K-5 STEM+ ACTIVITIES

THANK YOU FOR UTILIZING OUR STEM+ ACTIVITIES.

GRADE K: MY BODY
Take a Deep Breath

GRADE 1: MY BLOOD
A Job for Every Part

GRADE 2: MY BONES
All Together Now

GRADE 3: MY CIRCULATORY SYSTEM
Teamed Up to Move Blood

GRADE 4: MY CELLS
Comparing Plant Cells and Animal Cells

GRADE 5: MY IMMUNE SYSTEM
A Team of Infection Fighters

FACT-A-DAY STEM CALENDAR
MY LUNGS: TAKE A DEEP BREATH
Students learn about the connection between lungs and blood with this hands-on lesson.

Students Will Learn:
- When we breathe in air, it goes to our lungs.
- Our blood picks up oxygen from the air we breathe in.
- Blood delivers oxygen throughout the body.

Estimated Activity Time: 30–35 minutes

WORDS TO KNOW
inhale: breathe in
lungs: body part involved in breathing
ribs: bones that form a cage around the heart and lungs to protect them
oxygen: a gas that does not have any color or smell and is needed for plants and animals to live

Background Information
What does breathing have to do with blood? A lot. When you inhale, you take in air and send it to your lungs. The heart pumps blood to the lungs, where it picks up oxygen from the air you breathe in. Then the blood delivers oxygen throughout the body.
Materials:
2 plastic sandwich bags for each student, plus 2 more
2 plastic drinking straws for each student, plus 2 more tape
copy of the My Lungs printable for each student

Steps:
1. Instruct each student to put his hands on his chest and take a deep breath. Then have him breathe out. Explain that as he felt his chest expand and return to its normal size, he felt his two lungs at work. Lungs expand and contract like balloons. Special bones called ribs go around the lungs and heart to protect them.

2. Ask students to observe carefully as you take a straw, insert one end of it in a plastic bag, gather the top of the bag, and then tape the bag to the straw. Repeat with a different straw and bag. Then wrap a piece of tape around the upper part of the two straws to hold them together. Encourage students to imagine that the bags are lungs. Point to the straws as you explain that when a person breathes in air, it goes into two large tubes. One tube goes into the left lung and one tube goes into the right lung. Then blow air through the straws to inflate the bags. Let the air out. Repeat a few times as students watch.

3. Remind students that blood travels throughout their bodies. When blood goes to the lungs, it picks up oxygen from the air that was breathed in. Then the blood delivers the oxygen all around the body.

4. Give each student a copy of the printable. Remind students that they use their lungs all the time, especially when they blow up balloons, blow bubbles, or participate in physical activity. Read the caption and sentence starters with students. As students complete the sentences, circulate among them. If desired, help youngsters assemble models of lungs like the one you made.

Terrific Teams
Lungs and blood use teamwork to ensure that oxygen is delivered throughout the body. The Leukemia & Lymphoma Society (LLS) depends on teamwork too. LLS teams up with experts from the medical and science fields to make a positive impact on the lives of people whose blood doesn't work well.

Standards Covered:
CCSS.W.K.2: Use a combination of drawing, dictating, and writing to compose informative/explanatory texts in which they name what they are writing about and supply some information about the topic.
My Lungs

I use my lungs when I breathe. They help my blood get oxygen.

My lungs are ____________________

My lungs can ____________________

Follow your teacher’s directions.
A JOB FOR EVERY PART

Each of the four main ingredients of blood has an important role in our well-being. Students review the roles as they create models of blood during this fascinating activity.

Students Will Learn:

- Plasma, red blood cells, white blood cells, and platelets have different functions.
- The number of white blood cells increases when a person is sick.
- Using teamwork means working together toward the same goal.

Estimated Activity Time: 60 minutes

WORDS TO KNOW

plasma: yellowish part of blood that is mostly water
red blood cell: red-colored cell that carries oxygen to all parts of the body
oxygen: gas that does not have any color or smell and is needed for plants and animals to live
white blood cell: colorless cell in blood that helps protect the body from infection
platelets: tiny cells that stop bleeding
clot: lump created when a liquid sticks together
hormone: a substance made in the body that controls how the body grows and develops
teamwork: working together with other people to accomplish a shared purpose or goal

Background Information

The four main ingredients of blood are plasma, red blood cells, white blood cells, and platelets. Each ingredient has one or more essential roles. Plasma carries nutrients from food to give our bodies energy. Plasma also carries hormones that have messages for our body, such as growth hormones that get our bones and muscles to grow. Plasma carries proteins such as the ones needed for clotting too. Red blood cells carry oxygen throughout the body. White blood cells fight infection, and platelets help blood clot.
Materials for each small group:
slides 1–6 of the Classroom Presentation
9-ounce clear plastic cup
½ cup vegetable oil (plasma)
½ cup red pony beads (red blood cells)
dry lima bean (white blood cell)
½ teaspoon dry lentils (platelets)
copy of the “What’s in Blood?” printable for each student
crayons for each student
class supply of the activity cards, cut out (If necessary, use additional cards so you have sets with exactly four cards, giving some students an extra card if needed.)
class supply of provided exit tickets, cut apart

Steps:

1. Review with students the following information from slides 1–5 of the Classroom Presentation:
   - Blood is made of four main ingredients—plasma, red blood cells, white blood cells, and platelets.
   - More than half of blood is plasma, a watery yellow liquid. It gives our bodies nutrients from food.
   - Red blood cells carry oxygen. Our bodies can't survive without oxygen.
   - White blood cells fight infections.
   - When a person gets a small cut, platelets help the blood clot so that the cut stops bleeding.

2. Instruct the students in each group to combine the oil, beads, lima bean, and lentils in their cup as you identify what each ingredient represents. Point out that we cannot see the individual ingredients in real blood without a microscope.

3. Ask students to compare the red blood cells and white blood cells in terms of quantity and size. Wonder aloud what happens to the white blood cells when a person gets sick. Guide students to conclude that the number of white blood cells increases.

4. Name each part of blood represented and have students recap what they know about it. Then give each student a copy of the printable. Instruct him or her to draw, color, and label a diagram of the group’s blood model and then complete the rest of the page.

5. Suggest that the four parts of blood are like a team. Each part has an important role in ensuring our blood works well. Explain that using teamwork means working together toward the same goal.

Mark Your Calendar
What color is associated with blood? Red, of course! That's why many landmarks around the world turn their lights red during September, Blood Cancer Awareness Month. It's a great way to encourage further blood research and celebrate all that researchers have already learned about helping people whose blood doesn't work well.

Social-Emotional Learning Tip: Why Is Teamwork Important?
When students use teamwork, it promotes respect for others, improves communication and social skills, encourages good sportsmanship, boosts self-confidence, increases engagement, and builds a foundation for skills valued in the workplace.
6. Give each student an activity card at random. Explain that when you say “Teamwork,” students will silently walk around, quickly form groups that include one card for each of the four parts of blood, and then sit down.

7. Signal students to start. After every student is in a group, check that each group has cards with the four main parts of blood. Then display slide 6 of the Classroom Presentation. Use the questions to guide a discussion.

8. Wrap up the lesson by having each student complete one or both of the provided exit tickets.

9. Throughout the year, use the printable certificate to recognize students who display good teamwork skills.

Now More Than Ever

Today’s children live in a world dominated by technology, and all the cell phones and social media outlets have affected them in some not-so-positive ways. Recent studies have shown that today’s kids are suffering from mental health issues more than ever before. Experts agree that addressing students’ social-emotional needs helps children learn better and be more successful at school. In addition, integrating social-emotional lessons in the classroom helps students grow into citizens who lead positive lives and contribute to society.

Standards Covered:

CCSS.SL.1.2: Ask and answer questions about information presented orally.
CCSS.L.1.6: Use words or phrases acquired through conversations.
What's in Blood?

Draw and color a model of blood below. Use the word bank to label it.

<table>
<thead>
<tr>
<th>Word Bank</th>
</tr>
</thead>
<tbody>
<tr>
<td>plasma</td>
</tr>
</tbody>
</table>

Cut.
Glue to match.

<table>
<thead>
<tr>
<th>plasma</th>
</tr>
</thead>
<tbody>
<tr>
<td>red blood cells</td>
</tr>
<tr>
<td>white blood cells</td>
</tr>
<tr>
<td>platelets</td>
</tr>
</tbody>
</table>

- protect against sickness
- makes up more than half of our blood
- stop cuts from bleeding
- carry oxygen to all parts of our body
**EXIT TICKET**

Make a word using two words from the box.

Using **work** and **sun** means working together to meet a goal.

Write the word in the blank.

**EXIT TICKET**

Make a word using two words from the box.

Using **team** and **shine** means working together to meet a goal.

Write the word in the blank.

---

**EXIT TICKET**

Fill in the blanks with letters from the box.

Red blood cells carry ___ x y ___ e ___.

W___ t___ blood cells fight infections.

---

**EXIT TICKET**

Fill in the blanks with letters from the box.

Red blood cells carry ___ x y ___ e ___.

W___ t___ blood cells fight infections.

---

**EXIT TICKET**

Make a word using two words from the box.

Write the word in the blank.

**work** **sun** team **shine**

---

**EXIT TICKET**

Make a word using two words from the box.

Write the word in the blank.

**work** **sun** team **shine**

---

Grade 1: My Blood
A Job for Every Part
PenniesforPatients.org
<table>
<thead>
<tr>
<th>Plasma</th>
<th>Red Blood Cells</th>
<th>White Blood Cells</th>
<th>Platelets</th>
</tr>
</thead>
<tbody>
<tr>
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<td>Red Blood Cells</td>
<td>White Blood Cells</td>
<td>Platelets</td>
</tr>
<tr>
<td>Plasma</td>
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</tr>
<tr>
<td>Plasma</td>
<td>Red Blood Cells</td>
<td>White Blood Cells</td>
<td>Platelets</td>
</tr>
</tbody>
</table>
Blood has four main ingredients.

Each ingredient works in a different way to keep our bodies healthy.

What are the ingredients?

Look at the next four slides to check your answer.
1. Plasma

More than half of our blood is plasma.

Plasma is not red. It’s light yellow!

Plasma carries three types of blood cells throughout our bodies.
2. Red Blood Cells

Red blood cells carry a gas called oxygen to different parts of our bodies.

We cannot live without oxygen.

Most of the cells in blood are red blood cells.
3. White Blood Cells

White blood cells fight germs.

White blood cells are bigger than red blood cells.

A healthy person has fewer white blood cells than red blood cells.
4. **Platelets**

Platelets help stop bleeding.

They stick together and make a clot. The clot stops the bleeding.
Think About It!

• How did you communicate during the activity?

• Is teamwork just for sports? Explain.

• How are the four main parts of blood like a team? Do we need all four parts?

Teamwork works.
Students explore joints and learn what makes the skull, spine, and ribs special.

Students Will Learn:
- that joints and bones work together for movement
- why bones such as the skull, spine, and ribs are special

Estimated Activity Time: 55–60 minutes

**WORDS TO KNOW**

**joint**: a place where two bones of the skeleton come together, usually in a way that allows motion

**ligament**: body tissue that holds organs in place and fastens bones together

**spinal disk**: cushioning tissue between vertebrae

**vertebrae**: the small bones that make up the backbone (spine)

**Background Information**

The place where two bones come together is called a joint. Some joints move, such as those in the arms and legs. The skull, spine, and ribs are part of a system of bones. The skull is mostly made of bones that are fused together, or connected. The spine is a group of many bones called vertebrae working together as one. The rib bones are curved. Some ribs are connected to other bones, while a few are only held in place by connective tissue.
Materials for each student:
slide 6 from the Classroom Presentation
copy of the “All Together Now” printable
2 craft sticks
ball of modeling clay

Steps:
1. Start with a few commands, such as “stand up,” “touch a finger to your shoulder,” and “sit down.” Tell students that in this lesson they will learn what makes these movements possible.
2. Distribute the materials to each student. Lead students to complete the printable as directed.
3. Discuss with students what they discovered as they worked with the craft sticks and clay. Lead students to understand that even though bones are strong, they do not easily bend—and if they do bend, they break. Further explain that joints are found where two bones meet. Joints in the arms and legs move, allowing for bending and other movements.
4. Follow up by sharing slide 6 with students. Explain that the skull, ribs, and spine are special bones. One reason they are special is they are all connected in one system of bones. The skull is also special because it has 22 bones that are fused together to protect the brain and form the face. There is only one bone in the skull—the jawbone—that moves with help from a joint. Tell students the ribs are special because they are curved. Some ribs are connected to other bones; others stay in place with help from connective tissue. Ribs protect the lungs and heart. Finally, help students understand that the spine is made up of small bones stacked on top of each other. The spine acts as one bone, yet it helps the body move.
5. Direct each student to use the words joints, skull, ribs, and spine to write a short summary of the information learned in the lesson.

Standards Covered:
CCSS.ELA-LITERACY.W.2.2: Write informative/explanatory texts in which they introduce a topic, use facts and definitions to develop points, and provide a concluding statement or section.
**All Together Now**

**What You Need**

- 2 craft sticks
- ball of clay

**What You Do**

1. Gently bend one craft stick. Write what happens. __________________________________________

2. Roll your clay to make a smooth ball. Stick one end of each craft stick in the clay. Draw what you see.

3. Try to move one or both craft sticks so they are closer together or farther apart. Write what happens. __________________________________________

**Important to Know**

The place where two bones come together is called a **joint**. Some joints, like those in your arms and legs, move.

**Think and Write**

How are your bones like the craft sticks? __________________________________________

____________________________________________________________________________________

____________________________________________________________________________________

How are your joints like the ball of clay? __________________________________________

____________________________________________________________________________________

____________________________________________________________________________________
Picture This!

**Self-confidence** is feeling good about yourself and your abilities.

Someone who is self-confident...

- speaks clearly and calmly
- stands up straight
- comes across as positive or hopeful to others
- accepts compliments
- does the right thing no matter what others think or say
- is firm in his or her beliefs, is not wishy-washy
- does everything possible to achieve more
- knows he or she makes mistakes but learns from them
TEAMED UP TO MOVE BLOOD
Introduce students to the circulatory system with this interactive, whole-group activity.

Students Will Learn:
• the parts of the circulatory system
• the functions of the circulatory system

Estimated Activity Time: 35–40 minutes

WORDS TO KNOW
arteries: blood vessels that carry blood away from the heart to the capillaries
blood vessels: tubes that move blood through the body
capillaries: tiny blood vessels that connect arteries and veins; it’s here that oxygen is released to cells and where cells release carbon dioxide to the blood
carbon dioxide: gas that people breathe out and cells release
cells: basic unit of life
circulatory system: the body system that moves blood
heart: body part located in the chest between the lungs that pumps blood throughout the body
oxygen: gas that people breathe in and cells take in
veins: blood vessels that carry blood from the capillaries to the heart

Background Information
The circulatory system includes the heart, blood, and a variety of blood vessels. Together, these body parts move blood around the body. Blood carries oxygen and nutrients (food) to cells throughout the body. Then the blood carries carbon dioxide and waste away from the cells.
**Materials:**
slides 1 and 2 from the Classroom Presentation
one or more copies of the “Circulatory System Cards” printable
scissors

**In advance:** Copy the provided cards so that each child has
one card, making extra copies of card 5 as needed. Cut the cards
apart.

**Steps:**

1. Tell students they will learn that blood moves through the body
via the circulatory system. Explain to students that the circulatory
system works quickly, so its parts must work together to move
blood through the body.

2. Give each child a card. Instruct the student with card 1 (heart) to
stand in the middle of the room and read aloud what is written on
the card. Explain to students that the heart is the main organ of
the circulatory system. It is located in the chest.

3. Invite the student with card 2 (artery) to stand in front of the
student from Step 2 and have the student with card 3 (vein) stand
to the left of the student from Step 2. Direct the student with card
2 to read the card text aloud, followed by the student with card 3.

4. Lead the student with card 4 (capillary) to stand between the
students with cards 2 and 3. Have him read aloud the description
from his card. Explain to students that capillaries are the smallest
blood vessels, or tubes that move blood in the body. Tell them
that arteries and veins are bigger.

5. Instruct the remaining students to stand and read their cards (body cells) in unison. Explain to the class that
like these students, body cells are spread out all over the body. The blood has many places to visit each time
the heart pumps, which is about 90 times a minute for a seven-year-old child.

6. Have all students take their seats. Then share slide 1 from the Class Presentation. Review with students how
the circulatory system works.

7. Share slide 2 to explain why the circulatory system needs to move blood throughout the body.

**To wrap up:** Direct each student to write in a science journal or on a sheet of paper what he or she
learned about the circulatory system.

**Standards Covered:**
CCSS.ELA-LITERACY.W.3.2: Write informative/explanatory texts to examine a topic and convey
ideas and information clearly.
### Circulatory System Cards

<table>
<thead>
<tr>
<th>Card</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>I am the <strong>heart</strong>. I pump blood throughout the body. I move blood with carbon dioxide and waste into the lungs. After the blood gets fresh oxygen and food in the lungs, the blood comes back to me. Then I pump the blood into the body and its millions of cells.</td>
</tr>
<tr>
<td>2</td>
<td>I am a kind of blood vessel called an <strong>artery</strong>. I move blood from the heart. Many arteries are found in the body.</td>
</tr>
<tr>
<td>3</td>
<td>I am a kind of blood vessel called a <strong>vein</strong>. I move blood back to the heart. Many veins are found in the body.</td>
</tr>
<tr>
<td>4</td>
<td>I am a kind of blood vessel called a <strong>capillary</strong>. I connect the arteries and veins. I make sure body cells get oxygen and food from the blood. I also take blood with carbon dioxide and waste back to the heart.</td>
</tr>
<tr>
<td>5</td>
<td>I am a <strong>cell</strong>. I take oxygen and food from the blood. I release carbon dioxide and waste back to the blood.</td>
</tr>
<tr>
<td>5</td>
<td>I am a <strong>cell</strong>. I take oxygen and food from the blood. I release carbon dioxide and waste back to the blood.</td>
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</tr>
</tbody>
</table>
The Circulatory System

The **heart** pumps the blood to the **lungs**. The lungs replace the carbon dioxide with oxygen. (Nutrients get replaced in the digestive system.) Blood moves to the **heart**.

**Arteries** move the blood with oxygen and nutrients (food) to **capillaries**.

**Capillaries** take the blood to the body’s cells.

The **body’s cells** swap the oxygen and nutrients for carbon dioxide and waste.

**Capillaries** move the blood with carbon dioxide and waste to the **veins**.

The **veins** carry this blood to the **heart**.

The **heart** pumps blood out to the body through **arteries**.
The circulatory system moves blood around the body. Why is this important?

1. Blood helps your body stay at the right temperature.
2. Blood carries hormones to the cells.
4. Blood helps the body heal from a cut.
COMPARING PLANT CELLS AND ANIMAL CELLS
They’re alike, but they’re different too! Use this small-group activity to help students see how the cells of plants and animals are both alike and different.

Students Will Learn:
• the parts of cells and the function of each part
• how plant and animal cells are alike and different
• how to be an effective member of a team

Estimated Activity Time: 50–60 minutes

WORDS TO KNOW

**cell:** basic unit of life
**organelle:** structure in a cell that performs specific functions
**nucleus:** control center for the cell’s activities
**chromosomes:** threadlike structures inside the nucleus that contain information about the characteristics of an organism
**cell wall:** tough outer covering that supports and protects a plant cell
**cell membrane:** thin layer that surrounds the cell and holds it together; controls movement of substances in and out of cell
**cytoplasm:** jellylike substance that fills most of a cell; contains chemicals that keep the cell functioning
**chloroplasts:** structures that make food for a plant cell
**vacuoles:** structures that store food, water, or waste
**mitochondria:** structures that release energy from food
**teamwork:** working with other people to accomplish a shared purpose or goal

Background Information
Cells are the basic units of structure and function in all living things. All plants and animals are composed of one or more cells. Cells come in different shapes and sizes, depending on the jobs they do.

Plant cells and animal cells have similar structures but with some differences. Plant cells have two organelles (cell parts) that are not found in animal cells: the cell wall and chloroplasts. All organelles perform specific functions that help the organism live and grow.
Materials for each pair of students:
slides 1–3 from the Classroom Presentation
copy of “Detailing the Differences” printable
copy of “Match 'em Up!” printable
scissors
glue
large sheet of construction paper
2 copies of “Teamwork Makes the Dream Work!” printable
class supply of provided exit tickets, cut apart

Additional Materials: copies of printable certificates, cut apart

Steps:
1. Review with students the information about cells using slide 1 from the Classroom Presentation.
2. Divide students into pairs.
3. Show slide 2 from the Classroom Presentation. Have each student talk with a partner about differences they observe in the two models on the slide. Briefly discuss students’ observations as a class. Then give each twosome a copy of the “Detailing the Differences” handout. Have each twosome examine the two diagrams and read the information on the cell organelles together. Then have the pair work together to answer the questions.
4. Provide time to go over students’ answers together as a class.
5. Ask each student to turn to a partner and discuss this question: How are the parts of a cell like a sports team? After several minutes, provide time for students to share their responses. Explain that the different parts of their cells work together to keep their bodies healthy, just like the members of a sports team work together to win a game.
6. Show slide 3 from the Classroom Presentation. Point out that teamwork is a skill that will help students be more successful at school, at home, and—later on—in their careers. Ask students to explain what the math statement at the bottom of the slide means. Then instruct each student to turn to his partner and brainstorm a list of traits shown by a good team member. (See the suggested list in the sidebar).

Treatment and Cures
The human body has over 37 trillion cells. Cancer happens when some cells grow too fast and spread out of control. Leukemia and lymphoma are blood cancers. The Leukemia & Lymphoma Society has invested more than $1 billion in research to advance treatments and cures.

Social-Emotional Learning Tip: What Does a Good Teammate Do?
• Communicates ideas clearly to the rest of the team
• Listens carefully to teammates
• Gives teammates a hand when they need help
• Does his or her own part
• Helps the team finish the task successfully and on time
• Asks questions if he or she doesn’t understand something a teammate says
• Encourages teammates to express their opinions, questions, and ideas

Christopher Vakoc, MD, PhD
7. Have students turn over their “Detailing the Differences” printable. Then give each twosome the “Match 'em Up!” printable, scissors, glue, and a large sheet of construction paper. Go over the directions on the printable with students. Encourage students to use the traits listed on the board to help them work with their teammate to successfully complete the activity.

8. Provide time to go over students’ answers together as a class. Then give each student a copy of the “Teamwork Makes the Dream Work!” printable. Go over the directions with the class, and then have each child complete the page for classwork or homework.

9. Wrap up the lesson by having each student complete one or both of the provided exit tickets.

10. Throughout the year, use the printable certificate to recognize students who display good teamwork skills.

A Word About Teamwork

A recent Pew Research Center study asked a sample of adults to name ten skills children most need in order to get ahead. Teamwork was named by almost 80 percent of the respondents, landing it in the top four behind communication, reading, and math. Working with others to accomplish a shared goal requires listening, respect, communication, flexibility, and other important skills. Look for opportunities to highlight teamwork in your classroom, including this lesson's teamwork-related activity on the body’s cells!

Standards Covered:

NGSS 4-LS1-1: Construct an argument that plants and animals have internal structures that function to support survival, growth, behavior, and reproduction.

CCSS.SL.4.1: Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 4 topics and texts, building on others’ ideas and expressing their own clearly.

CCSS.RI.4.7: Interpret information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, time lines, animations, or interactive elements on Web pages) and explain how the information contributes to an understanding of the text in which it appears.
Detailing the Differences

Plant cells and animal cells have a lot in common, but they are different too. Study the diagrams and read the information below. Then answer the questions.

**Plant Cell Organelles**
1. **nucleus**: control center for cell's activities
2. **chromosomes**: threadlike structures inside nucleus that contain information about characteristics of plant
3. **cell wall**: tough outer covering that supports and protects plant cell
4. **cell membrane**: thin layer that surrounds cell and holds it together; controls movement of substances in and out of cells
5. **cytoplasm**: jellylike substance that fills most of cell; contains chemicals that keep cell functioning
6. **chloroplasts**: structures that make food for plant cell
7. **vacuoles**: structures that store food, water, or wastes
8. **mitochondria**: structures that release energy from food

**Animal Cell Organelles**
1. **nucleus**: control center for the cell's activities
2. **chromosomes**: threadlike structures inside nucleus that contain information about characteristics of animal
3. **cell membrane**: thin layer that surrounds cell and holds it together; controls movement of substances in and out of cells
4. **cytoplasm**: jellylike substance that fills most of cell; contains chemicals that keep cell functioning
5. **vacuoles**: structures that store food, water, or wastes
6. **mitochondria**: structures that release energy from food

Work with your partner to answer these questions on your own paper.

1. What structures do both plant cells and animal cells have?
2. How are plant cells and animal cells different?
3. What difference do you notice about the vacuoles in the animal cell and the plant cell?
4. What kind of cell is model A?
   What kind of cell is model B?
**Match ’em Up!**

**Directions:**
1. Cut out the cards. Sort them into three piles—organelle, function, and item.
2. Match an organelle card to its function and an everyday item that represents that function. Place them in a row at the top of your paper as shown.
3. Repeat Step 2 for the remaining cards.
4. Ask your teacher to check your arrangement. Then glue the cards in place.

<table>
<thead>
<tr>
<th>Organelle</th>
<th>Function</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>nucleus</td>
<td>make food for plant cell</td>
<td>batteries</td>
</tr>
<tr>
<td>chromosomes</td>
<td>protects the plant cell</td>
<td>libraries</td>
</tr>
<tr>
<td>cell wall</td>
<td>controls the cell’s activities</td>
<td>gate or door</td>
</tr>
<tr>
<td>cell membrane</td>
<td>release energy from food</td>
<td>closets</td>
</tr>
<tr>
<td>cytoplasm</td>
<td>contain information about organism’s characteristics</td>
<td>swimming pool</td>
</tr>
<tr>
<td>vacuoles</td>
<td>contains chemicals that help cell function; jellylike substance</td>
<td>chefs</td>
</tr>
<tr>
<td>mitochondria</td>
<td>store food, water, and waste</td>
<td>television remote</td>
</tr>
<tr>
<td>chloroplasts</td>
<td>surrounds cell and holds it together; controls movement of substances in and out of cells</td>
<td>house walls, floor, and ceiling</td>
</tr>
</tbody>
</table>
Detailing the Differences

Answer Key

1. nucleus, chromosomes, cell membrane, cytoplasm, vacuoles, mitochondria
2. Plant cells have a cell wall and chloroplasts.
3. Some (but not all) animal cells have a few small vacuoles. Plant cells usually have one large vacuole.
4. animal; plant

Match ’em Up!

Answer Key

<table>
<thead>
<tr>
<th>Organelle</th>
<th>Function</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>nucleus</td>
<td>controls cell’s activities</td>
<td>television remote</td>
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</table>
The human body is made up of different types of cells. Each of these cells has a different job. Cells in a person with cancer behave differently than normal cells.

Fill in each box with a trait shown by a good teammate.

 Trait #1
 Trait #2

Trait #1
 Trait #2
Teamwork Makes the Dream Work!

Fill in each bubble with a trait a good teammate shows. Then explain why the trait is important. Use the back of this page if you need more space.

TEAMWORK

Do This! Think about the last time you worked with a partner or group on a task. How did you do on each of the traits above? In each bubble's box, write the matching number from the code.

Did you know...?
The different cells in your body work as a team to keep you healthy.

Code
1 — I’m patting myself on the back because I did great on this trait!
2 — I did pretty well on this trait. Soon I’ll be an expert!
3 — This trait is not one of my strengths yet, but I’ll keep working on it!
What is a cell, anyway?

- **Cells** are basic units of structure and function in living things.
- Most cells are so small you can only see them with a microscope.
- The human body has over 37 trillion cells!
Plants and animals are made of cells. Plant cells and animal cells are alike in some ways and different in others.

Look at these two cells. How do they look alike? How do they look different?
The parts of the cell work together to keep you healthy. Every part is important and has a job to do!

Scientists also use **teamwork** in their jobs. For example, they work with other scientists to develop new treatments and cures for blood cancers like leukemia and lymphoma.

**Working Together > Working Alone**
MY IMMUNE SYSTEM

A TEAM OF INFECTION FIGHTERS
Get to know your immune system’s second line of defense with a fun group research activity.

Students Will Learn:
- what the inner parts of the immune system are and how they help protect you
- the different types of white blood cells
- the importance of recognizing personal strengths

Estimated Activity Time: 60–80 minutes

WORDS TO KNOW
antibodies: substances produced by special white blood cells that counteract the effects of a disease germ or its poisons
B cells: lymphocytes that produce antibodies
leukocytes: white blood cells produced in the bone marrow that play an important role in fighting off sickness
lymph: fluid which carries white blood cells to places where they are needed
lymph nodes: small, round masses of tissue that contain lymph; are like filters that remove germs; found in certain areas of your body such as the neck and armpits; swollen nodes indicate the presence of an infection
lymph vessels: system of thin tubes that run throughout your body and contain lymph
lymphocytes: white blood cells that work on bacterial and viral infections; there are three different types, B cells, T cells, and NK cells
macrophages: biggest of the white blood cells; they “eat” or clean up other white blood cells that have been damaged while doing their jobs
neutrophils: white blood cells that can find, kill, and ingest pathogens that are trying to get into your body; they only live a few days, but bone marrow produces more every day
T cells: lymphocytes that look for and kill cells in your body that are hiding invaders or are different from normal healthy cells
personal strengths: tasks or actions you do well; abilities and traits you have that help you in challenging situations

Background Information
If a pathogen is able to get through the body’s first line of defense, an infection develops. When this happens, the body’s second line of defense is activated. This part of the immune system attacks and destroys any germs that have managed to get inside your body. Different types of white blood cells and the lymphatic system make up this important part of your immune system.
Materials for each group:
slide 6 of the Classroom Presentation
8 copies of “The Inner Fighters” trading card template
tape or glue
reference materials
crayons, markers, or colored pencils
class supply of provided exit tickets, cut apart

Additional materials:
class clothesline
clothespins
class supply of “My Personal Strengths” trading card template
class supply of the student certificates, cut apart

In advance: Ask your school’s media specialist for help gathering grade-appropriate references on the immune system.

Steps:
1. Review with students the information they learned in the previous activity about the “outer fighters” of the immune system (skin, tears, saliva, mucus, etc.). Then display slide 6 of the Classroom Presentation and read over the information together with students.

2. Divide the class into groups of four or five students each, and distribute the materials listed above to each group. Point out that the inner fighters of the immune system are like a team that works together when you get sick. Each team member has a special job or ability that helps your body fight an infection. Explain that each group will be responsible for creating a set of team “trading cards” that give vital information about each of these important parts of the immune system.

3. Direct each group to follow these steps for completing each trading card:
   a. Cut out each trading card pattern along the bold line, fold it on the dotted line, and then tape or glue the two sides together.
   b. Label the flags on both sides of each card with a term from slide 6 of the Classroom Presentation.
   c. Research each term and complete the back side of the card.
   d. Illustrate the front of the card with a drawing of the item (or a cartoon figure to represent the item).

4. Once a team has completed all eight of its trading cards, have the group choose two team colors and decorate both sides of each card. Then have the group members clip the cards on a class clothesline.

5. Display slide 7 of the Classroom Presentation and read the information with students. Talk with students about how they—like the parts of the immune system—have special abilities and strengths. Ask students to help you list the benefits of knowing what you’re good at doing. Use the information in the sidebar to guide this discussion.

Social-Emotional Learning Tip: Recognizing My Strengths
Each “inner fighter” of our immune system is able to do a certain infection-fighting job. In the same way, each student also has unique strengths and abilities. Share with students these benefits of recognizing one’s special strengths:
• Recognizing your strengths can build your confidence and motivate you to keep moving forward.
• If you know your strengths, you can use them to help you do better in school.
• If you know your strengths, you can use them to help you achieve your goals.
• Knowing you have special strengths can help you understand why people are good at different activities and skills.
• If you know that everyone has different strengths, you are more likely to accept people who are different from you.
• Knowing your strengths helps you be positive and bounce back from a setback.
6. Give each student a copy of the “My Personal Strengths” trading card template. Direct each student to follow these steps for completing his or her trading card:
   a. Cut out the trading card pattern along the bold line, fold it on the dotted line, and then tape or glue the two sides together.
   b. Label the flags on both sides of the card with your name.
   c. Follow the directions to complete the back of the card.
   d. Illustrate the front of the card with a drawing of yourself or symbols that illustrate your personal strengths.

7. Provide time for students to share their personal trading cards in small groups. Then clip the cards on the class clothesline.

8. Wrap up the lesson by having each student complete one or both of the provided exit tickets.

9. Throughout the year, use the printable certificate to recognize students’ special strengths.

Getting at Personal Strengths

One simple way to help students identify their strengths is to listen to them. Ask students questions that require more than a simple yes or no. Follow up each answer by repeating what you think you heard, followed by “Why do you think that?” This tip will provide insights into the activities, ways of learning, and relationships that energize a student, which in turn can point to his or her innate strengths.

Standards Covered:

CCSS.ELA-LITERACY.W.5.8: Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources.

CCSS.ELA-LITERACY.RI.5.3: Explain the relationships or interactions between two or more individuals, events, ideas, or concepts in a historical, scientific, or technical text, including what happened and why, based on specific information in a text.

CCSS.ELA-LITERACY.RI.5.4: Determine the meaning of general academic and domain-specific words or phrases in a text relevant to a grade 5 topic or subject area.
List five things you are really good at doing. Use the areas listed below to help you.

1. ______________________________________
2. ______________________________________
3. ______________________________________
4. ______________________________________
5. ______________________________________

- school subjects and skills
- hobbies and things I like to do
- responsibilities at home
- after-school activities
- relationships with my family and friends
Today you learned it is important to recognize your personal strengths. Finish the sentence. 
One benefit of knowing what you’re good at is ____________________________
_____________________________________________________
_____________________________________________________
_____________________________________________________

Name ________________________________

Today you learned about the “inner fighters” of your immune system. 
Circle each “inner fighter” listed below.
lymphatic system
antibodies
white blood cells
red blood cells

Name ________________________________

Today you learned it is important to recognize your personal strengths. Finish the sentence.
One benefit of knowing what you’re good at is ____________________________
_____________________________________________________
_____________________________________________________
_____________________________________________________

Name ________________________________
Sometimes pathogens can get past the outer fighters of your immune system. When they do, an infection develops and your body responds by activating a **second line of defense**, your body’s “inner fighters.”

Your inner fighters are:

- **White blood cells that help fight off sickness**
  - B cells
  - T cells
  - NK cells
  - Macrophages
  - Neutrophils
  - Lymph vessels
  - Lymph
  - Lymph nodes
  - Antibodies

- **The lymphatic system**
### Fact-a-Day STEM Calendar

Hold students’ interest in STEM topics by sharing one fun and fascinating fact each day.

<table>
<thead>
<tr>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Thursday</th>
<th>Friday</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Globetrotting</strong>&lt;br&gt;The element polonium is named after Poland.</td>
<td><strong>Over-the-top</strong>&lt;br&gt;5.88 trillion miles = a light year, the distance that light travels in a vacuum in a year.</td>
<td><strong>Wild word</strong>&lt;br&gt;Quark are believed to be one of the basic building blocks of matter.</td>
<td><strong>Think-it-over</strong>&lt;br&gt;A chameleon can look in two different directions at once.</td>
<td><strong>Fun-for-all</strong>&lt;br&gt;Why can't you trust atoms? They make up everything.</td>
</tr>
<tr>
<td><strong>Russian chemist Dmitri Mendeleev published what most consider to be the first periodic table in 1869.</strong></td>
<td><strong>The human body has over 37 trillion cells.</strong></td>
<td><strong>Dark matter cannot be detected but scientists know it exists because of the pull of gravity.</strong></td>
<td><strong>Water can freeze and boil at the same time.</strong></td>
<td><strong>How did Ben Franklin feel after he discovered electricity? Shocked!</strong></td>
</tr>
<tr>
<td><strong>Gregor Mendel, who established genetics in the early 1900s, was an Austrian monk.</strong></td>
<td><strong>Every year about 18,000 species are discovered—and about 20,000 become extinct.</strong></td>
<td><strong>Substances that are immiscible are incapable of being mixed. Water and oil are an example.</strong></td>
<td><strong>The scientific term for brain freeze is sphenopalatine ganglioneuralgia.</strong></td>
<td><strong>Why was the book about helium on the bestseller list? Readers couldn't put it down.</strong></td>
</tr>
<tr>
<td><strong>The Greek philosopher Aristotle was one of the first to classify animals according to their characteristics.</strong></td>
<td><strong>The human body has more than 60,000 miles of blood vessels—enough to wrap around the world twice.</strong></td>
<td><strong>Quark are believed to be one of the basic building blocks of matter.</strong></td>
<td><strong>A frog has an eardrum on the outside of its body.</strong></td>
<td><strong>Why can't you trust atoms? They make up everything.</strong></td>
</tr>
<tr>
<td><strong>The word “scientist” was introduced by Cambridge University historian and philosopher William Whewell in 1834.</strong></td>
<td><strong>Our brains have about 86 billion neurons.</strong></td>
<td><strong>An ectotherm is another word for a cold-blooded animal.</strong></td>
<td><strong>In 2012 a fifth grader accidentally created a new molecule in science class.</strong></td>
<td><strong>What message would blood like to send to the world? B positive!</strong></td>
</tr>
</tbody>
</table>

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*LEUKEMIA & LYMPHOMA SOCIETY®*

*Middle School Calendar* PenniesforPatients.org
Through the COVID-19 global pandemic, The Leukemia & Lymphoma Society (LLS) has remained more dedicated than ever in our support of blood cancer patients and their families.

With schools across the country shut down, educators and parents have been working overtime to ensure that their children's intellectual development does not suffer. LLS and Pennies for Patients is proud to be a part of that effort.

We want children to remain engaged and motivated to learn while at home, and our hope is that the various free at-home STEM (Science, Technology, Engineering, and Math) and Social-Emotional Learning (SEL) resources have helped to do just that.

- The Pennies for Patients Team