



## Anatomy and Physiology – Unit 14 - The Urinary System (Chapter 18)

**Overview:** The urinary system includes the kidneys, the ureters, the urinary bladder, and the urethra. The kidneys produce urine, a fluid containing water, ions, and soluble compounds. During urination, urine is forced out of the body. The three main functions of the urinary system are excretion- the removal of organic waste products from body fluids; elimination-the discharge of these waste products into the environment; and homeostatic regulation of the volume and solute concentration of blood plasma. Nephrons, located in the kidneys are responsible for 1) production of filtrate, 2) the reabsorption of nutrients, and 3) the reabsorption of water and ions.

### Essential Questions:

- How are the anatomy and physiology of the human Urinary system related?
- How does the shape and location of nephrons make it a viable part of the urinary system?
- What are the major organs and their functions of the urinary system?
- Why is communication between the urinary and nervous systems (and Circulatory system) of humans crucial to homeostatic regulation?
- What are the basic mechanisms involved in maintaining fluid balance and electrolyte balance?
- What are the functional relationships between the human urinary system and other human systems?

### NYSSLS Standards:

- **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.**
  - (DCI) **LS1.A: Structure and Function:** Systems of specialized cells within organisms help them perform the essential functions of life
  - (CCC) **Structure and Function:** Investigating or designing new systems or structures requires a detailed examination of the properties of different materials, the structures of different components, and connections of components to reveal its function and/or solve a problem.
  - (SEP) **Constructing Explanations and Designing Solutions:** 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.
- **HS-LS1-2. Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.**
  - (DCI) **LS1.A: Structure and Function:** 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.
  - (CCC) **Systems and System Models:** Models (e.g. physical, mathematical, computer models) can be used to simulate systems and interactions -- including energy, matter, and informational flows -- within and between systems at different scales.
  - (SEP) **Developing and Using Models:** Develop and use a model based on evidence to illustrate the relationships between systems or between components of a system. Use a model based on evidence to illustrate the relationships between systems or between components of a system.
- **HS-LS1-3. Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis**
  - (DCI) **LS1.A: Structure and Function:** 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.
  - (CCC) **Stability and Change:** Feedback (negative or positive) can stabilize or destabilize a system.
  - (SEP) **Planning and Carrying Out Investigations:** 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



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<b>3D Learning Overview:</b> <b>KNOW</b> → <u>Disciplinary Core Ideas</u> (DCI): what students need to know  <b>UNDERSTAND</b> → <u>Crosscutting Concepts</u> (CCC): what students look for/ applies across all science domains and <u>Science &amp; Engineering Practices</u> (SEP): how students explore and apply		<b>Crosscutting Concepts (CCC):</b> <ul style="list-style-type: none"> <li>● Patterns</li> <li>● Cause and Effect</li> <li>● Scale, Proportion, and Quantity</li> <li>● Systems and System Models</li> <li>● Energy and Matter</li> <li>● Structure and Function</li> <li>● Stability and Change</li> </ul>		<b>Science and Engineering Practices (SEP):</b> <ul style="list-style-type: none"> <li>● Asking questions (for science) and defining problems (for engineering)</li> <li>● Developing and using models</li> <li>● Planning and carrying out investigations</li> <li>● Analyzing and interpreting data</li> <li>● Using mathematics and computational thinking</li> <li>● Constructing explanations (for science) and designing solutions (for engineering)</li> <li>● Engaging in argument from evidence</li> <li>● Obtaining, evaluating, and communicating information</li> </ul>	
Time Frame	Skills, Practices or Expectations	Textbook Resources	Online Resources	Vocabulary	Higher Order Questions
<b>5.8.23 -5.19.23</b>  <b>NOTE:</b> <b>5.10.23 – Early Release Day</b> <b>5.11.23 – Superintendent Conference Day</b>	<b>Anatomy and Physiology:</b> The students will be able to: <ul style="list-style-type: none"> <li>● Describe the anatomy and physiology of the human urinary system.</li> <li>● Describe the anatomy and physiology of the kidneys.</li> <li>● Distinguish between normal and abnormal urine.</li> <li>● Describe the effects of aging on the human urinary system.</li> <li>● Describe the functional relationships between the human urinary system and other human body systems.</li> </ul> <b>Diseases/Disorders:</b> The students will be able to: <ul style="list-style-type: none"> <li>● Explain the effects of lack of exercise on the urinary system.</li> <li>● Describe a disease or disorder of the human urinary system including symptoms, diagnosis, medications, prevention, and treatment.</li> </ul>	<b>Chapter 18</b>  18-1 Urinary System Component and Functions (p.601-602) <ul style="list-style-type: none"> <li>● Figure 18-1 Components of Urinary System (p.601)</li> </ul> 18-2 Highly Vascular Kidneys Contain Functional Units Called Nephrons (p.602-609) <ul style="list-style-type: none"> <li>● Figure 18-3 Structure of the Kidney (p.603)</li> <li>● Figure 18-4 Blood Supply to Kidneys (p.604)</li> </ul> 18-3 Formation of Urine (p.609-613) <ul style="list-style-type: none"> <li>● Table 18-3 General Characteristics of Normal Urine (p.613)</li> </ul> 18-4 Normal Kidney Function Depends on Stable GFR (p.613-617) <ul style="list-style-type: none"> <li>● Figure 18-8 Summary of Kidney Function and Urine Formation (p.614)</li> </ul> 18-5 Ureters, Bladder, Urethra (p.617-620) <ul style="list-style-type: none"> <li>● Figure 18-10 Organs for Conduction and Storage of Urine (p.618)</li> </ul>	<b>Z Space Activities: (code)</b> Exploring Anatomy - Excretory System (E454) learn the functions of the kidneys and how urine is stored and transported out of the body <a href="#">Teacher Resource pdf</a> <a href="#">Student Resource pdf</a>  Tumor in the Kidney (A583) what happens if cellular regeneration goes wrong <a href="#">Teacher Resource pdf</a> <a href="#">Student Resource pdf</a>	acidosis/ alkalosis aldosterone angiotensin ii buffer system filtrate glomerular filtration rate glomerulus kidney nephron/ nephron loop ureters urinary bladder urine urethra  homeostasis/ homeostatic regulation disease/ disorder symptoms negative feedback loop positive feedback loop	<ul style="list-style-type: none"> <li>● Differentiate among fluid balance, electrolyte balance, and acid-base balance, and explain why they are important to homeostasis.</li> <li>● Why should a person with a fever drink more liquids?</li> <li>● Exercise physiologists recommend that adequate amounts of fluid be ingested before, during, and after exercise. Why is adequate fluid replacement during extensive sweating important?</li> <li>● Long-haul truck drivers are on the road for long periods of time between restroom stops. Why might that lead to kidney problems?</li> <li>● For the past week, Susan has felt a burning sensation in the area of her urethra when she urinates. She checks her temperature and finds she has a low-grade fever. What is likely occurring and what unusual</li> </ul>



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	<ul style="list-style-type: none"> <li>Diagnose a human urinary system disease/disorder given a data set of symptoms.</li> <li>Explain homeostasis in the human urinary system through negative and positive feedback mechanisms.</li> <li>Predict prevention and treatment of a human urinary system disorder based on a given data set</li> </ul>	<p>18-6 Fluid Balance, Electrolyte Balance, Acid-Base Balance (p.620-622)</p> <ul style="list-style-type: none"> <li>Figure 18-13 Ions in Body Fluids (p.622)</li> </ul> <p>18-7 Blood Pressure and Osmosis (Fluid and Electrolyte Balance) (p.622-624)</p> <p>18-9 Age-Related Changes (p.628)</p> <p>Chapter 18 Review Questions p.633-635</p> <p>Urinary System and Other Body Systems (p.36)</p>			<p>substances are likely to be in her urine?</p>
<p><b>Resources</b></p>	<p><a href="http://ngss.nsta.org/Classroom-Resources.aspx">http://ngss.nsta.org/Classroom-Resources.aspx</a> - Searchable NYSSLS/NGSS aligned resources curated by NSTA</p> <p><b>Dissection Videos</b> (these videos -- dissection of heart, liver, uterus and eye -- were created in collaboration with the Jacobs School of Medicine and Biomedical Sciences. All dissection videos have two separate segments - an introduction segment and a dissection segment. All segments have an accompanied student activity resource)</p> <p>Access via Schoology BPS Science K-12 Group Resources 9-12 Resources Anatomy &amp; Physiology Dissection Videos</p> <p><a href="#">Virtual Frog Dissection</a> (step by step virtual dissection)</p> <p>PBS Learning Media Dissection Videos and Resources (<a href="#">Sheep Heart</a>, <a href="#">Cow Eye</a>, <a href="#">Frog</a>)</p> <p><a href="#">Virtual Fetal Pig Dissection</a> (from Whitman College)</p> <p><a href="#">Cow Eye Dissection</a> (video, step-by-step virtual dissection, PDF of student lab guide )</p> <p><a href="#">NYSED Bilingual Glossaries</a> – NYS Statewide Language Regional Bilingual Education Resource for NYSED approved bilingual glossaries.</p>				



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<p><b>English Language Learners (ELL) Enhancements</b></p> <p>To access <a href="#">hyperlinked</a> material, you must be logged into your BPS Google Drive</p>	<p><b><u>Listening</u></b></p> <ul style="list-style-type: none"> <li>● <b><u>Cross- Linguistic Practices:</u></b> Gives students opportunities to make connections between what they hear and their home language (ex: allow students to listen to a passage and identify cognates.)</li> <li>● <b><u>Build background knowledge</u></b></li> <li>● <b><u>Activating Prior Knowledge</u></b> means both eliciting from students what they already know and building initial knowledge that they need in order to access upcoming content</li> <li>● <b><u>Visuals</u></b> - GIFs, pictures- assist students in understanding. Use <a href="#">visual thinking strategies</a> to set learning lens</li> <li>● Video to review/ introduce topics– use <a href="#">closed captioning</a> to help students see the words and pronunciations while they listen</li> <li>● <b><u>Word stretching / Vowel stretching</u></b> when instructing allows student to listen closely to the pronunciation of the word</li> <li>● <b><u>Performance Level Descriptors</u></b> - description of expected output from students based on earned NYSESLAT levels in the modality of listening (Scroll for grades 9-12)</li> </ul>	<p><b><u>Speaking</u></b></p> <ul style="list-style-type: none"> <li>● <b><u>Sentence Frames</u></b> - to begin a sentence - such as <i>Evolution is...</i> or <i>I think that evolution is...</i></li> <li>● <b><u>Academic Conversation Starters:</u></b> Have a visual of a list of academic sentence starters that students can refer to in a discussion (helps students have a more science focused dialogue). Examples include- I expect ____ to happen. My data shows that...</li> <li>● <b><u>Choral Reading</u></b> - To build fluency, self-confidence and motivation with <a href="#">reading/speaking</a></li> <li>● Create <a href="#">movement</a> to go with the word. Movement can be a motivating factor, as well as a kinesthetic tool for conceptualizing the rhythm and flow of fluent reading while triggering brain function for optimal learning</li> <li>● <b><u>Performance Level Descriptors</u></b> - description of expected output from students based on earned NYSESLAT levels in the modality of speaking(Scroll for grades 9-12)</li> </ul>	<p><b><u>Reading</u></b></p> <ul style="list-style-type: none"> <li>● <b><u>Supplementary Text</u></b> to help reinforce concepts. If necessarily, use lower Lexile levels to ensure comprehension.</li> <li>● <b><u>Visual Aids</u></b> - Pictures or models to support vocabulary words and concepts</li> <li>● Video to review or introduce a topic - use <a href="#">closed captioning</a> to help students read along while they listen to the content</li> <li>● <b><u>4 Square / Frayer models</u></b> to help students gain a deeper understanding of vocabulary.</li> <li>● <b><u>Highlighting</u></b> important text to assist students in answering questions after the reading.</li> <li>● <b><u>Chunking</u></b>-Break reading of text into chunks or paragraphs</li> <li>● <b><u>Performance Level Descriptors</u></b> - description of expected output from students based on earned NYSESLAT levels in the modality of reading(Scroll for grades 9-12)</li> <li>● <b><u>Vocabulary Morphology</u></b>- Morphology relates to the segmenting of words into affixes (prefixes and suffixes) and roots or base words, and the origins of words. Understanding that words connected by meaning can be connected by spelling can be critical to expanding a student’s vocabulary.</li> </ul>	<p><b><u>Writing</u></b></p> <ul style="list-style-type: none"> <li>● <b><u>Sentence Frames</u></b> - to begin a sentence- such as <i>Biodiversity is...</i> or <i>An example of competition is....</i></li> <li>● <b><u>Cloze passages</u></b> with word banks</li> <li>● <b><u>Word banks</u></b></li> <li>● <b><u>Graphic Organizers</u></b> to help break down the writing process and organize thoughts</li> <li>● <b><u>Standards-based sentence stems</u></b></li> <li>● <b><u>Performance Level Descriptors</u></b> - description of expected output from students based on earned NYSESLAT levels in the modality of writing(Scroll for grades 9-12)</li> </ul>	<p><b><u>Instructional Accommodations (depending on the student’s needs)</u></b></p> <ul style="list-style-type: none"> <li>● <b><u>Extended time</u></b> for tests in class, projects and assignments</li> <li>● <b><u>Directions read.</u></b> Broken down as necessary</li> <li>● <b><u>Model</u></b> how to complete the activity in the lesson</li> <li>● <b><u>Oral simplification</u></b> of directions or questions</li> <li>● <b><u>Translated version</u></b> of test when available. Student may have both version English and native language version</li> <li>● Use of <a href="#">approved bilingual glossaries</a> from NYS in each subject</li> </ul>
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<p><b>Special Education Modifications</b></p> <p>Special Education students must have accommodations as per Individual Educational Plan (IEP)</p>	<p><b><u>Instructional</u></b></p> <ul style="list-style-type: none"> <li>● <b>Pre-teach</b> vocabulary</li> <li>● Use <b>picture vocabulary</b></li> <li>● Scaffold <b>Depth of Knowledge</b> questions</li> <li>● Provide copy of notes/<b>notes in “cloze”</b> form</li> <li>● Use of <b>Think, Pair, and Share</b> strategy to help process information</li> <li>● <b>Scaffold</b> written assignments with the use of <b>graphic organizers</b></li> <li>● Allow for <b>multiple ways to respond</b> (verbal, written, response board)</li> <li>● Provide <b>model of performance task</b></li> <li>● <b>Modify informational text</b> to fit the needs of the students</li> <li>● Provide a digital or paper <b>interactive notebook</b></li> <li>● Present complex <b>tasks in multiple ways</b></li> <li>● Provide <b>mnemonic strategies</b> for Chemistry concepts</li> </ul>	<p><b><u>Technology:</u></b></p> <ul style="list-style-type: none"> <li>● <b>Audio</b> reading of text</li> <li>● <b>Text to type</b> functions</li> <li>● <b>Videos</b> to clarify/visualize Chemistry concepts</li> <li>● <b>Record class lecture/discussions</b> and make accessible to student</li> <li>● <b>Nearpod-</b> interactive presentations of notes</li> <li>● <b>Playposit</b> - show a video clip about the topic and add your own questions for them to answer as they watch</li> <li>● Allow students to type answers in chat on <b>Teams</b></li> </ul> <p><b><u>Other:</u></b></p> <ul style="list-style-type: none"> <li>● Arrange seating for maximum engagement and minimum distraction</li> <li>● Accessible lab space (counter level)</li> </ul>	<p><b><u>In Class Assessments</u></b></p> <ul style="list-style-type: none"> <li>● Provide <b>review packet or review sheet</b> of concepts covered on the test</li> <li>● Practice similar questions prior to the test</li> <li>● Provide <b>multiple options</b> for projects</li> <li>● Give a <b>timeline</b> of when things are due and remind them of the process often.</li> <li>● <b>Use of timer</b> in class</li> <li>● Break all complex tasks into chunks</li> </ul>
<p><b>Step Up to Writing</b></p> <p>Step Up to Writing materials can be found in BPS Science K-12 Schoology Folder 9-12 Resources Chemistry Resources Curriculum Materials</p>	<p><b><u>SUTW Strategy</u></b></p> <ul style="list-style-type: none"> <li>● Informal Outline</li> <li>● Color-Coding – Informative/Explanatory Text</li> <li>● Two-column notes</li> <li>● I-V-F Topic Sentence progressing to Four Step Summary Paragraph</li> <li>● CUPS – Capitalization, Usage, Punctuation, Spelling</li> <li>● Transitions</li> </ul>		
<p><b>Culturally and Linguistically Responsive Teaching (CLRT) in the Science Classroom</b></p>	<p>Materials, resources, and/or discussions address diverse cultural backgrounds and real-world applications</p> <ul style="list-style-type: none"> <li>● Artifacts (posters, charts, etc.) in the science classroom are representative of the cultures of the student population</li> <li>● All students are given an opportunity to engage in science discourse</li> <li>● Teacher demonstrates high expectations for all students</li> </ul> <p>CLRT resources which align to Science content are denoted with a *</p>		