each straw.



Step 4

Insert the first straw into the bottom hole. (This is the blue balloon straw in the photo.) Insert the second straw, with the balloon on its short end, into the top hole. (This is the orange balloon straw in the photo.) You may need to twist the balloon to fit it through the hole.



Step 5

Use the third straw as a tool to bend down the portions of the two straws inside the bottle. They need to bend downward so that water can flow properly through the bottle in a later step.



Step 6

Arrange the three glasses or containers with one turned upside down, and set the bottle on top of that one. (You may need to secure the bottle with masking tape.) Place each upright glass or container so a straw extends into it. (Adjust the size or height of your glasses as needed.)



Step 7

Apply glue around the holes in the bottle where you inserted the straws. This will keep the straws from moving, and seal the holes around the straws so air or water cannot leak out. To get a good seal, you may need a second layer of glue after the first dries.



Step 8

Fill the glass that has the upper most straw with water. Make sure the water covers the end of the straw by at least 5 cm (as in the photo). If you have red food coloring, add about 5 drops to the water—this glass represents blood the heart pumps. Leave the other glass empty.



Step 9

Fill the bottle with water to cover the tip of the lower straw by about 1-2 cm (as in the photo). You may need a funnel.



Step 10

Take the third balloon, and cut off one third of it including the mouth. Stretch the balloon mouth over the bottle mouth.



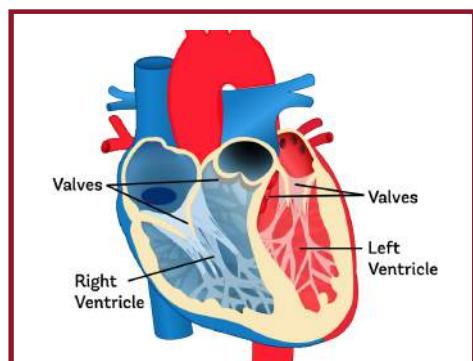
Step 11

Place the long syringe tip inside the bottle mouth. Pull up the cut balloon piece to make an airtight seal between the bottle and ear syringe. Your pump is ready! Squeeze and release the bulb of the ear syringe. What happens to the red water? Does it flow from its glass to the empty glass on the other side?



What's Going On?

Your heart has four separate chambers. The model you built is similar to two of the chambers, called the ventricles. A ventricle has two one-way valves that work like the model you built. Your heart squeezes to pump blood, similar to you squeezing the ear syringe. When you squeezed the ear syringe, air pushed on the water and the orange balloon valve. The water exited through the blue balloon straw, but air pressure closed the orange balloon valve. When you let go of the ear syringe, air outside pushed on the water in the glasses outside the plastic bottle. This pressure difference pulled water into the bottle through the orange balloon valve, and closed the blue balloon valve.

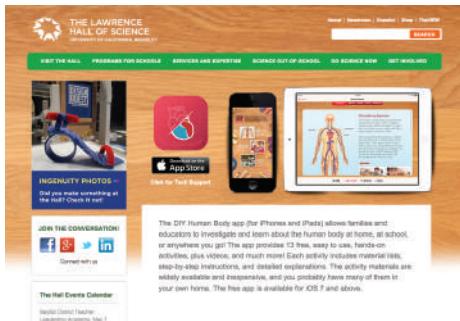


Exercising & Your Heart

How does exercise keep your heart healthy? Exercise makes muscles stronger. Your heart is a muscle, and a stronger heart pushes more blood with each beat, and doesn't have to beat so fast. If your heart can work less to pump the same amount of blood, the force on your arteries is less, which lowers your blood pressure. Exercise also helps blood flow better to small blood vessels around your heart. These blood vessels bring oxygen and nutrients to the heart muscle, keeping it healthy. The American Heart Association recommends that kids get at least 60 minutes of exercise each day. You can walk around your neighborhood, play soccer, ride a bike, or do any physical activity you like.



Learn More



For more info and other activities, visit:

LawrenceHallofScience.org/do_science_now/diy_human_body

Credits



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THE LAWRENCE
HALL OF SCIENCE

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