

Ledyard Public Schools
Science Curriculum

Human Biology

1452

Instructional Council Approval March 6, 2005

The Processing and Delivery of Nutrients and Oxygen

Nutrition and Digestion, Gas Exchange, Circulation, and The Immune System

Suggested time: Approximately 20 - 22 class periods

Essential Question

How do humans obtain, process, deliver and eliminate nutrients and oxygen.

Focus Questions

1. How does the structure and function of the human digestive system supply nutrients for survival and eliminate wastes?

Learning objectives The Student will be able to:

- a. Identify, orally or in writing, the location of the parts of the digestive system.
- b. explain how each alimentary structure contributes to digestion.
- c. correlate digestion with absorption and cellular uptake.
- d. explain the importance of proper elimination of wastes of digestion.
- e. explain symptoms and treatments of irregularities of human digestion.

2. What are the components of a healthy diet?

Learning objectives The Student will be able to:

- a. compare the sources of chemical energy that power the body.
- b. discuss compatible protein needs for health in any diet.
- c. explain why vitamins and minerals are required for body function.
- d. summarize nutrient deficiency and affects on normal function
- e. discuss the range of diet fads

3. How do humans inspire air, exchange gasses, and expire to maintain homeostasis?

Learning objectives The Student will be able to:

- a. Identify, orally or in writing, the location and parts of the human respiratory system.
- b. explain the functions of each structure of the respiratory system.
- c. articulate how the structure of the system allows for diffusion of gasses.
- d. explain what asthma is and how it is treated.
- e. discuss the transport of exchanged gasses occur in humans
- f. use drawings to trace the movement of gases from blood to cells and back to blood to describe how gas exchange occurs at the capillary and cellular level.

4. How are nutrients, chemical messages, heat and gases distributed throughout the body?

Learning objectives The Student will be able to:

- a. Identify, orally or in writing, the location and function of the parts of the circulatory system.
- b. draw, label, and describe, orally or in writing, the function of major heart cavities, valves, incoming and outgoing vessels, and coronary circulation.
- c. discuss how control of heart rate occurs in humans.
- d. explain what lymph is, where it goes, and how it returns to the blood.

5. What is cardiovascular disease?

Learning objectives The Student will be able to:

- a. differentiate between heart attack and stroke.
- b. explain the process of hardening of the arteries (atherosclerosis).
- c. explain the cause of varicose veins

6. What are specific and nonspecific defenses against infectious organisms, viruses or substances?

Learning objectives The Student will be able to:

- a. identify, orally or in writing, the structure and functions of the parts of the skin.
- b. explain how and where tears and mucus block entrance into our bodies.
- c. explain how Hydrochloric acid works to kill most pathogens.
- d. explain the role of the inflamed response.
- e. trace the clotting of blood in open wounds of the skin.
- f. compare how killer cells and nonspecific proteins provide protection.
- g. discuss how humans obtain passive immunity or resistance.
- h. differentiate the roles of B cells, T-helper cells (CD4 cells), cytotoxic T cells (CD8 cells), and macrophages in immunity.
- i. explain how antibodies help destroy non-self organisms or matter.
- j. contrast vaccinations and antitoxin treatments.
- k. survey and summarize immune disorders and the impact on the immune system.

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

A digestive enzyme laboratory activity
Dissection of fetal pig digestive tract, lungs and trachea, heart and major aortas and veins
A Blood pressure/ heart rate lab using electronic monitors (sphygmomanometers)
Dissection of a beef or sheep heart Laboratory activity
Infected person activity with phenolphthalein solutions

Resources

Student: **Essential Biology** – Campbell, Reece, and Simon, Benjamin Cummings, 2004

Teacher: **Essential Biology** – Campbell, Reece, and Simon, Benjamin Cummings, 2004
Teacher Edition, Study Guide, Test bank, Solutions Manual,
Transparencies, Lab manual & other ancillaries
A Source book for the Biological Sciences, Morholt & Branswein., HBJ

Laboratory Anatomy of the Fetal Pig,

Theron O. Odlaug, 1996 (11th ed)

Dissection Guide and Atlas to the Fetal Pig

David G. Smith & Michael P. Schenk, 1998

Curriculum Alignment with State of Connecticut Science Standards

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

Focus Question	Content Standard	Supportive Concepts
1. Digestive System	B5	47, 52, 53, 54
2. Diet	B5	47, 52
3. Respiration	B5	47
4. Circulatory System	B5	47
5. Cardiovascular Disease	B5	47
6. Infection	B5	57, 58, 59, 60, 61, 62

Maintaining Internal Homeostasis

Osmoregulation and Temperature

Suggested Time: 4 - 6 class periods

Essential Question

How are heat and blood concentration maintained in the human body?

Focus Questions:

1. How does the human body control temperature?

Learning objectives – The Student will be able to:

- a. identify the role of the hypothalamus in homeostasis of temperature and blood concentration.
- b. explain the feedback system that controls body temperature in humans.
- c. sequence the body responses to temperatures which are too high or too low.
- d. explain the differences between hypothermia, heat stroke and sun stroke.

2. How does the human body control dissolved substances (concentration) of the blood?

Learning objectives – The student will

- a. identify, orally or in writing, the location and the anatomy of the kidney and urinary bladder.
- b. demonstrate understanding of how the nephron filters blood.
- c. summarize how the kidney controls blood volume and blood pressure.
- d. correlate hypertension with kidney function.

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Required Activities

Dissection of the fetal pig kidneys, urethras and urinary bladder
Diagram the kidney/urinary bladder system and the function of the parts to produce urine.

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Focus Question	Content Standard	Supportive Concepts
1. Temperature Control	B5	56
2. Dissolved Substances	B5	47, 52, 53, 54

The External Environment

Interpretation and response by the Senses, Skeletal system, Muscular system

Suggested Time: 12 – 14 class periods

Essential Question

How does the human body receive information from the external and internal environment and respond to needs?

Focus Questions

1. What are the five senses that humans use to interpret environmental changes?

Learning objectives - The student will

- a. distinguish between five different types of sensory receptors.
- b. summarize, using a diagram, the structure and function of the eye, nose, ear, tongue, and skin for touch and temperature.
- c. correlate the central and peripheral nervous systems and their basic function.
- d. diagram the basic structure and describe the function of a neuron.

2. What are the major bones and joints of the human skeleton?

Learning objectives - The Student will be able to:

- a. demonstrate the names and location of the bones of the appendicular skeleton.
- b. demonstrate the names and location of the bones of the axial skeleton.
- c. discuss the relationships between skeletal components and red and yellow bone marrow and its function.

3. How do the muscles work with the skeleton to move the body?

Learning objectives - The Student will be able to:

- a. identify and recall the names of the major external skeletal muscles.
- b. explain how a muscle contracts to do work.
- c. correlate the role of muscles, tendons, and ligaments.
- d. explain the difference between aerobic and anaerobic muscle movement.

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Required Activities

- A human sense laboratory activity including at least two of taste, smell, vision or skin senses
- A dissection of the fetal pig eye and surface muscles.
- Utilize anatomical charts and models to identify the parts of the eye, ear, skin, bones and major external muscles
- A dissection to display superficial muscles of the arms, legs, and torso.

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Focus Question	Content Standard	Supportive Concepts
1. Senses	B5	48, 49, 51
2. Bones	B5	
3. Muscles	B5	55

Reproduction

Suggested Time: Optional - As time permits

Essential Questions

1. How do the male and female reproductive systems produce eggs and sperm?
2. How does a human zygote develop into a baby in nine months?

Focus Questions

1. What are the structures and functions of the female and male reproductive system?

Learning objectives- The Student will be able to:

- a. label drawings of the male and female reproductive systems.
- b. compare the structure and function of each system.
- c. explore the types of sexually transmitted diseases

2. What is the cycle of egg production in females and sperm production in males?

Learning objectives - The Student will be able to:

- a. draw and label a diagram of the female menstrual cycle.
- b. correlate the onset of menstruation and sexual maturity.
- c. correlate the onset of puberty and sperm production.

3. Categorize the development and birth process of humans.

Learning objectives - The Student will be able to:

- a. compare the trimesters of development for appearance, size and function.
- b. discuss labor and the birth process.

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Required Activities

Dissection of fetal pig reproductive systems and sharing between groups.

Recommended Activities

Construct paper models of babies at various trimesters.
Research and report on cervical and ovarian cancer, prostate cancer, and menstrual irregularities.

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Focus Question	Content Standard	Supportive Concepts
1. Reproductive systems	B5	56
2. Production cycle	B5	56
3. Birth Process	B5	56