Science Grade 07 Unit 08 Exemplar Lesson 01: Human Body Systems

This lesson is one approach to teaching the State Standards associated with this unit. Districts are encouraged to customize this lesson by supplementing with district-approved resources, materials, and activities to best meet the needs of learners. The duration for this lesson is only a recommendation, and districts may modify the time frame to meet students’ needs. To better understand how your district may be implementing CSCOPE lessons, please contact your child’s teacher. (For your convenience, please find linked the TEA Commissioner’s List of State Board of Education Approved Instructional Resources and Midcycle State Adopted Instructional Materials.)

Lesson Synopsis

This lesson focuses on the main functions of the systems for the human organism. Students will identify the functions of each system as well as the corresponding organs.

TEKS

The Texas Essential Knowledge and Skills (TEKS) listed below are the standards adopted by the State Board of Education, which are required by Texas law. Any standard that has a strike-through (e.g. sample phrase) indicates that portion of the standard is taught in a previous or subsequent unit. The TEKS are available on the Texas Education Agency website at http://www.tea.state.tx.us/index2.aspx?id=6148.

7.12 Organisms and environments. The student knows that living systems at all levels of organization demonstrate the complementary nature of structure and function. The student is expected to:

7.12B Identify the main functions of the systems of the human organism, including the circulatory, respiratory, skeletal, muscular, digestive, excretory, reproductive, integumentary, nervous, and endocrine systems.

Supporting Standard

Scientific Process TEKS

7.2 Scientific investigation and reasoning. The student uses scientific inquiry methods during laboratory and field investigations. The student is expected to:

7.2D Construct tables and graphs, using repeated trials and means, to organize data and identify patterns.

7.2E Analyze data to formulate reasonable explanations, communicate valid conclusions supported by the data, and predict trends.

7.3 Scientific investigation and reasoning. The student uses critical thinking, scientific reasoning, and problem solving to make informed decisions and knows the contributions of relevant scientists. The student is expected to:

7.3B Use models to represent aspects of the natural world such as human body systems and plant and animal cells.

7.3C Identify advantages and limitations of models such as size, scale, properties, and materials.

7.4 Scientific investigation and reasoning. The student knows how to use a variety of tools and safety equipment to conduct science inquiry. The student is expected to:

7.4A Use appropriate tools to collect, record, and analyze information, including life science models, hand lens, stereoscopes, microscopes, beakers, Petri dishes, microscope slides, graduated cylinders, test tubes, meter sticks, metric rulers, metric tape measures, timing devices, hot plates, balances, thermometers, calculators, water test kits, computers, temperature and pH probes, collecting nets, insect traps, globes, digital cameras, journals/notebooks, and other equipment as needed to teach the curriculum.

GETTING READY FOR INSTRUCTION

Performance Indicators

Grade 07 Science Unit 08 PI 01

Build a layered paper model of the systems in the human body. Number each organ, and provide a function key for the organs.

Standard(s): 7.3B, 7.3C, 7.12B

ELPS.c.1C

Key Understandings

- No body system functions alone.
  - What are the systems of the human body?
  - What is the main function of each system?
  - What organs allow each system to function?
  - What body systems work together?

Vocabulary of Instruction
Materials

- balloon (1 per group)
- beaker (250 mL, 1 per group)
- beakers (500 mL, 2 per group)
- bottle caps (soda or water, 4 per group)
- box cutter (1 per teacher)
- clay
- clear tape (1 roll per group)
- coffee filters (2–3 per group, per class)
- colored pencils (multiple per class)
- cotton swabs (4 per group)
- crumbled crackers or bread (56.7 g per group, per class)
- food coloring (yellow and other colors)
- hand lens (1 per pair of students)
- kitchen match (small, wooden, see Advance Preparation, 1 per student)
- marker (permanent, per group)
- meat (chopped bologna or other sandwich, 56.7g per group, per class)
- metric tape measure (1 per pair of students)
- microscope (1 per group)
- microscope slide (1 per student)
- paper (notebook, 1 sheet per pair of students)
- petroleum jelly (1 per group)
- plastic (trash bag or shopping bag cut in 30 cm diameter circle, 1 per group)
- plastic bottle (2 liter, per group)
- reference materials from library (per class)
- resealable plastic bags (freezer, pint-size, 4 per group)
- resealable plastic bags (multiple per class)
- rubber bands (2 per group)
- ruler (1 per group)
- safety goggles (1 pair per student)
- sand (200 mL per group)
- scissors (1 pair per student)
- shredded cheese (56.7 g per group, per class)
- shredded lettuce or spinach pieces (56.7 g per group, per class)
- stapler (1 per class)
- tape (masking, 1 roll per group)
- tape or glue (per class)
- textbooks (per class)
- timing device (1 per teacher)
- triple beam balance (1 per group)
- vinegar (240 mL per group, per class)
- water (per class)

Attachments

All attachments associated with this lesson are referenced in the body of the lesson. Due to considerations for grading or student assessment, attachments that are connected with Performance Indicators or serve as answer keys are available in the district site and are not accessible on the public website.

- Handout: Human Body Systems Chart (1 per student)
- Teacher Resource: PowerPoint: Muscular and Skeletal Systems
- Teacher Resource: PowerPoint: Circulatory System
- Teacher Resource: Model of the Lung (see Advance Preparation, 1 for projection, 1 per group)
- Teacher Resource: Pictures of Lungs (see Advance Preparation, 1 for projection, 1 per group)
- Teacher Resource: PowerPoint: Respiratory System
- Teacher Resource: Modeling Digestion Lab (see Advance Preparation, 1 per group)
- Handout: Digestive System (1 for projection and 1 per student)
Resources
None Identified

Advance Preparation

1. Collect, assemble, and prepare all materials.
2. Prior to Day 1, arrange for access to computers/Internet or other campus resources for student research.
3. Prior to Day 4, locate a picture of a bone, muscle, and tendons working together. You may wish to use the Teacher Resource: PowerPoint: Muscular and skeletal systems.
4. Prior to Day 5, roll dime-sized balls of clay for each student. Break or cut off match heads for safety. You will need one per student, per class.
5. Prior to Day 6:
   - Use a box cutter to remove the bottom of a class set of 2 L plastic bottles for modeling the lung. The models will be dismantled after each class period. Do not allow students to handle the box knife. You will need one bottle per group.
   - Pre-cut 30 cm diameter circles of plastic bag. You will need one circle per group.
   - Construct an example model.
   - Print on cardstock and laminate the Teacher Resources: Model of the Lung and Pictures of Lungs (1 per group).
6. Prior to Day 7:
   - Obtain and chop the lunch meat and lettuce the day before the Modeling Digestion Lab and refrigerate.
   - Print on cardstock and laminate the Teacher Resource: Modeling Digestion Lab (1 per group).
7. Prior to Day 10, print on cardstock, laminate, and cut the Teacher Resource: Filter It (1 half sheet per group).
8. Prior to Day 13, print on cardstock, laminate, cut out, and bag the Teacher Resource: Reproductive System Cards (1 set per group).
9. Prior to Day 14, print on cardstock, laminate, cut out, and bag the Teacher Resource: Nanobot Station Cards (1 per station).
10. Prepare attachment(s) as necessary.

Background Information
Prior to this lesson, students looked at the connection between structure and function on the cellular level. During this lesson, students study human body systems for the first time. Students should understand that most organisms are composed of different parts and organisms may not function if some parts are missing. Students should also know that a combination of parts can perform functions that the single parts cannot perform alone. More specific to the human body, students in Grade 7 should realize that the human body has parts that help it seek and take in food when it feels hunger. They should understand that the brain is the part of the body that enables humans to think and it communicates with the other parts of the body.

STAAR Note:
Student Expectation 7.12B is a Supporting Standard on the Grade 8 STAAR, and this is the last time this information dealing with the function of body systems is directly taught before the test. The concepts from this lesson also build a foundation for concepts tested in Reporting Category 4: Biological Processes and Systems on the Biology STAAR.

INSTRUCTIONAL PROCEDURES

<table>
<thead>
<tr>
<th>Instructional Procedures</th>
<th>Notes for Teacher</th>
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<tr>
<td>ENGAGE – Levels of Organization in Humans</td>
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1. Post the following chart on the board or projection device. Instructional Notes:
   - This Engage activity serves as a pre-assessment of prior knowledge.
Recall that in the last unit we studied the levels of organization. In your science notebooks, create a chart like this and spend a few minutes filling it in. List as many examples as you can.

2. Allow students time to construct the chart and fill it in. Monitor students for prior knowledge or misconceptions.

EXPLORE – Body Systems

1. Say:
   - In this unit you will be identifying the ten major human body systems that allow the human body to function. Today, you will complete a research activity on one of the body systems. In your research, you will answer these questions:
   - What organs allow the system to function?
   - What is the function of the system?
   - What body systems work together?
   - You will share your research with the class.

2. Assign each student one of the body systems. At this point, students should work individually to collect information on the assigned body system.

3. Allow students time to collect information from a variety of resources including textbooks, the Internet, and library materials.

4. Instruct students to use their research questions and answers to write a summary of their findings in their notebooks.

5. Monitor and assist students while they write their summaries. Check for accuracy of information.

6. Instruct each student to partner with another student who has been assigned a different system. Instruct students to trade summaries and peer edit the summary for content.

7. Allow time for revisions if necessary.

8. Instruct any students who were assigned the same body system to partner to compare information and work on combining the information into one summary.

9. Allow students time to revise the summary.

10. Allow groups a few minutes to plan how to present their summaries to the class on the following day.

EXPLAIN – Student Presentations

1. Say:
   - Today, you will continue identifying the ten major human body systems that allow the human body to function. You will do this by completing a chart while your classmates present information about each body system.

2. Inform students that today you will check for understanding by allowing student groups
to present their information from the previous day’s summaries about each body system.

3. Distribute the Handout: Human Body Systems Chart to each student.

4. During each presentation, students should be adding information to their handout.

5. Instruct students to include the answers to these questions:
   - What organs allow the system to function?
   - What is the function of the system?
   - What body systems work together?

6. Monitor and assist students in recording accurate information. Instruct students to affix their handouts to their science notebooks.

EXPLORE/EXPLAIN – Muscular and Skeletal Systems

1. Say:
   - Today, you will identify the function of the muscular and skeletal systems by exploring how muscles and the skeletal system work together.

2. Instruct students to place one arm in the muscle builder position. Instruct them to place one hand around their opposite upper arm so that the thumb is on bottom and the other four fingers are on top. Feel for the biceps on top of the upper arm and triceps on the bottom.

3. Instruct students to bend and flex their arm several times while sensing the movement of both muscles with the hand that is wrapped around the arm. Students should record their observations in their science notebooks.

4. Working in pairs, students will measure the length of each other’s biceps when their arm is bent (not flexed) and when it is straight. (Model the process for students.) Students will need to construct a data table and record the data in their science notebooks. Monitor students throughout the process.

5. Repeat the process for the triceps.

6. Still working in pairs, students will measure the width (thickness) of the upper arm when the arm is extended to the side. Students will record these measurements on the data table. Continue to monitor students.

7. Each student will then bend their arm, to tighten the muscle (flex, like a body builder). Each pair will re-measure the muscle and record the data.

8. Locate and show a picture of a bone, muscle, and tendons working together. You may wish to use the Teacher Resource: PowerPoint: Muscular and Skeletal Systems. Explain how the all three components work together.

9. Post the following questions on the board or overhead, and ask students to write responses in their notebooks:
   - How did the biceps and triceps change as you bent and straightened your arm? When the arm was extended, the biceps would lengthen and the triceps would contract (shorten). The reverse would occur when the arm was bent.
   - How do the skeletal muscles cause bones to move? Muscles are attached to bones by tendons. The muscles work in pairs and pull against the bone to cause movement. When one muscle contracts, the other relaxes.
   - What did your finding about the thickness of the upper arm suggest about how muscles work? The thickness of the arm stayed almost the same. The muscles alternate flexing and extending, taking up the same amount of space in either position.

Materials:
- metric tape measure (1 per pair of students)

Attachments:
- Teacher Resource: PowerPoint: Muscular and Skeletal Systems
- Handout: Human Body Systems Chart (from previous activity)

Instructional Notes:
Descriptions should include specific movements of the muscles.
Measurements should be taken in metric units.
It may be difficult to measure much change in the triceps.
You may want to co-construct a data table with students prior to measuring.
Ask students to visualize a turkey or chicken drumstick. The tough, white bands are tendons. Show students a picture of a muscle, bone, and tendon working together.

Misconception:
- Students may think that bones are solid, that they don’t have spaces.

Check For Understanding:
The summaries of the systems and their organs may be used as formative assessment.

Suggested Day 4
10. Ask students to share their answers with the class, and clarify any misconceptions.

11. Instruct students to create a page in their notebooks for the muscular system that will be followed by a page for the skeletal system. Explain that they should record all notes, terms, questions, and answers in this location. Ask students to organize their notebook pages according to system, function, organs, and interactions with other systems, terms, and questions.

12. Project the Teacher Resource: PowerPoint: Muscular Skeletal Systems, and ask students to take notes in their notebooks. Pause to allow students time to write down appropriate information. Point out important information to students. Monitor to ensure that students are recording correct information.

13. Instruct students to sketch their biceps and triceps and label the major components of how the skeletal muscles cause bones to move (tendons). It may be helpful to post the vocabulary necessary on the board for students who may need assistance (Ex: Tendons- allowing muscle and bones to work together).

14. Facilitate a discussion based on the following questions, and ask students to reference their Handout: Human Body Systems Chart (previously affixed to notebook). Instruct students to copy the questions and answer them in their notebooks.

Ask:

- What organs allow the muscular system to function? (Cardiac, smooth, and skeletal muscles, tendons, ligaments)
- What is the function of the muscular system? (Allow the body to move and aid in circulation and digestion)
- What body systems work together with the muscular system? (The muscles need food from the digestive system and oxygen from the respiratory system delivered by the circulatory system. They also depend on the circulatory and excretory system to remove waste products.)
- What is the function of the skeletal system? The function of the skeletal system is to provide structure and protection for the body. It contains resources to generate new blood cells.
- What are the organs of the skeletal system? Bones and joints
- How are the bones of the skeletal system held together? Our bones are held together by ligaments. Ligaments are stretchy bands of tissue that hold bones together, allow joints to move, and stabilize them so they stay properly aligned.
- What body systems work together with the skeletal system? (The circulatory system transports blood to and from bones; the digestive system provides minerals and vitamins to bones; and the muscular system moves bones.)

5. Allow students time to modify the answers on their Handout: Human Body Systems Chart.

6. Instruct students to summarize the functions of the muscular and skeletal systems and their organs in their notebooks.

<table>
<thead>
<tr>
<th>EXPLORE/EXPLAIN – Circulatory System</th>
<th>Suggested Day 5</th>
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<tbody>
<tr>
<td><strong>1.</strong> Say:</td>
<td><strong>Materials:</strong></td>
</tr>
<tr>
<td>- Today, you will work to identify the function of the circulatory system by exploring how the heart works.</td>
<td>- clay (see Advance Preparation, dime-size ball per student)</td>
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<tr>
<td>- Distribute a ball of clay and a small, wooden kitchen match to each student. Instruct students to roll out a small amount of clay into the size of a dime.</td>
<td>- kitchen match (small, wooden, see Advance Preparation, 1 per student)</td>
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<tr>
<td>- Instruct students to push a small wooden kitchen match into the clay. <em>This is our “pulse-o-meter.”</em></td>
<td>- timing device (1 per teacher)</td>
</tr>
<tr>
<td>- Place the clay on your wrist. Move the “pulse-o-meter” around until you find the spot with the strongest beat. The match should twitch with each pulse beat.</td>
<td><strong>Attachments:</strong></td>
</tr>
<tr>
<td>- Explain to students that one’s pulse is the force felt in an artery of the heart contracting in your chest.</td>
<td>- Teacher Resource: PowerPoint: Circulatory System</td>
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<tr>
<td>- Demonstrate to students that a person’s pulse can be taken at certain points on the body. Some of these points are the inner part of wrist, side of the neck, side of head (temple), underarm, and back of knees. *(Never use your thumb to feel a pulse as it</td>
<td></td>
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**Safety Note:**

Break or cut off the head of the match prior to distributing to students.
7. Once students have found a pulse point, instruct them to sit quietly and count the number of beats in 15 seconds. (*The teacher may be the time keeper.*) Multiply the number of beats by four to get the number of beats in one minute.

8. Instruct students to record this number in their notebooks.

9. Instruct students to choose an activity to do for three minutes. They may choose jogging in place, jumping jacks, marching in place, or making arm circles.

10. When three minutes have passed, instruct students to place the pulse-o-meter back on their pulse point and count the beats for 15 seconds. (*The teacher may be the timer.*) Multiply the number of beats by four to get the number of beats in one minute.

11. Instruct students to record this number in their notebooks.

12. After completing the activity, facilitate a discussion on the following questions. Instruct students to copy and answer the questions in their notebooks.

   Ask:
   
   - What is the relationship between physical activity and pulse rate? *The amount of physical activity causes the pulse rate to go up.*
   - Which activity caused their pulse rate to increase the most? *The activity that was the most vigorous.*
   - Why do you think activity caused the heart to pump faster? *The muscles need more oxygen, signaling the heart to pump faster.*


14. Instruct students to label a page in their notebooks “Circulatory System” and take notes as you facilitate a discussion during the progression of the presentation.

15. Explain that the circulatory system is made up of the vessels and muscles that control the flow of blood through the body.

16. After completing the notes, facilitate a discussion on the following questions. Ask students to reference their Handout: *Human Body Systems Chart* (previously affixed to notebook). Instruct students to copy and answer the questions in their notebooks.

   Ask:
   
   - What organs allow the circulatory system to function? (*The heart, blood vessels (arteries and veins), and blood allow the circulatory system to function.*)
   - What is the function of the circulatory system? (*The circulatory system transports nutrients and oxygen to the cells of the body and removes wastes.*)
   - What body systems work together to help the circulatory system? (*The circulatory system depends on the muscular system to pump the blood- the heart is made of cardiac muscle. It also depends on the respiratory and digestive system to provide the nutrients and oxygen needed for the cells and on the excretory system to remove wastes from the bloodstream.*)

7. Allow students time to modify the answers on their Handout: *Human Body Systems Chart.*

8. Instruct students to summarize the main functions of the circulatory system and its organs in their notebooks.

**EXPLORE/EXPLAIN – Respiratory System Model**

1. Say:

   - Today, you will work to identify the function of the respiratory system by building a model of the lung.

2. Divide the class into groups of 4–5.

3. Project the Teacher Resource: *Model of the Lung* (see Advance Preparation), and discuss the expectations with students. Answer any questions they may have.

4. Distribute the Teacher Resources: *Model of the Lung* (see Advance Preparation) and *Pictures of Lungs* (see Advance Preparation) to each group.

5. Instruct students to complete the models and record observations in their notebooks.

6. Monitor groups, and assist as needed.

**Materials:**

- plastic bottle (2 liter, 1 per group)
- plastic (trash bag or shopping bag cut in 30 cm diameter circle, 1 per group)
- rubber bands (2 per group)
- balloon (1 per group)
- tape (masking, 1 roll per group)
- clay (1 small ball per group)
- ruler (1 per group)

**Attachments:**
7. When students compare the pictures of lungs to the 3-D models, instruct them identify advantages and limitations of both models.

8. Students should sketch the 3-D and 2-D models and record the advantages and limitations of the models in their notebooks.

9. Discuss the advantages and limitations of the models.

10. Instruct students to create a page in their notebooks for the respiratory system. Explain that they should record all notes, terms, questions, and answers in this location as they view the presentations.

1. Project the Anatomy of Breathing Simulation (see Advance Preparation) site for students to observe and analyze how the respiratory system functions. Instruct students to take notes in their notebooks. Point out the important information students should record. You may need to replay the simulation multiple times for students to absorb the details.

2. Project the Teacher Resource: PowerPoint: Respiratory System, and instruct students to continue taking notes as you facilitate a discussion throughout the progression of the presentation.

3. After completing the investigation, simulation, and notes, facilitate a discussion on the following questions. Ask students to reference their Handout: Human Body Systems Chart (previously affixed to notebook). Instruct students to copy and answer the questions in their notebooks.

   Ask:
   
   - What organs allow the respiratory system to function? (The lungs, trachea, and diaphragm allow the respiratory system to function.)
   - What is the function of the respiratory system? (The respiratory system allows for oxygen and carbon dioxide exchange.)
   - What body systems work together to help the circulatory system? (The respiratory system depends on the muscular system to pull air into the lungs— the diaphragm is a muscle. It also depends on the circulatory and digestive systems.)

4. Instruct students to summarize the main functions of the respiratory system and its organs in their notebooks.

5. Allow students time to modify the answers on their Handout: Human Body Systems Chart.

EXPLORE/EXPLAIN – Digestive System

Suggested Days 7 and 8

1. Say:
   
   - Today, you will work to identify the function of the digestive system by building a model of digestion.

2. Project the Handout: Modeling Digestion Lab (see Advance Preparation). Discuss the expectations, and answer any questions students may have.

3. Address safety procedures with the students before allowing them to begin:
   
   - use of goggles
   - leaks in bags
   - disposal of liquid and solid waste

4. Divide the class into groups of 4–5.

5. Distribute the Handout: Modeling Digestion Lab (see Advance Preparation) to each group. Instruct students to complete the investigation.

6. Monitor and assist students as needed.

7. Project the Handout: Digestive System. Ask students to name as many organs as possible.

8. Facilitate a discussion by asking students what they think the digestive system does. Accept all answers.


Materials:

- safety goggles (1 pair per student)
- resealable plastic bags (freezer, pint-size, 4 per group)
- marker (permanent, per group)
- petroleum jelly (1 per group)
- bottle caps (soda or water, 4 per group)
- cotton swabs (4 per group)
- food coloring (yellow, 1 per group)
- vinegar (240 mL per group, per class)
- beaker (250 mL, 1 per group)
- triple beam balance (1 per group)
- meat (chopped bologna or other sandwich, 56.7 g per group, per class)
- shredded lettuce or spinach pieces (56.7 g per group, per class)
- crumbled crackers or bread (56.7 g per group, per class)
- shredded cheese (56.7 g per group, per class)
- tape or glue (per class)

Attachments:
10. Distribute the Handout: Digestive System to each student, and instruct them to label the diagram and take notes as you progress through the presentation. Students should affix the handout to their notebooks after completion.

11. Project the Teacher Resource: Journal of a Hamburger to let students see how the chart will be constructed. Students will draw the chart in their notebooks, leaving a larger space for their responses than is indicated on the example.

12. Students may complete their Journal of a Hamburger in their same groups, or you may form new groups.

13. Use the Teacher Resource: Journal of a Hamburger KEY to discuss the path of a hamburger through the digestive system.

14. Instruct students to affix their Journal of a Hamburger to their notebooks.

15. Return to the data collected during the Modeling Digestion Lab. Ask for student volunteers to read their hypotheses aloud. Write several responses on the board. Answers will vary.

16. Work with students to develop a common hypothesis from the samples given.

17. This is an appropriate time to remind students that a hypothesis is a tentative statement that proposes a possible explanation to some phenomenon or event. A useful hypothesis is a testable statement which may include a prediction. A hypothesis should not be confused with a theory. Theories are generalizations based on a large amount of data.

18. Students will add an analysis section to their investigation observations and answer the questions below. Post the questions on the board.

- What did the plastic bag represent in this model? (Stomach)
- What did the petroleum jelly represent in this model? (Mucus lining)
- What did the vinegar represent in this model? (Stomach acid)
- Which type of food digested the quickest in this model? (Bread or crackers)
- What are some limitations of this model? Explain. Vinegar was weaker than stomach acid; some enzymes were missing; time was too short for digestion; not enough churning of food for mechanical breakdown, etc.
- What are some advantages of this model? Explain. The model demonstrates the process of digestion and how digestion functions inside of the human body.

19. Instruct students to work with a partner to write a conclusion that either confirms or disproves the hypothesis for the activity. They may use their observations and the information on the Journal of a Hamburger chart. Conclusions should be recorded in the notebooks.

20. After completing the activity, facilitate a discussion on the following questions. Ask students to reference their Handout: Human Body Systems Chart (previously affixed to notebook).

21. Instruct students to copy and answer the questions in their notebooks.

- What organs allow the digestive system to function? (The mouth, esophagus, stomach, small intestine, large intestine, gall bladder, liver, and anus allow the digestive system to function.)
- What is the function of the digestive system? (The digestive system breaks down food into a form usable by the cells of the body.)
- What body systems work together to help the digestive system? (The digestive system depends on the muscular system to move the food through the system—the system is lined with smooth muscle. It also depends on the respiratory and circulatory systems.)

22. Allow students time to modify the answers on their Handout: Human Body Systems Chart.

23. Instruct students to summarize the main functions of the digestive system and its organs in their notebooks.

EXPLORE/EXPLAIN – Integumentary System

1. Say:

- Today, you will work on identifying the function of the integumentary system by examining your skin, nails and hair.

Teacher Resource: Modeling Digestion Lab (see Advance Preparation, 1 per group)
Handout: Digestive System (1 for projection and 1 per student)
Teacher Resource: PowerPoint: Digestive System
Teacher Resource: Journal of a Hamburger (1 for projection)
Teacher Resource: Journal of a Hamburger KEY
Handout: Human Body Systems Chart (from previous activity)

Safety Notes:

Students are to wear safety goggles during this activity.

Science Notebooks:

Students record observations, notes, hypotheses, conclusions, questions and answers, and summaries in their notebooks.

Materials:

- microscope (1 per group)
2. Divide the class into groups of four.
3. Instruct students to take a small piece of clear tape and press it on the back of their hand and remove it quickly.
4. Instruct students to affix the tape to a microscope slide, sticky side up. Students should assist one another with this process.
5. Students should look at the sticky side of the tape with a hand lens or microscope.
6. Monitor and assist students as needed.
7. Instruct students to draw what they see in their science notebooks. Make sure all drawings are done in the field of view circle and in proportion. Students should see dead skin cells stuck to the tape.
8. Instruct students to carefully pull one hair out of their head or arm. Try to find one with a small white bulb on the skin end of the hair.
9. Instruct students to affix the hair to a microscope slide. Students should assist one another with this process.
10. Instruct students to examine the hair shaft and both ends with the hand lens or microscope.
11. Continue to monitor and assist students as needed.
12. Instruct students to draw observations in their science notebooks. Make sure all drawings are done in the field of view circle and in proportion.
13. Instruct students to remove tape and hair from slides and clean them before returning them to the teacher.
14. Allow students time to modify the answers on their Handout: Human Body Systems Chart.
15. Instruct students to summarize the main functions of the integumentary system and its organs in their notebooks.

EXPLORE/EXPLAIN – Excretory System/Filter It

1. Say:
   - Today, you will work to identify the function of the excretory system by building a model of a filtration system.
2. Project the Teacher Resource: Filter It (see Advance Preparation), and discuss the expectations with students. Answer any questions they may have.
3. Divide the class into groups of 4–5 to complete the investigation.
4. Monitor groups, and assist as needed.
5. Project the Teacher Resource: Excretory System. Instruct students to

Materials:
- sand (200 mL per group)
- water (per class)
- food coloring (any color, per group)
- beakers (500 mL, 2 per group)
- coffee filters (2–3 per group, per class)
- rubber bands (2 per group)

Attachments:
- Teacher Resource: Excretory System
- Handout: Human Body Systems Chart (from previous activity)
label a page in their notebooks “Excretory System” and take notes as your progress through the presentation.

6. After completing the investigation and notes, facilitate a discussion on the following questions. Ask students to reference their Handout: Human Body Systems Chart (previously affixed to notebook). Instruct students to copy and answer the questions in their notebooks.

Ask:

• What organs allow the excretory system to function? (The kidneys, ureter, bladder, and urethra allow the excretory system to function.)

• What is the function of the excretory system? (The excretory system removes waste materials from the body.)

• What body systems work together to help the excretory system? (The excretory system depends on the circulatory system to move the wastes from the cells and deliver them to the kidneys. It also depends on the respiratory system to remove carbon dioxide from the body. The skin can also remove salt from the body by sweating.)

7. Allow students time to modify the answers on their Handout: Human Body Systems Chart.

8. Instruct students to summarize the main functions of the excretory system and its organs in their notebooks.

EXPLORE/EXPLAIN – Nervous System/Traveling Impulse

1. Say:

• Today, you will work to identify the function of the nervous system by determining how fast an impulse travels.

2. Inform students that you will time how long it takes for an impulse to travel through a path.

3. Construct a data table to complete on the board.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Trial 1 Time (s)</th>
<th>Trial 2 Time (s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eyes open</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eyes closed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Change direction</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bring</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4. Instruct students to stand in a circle and hold hands.

5. Lightly squeeze the shoulder of a student designated to begin the impulse (squeeze).

6. As soon as each student feels the squeeze on their left shoulder, they will squeeze the shoulder to their right.

7. The impulse and timing stops as soon as the impulse reaches the left hand of the student who started the squeeze. Have the student call out when the impulse returns.

8. Record the time for this trial. Encourage students to try to pass the impulse faster on trial #2. Repeat steps 3–6 again. Record data for trial #2.

9. At this point, have students drop hands and ask:

• How could this activity model an impulse? (How a nerve impulse travels through the nervous system)

10. Explain to students that different types of nerve impulses can travel at different speeds. Regardless of the type, even the top speed is three million times slower than the speed of electricity traveling through a wire. Share the following numbers with students:

    • Motor (muscle movement) impulses travel at 119 m/s.
    • Sensory impulses travel at 76.2 m/s.
    • Pain impulses travel at 0.61 m/s.

11. Inform students that the variables will change because of the many internal and external stimuli that affect the body. Not all impulses are the same.

12. The second part of the activity will be conducted in the same manner. Instruct students to close their eyes while the shoulder-squeeze circulates.

• Teacher Resource: Filter It (see Advance Preparation, 1 half sheet per group)

• Teacher Resource: PowerPoint: Excretory System

• Handout: Human Body Systems Chart (from previous activity)

Science Notebooks:

Students record observations, questions and answers, notes, and summaries in their notebooks.
13. Students will record the data from trial 1 and 2 while conducting the experiment with their eyes closed. Data should be recorded in the data chart created at the beginning of the lesson. *(By closing the eyes, the students are less able to anticipate the oncoming impulse. The time may be slower.)*

14. Other variations to try can include:
   - sending the impulse to the left instead of the right
   - crossing arms and holding hands
   - starting at a different student each time
   - chanting or singing while passing the impulse

15. Be sure to record the time on the board, and have a discussion about the results after each variation.

16. Instruct students to return to their seats and record the data table and reflections about what caused the time differences with each variation within their notebooks. They should identify some limitations of this model.

17. Project the Teacher Resource: PowerPoint: Nervous System. Instruct students to label a page in their notebooks “Nervous System” and take notes as you progress through the presentation.

18. After completing the activity and notes, facilitate a discussion on the following questions. Ask students to reference their Handout: Human Body Systems Chart (previously affixed to notebook).

19. Instruct students to copy and answer the questions in their notebooks. Ask:
   - What organs allow the nervous system to function? *(The brain, spinal cord, nerves, and sense organs allow the nervous system to function.)*
   - What is the function of the nervous system? *(The nervous system controls the actions of the body by collecting information through the sense organs and sending impulses to the body through the nerves.)*
   - What body systems work together to help the nervous system? *(The nervous system depends on the muscular system to respond to the impulses from the brain. It also depends on the respiratory and circulatory systems for oxygen in the brain cells.)*

20. Allow students time to modify the answers on their Handout: Human Body Systems Chart.

21. Instruct students to summarize the main functions of the nervous system and its organs in their notebooks.

**EXPLORE/EXPLAIN – Endocrine System**

1. Say:
   - Today, you will work to identify the function of the endocrine system through a class discussion.

2. Explain to students that you are going to give them a stimulus and they are to discuss their response to the stimulus with a partner.

3. Divide the class into pairs.

4. Below are some examples of stimuli you may use to prompt responses from students: *(Be sensitive to the cultural diversity in your classroom.)*
   - Play an upbeat song, classical music, or a children’s song.
   - While students close their eyes, make a loud, startling sound.
   - Play a clip such as CNN heroes to evoke an emotion.
   - Show pictures such as fires, tornadoes, animals, tests, sky diving, presents, cake, etc.

5. After each stimulus, pause to give students time to discuss their responses with a partner.

6. Ask volunteers to share responses with the class.

7. Distribute the Handout: Endocrine System to each student. Instruct the students to label the glands with the hormones produced and take notes as you progress through the presentation.
8. Project the Teacher Resource: PowerPoint: **Endocrine System**.

9. Discuss the glands of the endocrine system and hormones produced to regulate the functions of the body. Pause to give students time to take notes.

10. Instruct students to affix their handouts to their notebooks.

11. After completing the notes, facilitate a discussion on the following questions. Ask students to reference their Handout: **Human Body Systems Chart** (previously affixed to notebook).

12. Instruct students to copy and answer the questions in their notebooks.
   - **What organs allow the endocrine system to function?** *(The glands and hormones allow the endocrine system to function.)*
   - **What is the function of the endocrine system?** *(The endocrine system produces hormones to control the function of the body.)*
   - **What body systems work together to help the endocrine system?** *(The endocrine system depends on the circulatory and nervous systems.)*

13. Allow students time to modify the answers on their Handout: **Human Body Systems Chart**.

14. Instruct students to summarize the main functions of the endocrine system and its organs in their notebooks.

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**EXPLORE/EXPLAIN – Reproductive System**

Suggested Day 13

1. Say:
   - **Today, you will work to identify the function of the reproductive system, sequencing events in reproduction.**

2. Divide the class into pairs.

3. Distribute the Handout: **Reproductive System Cards** (see Advance Preparation) to each pair of students.

4. Instruct the students to organize the cards into the sequence of steps involved in sexual reproduction. Instruct students to lay the cards out in sequential order on their desks. Ask each pair of students to leave one sheet of paper titled “Feedback” on their desk.

5. Conduct a gallery walk in which students leave a note on the “Feedback” sheet for the group offering suggested improvements or a different sequence of the cards.

6. Once students have completed the gallery walk, have them return to their seats and modify their sequence based on feedback.

7. After completing the activity, facilitate a discussion on the following questions. Ask students to reference their Handout: **Human Body Systems Chart** (previously affixed to notebook).

8. Instruct students to copy and answer the questions in their notebooks.
   - **What organs allow the reproductive system to function?** *(The testes and ovaries allow the reproductive system to function.)*
   - **What is the function of the reproductive system?** *(The reproductive system produces offspring.)*
   - **What body systems work together to help the reproductive system?** *(The reproductive system depends on the respiratory, circulatory, and endocrine systems.)*

9. Allow students time to modify the answers on their Handout: **Human Body Systems Chart**.

10. Instruct students to summarize the main functions of the reproductive system and its organs in their notebooks. Allow students to reference their endocrine system notes and the cards.

11. Collect card sets.

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**Instructional Notes:**

Many districts teach the reproductive system as a part of their Health program. Please refer to your district’s approved policies and procedures regarding the teaching of this content.

**Science Notebooks:**

Students record observations, questions and answers, notes, and summaries in their notebooks.
1. Place the Nanobot Station Cards (see Advance Preparation) in different stations around the room before class.

2. Say:
   - Today, you will work on identifying the function of the body systems by identifying systems from the viewpoint of alien nanobots.
   - From the viewpoint of alien nanobots that explored a human body, identify the systems and their functions from the data collected by the nanobots.
   - Begin at your assigned Nanobot Station Card. Read the data collected by the nanobots.
   - Rotate through the stations at your teacher’s signal and the direction designated by the teacher.
   - Using the data from the station cards, complete the Systems Matrix handout in your own words.

3. Assign each student to a station from which they will begin their rotations.

4. Distribute the Handout: Systems Matrix to each student. Instruct students to complete the information. Instruct students to explain in their own words, not just copy information on the station cards.

5. Instruct students to affix their Systems Matrix to their notebooks after completion.

---

**Materials:**
- tape or glue (per class)

**Attachments:**
- Handout: Nanobot Station Cards (see Advance Preparation, 1 class set)
- Handout: Systems Matrix (1 per student)
- Teacher Resource: Systems Matrix KEY

**Check For Understanding:**
The Systems Matrix may serve as a formative assessment.

**Science Notebooks:**
Students affix their Systems Matrix to their notebooks.

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**EVALUATE – Performance Indicator**

**Grade 07 Science Unit 08 PI 01**
Build a layered paper model of the systems in the human body. Number each organ, and provide a function key for the organs.

**Standard(s):** 7.3B, 7.3C, 7.12B

**ELPS**
ELPS.c.1C

1. Refer to the Teacher Resource: Performance Indicator Instructions KEY for information on administering the assessment

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**Materials:**
- colored pencils (multiple per class)
- scissors (1 pair per student)
- stapler (1 per class)

**Attachments:**
- Handout: Layered Paper Model Forms (3 copies per student)
- Teacher Resource: Performance Indicator Instructions KEY (1 for projection)
Human Body Systems Chart

During the presentations, fill in the information for each body system.

<table>
<thead>
<tr>
<th>Organ System</th>
<th>Functions</th>
<th>Main Organs</th>
<th>Interacts With</th>
</tr>
</thead>
<tbody>
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<td>Organ System</td>
<td>Functions</td>
<td>Main Organs</td>
<td>Interacts With</td>
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</tbody>
</table>
Model of the Lung

Materials (per group):

- 20 ounce or 2 liter plastic bottle
- rubber bands (2)
- piece of plastic from trash bag or shopping bag (cut in a 30 cm diameter circle)
- marker
- balloon
- scissors
- ruler
- masking tape
- clay

Procedure:

1. Stretch a balloon several times. Place the balloon so it hangs down into the neck of the bottle.

2. Stretch the opening of the balloon over the neck of the bottle. Use a rubber band around the bottle neck to hold the balloon in place. It may be necessary to place masking tape over the rubber band to hold it more securely.

3. Fold the plastic circle in half two times. To make a handle, twist a small portion of the folded corner and wrap it with masking tape.

4. Use a rubber band to tightly secure the plastic circle to the open bottom of the bottle, leaving the handle on the outside. Leave a small amount of slack in the plastic.

5. Using the handle, softly push and pull to move the plastic in and out. Record what you observe in your notebook.

6. Hold the mouth of the bottle near your cheek while gently pushing and pulling the plastic in and out. Record your observations in your notebook.

7. In your notebook:
   - Describe and explain the behavior of the balloon as the plastic moved in and out.
   - Sketch the 3-D model of the lung.
   - Compare a human lung to your lung model. Identify the parts of the model that represent the following: lungs, chest cavity, end of the trachea, and diaphragm. You may use reference materials.

[Diagram of the model of the lung]
Pictures of Lungs

http://commons.wikimedia.org/wiki/File:Respiratory_system.svg

http://commons.wikimedia.org/wiki/File:Thoracic_anatomy.jpg
Modeling Digestion Lab

Problem: Which type of food (proteins, starches, vegetables, or fat) needs more time for digestion?

Hypothesis:

Materials: (per group of 4)
- safety goggles
- resealable, pint-size, plastic, freezer bags (4)
- permanent marker
- triple beam balance
- crumbled crackers or bread
- petroleum jelly
- piece of chopped bologna or other sandwich meat
- cotton swabs (4)
- soda or water bottle caps (4)
- shredded cheese
- yellow food coloring
- shredded lettuce or spinach pieces (a small handful)
- beaker or measuring cup
- vinegar

Safety Note: Safety goggles are to be worn during this activity.

Procedure:
1. Record all observations, hypotheses, inferences, etc. in your notebook.
2. Label each bag with one of the titles listed below:
   - Protein
   - Vegetables/Roughage
   - Starches/Carbohydrates
   - Dairy/Fat
3. Use the cotton swab to lightly coat the inside of each bag with petroleum jelly.
4. Measure 60 mL (about ¼ cup) of vinegar in a beaker or measuring cup, and add this to the first bag. Repeat this for the other three bags.
5. Add one drop of food coloring to one side of the bag so the drop slides down the petroleum jelly. Repeat this for the other three bags.
6. Using the balance, mass out 56.7 grams of each food item: meat, vegetable, starch, and dairy.
7. Add the food item to its labeled bag. Seal the bag.
8. Shake the resealed bag vigorously, using a side-to-side motion 50 times.
9. Compare each bag, and develop a hypothesis about which types of foods might need more digestion time.
10. Carefully unseal one end of the bag, and pour the liquid into the container designated by your teacher. Try not to pour out pieces of solid material. Reseal the bag, and dispose of it in the trash. Clean your work area, and wash your hands.
Journal of a Hamburger

<table>
<thead>
<tr>
<th></th>
<th>Physical Changes</th>
<th>Chemical Changes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mouth</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Esophagus</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stomach</td>
<td></td>
<td></td>
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<tr>
<td>Small Intestine</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Large Intestine</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rectum</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Journal of a Hamburger KEY

<table>
<thead>
<tr>
<th></th>
<th>Physical Changes</th>
<th>Chemical Changes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mouth</strong></td>
<td>The teeth and tongue start tearing the food into smaller pieces. While swallowing is a voluntary action, once the food reaches the esophagus, involuntary muscles take over for the rest of the trip through the system, until food reaches the anus.</td>
<td>Saliva, from the salivary glands, moistens the food and begins the digestion of starch into sugar.</td>
</tr>
<tr>
<td><strong>Esophagus</strong></td>
<td>Muscular tube that can push the food into the stomach in seven seconds. The squeezing motion is called peristalsis and looks like an ocean wave passing through the system.</td>
<td>None</td>
</tr>
<tr>
<td><strong>Stomach</strong></td>
<td>Muscles in the stomach contract and churn the food. The stomach is coated with mucus to protect it from digestive juices. Food stays here 3–4 hours. It leaves here in a thick, liquified state.</td>
<td>An acid bath soaks the food. The hydrochloric acid kills germs in the food as well as helping to dissolve it. Protein digestion starts here with the help of enzymes.</td>
</tr>
<tr>
<td><strong>Small Intestine</strong></td>
<td>A 6.1 m (20 ft) tube where final digestion and absorption occurs. There are millions of small, finger-like projections called villi. The villi absorb useful food particles and pass them to the blood. Peristalsis pushes food through the intestine. Food can remain here for up to eight hours. (Note- Absorption is a process causing a physical change of location.)</td>
<td>Digestive juices from the liver and pancreas break down fats, proteins, and starches. The liver makes bile, stores it in the gall bladder, and releases it into the small intestine. Bile breaks down fats. The pancreas makes enzymes that break down starches and releases it here as well. It also produces a substance to neutralize acid in the small intestine. Final protein digestion occurs here.</td>
</tr>
<tr>
<td><strong>Large Intestine</strong></td>
<td>A 1.5 m (5 ft) tube where non-useful parts of food end up. Also mixed in are seeds, old blood cells, body cells, plant fibers, gum, and anything else that is not digestible. The solid material left behind (feces) is moved by peristalsis to the rectum.</td>
<td>Water is absorbed into the body here. As water is removed from the waste material, the waste becomes more solid.</td>
</tr>
<tr>
<td><strong>Rectum</strong></td>
<td>The mostly solid feces are expelled from the body through the anus during a bowel movement. The waste may stay here 1–2 days.</td>
<td>None</td>
</tr>
</tbody>
</table>
Filter It

Record all observations, questions, and answers in your notebook.

How are wastes filtered from our bodies?

Materials:
- sand (approximately 200 mL)
- water
- food coloring
- rubber bands
- beakers (2)
- coffee filters (2–3)

Procedures:
1. Measure about 200 mL of sand in a beaker.
2. Add a small amount of water (75–100 mL) to make a loose mixture in the beaker.
3. Add a few drops of food coloring to the mixture.
4. Fill the beaker or jar about half full of water.
5. Layer 2–3 coffee filters, and secure them over the neck of a second beaker or jar with a rubber band. Do not pull filters tightly across the opening. Allow the filters to dip a little.
6. Carefully and slowly pour the sand and water mixture onto the filter paper. Take care not to overflow the filter.
7. In your notebook, describe what happened to the mixture.
8. Clean up, and dispose of materials according to your teacher's instructions.
Endocrine System

Label the body with the location of the endocrine glands. Next to each label, identify the hormone produced.

### Reproductive System Cards

Sort the cards into a logical sequence that relates to the process of reproduction.

<table>
<thead>
<tr>
<th>Every human cell (except sperm and egg cells) contains 46 chromosomes, which contain all of the instructions necessary for making a human organism.</th>
<th>In sexual reproduction, each parent contributes ½ of the information the offspring needs to develop. This information is housed in either an egg or a sperm cell, which each contain 23 chromosomes.</th>
</tr>
</thead>
<tbody>
<tr>
<td>The egg cell develops in an organ called the ovary in the female. Each month, the female releases an egg.</td>
<td>The sperm develop in an organ called the testes in the male. The male makes millions of sperm.</td>
</tr>
<tr>
<td>During a process called fertilization, the sperm cell joins with the egg, creating a new cell called a zygote.</td>
<td>If the egg is not fertilized, it is removed from the body through natural processes.</td>
</tr>
<tr>
<td>The zygote implants on the wall of a female organ called the uterus and continues to develop through the process of mitosis.</td>
<td>This development in humans is called a pregnancy and generally takes nine months to complete.</td>
</tr>
</tbody>
</table>
Nanobot Station Cards

I am the system that…

1. …helps transport material through the body.
2. …carries oxygen to the cells.
3. …carries away carbon dioxide and waste from the cells.
4. …contains three special types of cells: white, red, and platelets.
5. …contains veins, venules, arteries, arterioles, and capillaries.

I am the system that…

1. …helps oxygen get in and carbon dioxide get out of the body.
2. …contains bronchi, bronchioles, alveoli, pharynx, and larynx, among other organs.
3. …warms and moistens air entering the body.
4. …has a set of organs that can float.
5. …has a flat muscle that causes inhaling and exhaling by causing a change in air pressure.
I am the system that…

1. …breaks down food into usable molecules for the cells.
2. …contains organs that absorb nutrients and water.
3. …uses enzymes to help break down nutrients.
4. …includes both mechanical and chemical means to break down food.
5. …has an organ for removal of indigestible matter.

I am the system that…

1. …removes liquid and solid waste from the body.
2. …contains an organ that removes various salts through sweating.
3. …removes urea and nitrogen wastes by various organs.
4. …has organs that filter the blood.
5. …keeps the body from building up dangerous toxins.
I am the system that…

1. …supports the body.
2. …protects the internal organs within a hard framework.
3. …provides attachment points for muscles.
4. …has cartilage between joints.
5. …has several types of joints to allow movement.

I am the system that…

1. …pulls on the bones to move the body.
2. …has three types of fibers: striated, smooth, and cardiac.
3. …has parts that are controlled by conscious thought and other parts that are controlled automatically.
4. …produces movement by using opposing pairs of fiber bundles.
5. …has the parts that cause voluntary movement will wither if not used, but can be built up with exercise.
I am the system that…

1. …controls all parts of the body.
2. …gathers information from external and internal stimuli.
3. …has two branches of the system: central and peripheral.
4. …has special cells that change messages from electrical to chemical impulses.
5. …contains a long cord that acts as a switchboard for impulses traveling to and from the main organ.

I am the system that…

1. …regulates many processes in the body to maintain homeostasis.
2. …produces chemical messages called hormones.
3. …contains glands without ducts.
4. …secretes hormones into the body.
5. …stimulates the production of sperm and release of eggs.
I am the system that...

1. ...has a few organs that are different in males and females.
2. ...is responsible for the creation of new life.
3. ...is controlled by hormones.
4. ...allows the species to continue.
5. ...has two major gametes: egg and sperm.

I am the system that...

1. ...contains the largest organ in the body.
2. ...includes hair and nails.
3. ...has pigments as a protection from the harmful rays of the Sun.
4. ...can stretch to accommodate growth.
5. ...the top layer is actually dead cells.
<table>
<thead>
<tr>
<th>Icon</th>
<th>System Name</th>
<th>Function</th>
<th>Organs &amp; Structures</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Icon" /></td>
<td>System Name</td>
<td>Function</td>
<td>Organs &amp; Structures</td>
</tr>
<tr>
<td><img src="image2" alt="Icon" /></td>
<td>System Name</td>
<td>Function</td>
<td>Organs &amp; Structures</td>
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<td><img src="image3" alt="Icon" /></td>
<td>System Name</td>
<td>Function</td>
<td>Organs &amp; Structures</td>
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<tr>
<td><img src="image4" alt="Icon" /></td>
<td>System Name</td>
<td>Function</td>
<td>Organs &amp; Structures</td>
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<tr>
<td><img src="image5" alt="Icon" /></td>
<td>System Name</td>
<td>Function</td>
<td>Organs &amp; Structures</td>
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<td><img src="image6" alt="Icon" /></td>
<td>System Name</td>
<td>Function</td>
<td>Organs &amp; Structures</td>
</tr>
<tr>
<td>Icon</td>
<td>System Name</td>
<td>Function</td>
<td>Organs &amp; Structures</td>
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<td><img src="http://openclipart.org/detail/11476/rpg-map-symbols-maze-by-nicubunu" alt="System Name" /></td>
<td><img src="http://openclipart.org/detail/11476/rpg-map-symbols-maze-by-nicubunu" alt="Function" /></td>
<td><img src="http://openclipart.org/detail/11476/rpg-map-symbols-maze-by-nicubunu" alt="Organs &amp; Structures" /></td>
</tr>
<tr>
<td><img src="http://openclipart.org/detail/16970/balloons-by-jean_victor_balin" alt="Icon" /></td>
<td><img src="http://openclipart.org/detail/16970/balloons-by-jean_victor_balin" alt="System Name" /></td>
<td><img src="http://openclipart.org/detail/16970/balloons-by-jean_victor_balin" alt="Function" /></td>
<td><img src="http://openclipart.org/detail/16970/balloons-by-jean_victor_balin" alt="Organs &amp; Structures" /></td>
</tr>
<tr>
<td><img src="http://openclipart.org/detail/6118/blender-by-j_alves" alt="Icon" /></td>
<td><img src="http://openclipart.org/detail/6118/blender-by-j_alves" alt="System Name" /></td>
<td><img src="http://openclipart.org/detail/6118/blender-by-j_alves" alt="Function" /></td>
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<td><img src="http://openclipart.org/detail/173360/hourglass-by-markroth-173360" alt="Function" /></td>
<td><img src="http://openclipart.org/detail/173360/hourglass-by-markroth-173360" alt="Organs &amp; Structures" /></td>
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<tr>
<td><img src="http://openclipart.org/detail/89669/ghost_trick_or_treater-by-lctaliminal" alt="Icon" /></td>
<td><img src="http://openclipart.org/detail/89669/ghost_trick_or_treater-by-lctaliminal" alt="System Name" /></td>
<td><img src="http://openclipart.org/detail/89669/ghost_trick_or_treater-by-lctaliminal" alt="Function" /></td>
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</tr>
</tbody>
</table>
Systems Matrix **KEY**

Answers may vary. Students should explain in their own words and not just copy what is on the station cards. The answers on this sheet are representative, not final.

<table>
<thead>
<tr>
<th>Icon</th>
<th>System Name</th>
<th>Function</th>
<th>Organs &amp; Structures</th>
</tr>
</thead>
<tbody>
<tr>
<td>![Circulatory Icon]</td>
<td>Circulatory</td>
<td>Transports nutrients, oxygen, and waste to and from the cells</td>
<td>Heart, veins, arteries, venules, arterioles, capillaries, three types of blood cells</td>
</tr>
<tr>
<td>![Respiratory Icon]</td>
<td>Respiratory</td>
<td>Gets oxygen to the blood and removes carbon dioxide from it</td>
<td>Lungs, bronchi, bronchioles, alveoli, nasal cavity, pharynx, larynx, epiglottis, trachea</td>
</tr>
<tr>
<td>![Digestive Icon]</td>
<td>Digestive</td>
<td>Breaks down food small enough to get into your cells</td>
<td>Stomach, esophagus, mouth, salivary glands, large and small intestines, rectum, villi</td>
</tr>
<tr>
<td>![Excretory Icon]</td>
<td>Excretory</td>
<td>Removes waste from the body</td>
<td>Sweat glands, urinary bladder, urethra, ureter</td>
</tr>
<tr>
<td>![Skeletal Icon]</td>
<td>Skeletal</td>
<td>Protects organs, produces blood, stores minerals, movement and support</td>
<td>Bones, joints, ligaments</td>
</tr>
<tr>
<td>Icon</td>
<td>System Name</td>
<td>Function</td>
<td>Organs &amp; Structures</td>
</tr>
<tr>
<td>------</td>
<td>-------------</td>
<td>----------</td>
<td>---------------------</td>
</tr>
<tr>
<td><img src="icon" alt="Muscular" /></td>
<td>Muscular</td>
<td>Skeletal: Pull bones to cause movement Smooth: Organ muscle and vascular walls Cardiac: Heart contractions</td>
<td>Tendons, three types of muscle</td>
</tr>
<tr>
<td><img src="icon" alt="Nervous" /></td>
<td>Nervous</td>
<td>Master control for the rest of the systems</td>
<td>Brain, spinal cord, nerve cells, sense organs</td>
</tr>
<tr>
<td><img src="icon" alt="Endocrine" /></td>
<td>Endocrine</td>
<td>Produces hormones that control the levels of other substances in the body</td>
<td>Ductless glands, hormones</td>
</tr>
<tr>
<td><img src="icon" alt="Reproductive" /></td>
<td>Reproductive</td>
<td>Allows more humans to be born to continue the species</td>
<td>Egg, sperm, ovaries, testes</td>
</tr>
<tr>
<td><img src="icon" alt="Integumentary" /></td>
<td>Integumentary</td>
<td>Covers the body and makes vitamin D</td>
<td>Skin, hair, nails</td>
</tr>
</tbody>
</table>
Layered Paper Model Forms

Performance Indicator Instructions KEY

Performance Indicator

- Build a layered paper model of the systems in the human body. Number each organ and provide a function key for the organs. (7.3B, 7.3C; 7.12B)

Materials:
- colored pencils (multiple per class)
- scissors (1 pair per student)
- stapler (1 per class)

Attachments:
- Handout: Layered Paper Model Forms (3 copies per student)

Instructional Procedures:
1. Project the Performance Indicator on the board.
2. Share the Performance Indicator rubric or your expectations with students prior to students beginning the assessment.
3. Answer any questions students may have regarding the assessment. Some students may benefit from an actual model to assist them in building their model of systems.
4. Distribute three copies of the Handout: Layered Paper Model Forms to each student.
5. Instruct students to draw and color the main organs of each system on a separate body form (see Instructional Notes).
6. Instruct students to combine the skeletal system and integumentary system on the same form.
7. Students are to number each organ and provide a key to the functions for the organs.
8. Using the separate copies, instruct the students to cut out the sections to create a layered booklet and staple pages to bind the booklets.
9. Instruct students to refer to their notebook and the Nanobot Stations cards to assist them in the construction of the model.

Instructional Notes:

CAUTION: Inform students that they should NOT sketch the reproductive organs, but only represent them by a square for male and an upside down triangle for female in the general vicinity of where they are located.

Consider printing out pictures of systems and/or organs from the PowerPoint to post around the room.

Optional: Students could develop a technology project for the product.