Unit 5 - Absorption and Excretion (Life Science)

Content Area: **Science**
Course(s): **Anatomy & Physiology**
Time Period:
Length: **14 Days - Grade 11-12**
Status: **Published**

Title Section

Department of Curriculum and Instruction

Belleville Public Schools

Curriculum Guide

ANATOMY AND PHYSIOLOGY, GRADE 11-12

UNIT 5 - ABSORPTION AND EXCRETION

Belleville Board of Education

102 Passaic Avenue

Belleville, NJ 07109

Prepared by: MR. VINCENT A. ORREI

Dr. Richard Tomko, Ph.D., M.J., Superintendent of Schools

Ms. LucyAnn Demikoff, Director of Curriculum and Instruction K-12

Ms. Nicole Shanklin, Director of Elementary Education K-8, ESL Coordinator K-12

Mr. George Droste, Director of Secondary Education

Board Approved: September 23, 2019

Unit Overview

The respiratory system supplies oxygen to the blood while removing carbon dioxide. To accomplish this task, the lungs take in oxygen and pass it to the blood stream for transport while passing carbon dioxide from the blood back into the lungs to be exhaled. To investigate this section, students will first look at the anatomy and physiology of the organs involved in the system. Then students will explore the physiology of respiration, the mechanics of breathing. This will be followed with a closer look at the transport of oxygen and carbon dioxide between the blood vessels and the alveoli of the lungs. The section will conclude with a focus on the most common diseases of the respiratory system (COPD, lung cancer, asthma) and developmental changes the lungs go through from fetal development to old age.

The next section will be divided into two distinct sub-sections, the digestive system and metabolism. The digestive system will be explored first by looking at the anatomy and physiology of each organ involved. After that, students will learn about the gastrointestinal processes of each organ and their controls. These processes are: ingestion, propulsion, mechanical digestion, chemical digestion, absorption, and defecation. The unit will then have students investigate part two, metabolism. Students will discuss dietary sources of major nutrients, the concept of a kilocalorie, and the metabolism of each of the main nutrients. Students will also investigate metabolic controls and learn to calculate their basal metabolic rates. The section will conclude with the digestive system's role in heat regulation and changes in metabolism that occur with age.

The function of the urinary system is to remove cellular waste from the blood. In this section, students will investigate the anatomy and physiology of each organ involved and how your body maintains proper fluid, electrolyte, and pH balance. To begin this section, students will investigate the structure and function of the kidneys, ureters, urinary bladder, and urethra. After learning about each organ, students will further explore

the formation of urine and nephron structure. Next, the characteristics of urine will be investigated, and students will develop an understanding of how different urine composition can be a sign of disease. The section will also include the mechanisms that control the proper water, salt, and pH balance in the body and how they influence urine production. The section and unit will conclude with identification of the diseases associated with the kidneys and related changes that are experienced as we get older.

Enduring Understanding

After completing this unit, students will be able to understand the following:

- The digestive system is made up of several major organs and accessory structures each of which has unique roles.
- There is a specific pathway of food through the alimentary canal.
- The body digests certain molecules differently from others.
- There is a specific process of moving food along the gastrointestinal tract.
- Each exocrine organ along the GI tract has a specific set of functions.
- Digestive enzymes provide specific and important functions.
- Nutrients are absorbed through both chemical and mechanical processes the sequence and location of these processes is critical to proper functioning of the system.
- Certain minerals are essential for health; the function of each and the consequences of a deficiency are vital to understanding the digestive system.
- Breathing is a mechanical process the rate and depth can be affected by certain mechanical and chemical factors.
- Oxygen and carbon dioxide are transported in the blood; there are factors that affect transport of these and other respiratory gases.
- The structure of the kidney and the coverings allow it to perform its function.
- The blood supply through the kidney provides insight into its functioning.
- The anatomy of a nephron allows for its physiology.
- Kidney functions are crucial to maintaining homeostasis.
- Hormones play an essential role in the maintenance of sodium and water balance.
- The physical and chemical properties of urine serve as indicators of health.
- Male and female urinary systems differ slightly in course, length, and function.

Essential Questions

What happens to matter as it enters the digestive system?

What nutrients are necessary for a healthy body?

How does the digestive system extract what the body needs from food?

How is the digestive system connected to the circulatory system?

How does the structure of the digestive tract relate to its function?

Why is the respiratory system essential to the human body?

What is the interrelationship between the respiratory system and the other organ systems of the body?

How is the respiratory system involved in cellular respiration?

What is the interrelationship between urinary system and the other systems of the body?

How do the structure of the organs of the excretory system allow them to perform their functions?

Exit Skills

Upon completion of this unit, students should have achieved the following exit skills:

- Examine the respiratory system by:
  - Discussing the generalized functions of the respiratory system.
  - Listing the major organs of the respiratory system and describing the functions of each.
  - Comparing, contrasting, and explaining the mechanism responsible for the exchange of gases that occurs during internal and external respiration.
  - Listing and discussing the volumes of air exchanged during pulmonary ventilation.
  - Identifying and discussing the mechanisms that regulate respiration.
  -
- Examine the digestive system by:
  - Listing in sequence each of the component parts or segments of the alimentary canal from the mouth to the anus and identifying the accessory organs of digestion.
  - Listing and describing the four layers of the wall of the alimentary canal.
  - Comparing the lining layer in the esophagus, stomach, small intestine, and large intestine.
  - Discussing the basics of protein, fat, and carbohydrate digestion and giving the end products of each process.
  - Defining and contrasting mechanical and chemical digestion.
  - Defining peristalsis, bolus, chyme, jaundice, ulcer, and diarrhea.
  - Defining and contrasting catabolism and anabolism.
  -
- Examine the urinary system by:
  - Identifying the major organs and their functions.
  - Naming the parts of the nephron and describing the role each component plays in the formation of urine.
  - Explaining the importance of filtration, tubular reabsorption, and tubular secretion in urine formation.
  - Discussing the mechanisms that control urine volume.
  - Explaining how the kidneys act as vital organs in maintaining homeostasis.

New Jersey Student Learning Standards (NJSLS-S)

NextGen Science Standards

9-12.HS-LS1-1	Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins, which carry out the essential functions of life through systems of specialized cells.
9-12.HS-LS1-6	Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules.
9-12.HS-LS1-2	Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
9-12.HS-LS1-3	Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.
9-12.HS-LS1-7	Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed, resulting in a net transfer of energy.
9-12.HS-LS1-2.2.1	Develop and use a model based on evidence to illustrate the relationships between systems or between components of a system.
9-12.HS-LS1-4.2.1	Use a model based on evidence to illustrate the relationships between systems or between components of a system.
9-12.HS-LS1-7.2.1	Use a model based on evidence to illustrate the relationships between systems or between components of a system.
9-12.HS-LS1-3.3.1	Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly.
9-12.HS-LS1-4.4.1	Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions— including energy, matter, and information flows—within and between systems at different scales.
9-12.HS-LS1-2.4.1	Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions— including energy, matter, and information flows—within and between systems at different scales.
9-12.HS-LS1-6.5.1	Changes of energy and matter in a system can be described in terms of energy and matter flows into, out of, and within that system.
9-12.HS-LS1-7.5.1	Energy cannot be created or destroyed—it only moves between one place and another place, between objects and/or fields, or between systems.
9-12.HS-LS1-1.6.1	students investigate systems by examining the properties of different materials, the structures of different components, and their interconnections to reveal the system's function and/or solve a problem. They infer the functions and properties of natural and designed objects and systems from their overall structure, the way their components are shaped and used, and the molecular substructures of their various materials.
9-12.HS-LS1-1.6.1	Construct an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.
9-12.HS-LS1-6.6.1	Construct and revise an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world

	operate today as they did in the past and will continue to do so in the future.
9-12.HS-LS1-3.7.1	Feedback (negative or positive) can stabilize or destabilize a system.
9-12.HS-LS1-3.LS1.A.1	Feedback mechanisms maintain a living system's internal conditions within certain limits and mediate behaviors, allowing it to remain alive and functional even as external conditions change within some range. Feedback mechanisms can encourage (through positive feedback) or discourage (negative feedback) what is going on inside the living system.
9-12.HS-LS1-1.LS1.A.1	Systems of specialized cells within organisms help them perform the essential functions of life.
9-12.HS-LS1-2.LS1.A.1	Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level.
9-12.HS-LS1-1.LS1.A.2	All cells contain genetic information in the form of DNA molecules. Genes are regions in the DNA that contain the instructions that code for the formation of proteins, which carry out most of the work of cells.
9-12.HS-LS1-4.LS1.B.1	In multicellular organisms individual cells grow and then divide via a process called mitosis, thereby allowing the organism to grow. The organism begins as a single cell (fertilized egg) that divides successively to produce many cells, with each parent cell passing identical genetic material (two variants of each chromosome pair) to both daughter cells. Cellular division and differentiation produce and maintain a complex organism, composed of systems of tissues and organs that work together to meet the needs of the whole organism.
9-12.HS-LS1-6.LS1.C.1	The sugar molecules thus formed contain carbon, hydrogen, and oxygen: their hydrocarbon backbones are used to make amino acids and other carbon-based molecules that can be assembled into larger molecules (such as proteins or DNA), used for example to form new cells.
9-12.HS-LS1-7.LS1.C.1	As matter and energy flow through different organizational levels of living systems, chemical elements are recombined in different ways to form different products.
9-12.HS-LS1-7.LS1.C.2	As a result of these chemical reactions, energy is transferred from one system of interacting molecules to another. Cellular respiration is a chemical process in which the bonds of food molecules and oxygen molecules are broken and new compounds are formed that can transport energy to muscles. Cellular respiration also releases the energy needed to maintain body temperature despite ongoing energy transfer to the surrounding environment.
9-12.HS-LS1-6.LS1.C.2	As matter and energy flow through different organizational levels of living systems, chemical elements are recombined in different ways to form different products.

Interdisciplinary Connections

MA.S-ID.A	Summarize, represent, and interpret data on a single count or measurement variable
MA.S-ID.B	Summarize, represent, and interpret data on two categorical and quantitative variables
MA.S-IC	Making Inferences and Justifying Conclusions
LA.RST.11-12.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
LA.RST.11-12.4	Determine the meaning of symbols, key terms, and other domain-specific words and

	phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.
LA.RST.11-12.5	Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.
MA.S-IC.B	Make inferences and justify conclusions from sample surveys, experiments, and observational studies
LA.RST.11-12.6	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.
LA.RST.11-12.7	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
LA.RST.11-12.8	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.
LA.RST.11-12.9	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.
LA.WHST.11-12.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.
LA.WHST.11-12.4	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
LA.WHST.11-12.5	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
LA.WHST.11-12.6	Use technology, including the Internet, to produce, share, and update writing products in response to ongoing feedback, including new arguments or information.
LA.WHST.11-12.7	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
LA.WHST.11-12.8	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
LA.WHST.11-12.9	Draw evidence from informational texts to support analysis, reflection, and research.
HPE.2.1.12.A.1	Analyze the role of personal responsibility in maintaining and enhancing personal, family, community, and global wellness.
HPE.2.1.12.A.2	Debate the social and ethical implications of the availability and use of technology and medical advances to support wellness.
HPE.2.1.12.A.CS1	Developing and maintaining wellness requires ongoing evaluation of factors impacting health and modifying lifestyle behaviors accordingly.
HPE.2.1.12.B.1	Determine the relationship of nutrition and physical activity to weight loss, weight gain, and weight maintenance.
HPE.2.1.12.B.2	Compare and contrast the dietary trends and eating habits of adolescents and young adults in the United States and other countries.
HPE.2.1.12.B.3	Analyze the unique contributions of each nutrient class (fats, carbohydrates, protein, water, vitamins, and minerals) to one’s health.
HPE.2.1.12.B.CS1	Applying basic nutritional and fitness concepts to lifestyle behaviors impacts wellness.

HPE.2.1.12.C.1	Determine diseases and health conditions that may occur during one's lifespan and identify prevention and treatment strategies.
HPE.2.1.12.C.CS1	Personal health is impacted by family, community, national, and international efforts to prevent and control diseases and health conditions.
HPE.2.1.12.D.6	Demonstrate first-aid procedures, including Basic Life Support and automatic external defibrillation, caring for head trauma, bone and joint emergencies, caring for cold and heat injuries, and responding to medical emergencies.
HPE.2.1.12.E.1	Predict the short- and long-term consequences of unresolved conflicts.
HPE.2.1.12.E.CS1	Respect and acceptance for individuals regardless of gender, sexual orientation, disability, ethnicity, socioeconomic background, religion, and/or culture provide a foundation for the prevention and resolution of conflict.
SOC.9-12.1.2.1	Construct various forms of geographic representations to show the spatial patterns of physical and human phenomena.
SOC.9-12.1.4.2	Demonstrate effective presentation skills by presenting information in a clear, concise, and well-organized manner taking into consider appropriate use of language for task and audience.
9-12.HS-PS1-2	Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties.
9-12.HS-PS2-6.8.1	Communicate scientific and technical information (e.g. about the process of development and the design and performance of a proposed process or system) in multiple formats (including orally, graphically, textually, and mathematically).
9-12.HS-PS2-6.PS2.B.1	Attraction and repulsion between electric charges at the atomic scale explain the structure, properties, and transformations of matter, as well as the contact forces between material objects.

Learning Objectives

Identify the organs forming the respiratory passageway from the nasal cavity to the alveoli of the lungs and describe the function of each.

Describe the several protective mechanisms of the respiratory system.

Describe the structure and function of the lungs and the pleural coverings.

Explain the following: cellular respiration, external respiration, internal respiration, pulmonary ventilation, expiration, and inspiration.

Explain how the respiratory muscles cause volume changes that lead to air flow into and out of the lungs (breathing).

Define the following respiratory volumes: tidal volume, vital capacity, expiratory reserve volume, inspiratory reserve volume, and residual air.

Describe the process of gas exchange in the lungs and tissues.

Describe how oxygen and carbon dioxide are transported in the blood.

Name the brain areas involved in control of respiration.

Identify several physical factors that influence respiratory rate and describe their influence.

Explain the relative importance of oxygen and carbon dioxide in modifying the rate and depth of breathing.

Define apnea, dyspnea, hyperventilation, hypoventilation, and chronic obstructive pulmonary disorder (COPD). Describe the symptoms and probable causes of COPD, lung cancer, and asthma.

Describe the normal changes that occur in the respiratory system from infancy to old age.

Identify the organs of the alimentary canal and accessory digestive organs on a model and explain their functions.

Describe the composition and function of saliva.

Name the deciduous and permanent teeth and describe the basic anatomy of a tooth.

Explain how digestive villi aid digestive processes in the small intestine.

Describe the mechanisms of swallowing, vomiting, and defecation.

Explain how food in the digestive tract is mixed and moved along the tract.

List the major enzymes produced by the digestive organs and name the food on which they act.

State the function of bile and the ultimate end result of protein, lipid, and carbohydrate digestion.

Explain the terms calorie and nutrient and explain the six main nutrient categories.

Describe the metabolic roles of the liver.

List several factors that influence metabolic rate and indicate the effect of each.

Name important congenital disorders of the digestive system and significant inborn errors of metabolism.

Describe the effect of aging on the digestive system.

Describe the location and function of the kidneys in the body.

Identify the following regions of the kidney and describe their function: hilus, cortex, medulla, medullary pyramids, calyces, pelvis, and renal columns.

Recognize that the nephron is the structural and functional unit of the kidney and describe its anatomy.

Describe the process of urine formation, identifying the areas of the nephron that are responsible for filtration, reabsorption, and secretion.

Describe the function of the kidneys in excretion of nitrogen-containing wastes.

Define and explain polyuria, anuria, oliguria, and diuresis.

Describe the composition of normal urine and list abnormal urinary components.

Explain the general structure and function of the ureters, bladder, and urethra.

Compare the course and length of the male urethra to that of the female urethra.

Describe the difference in control of the external and internal urethral sphincters.

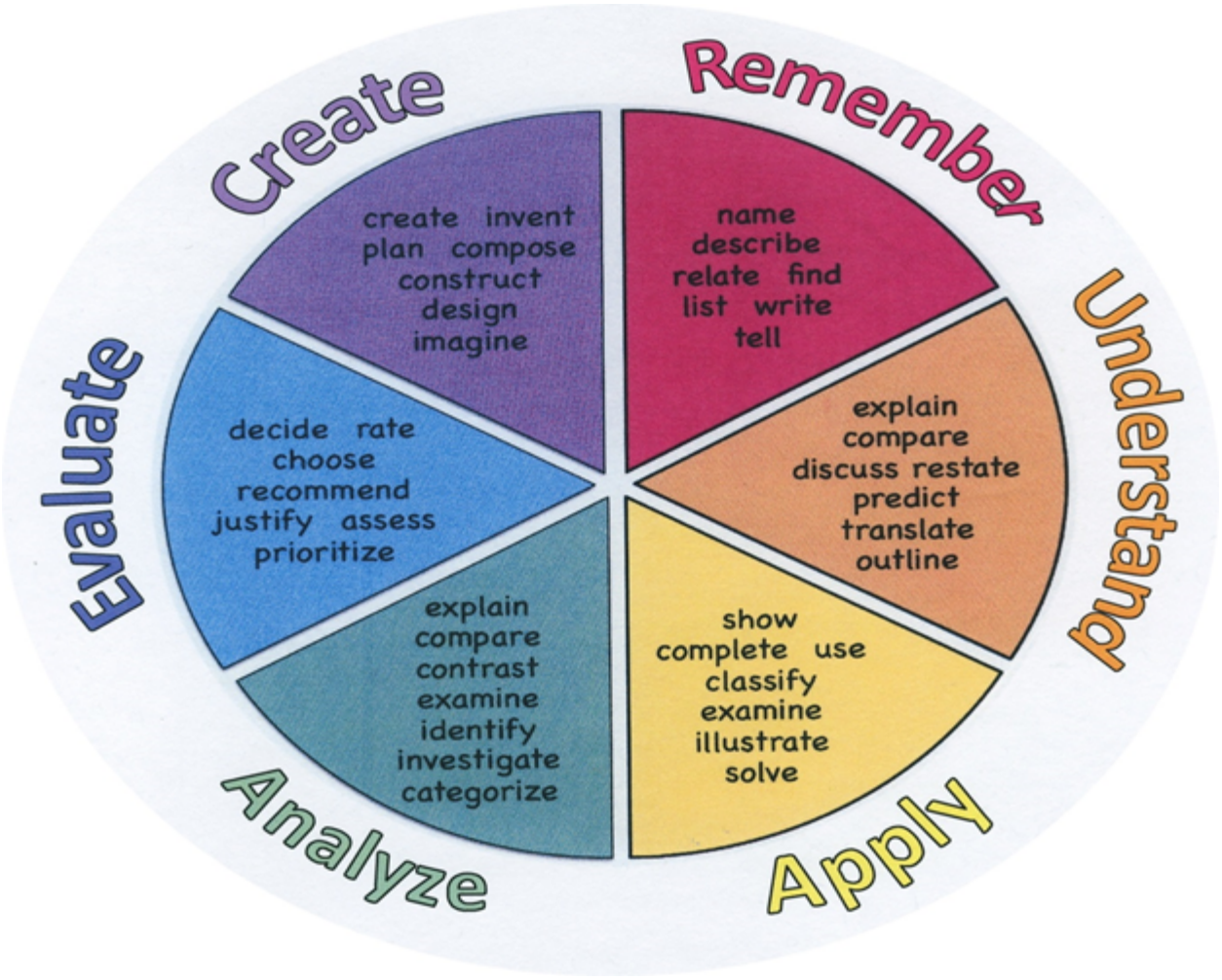
Explain the three most common urinary tract problems.

Explain the role of antidiuretic hormone (ADH) in the regulation of water balance by the kidney.

Describe the role of aldosterone in sodium and potassium balance in the blood.

Describe the main congenital problems that occur in the urinary system as well as those problems that develop with age.

Remember	Understand	Apply	Analyze	Evaluate	Create
Choose	Classify	Choose	Categorize	Appraise	Combine
Describe	Defend	Dramatize	Classify	Judge	Compose
Define	Demonstrate	Explain	Compare	Criticize	Construct
Label	Distinguish	Generalize	Differentiate	Defend	Design
List	Explain	Judge	Distinguish	Compare	Develop
Locate	Express	Organize	Identify	Assess	Formulate
Match	Extend	Paint	Infer	Conclude	Hypothesize
Memorize	Give Examples	Prepare	Point out	Contrast	Invent
Name	Illustrate	Produce	Select	Critique	Make
Omit	Indicate	Select	Subdivide	Determine	Originate
Recite	Interrelate	Show	Survey	Grade	Organize
Select	Interpret	Sketch	Arrange	Justify	Plan
State	Infer	Solve	Breakdown	Measure	Produce
Count	Match	Use	Combine	Rank	Role Play
Draw	Paraphrase	Add	Detect	Rate	Drive
Outline	Represent	Calculate	Diagram	Support	Devise
Point	Restate	Change	Discriminate	Test	Generate
Quote	Rewrite	Classify	Illustrate		Integrate
Recall	Select	Complete	Outline		Prescribe
Recognize	Show	Compute	Point out		Propose
Repeat	Summarize	Discover	Separate		Reconstruct
Reproduce	Tell	Divide			Revise
	Translate	Examine			Rewrite
	Associate	Graph			Transform
	Compute	Interpolate			
	Convert	Manipulate			
	Discuss	Modify			
	Estimate	Operate			
	Extrapolate	Subtract			
	Generalize				
	Predict				



Suggested Activities & Best Practices

- Respiratory system function and structure worksheet
- Crash Course videos with questions
- Measuring lung capacity test
- Respiratory diseases diagnosis activity
- Digestive system structure and function worksheet
- BMR and caloric intake lab-food diary for a week and balance of caloric output with caloric input
- Food digestion lab
- Webquest-virtual digestion activity
- Kidney structure and function worksheet
- Kidney dissection lab
- Urinalysis lab
- Unit test

Assessment Evidence - Checking for Understanding (CFU)

Google Classroom Assignment (Formative)

QUIA Quiz (Summative)

Pear Deck (Alternate)

Lab Reports (Alternate)

Common, Department Quarterly Benchmarks (Benchmark)

Oncourse Assessment Tools (Formative)

Unit Test/Quiz (Summative)

"Do Now/Exit Ticket" Activity (Formative)

- Admit Tickets
- Blank diagrams
- Compare & Contrast
- Crash Course Video Questions
- Define
- Describe
- Diagram Quizzes
- Evaluate
- Evaluation rubrics
- Exit Tickets
- Explaining
- Illustration
- Journals
- KWL Chart
- Lab-Food digestion
- Lab-Lung capacity
- Lab-Urinalysis
- Learning Center Activities
- Multimedia Reports
- Outline
- Quarterly Benchmarks
- Self- assessments
- Study Guide

- Teacher Observation Checklist
- Unit review/Test prep
- Unit tests
- Web-Based Assessments
- WebQuests

Primary Resources & Materials

Textbook: *Biology*, Miller and Levine

Chromebook: Online access to textbook and digital resources from *Biology,* Miller and Levine

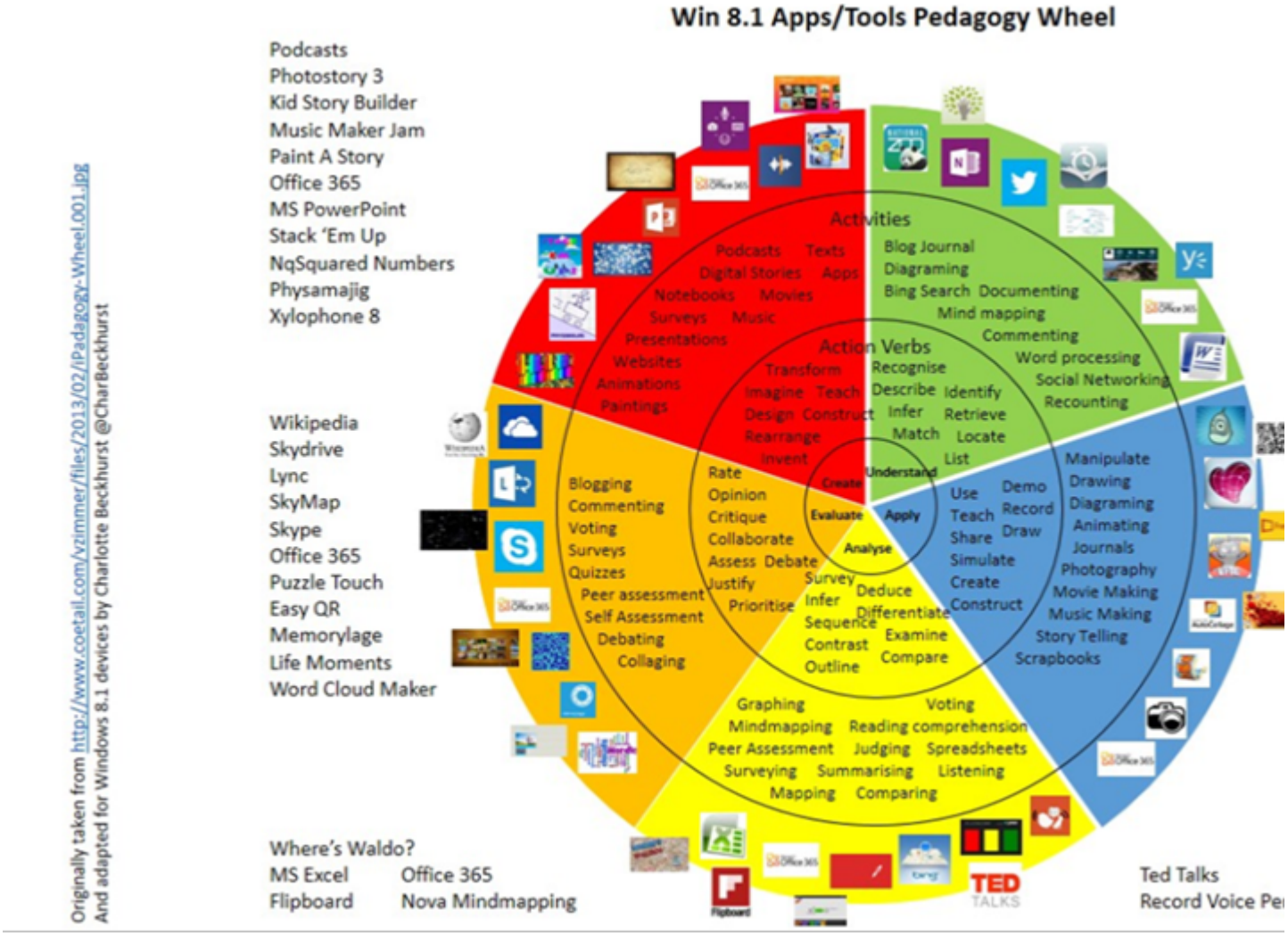
Ancillary Resources

YouTube videos - Crash Course/Anatomy and Physiology series with associated question worksheets
Human torso models
Diagram packages
Compound light microscopes
Selection of prepared slides showing properties of tissue types
Lung capacity lab kit
Food Digestion lab kit
Urinalysis lab kit
Sheep kidneys for dissection
Full-scale skeleton model

Technology Infusion

Student-issued Chromebooks
Interactive digital content available through Pearson EasyBridge
YouTube videos for lesson enhancement and differentiation
Google Classroom
Google Suite
Prezi
Subscription to Defined STEM website
Use MS Word, Excel, PowerPoint, OneNote
Smart TV
Wireless HDMI

Multimedia projector



Alignment to 21st Century Skills & Technology

CRP.K-12.CRP1	Act as a responsible and contributing citizen and employee.
CRP.K-12.CRP1.1	Career-ready individuals understand the obligations and responsibilities of being a member of a community, and they demonstrate this understanding every day through their interactions with others. They are conscientious of the impacts of their decisions on others and the environment around them. They think about the near-term and long-term consequences of their actions and seek to act in ways that contribute to the betterment of their teams, families, community and workplace. They are reliable and consistent in going beyond the minimum expectation and in participating in activities that serve the greater good.
CRP.K-12.CRP2	Apply appropriate academic and technical skills.
CRP.K-12.CRP2.1	Career-ready individuals readily access and use the knowledge and skills acquired through experience and education to be more productive. They make connections between abstract concepts with real-world applications, and they make correct insights about when it is appropriate to apply the use of an academic skill in a workplace situation.

CRP.K-12.CRP3	Attend to personal health and financial well-being.
CRP.K-12.CRP3.1	Career-ready individuals understand the relationship between personal health, workplace performance and personal well-being; they act on that understanding to regularly practice healthy diet, exercise and mental health activities. Career-ready individuals also take regular action to contribute to their personal financial well-being, understanding that personal financial security provides the peace of mind required to contribute more fully to their own career success.
CRP.K-12.CRP4	Communicate clearly and effectively and with reason.
CRP.K-12.CRP4.1	Career-ready individuals communicate thoughts, ideas, and action plans with clarity, whether using written, verbal, and/or visual methods. They communicate in the workplace with clarity and purpose to make maximum use of their own and others' time. They are excellent writers; they master conventions, word choice, and organization, and use effective tone and presentation skills to articulate ideas. They are skilled at interacting with others; they are active listeners and speak clearly and with purpose. Career-ready individuals think about the audience for their communication and prepare accordingly to ensure the desired outcome.
CRP.K-12.CRP7	Employ valid and reliable research strategies.
CRP.K-12.CRP7.1	Career-ready individuals are discerning in accepting and using new information to make decisions, change practices or inform strategies. They use reliable research process to search for new information. They evaluate the validity of sources when considering the use and adoption of external information or practices in their workplace situation.
CRP.K-12.CRP8	Utilize critical thinking to make sense of problems and persevere in solving them.
CRP.K-12.CRP8.1	Career-ready individuals readily recognize problems in the workplace, understand the nature of the problem, and devise effective plans to solve the problem. They are aware of problems when they occur and take action quickly to address the problem; they thoughtfully investigate the root cause of the problem prior to introducing solutions. They carefully consider the options to solve the problem. Once a solution is agreed upon, they follow through to ensure the problem is solved, whether through their own actions or the actions of others.
CRP.K-12.CRP9	Model integrity, ethical leadership and effective management.
CRP.K-12.CRP9.1	Career-ready individuals consistently act in ways that align personal and community-held ideals and principles while employing strategies to positively influence others in the workplace. They have a clear understanding of integrity and act on this understanding in every decision. They use a variety of means to positively impact the directions and actions of a team or organization, and they apply insights into human behavior to change others' action, attitudes and/or beliefs. They recognize the near-term and long-term effects that management's actions and attitudes can have on productivity, morals and organizational culture.
CRP.K-12.CRP10	Plan education and career paths aligned to personal goals.
CRP.K-12.CRP10.1	Career-ready individuals take personal ownership of their own education and career goals, and they regularly act on a plan to attain these goals. They understand their own career interests, preferences, goals, and requirements. They have perspective regarding the pathways available to them and the time, effort, experience and other requirements to pursue each, including a path of entrepreneurship. They recognize the value of each step in the education and experiential process, and they recognize that nearly all career paths require ongoing education and experience. They seek counselors, mentors, and other experts to assist in the planning and execution of career and personal goals.
CRP.K-12.CRP11	Use technology to enhance productivity.
CRP.K-12.CRP11.1	Career-ready individuals find and maximize the productive value of existing and new technology to accomplish workplace tasks and solve workplace problems. They are flexible and adaptive in acquiring new technology. They are proficient with ubiquitous technology applications. They understand the inherent risks-personal and organizational-of

	technology applications, and they take actions to prevent or mitigate these risks.
CRP.K-12.CRP12	Work productively in teams while using cultural global competence.
CRP.K-12.CRP12.1	Career-ready individuals positively contribute to every team, whether formal or informal. They apply an awareness of cultural difference to avoid barriers to productive and positive interaction. They find ways to increase the engagement and contribution of all team members. They plan and facilitate effective team meetings.
CAEP.9.2.12.C.1	Review career goals and determine steps necessary for attainment.
CAEP.9.2.12.C.2	Modify Personalized Student Learning Plans to support declared career goals.
CAEP.9.2.12.C.3	Identify transferable career skills and design alternate career plans.
CAEP.9.2.12.C.7	Examine the professional, legal, and ethical responsibilities for both employers and employees in the global workplace.
TECH.8.1.12.A	Technology Operations and Concepts: Students demonstrate a sound understanding of technology concepts, systems and operations.
TECH.8.1.12.A.1	Create a personal digital portfolio which reflects personal and academic interests, achievements, and career aspirations by using a variety of digital tools and resources.
TECH.8.1.12.A.2	Produce and edit a multi-page digital document for a commercial or professional audience and present it to peers and/or professionals in that related area for review.
TECH.8.1.12.A.3	Collaborate in online courses, learning communities, social networks or virtual worlds to discuss a resolution to a problem or issue.
TECH.8.1.12.A.4	Construct a spreadsheet workbook with multiple worksheets, rename tabs to reflect the data on the worksheet, and use mathematical or logical functions, charts and data from all worksheets to convey the results.
TECH.8.1.12.B.2	Apply previous content knowledge by creating and piloting a digital learning game or tutorial.
TECH.8.1.12.C.CS1	Interact, collaborate, and publish with peers, experts, or others by employing a variety of digital environments and media.
TECH.8.1.12.C.CS2	Communicate information and ideas to multiple audiences using a variety of media and formats.
TECH.8.1.12.C.CS3	Develop cultural understanding and global awareness by engaging with learners of other cultures.
TECH.8.1.12.C.CS4	Contribute to project teams to produce original works or solve problems.
TECH.8.1.12.D.CS2	Demonstrate personal responsibility for lifelong learning.
TECH.8.1.12.E.CS2	Locate, organize, analyze, evaluate, synthesize, and ethically use information from a variety of sources and media.
TECH.8.1.12.E.CS3	Evaluate and select information sources and digital tools based on the appropriateness for specific tasks.
TECH.8.1.12.E.CS4	Process data and report results.
TECH.8.1.12.F.CS2	Plan and manage activities to develop a solution or complete a project.
TECH.8.1.12.F.CS3	Collect and analyze data to identify solutions and/or make informed decisions.
TECH.8.1.12.F.CS4	Use multiple processes and diverse perspectives to explore alternative solutions.

21st Century Skills/Interdisciplinary Themes

- Communication and Collaboration

- Creativity and Innovation
- Critical thinking and Problem Solving
- ICT (Information, Communications and Technology) Literacy
- Information Literacy
- Life and Career Skills
- Media Literacy

21st Century Skills

- Financial, Economic, Business and Entrepreneurial Literacy
- Health Literacy

Differentiation

Unit-specific exemplars:

1) Teacher-led demonstrations will be provided to help facilitate the understanding of the function of digestive enzymes.

2) Problem-based learning is exemplified by emplyimg case studies in digestive pathologies.

3) Alternative assessments will be offered to denstrate knowledge of digestive and urinary system anatomy.

Differentiations:

- Small group instruction
- Small group assignments
- Extra time to complete assignments
- Pairing oral instruction with visuals
- Repeat directions
- Use manipulatives
- Study guides
- Teacher reads assessments allowed
- Rephrase written directions
- Multisensory approaches
- Additional time
- Preview vocabulary
- Preview content & concepts
- Behavior management plan
- Highlight text
- Student(s) work with assigned partner
- Visual presentation
- Small group setting

Hi-Prep Differentiations:

- Alternative formative and summative assessments
- Games and tournaments
- Group investigations
- Guided Reading
- Independent research and projects
- Interest groups
- Learning contracts
- Leveled rubrics
- Multiple intelligence options
- Multiple texts
- Project-based learning
- Problem-based learning
- Varying organizers for instructions

Lo-Prep Differentiations

- Choice of books or activities
- Exploration by interest
- Flexible grouping
- Goal setting with students
- Mini workshops to re-teach or extend skills
- Open-ended activities
- Varied supplemental materials

Special Education Learning (IEP's & 504's)

Unit-specific exemplars:

1) Preview of content, concepts and vocabulary will be used by assigning online modules from Miller/Levine Biology Online.

2) Work will be checked frequently for undersatnding with performing research project.

3) Unit test will be shortened and with fewer choices of answers and extra time will be granted for completion.

- printed copy of board work/notes provided
- additional time for skill mastery
- behavior management plan
- check work frequently for understanding
- computer or electronic device utilizes

- extended time on tests/ quizzes
- have student repeat directions to check for understanding
- highlighted text visual presentation
- modified assignment format
- modified test content
- modified test format
- modified test length
- multi-sensory presentation
- multiple test sessions
- preferential seating
- preview of content, concepts, and vocabulary
- Provide modifications as dictated in the student's IEP/504 plan
- reduced/shortened reading assignments
- Reduced/shortened written assignments
- secure attention before giving instruction/directions
- shortened assignments
- student working with an assigned partner
- teacher initiated weekly assignment sheet
- Use open book, study guides, test prototypes

English Language Learning (ELL)

Unit-specific exemplars:

1) Students will be directed to websites that offer diagrams that are less detailed to help facilitate basic knowledge of body systems.

2) ELL students will be paired with flent bilingual students to provide tutoring and assistance during class.

3) Unit tests will be worded in simple terms, will be offered as open-book, and may be completed with assistance from ELL faculty.

- teaching key aspects of a topic. Eliminate nonessential information
- using videos, illustrations, pictures, and drawings to explain or clarif
- allowing products (projects, timelines, demonstrations, models, drawings, dioramas, poster boards, charts, graphs, slide shows, videos, etc.) to demonstrate student’s learning;
- allowing students to correct errors (looking for understanding)
- allowing the use of note cards or open-book during testing

- decreasing the amount of workpresented or required
- having peers take notes or providing a copy of the teacher's notes
- modifying tests to reflect selected objectives
- providing study guides
- reducing or omitting lengthy outside reading assignments
- reducing the number of answer choices on a multiple choice test
- tutoring by peers
- using computer word processing spell check and grammar check features
- using true/false, matching, or fill in the blank tests in lieu of essay tests

At Risk

Unit-specific exemplars:

1) Alternative videos (Crash Couse) may be assigned to support student understanding of topics with visual assitance.

2) Students will be offered alternative assessment in nutrition by creating a food log and researching calorie content of the foods they eat..

3) Written tests may be performed open-book or with notes to assist in success.

- allowing students to correct errors (looking for understanding)
- teaching key aspects of a topic. Eliminate nonessential information
- allowing products (projects, timelines, demonstrations, models, drawings, dioramas, poster boards, charts, graphs, slide shows, videos, etc.) to demonstrate student's learning
- allowing students to select from given choices
- allowing the use of note cards or open-book during testing
- collaborating (general education teacher and specialist) to modify vocabulary, omit or modify items to reflect objectives for the student, eliminate sections of the test, and determine how the grade will be determined prior to giving the test.
- decreasing the amount of workpresented or required
- having peers take notes or providing a copy of the teacher's notes
- marking students' correct and acceptable work, not the mistakes
- modifying tests to reflect selected objectives
- providing study guides
- reducing or omitting lengthy outside reading assignments
- reducing the number of answer choices on a multiple choice test
- tutoring by peers
- using authentic assessments with real-life problem-solving
- using true/false, matching, or fill in the blank tests in lieu of essay tests
- using videos, illustrations, pictures, and drawings to explain or clarify

Talented and Gifted Learning (T&G)

Unit-specific exemplars:

1) Advanced case studies including pathologies of associated body systems may be provided to additionally challenge students.

2) Additional research into nutrition across the globe will be offered to increase the depth of knowledge.

3) Students will be urged to more deepy analyze the effect of high calorie diets on human physiology.

- Above grade level placement option for qualified students
- Advanced problem-solving
- Allow students to work at a faster pace
- Cluster grouping
- Complete activities aligned with above grade level text using Benchmark results
- Create a plan to solve an issue presented in the class or in a text
- Flexible skill grouping within a class or across grade level for rigor
- Higher order, critical & creative thinking skills, and discovery
- Multi-disciplinary unit and/or project
- Teacher-selected instructional strategies that are focused to provide challenge, engagement, and growth opportunities
- Utilize exploratory connections to higher-grade concepts
- Utilize project-based learning for greater depth of knowledge

Sample Lesson