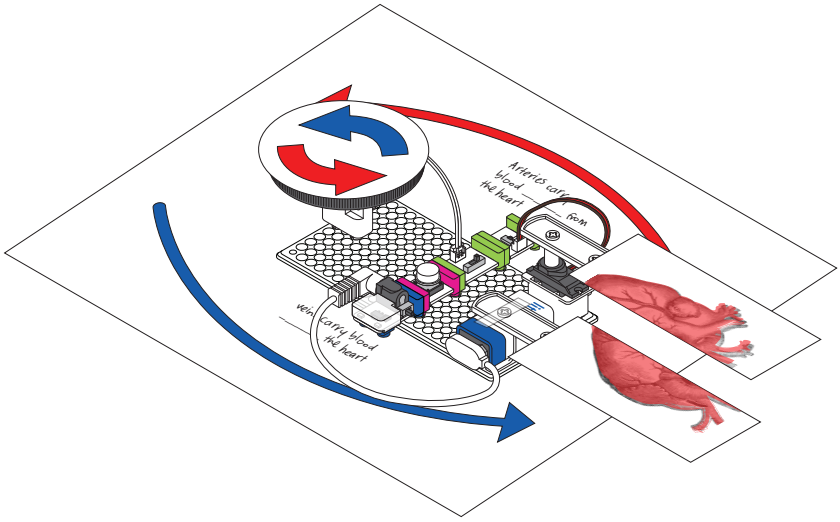
littleBits

HEART BEATS



GUIDED

DESIGN CHALLENGE
Design a littleBits model of the circulatory system to demonstrate the movement of blood with each heart squeeze.

WRITE

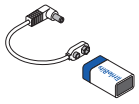
EXPLORE

- Complete Writing Box #1and #2 in your guided handout.

CREATE

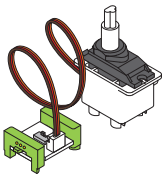
CREATE

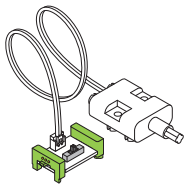
1. Gather your invention tools.

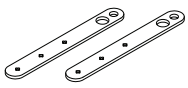

a1 battery & cable

p4 power

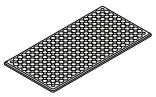
i3 button

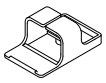

o11 servo


o25 DC motor


a23 mechanical arms (2)

a25 wheel

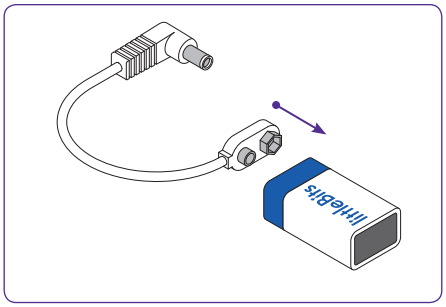

a30 mounting board

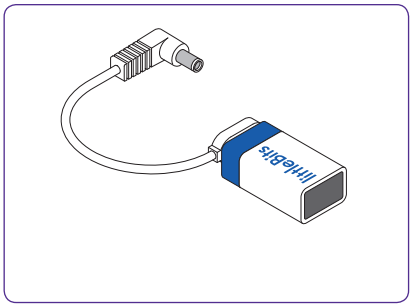

a31 battery clip

Other materials:

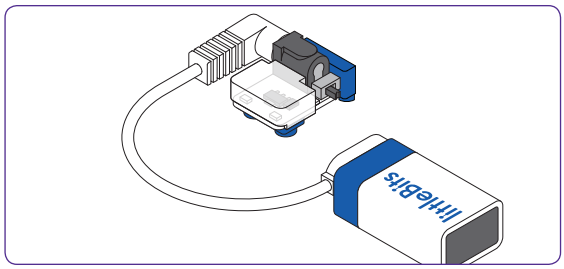
- Tape
- Anatomically printed heart + circulator disc (Handout A)
- 8x11 "circulatory placemat" (Handout B)
- 1 blue and 1 red crayon or marker
- Scissors

2. Attach the battery cable to the battery.

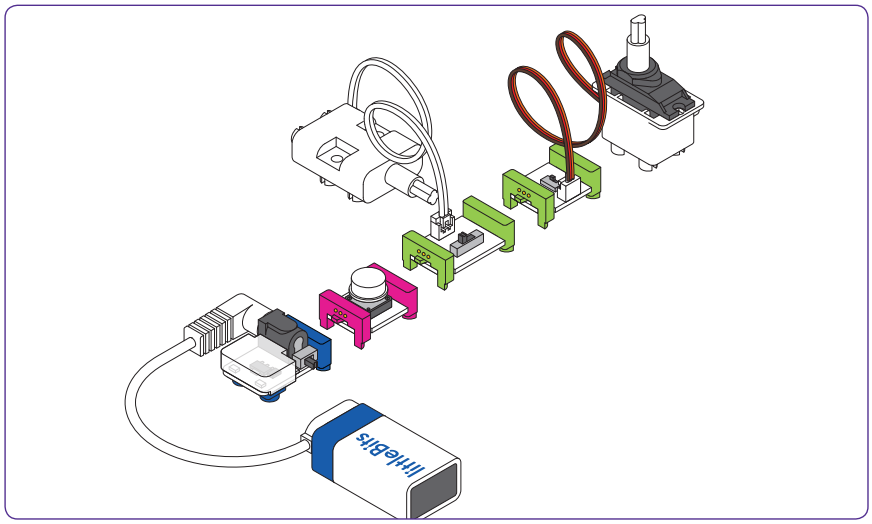




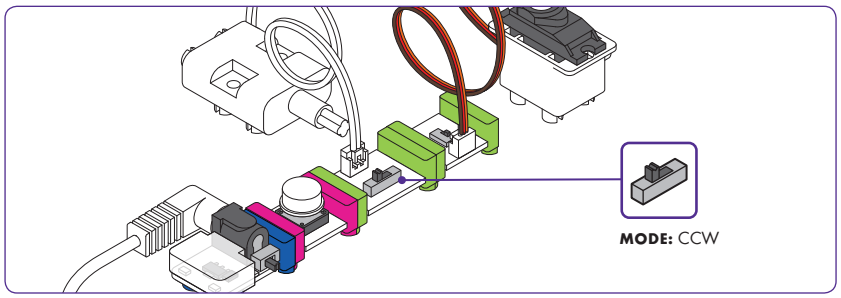
3. Attach the power Bit to the battery cable assembly.



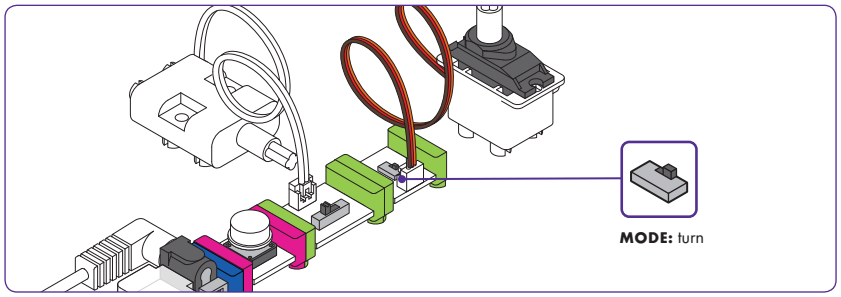
4. Snap this circuit together.



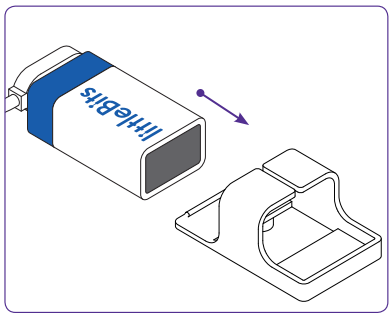
5. Switch the DC motor to "CCW" mode.



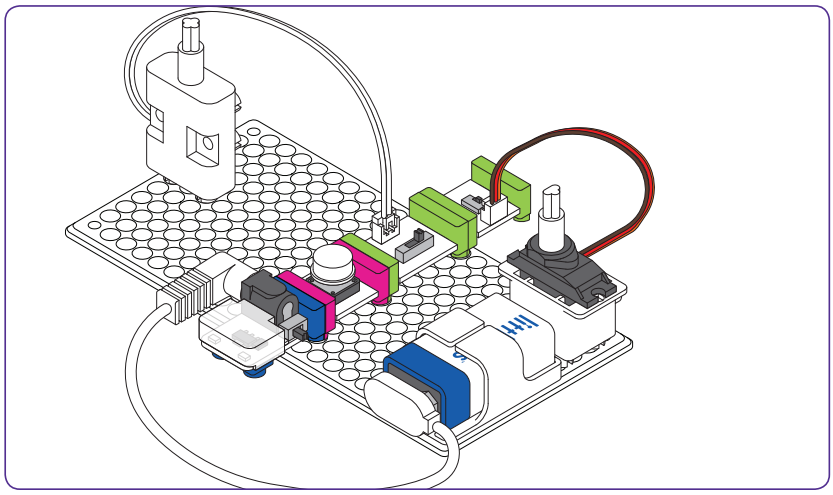
6. Switch the servo to "turn" mode.



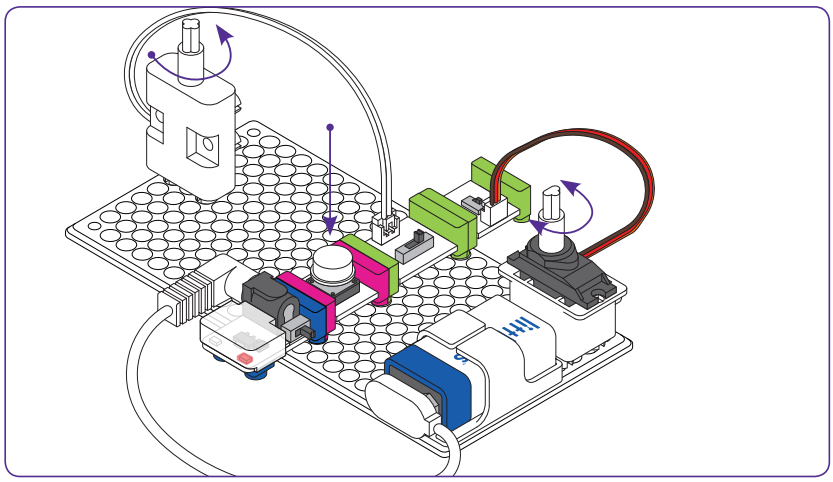
7. Slide the battery into the battery clip.



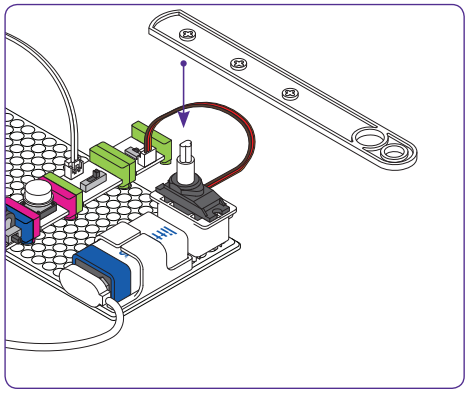
8. Press the circuit onto the center of the mounting board as shown. Make sure that the servo and DC motor are placed on opposite sides of the board. Press the battery clip into the board next to the servo.

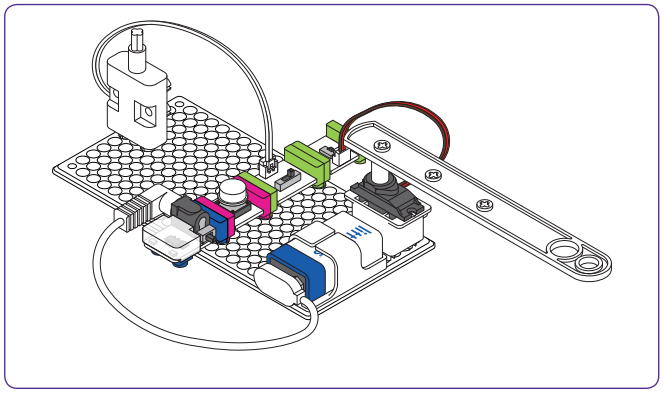


9. Power on your circuit. Push the button to test that the DC motor and servo spin. Leave your circuit on.

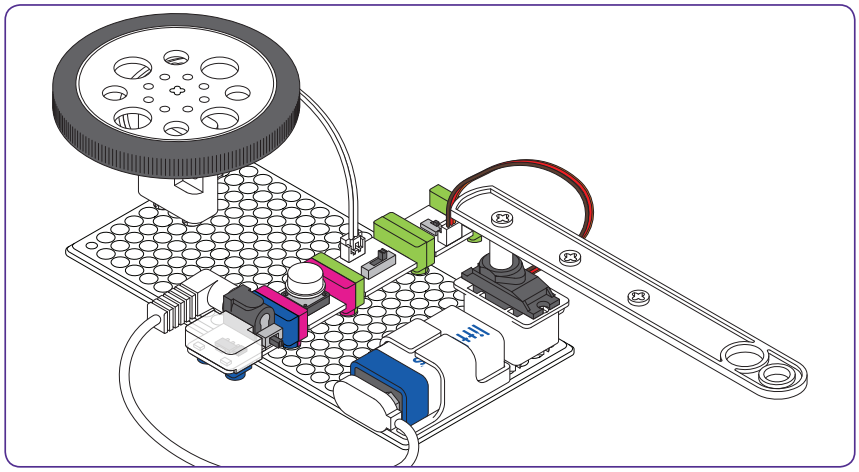


10. Press the cross hole on the end of the mechanical arm onto the servo axle. Your arm should extend away from the mounting board.

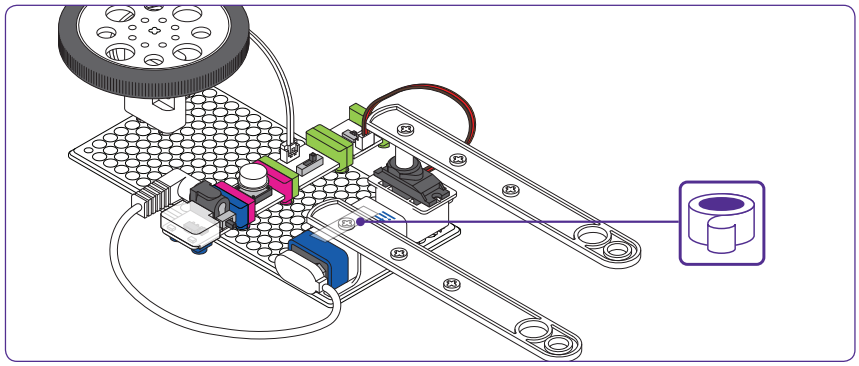




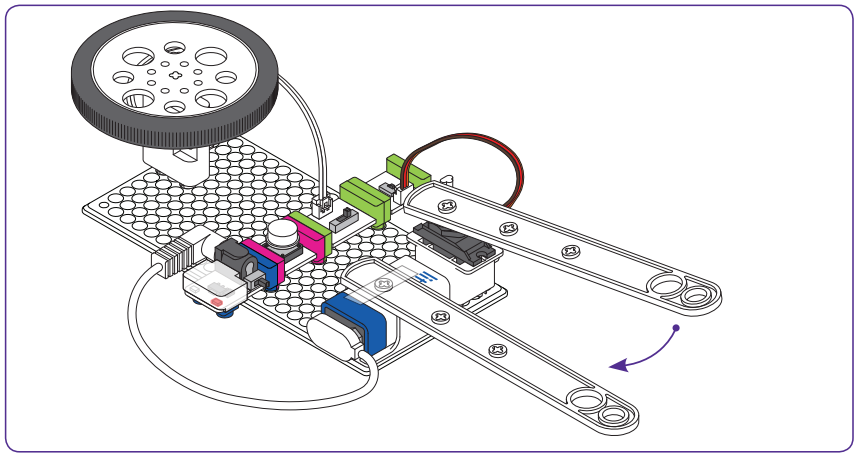
11. Pick up a wheel with the longer axle side facing down. Line up the cross axle of the DC motor with the cross hole of the wheel and gently press the two together.



12. Tape the second mechanical arm to the top of the battery so that it is in parallel to the servo arm.



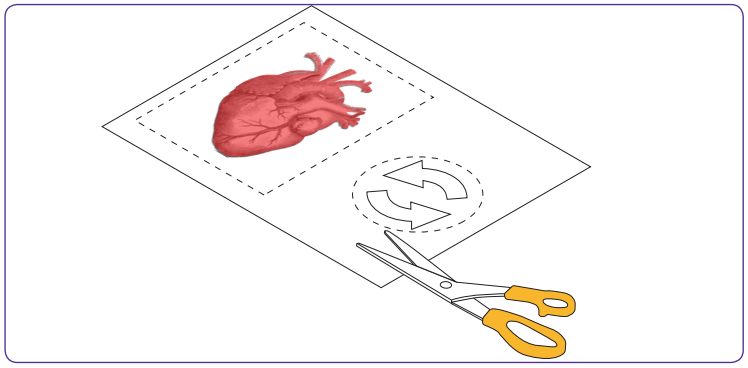
13. Let's test that your circuit works! Gently push the button and release. The mechanical arms will represent your "heart." Each open and shut motion demonstrates a heartbeat.



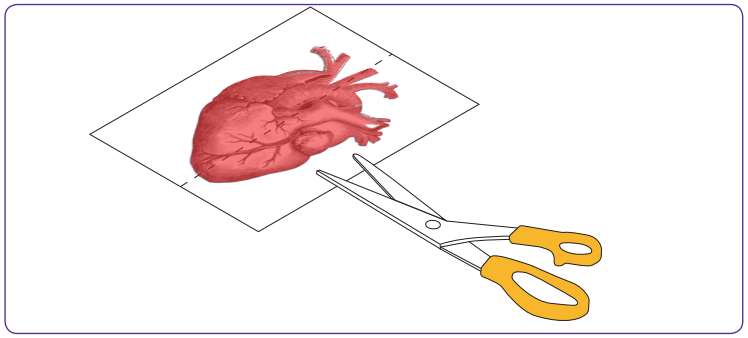
14. Power off your circuit while you continue to work.

Let's design our heart model

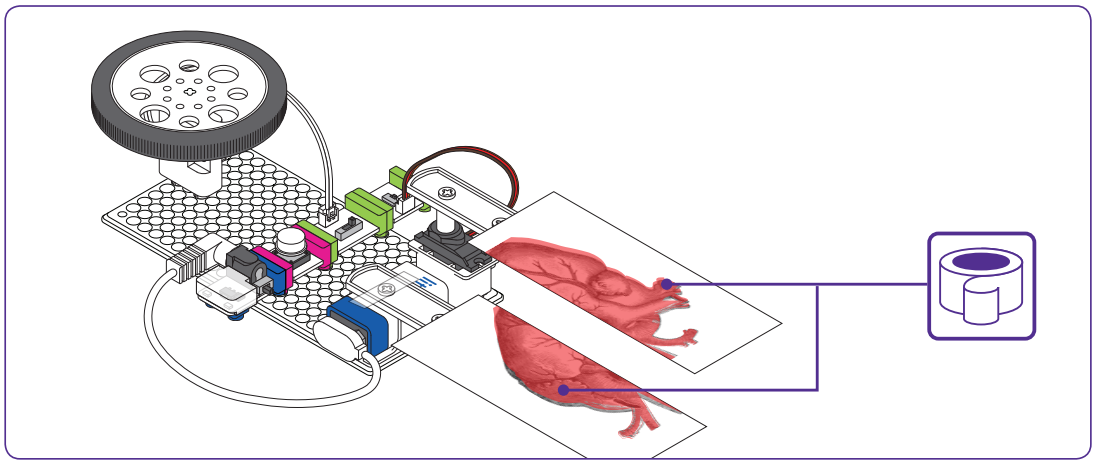
15. Cut out your anatomical heart and the circulatory disc. You'll find these sheets in your Student Handout.



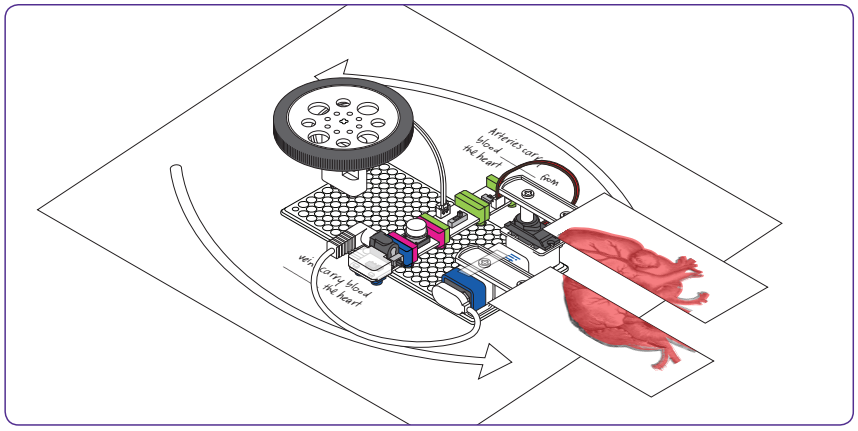
16. Take your anatomical heart and cut it in half down the middle.



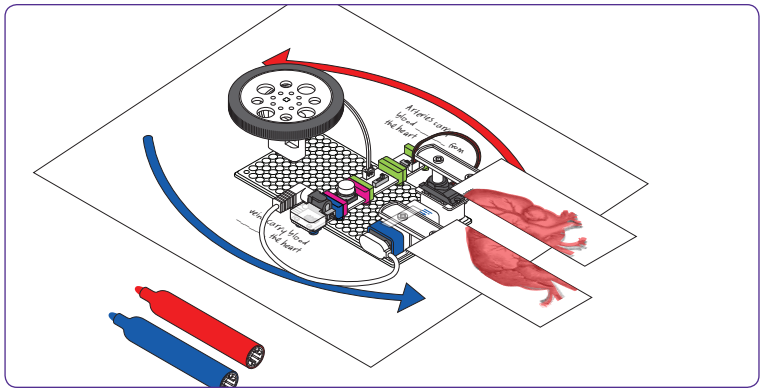
17. Tape a piece of the heart onto each arm so that it looks like a complete heart.

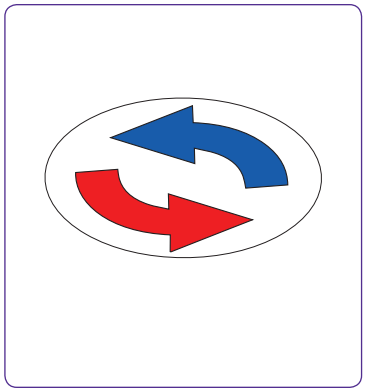


18. Take your "circulatory placemat" that represents the body's entire circulatory system. Orient your circuit in the center, with the "heart" on the right side and the wheel on the left.

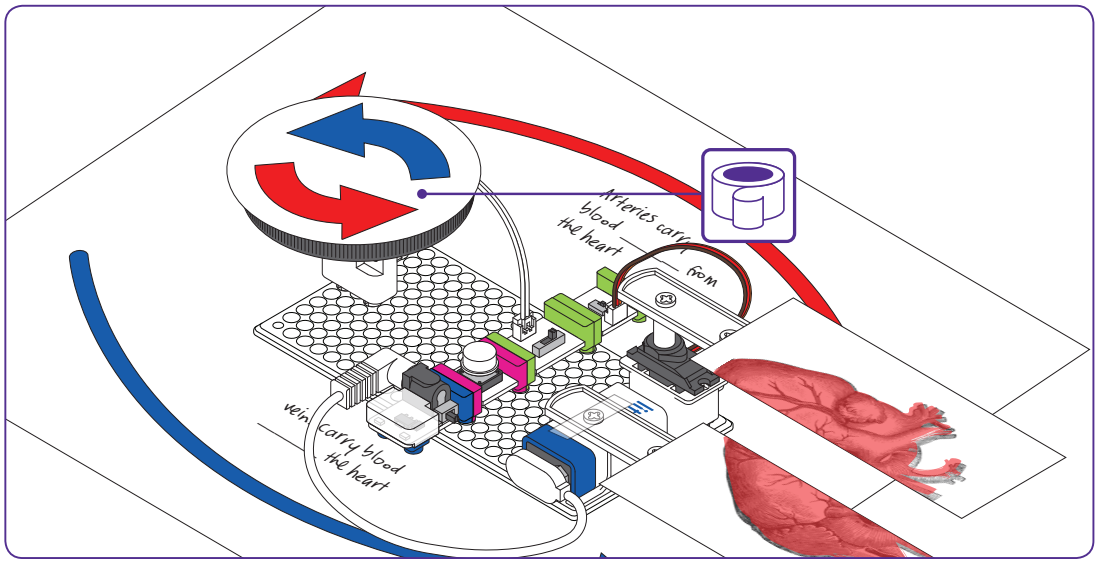


19. On the placement, color in the arteries red and the veins blue, and fill in the missing words. On the circulatory disc, color one arrow red and the other blue.





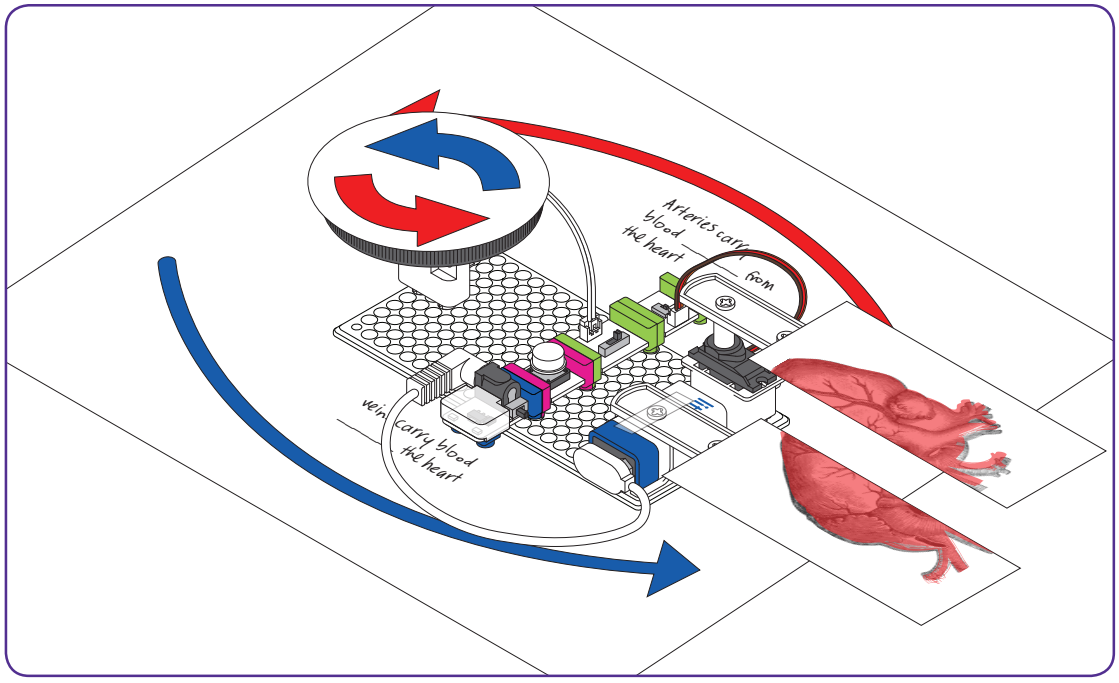
20. Tape the arrow disc to the top of the wheel.



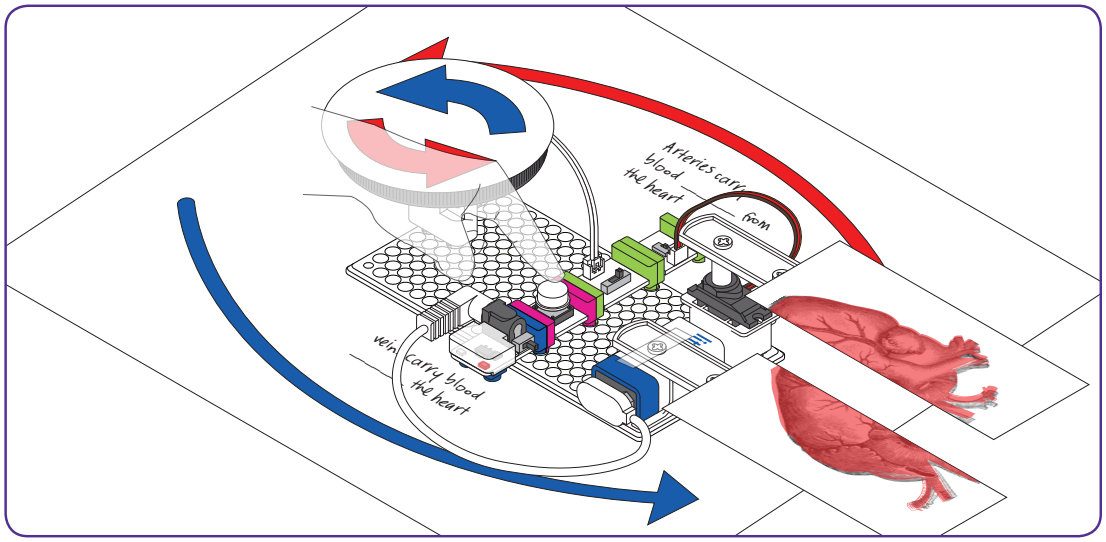
PLAY

PLAY

21. Check your model. Make sure the circuit is in the center of the placemat, the heart is taped onto the arms, and the disc is taped onto the wheel.



22. Turn on your circulatory model! Press the button quickly to see that the DC motor rotates slightly, while the "heart" beats open and closed. Turn to a partner and take turns explaining how your model helps show how the heart moves blood through our body.



REMIX WRITE

REMIX

- Complete Writing Box #3 in your guided handout.

CLEAN

CLEAN UP

- **Until next time, littleBits!** Place the Bits gently back in the box according to the diagram on the back of the Bit Index; return classroom materials to their proper place and check the area around your workstation.

littleBits

HEART BEATS

Name:

CHALLENGE OVERVIEW

Let's build a model of our heart!

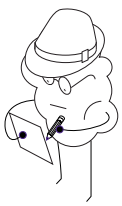
GUIDING QUESTIONS TO REACH LEARNING OBJECTIVES

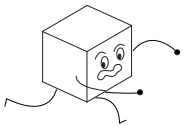
Why does our heart "beat"? How does our body receive oxygenated blood?

CREATE

1. In what way is the heart like a sponge? How are the two alike? Describe in 1–2 sentences.

2. Draw a model of what happens each time our heart "beats." What is happening to blood rich in oxygen, and what is happening to blood that needs oxygen?

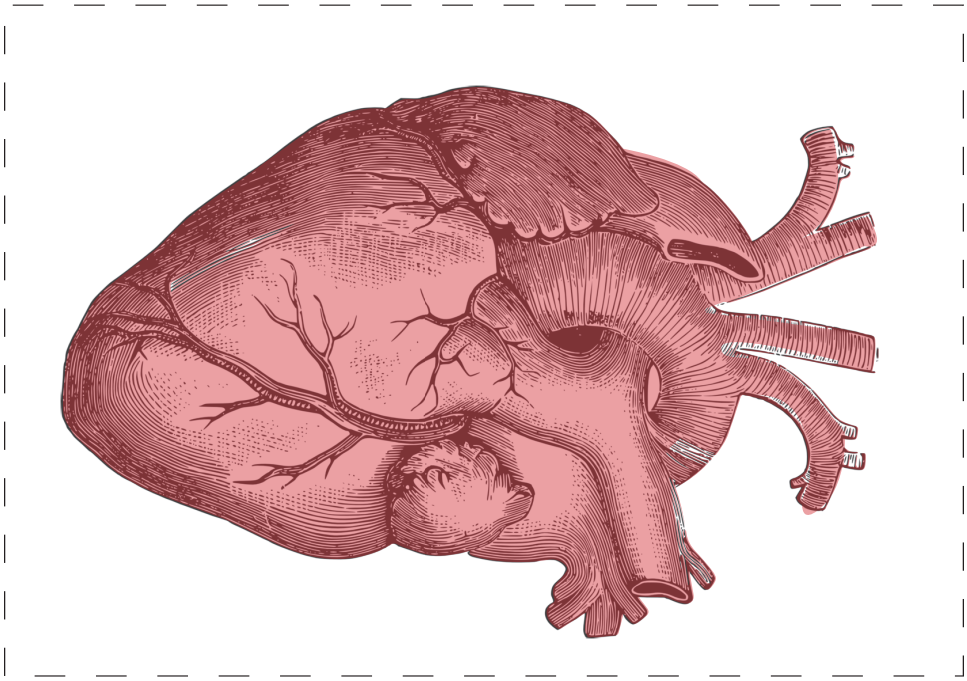


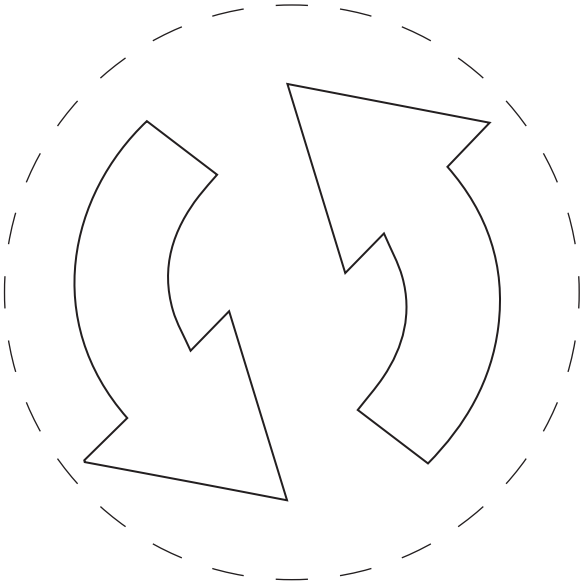


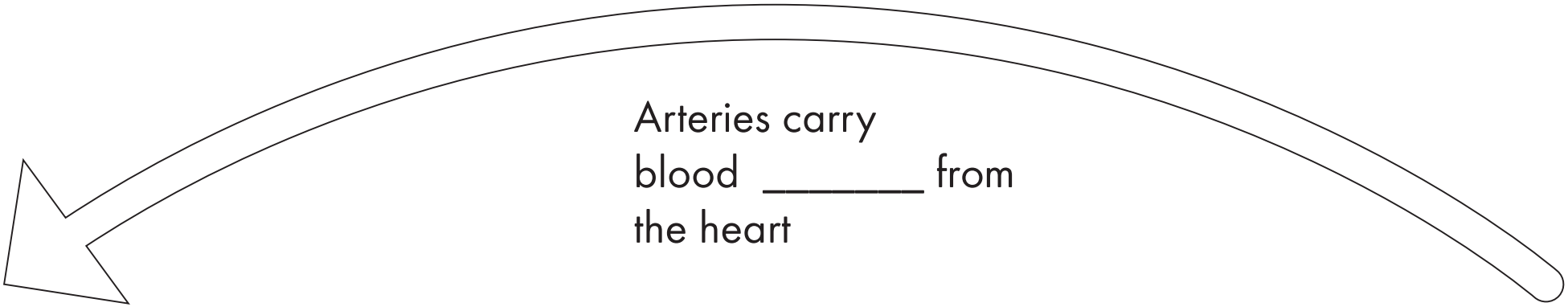
REMIX

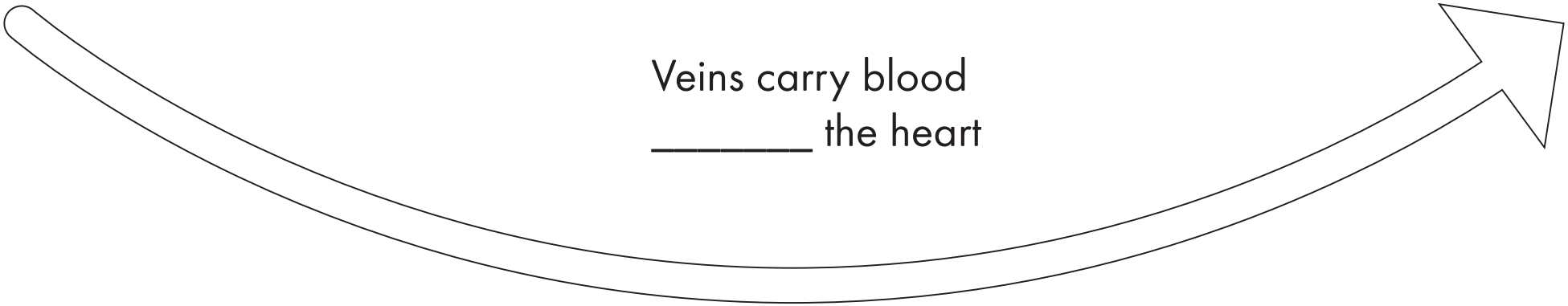
3. Record each group member's 15-second heart beat. Then use multiplication to calculate your resting heart beat (beats per minute).

NAME	15-SECOND HEART BEAT	MY RESTING HEART RATE







Arteries carry blood _____ from the heart

Veins carry blood _____ the heart