Winslow Township School District

Microbiology Lab CP (Semester Course)

Unit 8: Antimicrobial Drugs

Overview: In this unit students will develop their understanding of antimicrobial drugs and how they are produced and utilized in our world for treating patients. Students are expected to continue to demonstrate proficiency in developing and using models and analyzing and interpreting data from labs conducted in the classroom. Students are also expected to demonstrate their understanding of the core ideas through identification of disorders in case studies based on information learned.

Overview	Standards for Science	Unit Focus	Essential Questions
Unit 8 **Antimicrobial Drugs**	• **HS-LS1-1** • **HS-LS3-1** • **HS-LS3-2** • **HS-ETS1-1** • **WIDA 1, 4**	• Production of antibiotics • Modes of action of antimicrobial drugs • Modes of action of currently used antifungal drugs • Mechanisms of drug resistance • Compare/contrast synergism and antagonism	• How are antibiotics created? • How do antimicrobial drugs act on their corresponding microbes? • Why do antimicrobial drugs act differently than antifungal drugs? • Why is drug resistance a cause of worry for doctors?
Unit 8: Enduring Understandings	• Antibiotics are only those substances that are produced by one microorganism that kill, or prevent the growth, of another microorganism. • The discovery of antimicrobials like penicillin and tetracycline paved the way for better health for millions around the world. • β-Lactam antibiotics are bacteriocidal and act by inhibiting the synthesis of the peptidoglycan layer of bacterial cell walls. • Glycopeptide antibiotics include vancomycin, teicoplanin, telavancin, bleomycin, ramoplanin, and decaplanin. • Glycopeptide antibiotics inhibit the synthesis of cell walls in susceptible microbes by inhibiting peptidoglycan synthesis. • Antimicrobial drugs can have unintended side effects, including being toxic to organs. • The liver and kidney are particularly susceptible to organ toxicity as they are the sites of toxin filtration and toxin metabolic breakdown. • The toxic effects of antimicrobial drugs, while potentially harmful are very rare. • The attachment step is targeted by molecules that will block the receptor on the host cell surface, or on the viral capsid region responsible for binding to the host receptor. • Drugs that target the uncoating step bind to, and inactivate, proteins on the capsid surface responsible for the uncoating. • The release step is targeted by drugs that inhibit the activity of neuraminidase, an enzyme on the viral surface.		

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Curriculum Unit 8	Standards		Pacing	
			Days	Unit Days
Unit 8: **Antimicrobial Drugs**	**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.	3	13
	HS-LS3-1	Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.	2	
	HS-LS3-2	Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors.	2	
	HS-ETS1-1	Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.	2	
	Assessment, Re-teach and Extension		2	
	Final Exam		2	

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Disciplinary Core Ideas	**Indicator #**	**Indicator**
LS1.A: Structure and Function Systems of specialized cells within organisms help them perform the essential functions of life. (HS-LS1-1) 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. (HS-LS1-1) (Note: This Disciplinary Core Idea is also addressed by HS-LS3- 1.) **LS3.A: Inheritance of Traits** Each chromosome consists of a single very long DNA molecule, and each gene on the chromosome is a particular segment of that DNA. The instructions for forming species' characteristics are carried in DNA. All cells in an organism have the same genetic content, but the genes used (expressed) by the cell may be regulated in different way s. Not all DNA codes for a protein; some segments of DNA are involved in regulatory or structural functions, and some have no as-y et known function. (HS-LS3-1) **LS3.B: Variation of Traits** In sexual reproduction, chromosomes can sometimes swap sections during the process of meiosis (cell division), thereby creating new genetic combinations and thus more genetic variation. Although DNA replication is tightly regulated and remarkably accurate, errors do occur and result in mutations, which are also a source of genetic variation. Environmental factors can also cause mutations in genes, and viable mutations are inherited. (HS-LS3-2) Environmental factors also affect expression of traits, and hence affect the probability of occurrences of traits in a population. Thus the variation and distribution of traits observed depends on both genetic and environmental factors. (HS-LS3-2),(HS-LS3-3) **ETS1.A: Defining and Delimiting Engineering Problems** Criteria and constraints also include satisfying any requirements set by society, such as taking issues of risk mitigation into account, and they should be quantified to the extent possible and stated in such a way that one can tell if a given design meets them. (HS-ETS1-1) Humanity faces major global challenges today, such as the need for supplies of clean water and food or for energy sources that minimize pollution, which can be addressed through engineering. These global challenges also may have manifestations in local communities. (HS-ETS1-1)	**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.
	HS-LS1-2	Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
	HS-LS1-3	Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.
	HS-ETS1-1	Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.

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Unit 8 – Microbiology Lab CP	
Assessment Plan	
• Exploratory activities • Warm-up/Ticket Out activities • Class discussions • Student Participation • Teacher Observations • Virtual/Hands-On Labs • Self-Test Assessments • Staining Comparison Chart • Clinical Case Study Analysis	• Quizzes and Tests (Chapter 20/21 of "Microbiology: An Introduction, 11th edition" by Tortora, Funke, and Case) • Authentic assessments and projects • Exploratory activities • Presentations • Lecture Notes • Think-Pair-Share • Graphic Organizers • Study Questions at the end of each chapter • Multiple Choice and Critical Thinking at the end of each chapter
Resources	**Activities**
•Chromebooks •Textbook ("Microbiology: An Introduction, 11thed" Tortora, Funke, and Case) •Web Quests •Virtual Field Trips •Video Streaming •BrainPOP •Puzzlemaker: Game Based Learning | Discovery Education Diversity, Equity & Inclusion Educational Resources https://www.nj.gov/education/standards/dei/	• Use various forms of expository writing-procedural writing, narrative writing, descriptive writing, labeling, as well as to create visuals, graphs, tables, diagrams and charts. • Use scientific argumentation with exercises on writing claims, using evidence to support your claim and explaining the reasoning behind their claim. • Mini-lessons • Independent reading • Films • Website exploration • Discussions, dialogues • Debates • Laboratory experiments • Partner or small group work • Student presentations, reports, journals, reflections • In-class assessments • Written reports, essays, research, and homework

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Instructional Best Practices and Exemplars	
1. Identifying similarities and differences 2. Summarizing and note taking 3. Reinforcing effort and providing recognition 4. Homework and practice 5. Nonlinguistic representations	6. Cooperative learning 7. Setting objectives and providing feedback 8. Generating and testing hypotheses 9. Cues, questions, and advance organizers 10. Manage response rates

9.1 Personal Financial Literacy, 9.2 Career Awareness, Exploration, Preparation and Training & 9.4 Life Literacies and Key Skills

The implementation of the 21st Century skills and standards for students of the Winslow Township District is infused in an interdisciplinary format in a variety of curriculum areas that include, English language Arts, Mathematics, School Guidance, Social Studies, Technology, Visual and Performing Arts, Science, Physical Education and Health, and World Language. Additional opportunities to address 9.1, 9.2 & 9.4:

Philadelphia Mint: https://www.usmint.gov/learn/kids/resources/educational-standards

Different ways to teach Financial Literacy.

https://www.makeuseof.com/tag/10-interactive-financial-websites-teach-kids-money-management-skills/

9.4.12.TL.2: Generate data using formula-based calculations in a spreadsheet and draw conclusions about the data.

9.4.12.TL.4: Collaborate in online learning communities or social networks or virtual worlds to analyze and propose a resolution to a real-world problem (e.g., 7.1.AL.IPERS.6).

9.4.12.IML.7: Develop an argument to support a claim regarding a current workplace or societal/ethical issue such as climate change (e.g., NJSLSA.W1, 7.1.AL.PRSNT.4).

9.4.12.DC.7: Evaluate the influence of digital communities on the nature, content and responsibilities of careers, and other aspects of society (e.g., 6.1.12.CivicsPD.16.a).

9.4.12.DC.4: Explain the privacy concerns related to the collection of data (e.g., cookies) and generation of data through automated processes that may not be evident to users (e.g., 8.1.12.NI.3).

9.4.12.DC.1: Explain the beneficial and harmful effects that intellectual property laws can have on the creation and sharing of content (e.g., 6.1.12.CivicsPR.16.a).

9.4.12.DC.2: Compare and contrast international differences in copyright laws and ethics.

9.4.12.CT.1: Identify problem-solving strategies used in the development of an innovative product or practice (e.g., 1.1.12acc.C1b, 2.2.12.PF.3).

9.4.12.CT.2: Explain the potential benefits of collaborating to enhance critical thinking and problem solving (e.g., 1.3E.12profCR3.a).

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Modifications for Special Education/504

Students with special needs: The students' needs will be addressed on an individual and grade level using a variety of modalities. Accommodations will be made for those students who need extra time to complete assignment. Support staff will be available to aid students related to IEP specifications. 504 accommodations will also be attended to by all instructional leaders. Physical expectations and modifications, alternative assessments, and scaffolding strategies will be used to support this learning. The use of Universal Design for Learning (UDL) will be considered for all students as teaching strategies are considered.

- Small group instruction
- Audio books/ Text-to-speech platforms
- Leveled texts/Vocabulary Readers
- Leveled informational texts via online
- Modeling and guided practice
- Read directions aloud
- Repeat, rephrase and clarify directions
- Extended time as needed
- Break down assignments into smaller units
- Provide shortened assignments
- Modify testing format
- Repeat directions as needed
- Graphic organizers
- Study Guides, Study Aids and Re teaching as needed

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Modifications for At-Risk Students
Formative and summative data will be used to monitor student success. At first signs of failure, student work will be reviewed to determine support. This may include parent consultation, basic skills review and differentiation strategies. With considerations to UDL, time may be a factor in overcoming developmental considerations • Audio books and Text-to-speech platforms • Leveled texts/Vocabulary Readers • Leveled informational texts via online • Extended time as needed • Read directions aloud • Assist with organization • Use of computer • Emphasize/highlight key concepts • Recognize success • Provide timelines for work completion • Break down multi-step tasks into smaller chunks • Provide copy of class notes and graphic organizer

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English Language Learners	Modifications for Gifted Students

All WIDA Can Do Descriptors can be found at this link:
https://wida.wisc.edu/teach/can-do/descriptors
Grades 9-12 WIDA Can Do Descriptors...
Listening…
• Process recounts by…
  ○ Categorizing perspectives of multiple speakers
  ○ Identifying important information on specific event & concept from lecture/presentation
• Process explanations by…
  ○ Recognizing specific language used to enhance clarity and precision
  ○ Recognizing and following language related to the same event or phenomenon throughout presentations
• Process arguments by…
  ○ Identifying strengths, limitations, and potential biases from oral presentations
  ○ Organizing claims and counter claims presented in debates
Speaking…
• Recount by…
  ○ Adjusting presentation style, degree of formality, word choice, tone, and information to the context and audience
  ○ Presenting information that follows discipline specific organization (e.g., orientation to topic, sequence of events, conclusion)
• Explain by…
  ○ Providing precision and accuracy in classifications, procedures, processes, and accounts using abstraction, technical language, and a variety of active/passive verb forms
  ○ Following discipline-specific organization (e.g., orienting the reader, details, conclusion) and supporting presentations with graphs, formulas, quotes or other media
• Argue by…
  ○ Organizing claims and counter claims in debates with evidence from multiple sources
  ○ Negotiating differing cultural perspectives in pairs or small groups
Reading…
• Process recounts by…
  ○ Analyzing and comparing how authors use language for specific purposes and audiences
  ○ Identifying how authors develop and maintain cohesion by connecting ideas or events in extended texts
• Process explanations by…
  ○ Recognizing discipline-specific patterns (e.g., orienting the reader, part-whole classification, neutral/ authoritative tone)
  ○
	Students excelling in mastery of standards will be challenged with complex, high level challenges related to the topic.
	• Raise levels of intellectual demands
	• Require higher order thinking, communication, and leadership skills
	• Differentiate content, process, or product according to student's readiness, interests, and/or learning styles
	• Provide higher level texts
	• Expand use of open-ended, abstract questions
	• Critical and creative thinking activities that provide an emphasis on research and in-depth study
	• Enrichment Activities/Project-Based Learning/ Independent Study
	
	Additional Strategies may be located at the links:
	❖ Gifted Programming Standards
	❖ Webb's Depth of Knowledge Levels and/or Revised Bloom's Taxonomy
	❖ REVISED Bloom's Taxonomy Action Verbs

- Identifying authors' precision and accuracy in classifications, comparisons, accounts, or procedures as a result of clear language choices

- Process arguments by…
  - Evaluating word choice and nuance as tools for distinguishing facts, claims, reasoned judgment, and opinions
  - Identifying the logical connections among claims, counterclaims, reasons, and evidence

Writing…

- Recount by…
  - Summarizing content-related notes from lectures or readings
  - Producing research reports using multiple sources of information
- Explain by…
  - Developing ideas about phenomena with relevant and sufficient facts, extended descriptions, concrete details, or quotations
  - Maintaining discipline-specific patterns that bridge across key uses (e.g., explanation to argument in history, explanation to recount for information reports)
- Argue by…
  - Evaluating positive and negative implications associated with various positions (e.g., historical events, scientific discoveries, individuals)
  - Organizing information logically and coherently to represent contrasting views

Oral Language…

- Discuss by…
  - Identifying and reacting to subtle differences in speech and register (e.g., hyperbole, satire, comedy)
  - Producing coherent oral discourse appropriate to task, purpose, and audience
  - Synthesizing and sharing information from a variety of sources and perspectives

Students will be provided with accommodations and modifications that may include:

- Relate to and identify commonalities in Social Studies and science in student's home country
- Assist with organization
- Use of computer
- Emphasize/highlight key concepts
- Teacher Modeling
- Peer Modeling
- Label Classroom Materials - Word Walls

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Interdisciplinary Connections

English Language Arts/Literacy

1. Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. **RST.11-12.1** (HS-LS2-1),(HS-LS2-2),(HS-LS2-6)
2. 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. **RST.11-12.7** (HS-LS2-6)
3. 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. **RST.11-12.8** (HS-LS2-6)
4. 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. **RST.11-12.9** (HS-ETS1-1),(HS-ETS1-3)
5. Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. **WHST.9-12.2** (HS-LS2-1),(HS-LS2-2)
6. 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. **WHST.9-12.7** (HS-LS1-3)
7. 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. **WHST.11-12.8** (HS-LS1-3)
8. Draw evidence from informational texts to support analysis, reflection, and research. **WHST.9-12.9** (HS-LS1-1)
9. **WIDA Standards 1** English language learners communicate for social and instructional purposes within the school setting
10. **WIDA Standards 4** English language learners communicate information, ideas, and concepts necessary for academic success in the content area of science
11. Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. **SL.11-12.5** (HS-LS1-2)

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Mathematics

1. Reason abstractly and quantitatively. **MP.2** (HS-LS2-1),(HS-LS2-2),(HS-LS2-6)
2. Model with mathematics. **MP.4 (**HS-LS2-1),(HS-LS2-2)
3. Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays**. HSN.Q.A.1** (HS-LS2-1),(HS-LS2-2)
4. Define appropriate quantities for the purpose of descriptive modeling. **HSN.Q.A.2** (HS-LS2-1),(HS-LS2-2)
5. Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. **HSN.Q.A.3** (HS-LS2-1),(HS-LS2-2)
6. Represent data with plots on the real number line. HSS-ID.A.1 (HS-LS2-6)
7. Understand statistics as a process for making inferences about population parameters based on a random sample from that population. **HSS-IC.A.1** (HS-LS2-6)

Integration of Computer Science and Design Thinking NJSLS 8

- 8.2.12.EC.2: Assess the positive and negative impacts of emerging technologies on developing countries and evaluate how individuals, non-profit organizations, and governments have responded.
- 8.2.12.ETW.1: Evaluate ethical considerations regarding the sustainability of environmental resources that are used for the design, creation, and maintenance of a chosen product.
- 8.2.12.ETW.2: Synthesize and analyze data collected to monitor the effects of a technological product or system on the environment.
- 8.2.12.ETW.3: Identify a complex, global environmental or climate change issue, develop a systemic plan of investigation, and propose an innovative sustainable solution.
- 8.2.12.ED.5: Evaluate the effectiveness of a product or system based on factors that are related to its requirements, specifications, and constraints (e.g., safety, reliability, economic considerations, quality control, environmental concerns, manufacturability, maintenance and repair, ergonomics).
- 8.2.12.ED.6: Analyze the effects of changing resources when designing a specific product or system (e.g., materials, energy, tools, capital, labor).
- 8.2.12.ED.4: Design a product or system that addresses a global problem and document decisions made based on research, constraints, trade-offs, and aesthetic and ethical considerations and share this information with an appropriate audience.