

National Next Generation Science Standards

Students who demonstrate understanding can:

Standard (s):

HS-LS1-3. Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.

sources on the subject, demonstrating understanding of the subject under investigation.

STEM Practice:

Planning and Carrying Out Investigations

Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly.

Horizontal align.: N/A

Vertical align.: MS.LS1.A

CCSS ELA:

WHST.9-12.7. Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple

Standards Key

K = Kindergarten

3 = 3rd Grade
(numbered by grade)

MS = Middle School

HS = High School

PS = Physical Science

LS = Life Science

ES = Earth Science



WHST.11-12.8. Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.



TEACHERS GUIDE



**STUDEN BLOOD
PRESSURE KIT**
ITEM # 3646-52

BIOLOGY - LIFE SCIENCE

FROM MOLECULES TO ORGANISMS: STRUCTURES AND PROCESSES

Complete kit for learning about blood pressure including an aneroid blood pressure gauge, inflatable cuff, stethoscope, zippered case, and instructions. The manual sphygmomanometer gauge used in conjunction with a stethoscope measures blood pressure in the arm's artery as the heart pumps oxygenated blood throughout the body.

Excite students about how the human body works. Blood Pressure Reading. Blood Circulation. Heart Function.

Materials

- sphygmomanometer
- stethoscope
- blood pressure chart
- vocabulary and flow chart sheet
- break-away model of heart
- rubbing alcohol with cotton balls
- Student Blood Pressure Kit
- Alcohol Swaps
- Internet

Goals & Objectives

Students will:

- understand blood pressure terminology.
- use a Stethoscope.
- demonstrate a simple understanding of the cardiac cycle/explain heart function.
- explain what a medical practitioner is doing when taking a blood pressure.
- apply their knowledge to take their own or someone else's blood pressure.
- identify the scientist responsible for this discovery.
- apply this knowledge to make goals for a healthy adult life.

DISCUSSION

Advanced Discussion and Research

- 1 Use the Internet to identify how a person can raise or lower their blood pressure.
- 2 Research how high blood pressure is treated. Write a paragraph on how to lower high blood pressure by a) natural method and b) medication method.

Answers:

Raise Blood Pressure – talking, exercise, cuff over clothing, feet or back unsupported, full bladder, pain, arm position above or below heart level, caffeine
Lower Blood Pressure – rest, physical fit, medical condition

Answers:

Natural – exercise, weight loss, relaxation; Medical – statin prescription medication

ASSESSMENT

- Participation
- Student Handouts: Vocabulary/Flow Chart Sheet
- Research with citations and correct information
- Vocabulary: Heart, Artery, Vein, Capillary, Systolic Pressure, Diastolic Pressure, Blood Pressure, mmHG, Stethoscope, Sphygmomanometer, Air Release Valve, Cardiovascular, Hypertension, Hypotension, Auscultatory.

Answers: Heart – organ pumping oxygenated blood, Artery – blood vessels leaving heart with oxygenated blood, Vein – blood vessels returning blood to heart, Capillary – small blood vessels, Systolic Pressure – heart contraction, bulging artery due to heart pushing blood, Diastolic Pressure – pressure between heart contractions, Blood Pressure – systolic over diastolic, mmHG – millimeters of Mercury measurement is the unit for blood pressure, Stethoscope – medical instrument for listening to sounds produced within the body, Sphygmomanometer – pressure gauge, Pressure Release Valve – knob to let out air, Cardiovascular – heart and blood vessel system in the body

Blood Pressure Chart

(Numbers refer to millimeters of mercury, even though most measuring tools no longer use mercury in them.)

	Systolic		Diastolic
Hypotension	<90	/	<60
Normal	90-119	/	60-79
Prehypertension	120-139	/	80-89
Stage 1 Hypertension	140-159	/	90-99
Stage 2 Hypertension	160 +	/	100+

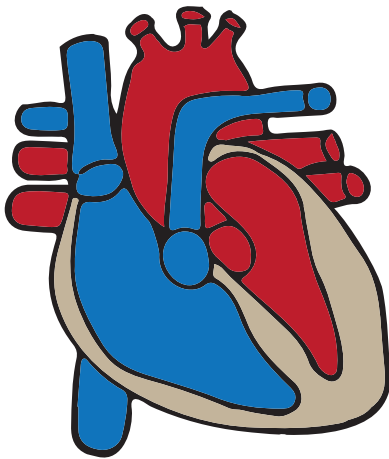
ACTIVITIES

Student Activities *continued*

- 12** The teacher should use alcohol and cotton to clean the earpieces of the stethoscope before a new student uses it.

Allow students to trade positions and repeat the procedure until all students have taken a blood pressure.

- 13** Heart Cardiovascular Function Each student colors in the heart organ (Student Handout). The left side is colored blue to indicate blood returning to the heart for oxygenation by blood vessels called veins. The right side is colored red to indicate oxygenated blood ready for pumping into the body through blood vessels called arteries.



Have each student look at the underside of their arm and feel with one finger the main artery in the bend of their arm. Mention tiny blood vessels are capillaries. What is the main function of the heart organ? *Answer: pumping oxygenated blood into the body.*

- 14** Students should use their notes and experiences with the lab to fill out the vocabulary/flow chart sheet.

- 15** Assign research. Students should name the scientist responsible for this technology/procedure, the date it occurred, and how it came about. They must cite the source(s) used. Next they should research the things that can cause a variation in blood pressure. Finally, they should write a paragraph, planning a lifestyle that will encourage a healthy heart and blood pressure.

How it works

The heart pumps oxygenated blood through arteries into the body. As the heart contracts, pressure rises in the arteries (systolic). Arterial blood pressure decreases between heart contractions (diastolic).

A sphygmomanometer (blood pressure gauge), is a device used to measure arterial blood pressure. An inflatable cuff, positioned around an arm, has air pumped into it causing blood flow to stop. A valve on the cuff is turned, releasing air from the cuff, and arterial blood begins flowing again. A mechanical manometer measures the arterial blood pressure as blood flow begins (systolic blood pressure reading). As air pressure in the cuff continues to decrease, blood flows unobstructed (diastolic blood pressure reading). A stethoscope magnifies the blood flow sounds in the body. The stethoscope is used in conjunction with the blood pressure gauge.

ACTIVITIES

- 1** Ask students what keeps their body alive. (Brain, heart, lungs?)
- 2** Tell them that the heart is one of the major organs; it supplies blood to the whole body and that blood carries oxygen and other necessities. If its supply is too low or too high, it creates a health issue.
- 3** Ask if anyone has ever had his/her blood pressure taken, or if they've seen it done.
- 4** Discuss the importance of being able to check a blood pressure to maintain health, or know if medical attention is needed. (For themselves, or a child they care for, or for an elderly relative, for example)
- 5** Ask students to take notes as you speak, write, or point out heart parts with the model.
- 6** Identify Parts in the Blood Pressure Kit. Group students in pairs and keep room quiet.
 - a** *Stethoscope:* Instrument magnifying body sounds like blood flow. Have each student put on a stethoscope and tap the end piece. Position the end piece over a partner's arm fold and listen for arterial blood flow sounds. It will be a faint thump sound. Partners reverse roles. Wipe earpieces with alcohol swaps between students.

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ACTIVITIES

- b** *Cuff:* Students place the inflatable cuff around each other's upper arm one inch above arm bend (elbow area). Remove cuff from arm without inflating. Reverse roles.
- c** As a class, ask students to raise their hands if they have had their blood pressure taken by each type of sphygmomanometer. Which type is most popular today?

- c** *Sphygmomanometer:* Measures pressure. Take the rubber cuff out of the cloth covering for a visual demonstration. Each student uses the hand pump to increase air pressure to at least 80 mmHG and turns the air release valve to release air from the cuff.

7 Blood Pressure Machine Types (Sphygmomanometers)

- a** Use the Internet to research and find a picture the 3 different types of sphygmomanometers: *mercury, aneroid, and digital*. Tell them they will be using one kind of blood pressure measuring tool. It is aneroid (manual, non-invasive.) It relies on listening, so it is what is called auscultatory. (Related to hearing.)

- b** Explain the mercury blood pressure machine and have students identify the units on the pressure gauge in their aneroid kit (mmHG = millimeters of Mercury).

8 Explain the cardiac cycle as follows:

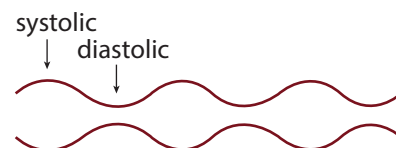
- a** Early in the cycle the heart is relaxed. It fills the ventricles with blood. This takes about 4 seconds. It is called the diastole segment.

- b** Now the heart contracts, spurting the blood through the ventricles and out to the arteries. This also takes about 4 seconds. It is called the systole segment.

- c** (These 2 segments make the "thump-thump" sound people say of the heart. But that sound is NOT what a medical practitioner hears through the stethoscope. They do hear indications of both segments, but with different sounds.)

9 Heartbeat Systolic & Diastolic Diagram

Each student draws and labels the following diagram of an artery.



ACTIVITIES



- 10** Demonstrate each step of taking a blood pressure, stopping to let one student from each group do as you do.

- a** Place cuff on left arm, at height of heart. Squeeze bulb until cuff is tight enough to stop flow in artery.

- b** Place stethoscope earpieces in ears and the disc on the vein at the left elbow. This is called the brachial artery.

- c** Slowly unscrew the button valve until you hear a "whoosh." Note the number on the gauge. This is the systolic blood pressure. These sounds are called Korotkoff Sounds.

- d** Release the valve more, until you can hear nothing. Note the number on the gauge. This is the diastolic pressure.

- e** Write the two numbers with the systolic pressure over

the diastolic pressure, like a fraction.

- 11** Why does the first sound indicate systolic? Because the artery has been so constricted that the only way blood gets through is during the highest point of the constriction phase, or systole segment. Conversely then, you quit hearing any noise when you reach the most relaxed phase of the heart, or the diastolic segment.

*Note

It is always best to DO an experiment ahead of time to be able to best present it to the class.

Have students compare their findings with the chart for normal/abnormal blood pressures.

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S T U D E N T
H A N D O U T

Student Name: _____

1 Vocabulary

Heart

Stethoscope

Artery

Sphygmomanometer

Vein

Air Release Valve

Capillary

Cardiovascular

Systolic Pressure

Hypertension

Diastolic Pressure

Hypotension

Blood Pressure

Auscultatory

mmHG



2

Write the blood pressure results you took and the name of the “patient.”

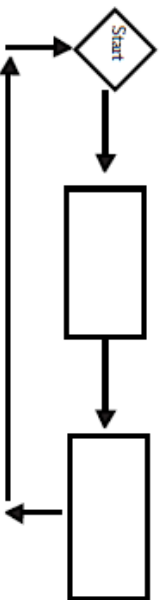
- Compare your findings to the normal/ abnormal blood pressure chart on the back of this worksheet.

4

Write a paragraph, planning a lifestyle that will encourage a healthy heart and blood pressure.

3

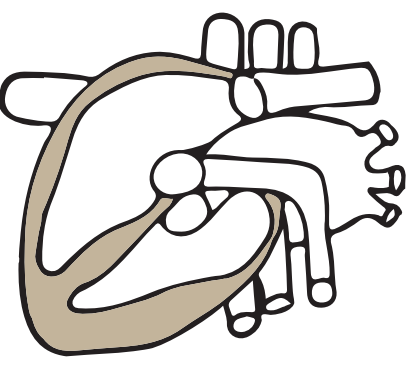
Complete the diagram about a cardiac cycle.



5

Color in the heart organ.

Color blue:
 indicate blood returning to the heart for oxygenation by blood vessels called veins. Color red: indicate oxygenated blood ready for pumping into the body through blood vessels called arteries.



Blood Pressure Chart

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