

Ledyard Public Schools  
Science Curriculum

Anatomy  
&  
Physiology

1453

Instructional Council Approval October 24, 2005

# The Body as a Whole

**Suggested Time**: 8 – 10 class periods

**Essential Question**:

What is the organization of the body - from cells to tissues to organs including the external and internal parts?

**Focus Questions**:

1. What is the external and internal anatomical organization of the human body?

**Learning Objectives** - The student will be able to;

- a. identify and name, orally or in writing, the anatomical regions.
- b. connect, orally or in writing, the directional and symmetrical terminology to anatomy.

2. What is the difference between cells, tissues, and organs?

**Learning Objectives** - The student will be able to;

- a. identify, orally or in writing, the structure and function of cells and their parts.
- b. classify tissues and their functions.
- c. describe, orally or in writing, the organs and their basic functions.

3. What is the anatomy and function of the skin?

**Learning Objectives** - The student will be able to;

- a. identify, orally or in writing, the internal and external structures of human skin.
- b. describe, orally or in writing, the functions of each of the structures.

**Assessment:**

Science assessment includes: tests, which assess content knowledge and application, skill acquisition and application of knowledge at all levels of critical thinking; quizzes; formal laboratory assessments as full lab reports, parts of lab reports or quiz type lab assessments; a variety of written, oral and visual presentations; as well as a variety of other individual and group work assessments. All tests must include free response questions (or constructed response) as well as appropriate content and/or skill assessment and, except where inappropriate, must be balanced in terms of the critical thinking skills expected of students. Laboratory reports (or parts) will follow the Ledyard High School standard Laboratory format. Other Laboratory assessments should reflect CAPT Style multiple choice and / or open-ended questions.

**Required Activities :**

- Use models, diagrams and cat dissection to correlate and confirm
  - anatomical regions and symmetry
  - skin and tissues
  - all organs
- Lab practicals to allow students to use sight identification as part of their assessment.

**Resources:**

**Student:** Principles of Anatomy and Physiology,  
 Tortora & Derrickson, Wiley, 11th ed., 2006  
A Brief Atlas of the Skeleton, Surface Anatomy and Selected Medical Images, Tortora, Wiley, 2006  
Gray’s Anatomy, Henry Gray, Running Press, 1974.

**Teacher :** Principles of Anatomy and Physiology,  
 Tortora & Derrickson, Wiley, 11th ed., 2006  
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**Curriculum Alignment with State of Connecticut Science Standards**  
**All areas address State Standards for Scientific Inquiry, Literacy and Numeracy**

Focus Question	Content Standard	Supportive Concept
1. Human Anatomy	B5	47
2. Cells, Tissues, Organs	B5	47, 55,
3. Skin	B5	57

# Support and Movement

**Suggested Time:** 14 – 16 class periods

## **Essential Questions**

1. What are the major bones and tissues of the skeletal system and their functions?
2. What are the muscles of the major muscle groups and their functions?

## **Focus Questions -**

1. What are the cells and tissues of the skeletal system?

**Learning Objectives** - The student will be able to;

- a. name, orally or in writing, the cells of the skeletal system and their functions.
- b. describe, orally or in writing, where the cells are found.

2. What are the bones and bone structures of the appendicular and axial skeleton?

**Learning Objectives** - The student will be able to;

- a. locate and name, orally or in writing, the bones of the appendicular skeleton.
- b. locate and name, orally or in writing, the bones of the axial skeleton.
- c. locate and identify, orally or in writing, major depressions, openings and projections on selected bones.

3. How do parts of the skeletal system articulate to provide protection and movement?

**Learning Objectives** - The student will be able to;

- a. locate and name, orally or in writing, the major joints of the skeleton.
- b. classify and describe, orally or in writing, the function of the major joints.

4. How does a muscle cell contract and carry on its functions?

**Learning Objectives** - The student will be able to;

- a. explain, orally or in writing, the functions of muscle groups in the body.
- b. identify and describe, orally or in writing, the parts of a muscle and muscle cells (fibers).
- c. describe, in writing the pattern of events that leads to muscle contraction.

5. What are the muscles of the major muscle groups of the body?

**Learning Objectives** - The student will be able to;

- a. locate and name, orally or in writing, the muscles of the head and neck.
- b. locate and name, orally or in writing, the muscles of the shoulders and arms.
- c. locate and name, orally or in writing, the muscles of the torso.
- d. locate and name, orally or in writing, the muscles of the pelvis and legs.

6. What are the attachments and what are the actions by muscles of the body called?

**Learning Objectives** - The student will be able to;

- a. name, orally or in writing, the insertions and attachments of selected muscles from each group in #5.
- b. describe in writing the actions of selected muscles as they move body parts.
- c. identify and name, orally or in writing, selected ligaments, tendons and cartilage integral to attachments.

**Assessment:**

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**Required Activities :**

- Use models, diagrams and cat dissection to correlate axial and appendicular skeletal elements
- Use models, diagrams and cat dissection to correlate and confirm :
  - major openings and projections on selected bones
  - major joints of the skeleton
  - muscle groups and all major muscles including their origin and insertion
  - selected tendons and ligaments
- Lab practicals to allow students to use sight identification as part of their assessment.

**Resources:**

**Student:**                    **Principles of Anatomy and Physiology,**  
    Tortora & Derrickson, Wiley, 11th ed., 2006  
**A Brief Atlas of the Skeleton, Surface Anatomy**  
**and Selected Medical Images,** Tortora, Wiley, 2006  
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**Gray’s Anatomy,** Henry Gray, Running Press, 1974.

**Curriculum Alignment with State of Connecticut Science Standards**  
**All areas address State Standards for Scientific Inquiry, Literacy and Numeracy**

Focus Question	Content Standard	Supportive Concept
1. Cells & Tissues	B1, B5	1, 2, 55, 56
2. Skeleton	B5	47
3. Protection & Movement	B5	47
4. Muscle Cells	B5	1, 2, 55, 56
5. Muscle groups	B5	55
6. Muscle Attachments	B5	55

# Nutrition, Respiration, and Excretion

**Suggested Time:** 18 – 20 class periods

## **Essential Questions**

1. How does the digestive system process food into nutrients that can be used by the body?
2. How does the respiratory system process oxygen and carbon dioxide for the body?
3. How are excess and waste solute levels of the blood maintained by the kidneys?

## **Focus Questions :**

1. What are the locations of and major functions of structures of the digestive system?  
**Learning objectives** – The student will be able to;
  - a. locate and name, orally or in writing, the structures of the digestive system.
  - b. describe, orally or in writing, the major functions of each structure of the digestive system.
  - c. correlate the structures and chemical and/or mechanical digestion contributions.
2. What are the locations of and major functions of structures of the respiratory system?  
**Learning objectives** – The student will be able to;
  - a. locate and name, orally or in writing, the structures of the respiratory system.
  - b. describe, orally or in writing, the major functions of each structure of the respiratory system.
  - c. explain how diffusion and partial gas pressures facilitate oxygen and CO<sub>2</sub> exchange
  - d. sequence, in writing or by diagram, breathing rates with blood pH and buffer changes.
3. What are the locations of and major functions of structures of the excretory system?  
**Learning objectives** – The student will be able to:
  - a. locate and identify, orally or in writing, the name of the structures of the urinary system.
  - b. describe, orally or in writing, the major functions of each structure of the urinary system.
  - c. discuss how proper blood volume and molarity are sensed and controlled by the body.

**Assessment:**

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**Required Activities :**

Use models, diagrams and cat dissection to correlate:  
 digestive system structure and functions  
 respiratory system structure and functions  
 excretory system structure and functions  
 Lab practicals to allow students to use sight identification as part of their assessment.

**Resources:**

**Student:**                    **Principles of Anatomy and Physiology,**  
    Tortora & Derrickson, Wiley, 11th ed., 2006  
**A Brief Atlas of the Skeleton, Surface Anatomy**  
**and Selected Medical Images,** Tortora, Wiley, 2006  
**Gray's Anatomy,** Henry Gray, Running Press, 1974.

**Teacher :**                    **Principles of Anatomy and Physiology,**  
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**Gray's Anatomy,** Henry Gray, Running Press, 1974.

**Curriculum Alignment with State of Connecticut Science Standards**  
**All areas address State Standards for Scientific Inquiry, Literacy and Numeracy**

Focus Question	Content Standard	Supportive Concept
1. Digestion	B5	47, 52
2. Respiration	B5	47,
3. Excretion	B5	47, 53, 54

# Transportation of Body Fluid

**Suggested Time** : 12 – 14 class periods

## **Essential Questions**

1. How do all the materials needed for homeostasis get circulated to cells of the body?
2. How does the blood get transported to all parts of the body?
3. Where does lymph come from, where does it go and what happens during the process?

## **Focus Questions**

1. What are the components of blood and how does this fluid support homeostasis?

**Learning Objectives** - The student will be able to;

- a. identify, orally or in writing, the cellular components of blood and the function of each type.
- b. explain how blood clots to prevent loss from vessels.
- c. list, orally or in writing, the blood types and their importance.
- d. summarize all other solutes found in blood and their major functions.
- e. integrate the spleen to the rest of circulatory system.

2. What are the structures of the heart and vascular system and how does each contribute to the circulation of blood?

**Learning Objectives** - The student will be able to;

- a. identify and name, orally or in writing, the parts of the heart and all major vessels connected to it.
- b. correlate, orally or in writing, the circulation of blood through the heart and vessels.
- c. compare, in writing, the structure and function of arteries, veins, and capillaries.
- d. summarize heart rate control.

3. What are the parts of the lymph system and what are their functions?

**Learning Objectives** - The student will be able to;

- a. explain the source and function of interstitial fluid.
- b. explain the flow of lymph into the vessels, nodes, and ducts to return to circulation.
- c. explain the function of lymph nodes and the lymphocytes found there.



**Assessment:**

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**Required Activities :**

Use models, diagrams and cat dissection to correlate:  
 circulatory system and functions  
 lymphatic system structure and function  
 Lab practicals to allow students to use sight identification as part of their assessment.

**Resources:**

**Student:**                    **Principles of Anatomy and Physiology,**  
    Tortora & Derrickson, Wiley, 11th ed., 2006  
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**and Selected Medical Images,** Tortora, Wiley, 2006  
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**Gray's Anatomy,** Henry Gray, Running Press, 1974.

**Curriculum Alignment with State of Connecticut Science Standards**  
**All areas address State Standards for Scientific Inquiry, Literacy and Numeracy**

Focus Question	Content Standard	Supportive Concept
1. Blood	B5	47
2. Vascular System	B5	47, 53
3. Lymph System	B5	47, 56

# Nervous and Chemical Control of the Body

**Suggested Time:** 16 – 18 class periods

## **Essential Questions**

1. How does the body receive and send messages?
2. How does the central and peripheral nervous system respond to internal and external stimuli?
3. How are external and internal stimuli processed into and throughout the nervous system?
4. How are chemical responses vital for control of body functions and homeostasis?

## **Focus Questions**

1. How does the structure and function of a neuron transmit signals throughout the nervous system?

**Learning Objectives** - The student will be able to;

- a. draw and label the parts of a neuron.
- b. explain how a neuron functions.
- c. summarize action potential transmission in neurons.

2. How do the roles of the central and peripheral nervous system differ, how are they dependent?

**Learning Objectives** - The student will be able to;

- a. differentiate, orally or in writing, between and name the parts of the central and peripheral nervous systems.
- b. summarize, orally or in writing, the functions of each part of the nervous system.
- c. compare, orally or in writing, the location of and functions of the sympathetic and parasympathetic systems.

3. How do each of the sense organs receive stimuli and transmit it to the nervous system?

**Learning Objectives** - The student will be able to;

- a. name and describe, orally or in writing, the function of the eye.
- b. name and describe, orally or in writing, the function of the ear.
- c. name and describe, orally or in writing, the function of the nose.
- d. name and describe, orally or in writing, the function of the tongue.
- e. name and describe, orally or in writing, the function of major chemoreceptors and mechanoreceptors in skin and the rest of the body.

4. How do the neurosecretory/endocrine glands exert control over major physiological responses?

**Learning Objectives** - The student will be able to;

- a. locate and identify, orally or in writing, the major functions of the hypothalamus.
- b. locate and identify, orally or in writing, the major functions of the pituitary gland.
- c. locate and identify, orally or in writing, the functions of the thyroid glands.
- d. locate and identify, orally or in writing, the functions of the adrenal glands.
- e. locate and identify, orally or in writing, the functions of the Islets of Langerhans in the pancreas.
- f. locate and identify, orally or in writing, the functions of the gonads.
- g. locate and hypothesize, orally or in writing, about the pineal glands.

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**Required Activities :**

Use models, diagrams and cat dissection to correlate:  
 central and peripheral nervous system structures and functions  
 eye, ear, nasal, tongue, and skin receptor structures and functions  
 endocrine/neurosecretory system structure and functions  
 hypothalamus, pituitary, thyroid, adrenal, pancreatic islets and gonad structure and functions  
 Lab practicals to allow students to use sight identification as part of their assessment.

**Resources:**

**Student:**                    **Principles of Anatomy and Physiology,**  
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**and Selected Medical Images,** Tortora, Wiley, 2006  
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**Curriculum Alignment with State of Connecticut Science Standards**  
**All areas address State Standards for Scientific Inquiry, Literacy and Numeracy**

Focus Question	Content Standard	Supportive Concept
1. Neurons	B5	48, 49, 50, 51
2. Nervous System	B5	48, 49, 50, 51
3. Senses	B5	48, 49, 50, 51
4. Endocrine System	B5	48, 49, 50

# Reproduction

**Suggested Time:** 6 – 7 class periods

## **Essential Questions**

1. How does the male reproductive system produce and deliver sperm for reproduction?
2. What is the biological feedback system that controls sexual maturity and secondary sex characteristics?
3. How does the female reproductive system produce eggs and provide for development of the fertilized egg from zygote to birth?
4. What is the biological feedback system that controls sexual maturity, egg production and menstruation, as well as the labor and birth process?

## **Focus Questions**

1. What is the structure and function of the parts of the male reproductive system?  
**Learning objectives** - The student will be able to
  - a. locate and identify, orally or in writing, the structures of the male reproductive system.
  - b. explain, orally or in writing, the functions of each part of the male reproductive system.
2. What are male secondary sex characteristics and why do they occur?  
**Learning objectives** - The student will be able to
  - a. describe, in writing, the process of puberty and development of male sex traits.
  - b. explain the role of the pituitary gland and Leydig's cells in sperm production and sexual maturity.
  - c. draw pictures of and explain the process of spermatogenesis.
3. What is the structure and function of the parts of the female reproductive system?  
**Learning objectives** - The student will be able to
  - a. locate and identify, orally or in writing, the structures of the female reproductive system.
  - b. explain, orally or in writing, the functions of each part of the female reproductive system.
  - c. describe in writing, using trimesters, development of a human embryo/fetus.
  - d. summarize the labor and birth process and related female structure involvement.
4. What are the female secondary sex characteristics and why do they occur?  
**Learning objectives** - The student will be able to
  - a. describe, in writing, the process of puberty and development of female sex traits.
  - b. explain the role of the pituitary gland and corpus luteum cells in egg production and sexual maturity.
  - c. draw pictures of and explain, in writing, the process of oogenesis.

**Assessment:**

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**Required Activities :**

Use models, diagrams and cat dissection to correlate:  
     the male and female reproductive systems structures and functions  
     circulatory system structures and functions  
 Lab practicals to allow students to use sight identification as part of their assessment.

**Resources:**

**Student:**                    **Principles of Anatomy and Physiology,**  
                                       Tortora & Derrickson, Wiley, 11th ed., 2006  
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**and Selected Medical Images,** Tortora, Wiley, 2006  
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**Curriculum Alignment with State of Connecticut Science Standards**

**All areas address State Standards for Scientific Inquiry, Literacy and Numeracy**

Focus Question	Content Standard	Supportive Concept
1. Male Reproductive System	B5	47, 56
2. Male Secondary Sex Characteristics	B5	47, 56
3. Female reproductive System	B5	47, 56
4. Female Secondary Sex Characteristics	B5	47, 56

# Immunity and Defense Against Disease

**Suggested Time:** 6 – 8 class periods

## **Essential Questions**

1. What is the immediate response that can successfully prevent infection or harm to the human body yet may offer no lasting immunity?
2. What are the responses to infection or harm to the human body that may invoke long term protection from disease?

## **Focus Questions**

1. How do skin, mucus, tears, the inflammatory response, interferon, and phagocytic killer cells provide general protection from infection, viruses, and substances which might be harmful?  
**Learning objectives** The Student will be able to
  - a. describe, in writing, how skin, tears and mucus blocks entrance of harmful organisms and substances.
  - b. explain how the inflamed response fights infection and allergic reactions.
  - c. relate the roles of killer cells in response to penetration of the skin.
2. How does the lymphatic system help the body protect itself?  
**Learning objectives** The Student will be able to
  - a. summarize the function of lymph nodes and infection.
3. How do B cells provide temporary protection from infection?  
**Learning objectives** The Student will be able to
  - a. explain the role of B cells in antibody production.
4. How do macrophages and CD8 cells identify nonself and what is their role in permanent immunity?  
**Learning objectives** The Student will be able to
  - a. explain the histocompatibility complex.
  - b. discuss the role of the histocompatibility complex in permanent immunity and in tissue rejection following transplants
  - c. summarize the role of the CD4 cell in permanent immunity.

**Assessment:**

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**Activities :**

To be determined

**Resources:**

**Student:**                   **Principles of Anatomy and Physiology,**  
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**Curriculum Alignment with State of Connecticut Science Standards**  
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Focus Question	Content Standard	Supportive Concept
1. Protection from Infection	B5	57, 58, 59, 60, 61
2. Lymphatic System	B5	62
3. B cells	B5	62
4. Macrophage and CD8 cells	B5	62