

2

Introduction to the Organ Systems

Pedagogical Tips

Encourage students to rely on prior knowledge as they complete these activities. This is a “big picture” activity. The goal is for students to relate what they already know to what they are learning in this unit. Remind them that they will spend the remainder of A&P I and II learning the details of each organ system.

Activity 1: Locating and Describing Major Organs and Their Functions (Estimated time: 45–60 minutes)

Materials and Advance Preparation

Torso model
Labeling stickers
Markers

Helpful Hints and Avoiding Pitfalls

Students have a tendency to get too detailed when completing Activity 1. Encourage them to keep functions very general as they fill out the accompanying chart. Remind them that this is just an overview and that they will be learning about each of these organ systems in detail as they progress through the course.

Activity 2: Using Anatomical Terminology to Describe Organ Locations (Estimated time: 20–30 minutes)

Materials and Advance Preparation

Torso model

Helpful Hints and Avoiding Pitfalls

One of the main goals of Activity 2 is to help students realize that they are not looking for a single correct answer. Group discussions allow students to consider a variety of “correct” answers as they learn to use anatomical terminology correctly.

Activity 3: Studying Homeostasis and Organ System Interactions (Estimated time: 30–45 minutes)

Materials and Advance Preparation

Laminated organ system interaction poster
Water-soluble markers

Print one poster for each lab group using the *Organ System Interaction Worksheet* (IRDVD) and laminate each poster.

Helpful Hints and Avoiding Pitfalls

If students have not had an introductory lecture on organ systems and homeostasis, then you might choose to do Activity 3 together as a class.

Active Learning Tips, Modifications, and Extensions

1. Assign additional physiological events for practice:
 - a. The role of the hypothalamus in regulating birth. [cardiovascular, endocrine, reproductive, nervous]
Key terms might include pressoreceptor, cervix, afferent message, efferent message, oxytocin, smooth muscle, positive feedback, pituitary gland.
 - b. The role of the pancreas in regulating blood glucose levels. [cardiovascular, endocrine, digestive]
Key terms might include β -cell, α -cell, glycogen, insulin, glucose, glucagon, liver, blood.

ANSWERS TO PRE-LAB ASSIGNMENTS

Lab 2: Introduction to the Organ Systems

Pre-Lab Activity 1:

- | | |
|------------|----------------|
| 1. a. Cell | 3. a. F |
| b. Atom | b. T |
| c. Organ | c. F |
| d. Tissue | d. F |
| | e. T |
| 2. a. 7 | 4. a. inferior |
| b. 8 | b. superior |
| c. 10 | c. inferior |
| d. 11 | d. medial |
| e. 1 | e. superior |
| f. 4 | |
| g. 3 | |
| h. 9 | |
| i. 5 | |
| j. 2 | |
| k. 6 | |

Pre-Lab Activity 3:

1. Maintenance of a stable internal environment in an ever changing external environment.
2. receptor, control center, effector
3. negative
4. positive
5. body temperature

Pre-Lab Activity 2:

1. cranial, vertebral
2. thoracic, abdomino pelvic

ANSWERS TO ACTIVITY QUESTIONS

Activity 1

Organ Identification Chart

| Organ | Organ System(s) | Function |
|-----------------|-------------------------------|--|
| Aorta (artery) | <i>Cardiovascular</i> | <i>Transports blood away from heart</i> |
| Bone | <i>Skeletal</i> | <i>Support, protection, attachment site for muscles, hematopoiesis, storage of fat and minerals</i> |
| Brain | <i>Nervous</i> | <i>Receives sensory input and initiates motor output</i> |
| Esophagus | <i>Digestive</i> | <i>Food tube</i> |
| Heart | <i>Cardiovascular</i> | <i>Pumps blood</i> |
| Kidney | <i>Urinary</i> | <i>Filters the blood to produce urine</i> |
| Large intestine | <i>Digestive</i> | <i>Reabsorbs water as it consolidates waste</i> |
| Larynx | <i>Respiratory</i> | <i>Contains voice box</i> |
| Liver | <i>Digestive</i> | <i>Stores glycogen, vitamins, and iron; produces bile; detoxifies toxins; produces plasma proteins</i> |
| Lungs | <i>Respiratory</i> | <i>Site of gas exchange</i> |
| Lymph node | <i>Lymphatic</i> | <i>Filters lymph</i> |
| Muscle | <i>Muscular</i> | <i>Movement; generation of heat</i> |
| Nerve | <i>Nervous</i> | <i>Conducts electrical impulses to and from the central nervous system (brain and spinal cord)</i> |
| Ovary | <i>Reproductive</i> | <i>Produces eggs and female sex hormones (estrogen and progesterone)</i> |
| Pancreas | <i>Digestive</i> | <i>Secretes digestive enzymes and hormones (insulin and glucagon)</i> |
| Pharynx | <i>Digestive; respiratory</i> | <i>The throat; passageway for food, fluid, and air</i> |
| Pituitary gland | <i>Endocrine</i> | <i>Secretes hormones</i> |
| Skin | <i>Integumentary</i> | <i>Protection, excretion, sensory receptor, temperature regulation</i> |
| Small intestine | <i>Digestive</i> | <i>Chemical digestion and absorption</i> |

| | | |
|------------------|-----------------------------|---|
| Spinal cord | <i>Nervous</i> | <i>Conducts electrical impulses to and from the brain</i> |
| Spleen | <i>Lymphatic</i> | <i>Removes aged, damaged red blood cells</i> |
| Stomach | <i>Digestive</i> | <i>Mechanical and chemical digestion of food</i> |
| Testis | <i>Reproduction</i> | <i>Produces sperm and testosterone</i> |
| Thyroid gland | <i>Endocrine; lymphatic</i> | <i>Produces hormones; immunity</i> |
| Urinary bladder | <i>Urinary</i> | <i>Transports urine from kidney to bladder</i> |
| Uterus | <i>Reproductive</i> | <i>Site of implantation of embryo</i> |
| Vagina | <i>Reproductive</i> | <i>Birth canal</i> |
| Vena cava (vein) | <i>Cardiovascular</i> | <i>Transports blood to the heart</i> |

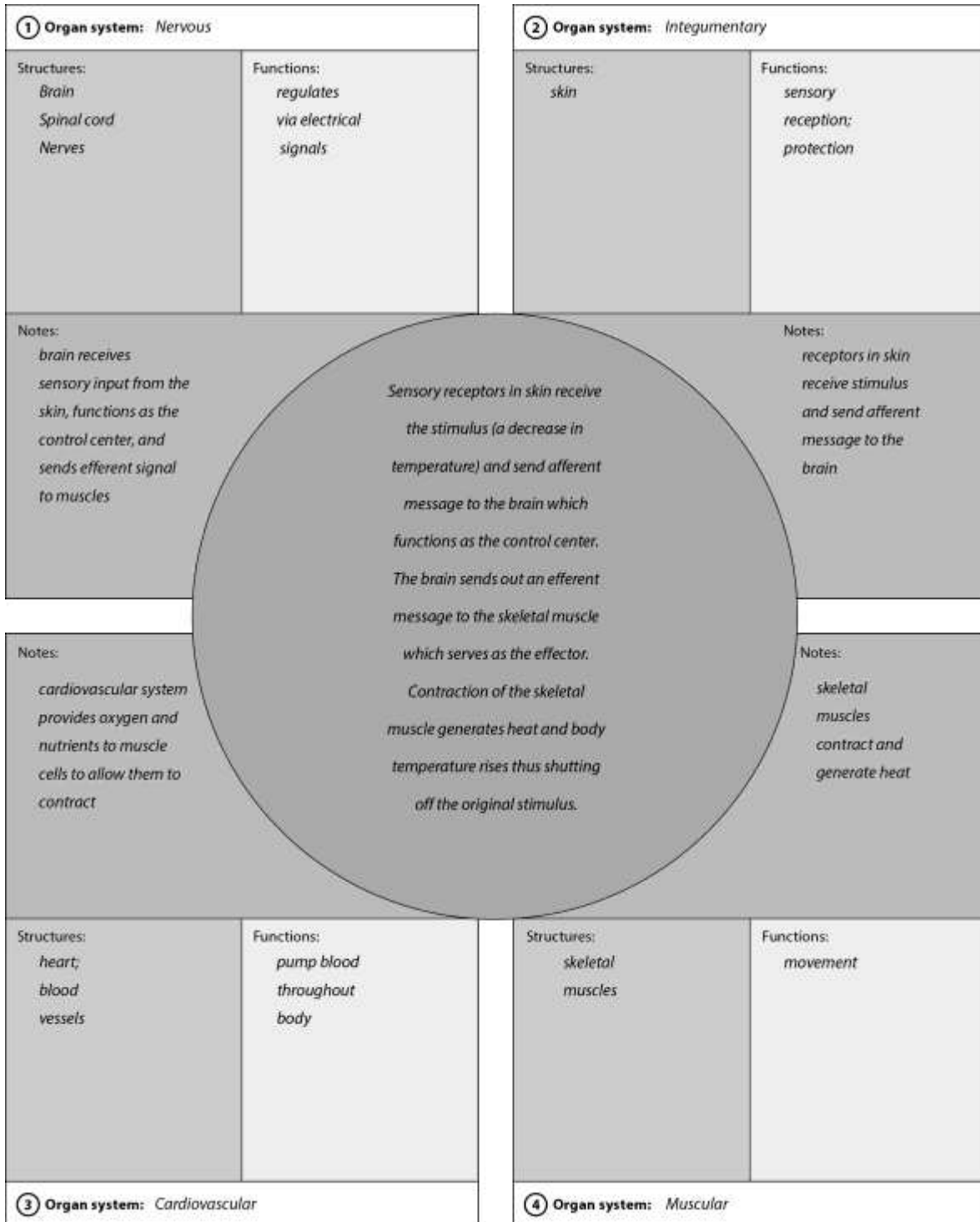
Activity 2

| Organ | Description of Location Using Correct Anatomical Terminology |
|-----------------|---|
| Brain | <i>The brain is located in the cranial cavity of the dorsal body cavity. It is superior to the spinal cord.</i> |
| Bronchus | <i>Answers will vary.</i> |
| Esophagus | <i>Answers will vary.</i> |
| Heart | <i>The heart is located in the thoracic cavity of the ventral body cavity. It is located medial to the lungs.</i> |
| Kidney | <i>Answers will vary.</i> |
| Hypothalamus | <i>Answers will vary.</i> |
| Large intestine | <i>Answers will vary.</i> |
| Larynx | <i>Answers will vary.</i> |
| Liver | <i>Answers will vary.</i> |
| Lungs | <i>Answers will vary.</i> |
| Ovary | <i>Answers will vary.</i> |
| Pancreas | <i>Answers will vary.</i> |
| Pharynx | <i>Answers will vary.</i> |

| | |
|-----------------|--|
| Pituitary gland | <i>Neuroendocrine organ located inferior to the brain. It is located in the cranial cavity of the dorsal body cavity.</i> |
| Skin | <i>The skin is superficial to the internal organs. It is not located in a body cavity.</i> |
| Small intestine | <i>Answers will vary.</i> |
| Spinal cord | <i>Answers will vary.</i> |
| Spleen | <i>Answers will vary.</i> |
| Stomach | <i>The stomach is located predominantly in the epigastric region of the abdominopelvic cavity, a subdivision of the ventral body cavity.</i> |
| Testis | <i>Answers will vary.</i> |
| Trachea | <i>Answers will vary.</i> |
| Thyroid gland | <i>Answers will vary.</i> |
| Ureter | <i>Answers will vary.</i> |
| Urethra | <i>Answers will vary.</i> |
| Urinary bladder | <i>Answers will vary.</i> |
| Uterus | <i>Answers will vary.</i> |

Activity 3

Organ System Interaction Worksheet



ANSWERS TO POST-LAB ASSIGNMENTS

Name: _____ Date: _____ Lab Section: _____

PART I. Check Your Understanding

Activity 1: Locating and Describing Major Organs and Their Functions

- Which of the following organs belong(s) to more than one organ system?
 - Ureter
 - Larynx
 - Esophagus
 - Kidney
 - Pituitary gland
- Which of the following organ systems is correctly matched with one of its functions?
 - Cardiovascular system—produces blood cells
 - Endocrine system—acts as a fast-acting control system
 - Respiratory system—transports oxygen and carbon dioxide
 - Muscular system—generates heat
 - Urinary system—returns excess tissue fluid to the bloodstream
- Which of the following pairs of organ systems functions primarily to regulate body functions?
 - Cardiovascular and nervous systems
 - Lymphatic and endocrine systems
 - Endocrine and nervous systems
 - Urinary and endocrine systems
 - Integumentary and nervous systems
- Immunity is carried out primarily by which of the following pairs of organ systems?
 - Respiratory and cardiovascular systems
 - Cardiovascular and lymphatic systems
 - Skeletal and cardiovascular systems
 - Urinary and integumentary systems
 - Nervous and lymphatic systems
- Which organ:

| | |
|------------------|---|
| <u>vein</u> | a. transports blood to the heart? |
| <u>trachea</u> | b. is commonly known as the windpipe? |
| <u>esophagus</u> | c. transports food from the pharynx to the stomach? |
| <u>bladder</u> | d. stores urine? |
| <u>testis</u> | e. produces sperm? |

Activity 2: Using Anatomical Terminology to Describe Organ Locations

1. Complete the following chart:

| Organ | Organ System to which It Belongs | Dorsal Body Cavity or Ventral Body Cavity? | Specific Body Cavity |
|-----------------|----------------------------------|--|-----------------------|
| brain | <i>nervous</i> | <i>dorsal</i> | <i>cranial</i> |
| gallbladder | <i>digestive</i> | <i>ventral</i> | <i>abdominopelvic</i> |
| heart | <i>cardiovascular</i> | <i>ventral</i> | <i>thoracic</i> |
| skin | <i>integumentary</i> | <i>none</i> | <i>none</i> |
| urinary bladder | <i>urinary</i> | <i>ventral</i> | <i>abdominopelvic</i> |

2. Complete each of the following statements with an accurate directional term:

- The thymus is inferior to the thyroid gland.
- The pituitary gland is inferior to the brain.
- The liver is superior to the gallbladder.
- The sternum is superficial to the heart.
- The esophagus is posterior to the trachea.

3. In which abdominopelvic region is each of the following organs predominantly found?

- | | |
|----------------------------|--------------------|
| <u>right hypochondriac</u> | a. liver |
| <u>hypogastric</u> | b. urinary bladder |
| <u>left hypochondriac</u> | c. spleen |
| <u>epigastric</u> | d. stomach |
| <u>right lumbar</u> | e. right kidney |

Activity 3: Studying Homeostasis and Organ System Interactions

1. Distinguish between a negative feedback mechanism and a positive feedback mechanism.

negative feedback shuts off original stimulus and
positive feedback enhances original stimulus

2. Does the regulation of body temperature involve a negative feedback mechanism or a positive feedback mechanism? Negative Why? output shuts off original stimulus

3. In the regulation of body temperature:

- | | |
|--------------------------|--|
| <u>receptors in skin</u> | a. Which component serves as the receptor? |
| <u>brain</u> | b. Which component serves as the control center? |
| <u>skeletal muscle</u> | c. Which component serves as the effector? |

4. Describe one way in which each of the following organ systems contributes to regulation of body temperature:
 - a. nervous stimulates muscle to contract
 - b. cardiovascular transports oxygen/nutrients to muscle cells
 - c. muscular muscles contract to generate heat
 - d. integumentary contains receptors that detect decrease in body temperature
5. Describe the concept of homeostasis and list three homeostatic mechanisms that occur in the body.

Homeostasis is the maintenance of a stable internal environment in an ever-changing external environment.
Answers will vary. Possible answers include: blood glucose regulation, regulation of body temperature, and regulation of breathing rate.

PART II. Putting It All Together

A. Review Questions

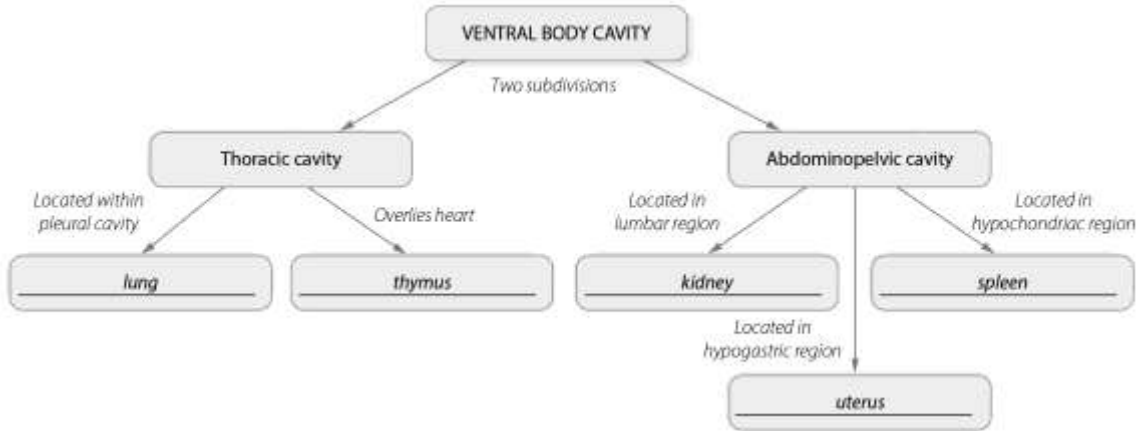
Answer the following questions using your lecture notes, your textbook, and your lab notes.

1. Briefly describe one example of how the circulatory, respiratory, and digestive systems work together to maintain homeostasis. Lungs (RS) are the site of gas exchange. The small intestine (DS) is site of nutrient absorption. The blood (CS) delivers oxygen and nutrients to the tissues.
2. Briefly describe one example of how the nervous, endocrine, and circulatory systems work together to maintain homeostasis. The heart (CS) is regulated by both electrical impulses (NS) and hormones (ES).
3. Calcium ions play a major role in many physiological events. A decline in blood calcium levels is regulated primarily by parathyroid hormone (PTH) released by the parathyroid gland. PTH stimulates certain bone cells to break down bone, the small intestine to absorb more calcium from the diet, and the kidneys to reabsorb more calcium from the blood. As a result of these actions, blood calcium levels rise, and PTH release is then inhibited.
 - a. List three organ systems involved in the maintenance of blood calcium levels, and state the role of each organ system in the process. ES, parathyroid glands release parathyroid hormone; SS, bone stores calcium and releases calcium into blood; CS, transports PTH to its target organs.
 - b. Is blood calcium regulation an example of negative feedback control or positive feedback control? Explain. Negative feedback because the output (↑ blood calcium) shuts off the original stimulus (↓ blood calcium).

B. Concept Mapping

1. Fill in the blanks to complete this concept map outlining selected organs found in the ventral body cavity.

| | | | | |
|--------|------|--------|--------|--------|
| kidney | lung | spleen | thymus | uterus |
|--------|------|--------|--------|--------|



2. Construct a unit concept map to show the relationships among the following set of terms. Include all of the terms in your diagram. Your instructor may choose to assign additional terms.

| | | | | | | | | | |
|------|----------|---------|-------|---------|--------|-----------|------|-------|---------|
| bone | pancreas | stomach | brain | pharynx | testis | esophagus | skin | heart | trachea |
|------|----------|---------|-------|---------|--------|-----------|------|-------|---------|

Answers will vary.