

	Name of Course: Toxicology
Unit 1	Introduction & History
Essential Question	What is toxicology? What are examples of historical events that involve toxicology?
Science Standards	<i>HS-LS2-7. Analyze direct and indirect effects of human activities on biodiversity and ecosystem health, specifically habitat fragmentation, introduction of non-native or invasive species, overharvesting, pollution, and climate change. Evaluate and refine a solution for reducing the impacts of human activities on biodiversity and ecosystem health. *</i> <i>Examples of solutions can include captive breeding programs, habitat restoration, pollution mitigation, energy conservation, and ecotourism.</i>
POG	1. Prepared for life after graduation a. I can set meaningful goals and effectively work towards them b. I can problem solve independently and collaboratively c. I can deal with setbacks and move forward d. I can build on my knowledge and experiences to be a lifelong learner 2. Literate across all disciplines a. I can access and evaluate information from multiple sources b. I can actively listen and respond appropriately c. I can communicate my ideas succinctly and clearly d. I can ask a variety of questions to direct my own learning and growth e. I can find and engage in texts/books that interest me 3. Creative, Collaborative, Problem Solver a. I can solve a problem in a variety of ways b. I can come up with ideas that are original and/or unique c. I can effectively collaborate with group members to works towards a common goal d. I can play different roles in a group and accept ideas that don't always align with my own e. I can support my ideas ethically by incorporating evidence from verified sources 4. 5. Socially, Emotionally & Physically Well a. I can communicate my needs, ask question and advocate for others b. I can approach challenges with a positive mindset c. I can be empathetic and accepting of myself and others d. I can participate in fulfilling activities and interests and develop healthy habits in and out of the classroom

Cross-Cutting Concepts		Skills: Science Practices	
1. 2. Cause & Effect 3. Systems & Systems Models 4. Energy and Matter: Flows, Cycles, and Conservation 5. 6. Stability and Change 7. Interdependence of Science, Engineering, and Technology 8. Influence of Engineering, Technology, and Science on Society and the Natural World		1. Asking questions 2. 3. Analyzing and interpreting data 4. 5. Constructing explanations 6. Engaging in argument from evidence 7. Obtaining, evaluating, and communicating information.	
Content Objectives "I can . . . " Statements	I can source reliable information on an assigned historical case study I can present relevant information pertaining to a related novel case I can evaluate whether or not the assigned case relates to the novel case		
Formative Practice	Students evaluate their knowledge on toxicology vocabulary and chemicals Students research case studies and their effect on public policy		
Summative Assessment	Toxicology Intro: What is a chemical? Molecular Murders: Presentation of Case Study (Collaborative Project)		
Text, Materials, and Resources	01 History		

Unit 02	Understanding Hazard and Risk
Essential Question	How bad is it?
Science Standards	<i>HS-ESS2-5. Describe how the chemical and physical properties of water are important in mechanical and chemical mechanisms that affect Earth materials and surface processes.</i> <i>Examples of mechanical mechanisms involving water include stream transportation and deposition, erosion using variations in soil moisture content, and frost wedging by the expansion of water as it freezes.</i> <i>Examples of chemical mechanisms involving water include chemical weathering and recrystallization (based on solubility of different materials) and melt generation (based on water lowering the melting temperature of most solids).</i> <i>HS-ESS2-6. Use a model to describe cycling of carbon through the ocean, atmosphere, soil, and biosphere and how increases in carbon dioxide concentrations due to human activity have resulted in atmospheric and climate changes.</i> <i>HS-ESS3-1. Construct an explanation based on evidence for how the availability of key natural resources and changes due to variations in climate have influenced human activity.</i> <i>Examples of key natural resources include access to fresh water (such as rivers, lakes, and groundwater), regions of fertile soils (such as river deltas), high concentrations of minerals and fossil fuels, and biotic resources (such as fisheries and forests).</i> <i>Examples of changes due to variations in climate include changes to sea level and regional patterns of temperature and precipitation.</i> <i>HS-ESS3-2. Evaluate competing design solutions for minimizing impacts of developing and using energy and mineral resources, and conserving and recycling those resources, based on economic, social, and environmental cost-benefit ratios.</i> <i>HS-LS1-2. Develop and use a model to illustrate the key functions of animal body systems, including (a) food digestion, nutrient uptake, and transport through the body; (b) exchange of oxygen and carbon dioxide; (c) removal of wastes; and (d) regulation of body processes.</i> <i>Emphasis is on the primary function of the following body systems (and structures): digestive (mouth, stomach, small intestine [villi], large intestine, pancreas), respiratory (lungs [alveoli], diaphragm), circulatory (heart, veins, arteries, capillaries), excretory (kidneys, liver, skin), and nervous (neurons, brain, spinal cord).</i> <i>HS-LS1-3. Provide evidence that homeostasis maintains internal body conditions through both bodywide feedback mechanisms and small-scale cellular processes.</i> <i>Feedback mechanisms include the promotion of a stimulus through positive feedback (e.g., injured tissues releasing chemicals in blood that activate platelets to facilitate blood clotting), and the inhibition of stimulus through negative feedback (e.g., insulin reducing high blood glucose to normal levels).</i>

	<i>Cellular processes include (a) passive transport and active transport of materials across the cell membrane to maintain specific concentrations of water and other nutrients in the cell and (b) the role of lysosomes in recycling wastes, macromolecules, and cell parts into monomers.</i> <i>HS-LS2-6. Analyze data to show ecosystems tend to maintain relatively consistent numbers and types of organisms even when small changes in conditions occur but that extreme fluctuations in conditions may result in a new ecosystem. Construct an argument supported by evidence that ecosystems with greater biodiversity tend to have greater resistance to change and resilience.</i> <i>Examples of changes in ecosystem conditions could include modest biological or physical changes, such as moderate hunting or a seasonal flood; and extreme changes, such as volcanic eruption, fires, the decline or loss of a keystone species, climate changes, ocean acidification, or sea level rise.</i> <i>HS-LS2-7. Analyze direct and indirect effects of human activities on biodiversity and ecosystem health, specifically habitat fragmentation, introduction of non-native or invasive species, overharvesting, pollution, and climate change. Evaluate and refine a solution for reducing the impacts of human activities on biodiversity and ecosystem health.</i> <i>Examples of solutions can include captive breeding programs, habitat restoration, pollution mitigation, energy conservation, and ecotourism.</i>
POG	1. Prepared for life after graduation a. I can set meaningful goals and effectively work towards them b. I can problem solve independently and collaboratively c. I can deal with setbacks and move forward d. I can build on my knowledge and experiences to be a lifelong learner 2. Literate across all disciplines a. I can access and evaluate information from multiple sources b. I can actively listen and respond appropriately c. I can communicate my ideas succinctly and clearly d. I can ask a variety of questions to direct my own learning and growth e. I can find and engage in texts/books that interest me 3. Creative, Collaborative, Problem Solver a. I can solve a problem in a variety of ways b. I can come up with ideas that are original and/or unique c. I can effectively collaborate with group members to works towards a common goal d. I can play different roles in a group and accept ideas that don't always align with my own e. I can support my ideas ethically by incorporating evidence from verified sources 4. 5. Socially, Emotionally & Physically Well a. I can communicate my needs, ask question and advocate for others b. I can approach challenges with a positive mindset

	c. I can be empathetic and accepting of myself and others d. I can participate in fulfilling activities and interests and develop healthy habits in and out of the classroom	
	Cross-Cutting Concepts	Skills: Science Practices
	1. 2. Cause & Effect 3. Scale, Proportion & Quantity 4. 5. Energy and Matter: Flows, Cycles, and Conservation 6. 7. 8. Interdependence of Science, Engineering, and Technology 9. Influence of Engineering, Technology, and Science on Society and the Natural World	1. Asking questions 2. 3. Planning and carrying out investigations 4. Analyzing and interpreting data 5. 6. Constructing explanations 7. Engaging in argument from evidence 8. Obtaining, evaluating, and communicating information.
Content Objectives "I can . . . " Statements	I can analyze data from a Safety Data Sheet SDS I can perform a risk assessment I can evaluate if a product should be banned and suggest chemical alternatives.	
Formative Practice	Discussion during Hazard and Risk presentation Assessing Chemical Hazards & Chemical Alternative Students will assess household product hazards	
Summative Assessment	Data Presentation Assessing Chemical Hazards Data Presentation Compare a Product with its Proposed Alternative	
Text, Materials, and Resources	 02 Understanding Hazard and Risk	

Unit 3	Toxicokinetics and Toxicodynamics
Essential Question	What is the process by which a substance enters the body and how does the substance affect the body?
Science Standards	<i>HS-LS1-2. Develop and use a model to illustrate the key functions of animal body systems, including (a) food digestion, nutrient uptake, and transport through the body; (b) exchange of oxygen and carbon dioxide; (c) removal of wastes; and (d) regulation of body processes. Emphasis is on the primary function of the following body systems (and structures): digestive (mouth, stomach, small intestine [villi], large intestine, pancreas), respiratory (lungs [alveoli], diaphragm), circulatory (heart, veins, arteries, capillaries), excretory (kidneys, liver, skin), and nervous (neurons, brain, spinal cord).</i> <i>HS-LS1-3. Provide evidence that homeostasis maintains internal body conditions through both bodywide feedback mechanisms and small-scale cellular processes. Feedback mechanisms include the promotion of a stimulus through positive feedback (e.g., injured tissues release chemicals in blood that activate platelets to facilitate blood clotting), and the inhibition of stimulus through negative feedback (e.g., insulin reducing high blood glucose to normal levels). Cellular processes include (a) passive transport and active transport of materials across the cell membrane to maintain specific concentrations of water and other nutrients in the cell and (b) the role of lysosomes in recycling wastes, macromolecules, and cell parts into monomers.</i>
POG	- Prepared for life after graduation - I can set meaningful goals and effectively work towards them - I can problem solve independently and collaboratively - I can deal with setbacks and move forward - I can build on my knowledge and experiences to be a lifelong learner - Literate across all disciplines - I can access and evaluate information from multiple sources - I can actively listen and respond appropriately - I can communicate my ideas succinctly and clearly - I can ask a variety of questions to direct my own learning and growth - I can find and engage in texts/books that interest me - Creative, Collaborative, Problem Solver - I can solve a problem in a variety of ways - I can come up with ideas that are original and/or unique - I can effectively collaborate with group members to works towards a common goal - I can play different roles in a group and accept ideas that don't always align with my own - I can support my ideas ethically by incorporating evidence from verified sources - Socially, Emotionally & Physically Well

	a. I can communicate my needs, ask question and advocate for others b. I can approach challenges with a positive mindset c. I can be empathetic and accepting of myself and others d. I can participate in fulfilling activities and interests and develop healthy habits in and out of the classroom	
	Cross-Cutting Concepts	Science Skill & Practices
	1. Cause & Effect 2. Scale, Proportion & Quantity 3. Systems & Systems Models 4. Energy and Matter: Flows, Cycles, and Conservation 5. Structure and Function. 6. 7. Interdependence of Science, Engineering, and Technology 8. Influence of Engineering, Technology, and Science on Society and the Natural World	1. Asking questions 2. 3. Analyzing and interpreting data 4. Using mathematics and computational thinking 5. Constructing explanations 6. Engaging in argument from evidence 7. Obtaining, evaluating, and communicating information.
Content Objectives "I can . . . " Statements	I can collect information on a specific target organ system I can analyze the structure, function(s), weaknesses, and importance of the system I can present my findings in both written abstract and oral presentation	
Formative Practice	Students will obtain information re: ADME from Toxicokinetics presentation Students will research a substance toxicity on an organ system	
Summative Assessment	Target Organ Talks	
Text, Materials, and Resources	 03 ToxioK & ToxioD	

Unit 4	Environmental Toxicology
Essential Question	How is the environment impacted by toxins? How can the impact be addressed?
Science Standards	<i>HS-ESS2-5. Describe how the chemical and physical properties of water are important in mechanical and chemical mechanisms that affect Earth materials and surface processes.</i> <i>Examples of mechanical mechanisms involving water include stream transportation and deposition, erosion using variations in soil moisture content, and frost wedging by the expansion of water as it freezes.</i> <i>Examples of chemical mechanisms involving water include chemical weathering and recrystallization (based on solubility of different materials) and melt generation (based on water lowering the melting temperature of most solids).</i> <i>HS-ESS2-6. Use a model to describe cycling of carbon through the ocean, atmosphere, soil, and biosphere and how increases in carbon dioxide concentrations due to human activity have resulted in atmospheric and climate changes.</i> <i>HS-ESS3-1. Construct an explanation based on evidence for how the availability of key natural resources and changes due to variations in climate have influenced human activity.</i> <i>Examples of key natural resources include access to fresh water (such as rivers, lakes, and groundwater), regions of fertile soils (such as river deltas), high concentrations of minerals and fossil fuels, and biotic resources (such as fisheries and forests).</i> <i>Examples of changes due to variations in climate include changes to sea level and regional patterns of temperature and precipitation.</i> <i>HS-ESS3-3. Illustrate relationships among management of natural resources, the sustainability of human populations, and biodiversity.</i> <i>Examples of factors related to the management of natural resources include costs of resource extraction and waste management, per capita consumption, and the development of new technologies.</i> <i>Examples of factors related to human sustainability include agricultural efficiency, levels of conservation, and urban planning. • Examples of factors related to biodiversity include habitat use and fragmentation, and land and resource conservation.</i> <i>HS-ESS3-5. Analyze results from global climate models to describe how forecasts are made of the current rate of global or regional climate change and associated future impacts to Earth systems.</i> <i>Climate model outputs include both climate changes (such as precipitation and temperature) and associated impacts (such as on sea level, glacial ice volumes, and atmosphere and ocean composition).</i> <i>HS-LS2-6. Analyze data to show ecosystems tend to maintain relatively consistent numbers and types of organisms even when small changes in conditions occur but that extreme fluctuations in conditions may result in a new ecosystem. Construct an argument supported by evidence that ecosystems with greater biodiversity tend to have greater resistance to change and resilience.</i>

	<i>Examples of changes in ecosystem conditions could include modest biological or physical changes, such as moderate hunting or a seasonal flood; and extreme changes, such as volcanic eruption, fires, the decline or loss of a keystone species, climate changes, ocean acidification, or sea level rise.</i> <i>HS-LS2-7. Analyze direct and indirect effects of human activities on biodiversity and ecosystem health, specifically habitat fragmentation, introduction of non-native or invasive species, overharvesting, pollution, and climate change. Evaluate and refine a solution for reducing the impacts of human activities on biodiversity and ecosystem health.*</i> <i>Examples of solutions can include captive breeding programs, habitat restoration, pollution mitigation, energy conservation, and ecotourism.</i>	
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Cross-Cutting Concepts		Science Skill & Practices
1. 2. Cause & Effect		1. Asking questions 2. Developing and using models

3. Scale, Proportion & Quantity 4. Systems & Systems Models 5. Energy and Matter: Flows, Cycles, and Conservation 6. 7. Stability and Change 8. Interdependence of Science, Engineering, and Technology 9. Influence of Engineering, Technology, and Science on Society and the Natural World	3. Planning and carrying out investigations 4. Analyzing and interpreting data 5. 6. Constructing explanations 7. Engaging in argument from evidence 8. Obtaining, evaluating, and communicating information.
Content Objectives "I can . . . " Statements	I can give examples/cases of how air pollution endangers human health. I can give examples of water pollutants and their sources I can explain the impact of water pollution on health I can cite evidence for climate change I can explain the link between climate change and air pollution I can list and explain some mechanisms of chemical transport
Formative Practice	Students will research Air Pollution, Water Pollution, Climate Change Students will research Environmental Transport and Fate
Summative Assessment	Students will choose one type of pollution and one specific issue to present to the class. Students will determine a solution for the issue, and the economic impact of their solution.
Text, Materials, and Resources	📌 04 Environmental Tox

Unit 5	Ecotoxicology
Essential Question	How do toxins affect Ecological systems?
Science Standards	<i>HS-ESS2-5. Describe how the chemical and physical properties of water are important in mechanical and chemical mechanisms that affect Earth materials and surface processes.</i> <i>Examples of mechanical mechanisms involving water include stream transportation and deposition, erosion using variations in soil moisture content, and frost wedging by the expansion of water as it freezes.</i> <i>Examples of chemical mechanisms involving water include chemical weathering and recrystallization (based on solubility of different materials) and melt generation (based on water lowering the melting temperature of most solids).</i> <i>HS-ESS2-6. Use a model to describe cycling of carbon through the ocean, atmosphere, soil, and biosphere and how increases in carbon dioxide concentrations due to human activity have resulted in atmospheric and climate changes.</i> <i>HS-ESS3-1. Construct an explanation based on evidence for how the availability of key natural resources and changes due to variations in climate have influenced human activity.</i> <i>Examples of key natural resources include access to fresh water (such as rivers, lakes, and groundwater), regions of fertile soils (such as river deltas), high concentrations of minerals and fossil fuels, and biotic resources (such as fisheries and forests).</i> <i>Examples of changes due to variations in climate include changes to sea level and regional patterns of temperature and precipitation.</i> <i>HS-ESS3-2. Evaluate competing design solutions for minimizing impacts of developing and using energy and mineral resources, and conserving and recycling those resources, based on economic, social, and environmental cost-benefit ratios.</i> <i>HS-ESS3-3. Illustrate relationships among management of natural resources, the sustainability of human populations, and biodiversity.</i> <i>Examples of factors related to the management of natural resources include costs of resource extraction and waste management, per capita consumption, and the development of new technologies.</i> <i>Examples of factors related to human sustainability include agricultural efficiency, levels of conservation, and urban planning.</i> <i>Examples of factors related to biodiversity include habitat use and fragmentation, and land and resource conservation.</i> <i>HS-ESS3-5. Analyze results from global climate models to describe how forecasts are made of the current rate of global or regional climate change and associated future impacts to Earth systems.</i> <i>Climate model outputs include both climate changes (such as precipitation and temperature) and associated impacts (such as on sea level, glacial ice volumes, and atmosphere and ocean composition).</i>

	<i>HS-LS2-6. Analyze data to show ecosystems tend to maintain relatively consistent numbers and types of organisms even when small changes in conditions occur but that extreme fluctuations in conditions may result in a new ecosystem. Construct an argument supported by evidence that ecosystems with greater biodiversity tend to have greater resistance to change and resilience.</i> <i>Examples of changes in ecosystem conditions could include modest biological or physical changes, such as moderate hunting or a seasonal flood; and extreme changes, such as volcanic eruption, fires, the decline or loss of a keystone species, climate changes, ocean acidification, or sea level rise.</i> <i>HS-LS2-7. Analyze direct and indirect effects of human activities on biodiversity and ecosystem health, specifically habitat fragmentation, introduction of non-native or invasive species, overharvesting, pollution, and climate change. Evaluate and refine a solution for reducing the impacts of human activities on biodiversity and ecosystem health.</i> <i>Examples of solutions can include captive breeding programs, habitat restoration, pollution mitigation, energy conservation, and ecotourism.</i>
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Cross-Cutting Concepts	Science Skill & Practices

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Content Objectives "I can . . . " Statements	I can evaluate importance of ecotoxicology to sustainability I can explain why sublethal responses to a chemical important I can analyze and interpret parabens ecotoxicity data. I can give evidence explaining why Ecotoxicology is much more challenging than human toxicology.
Formative Practice	Students research and analyze data regarding ecotoxicology. Students compare ecotoxicology with environmental toxicology Students assess greener solutions
Summative Assessment	Case Study with parabens and log P
Text, Materials, and Resources	 05 Ecotox

Unit 6	Student choice topic and presentation
Essential Question	What is of importance to me? What can I do?
Science Standards	<i>HS-ESS2-5. Describe how the chemical and physical properties of water are important in mechanical and chemical mechanisms that affect Earth materials and surface processes.</i> <i>Examples of mechanical mechanisms involving water include stream transportation and deposition, erosion using variations in soil moisture content, and frost wedging by the expansion of water as it freezes.</i> <i>Examples of chemical mechanisms involving water include chemical weathering and recrystallization (based on solubility of different materials) and melt generation (based on water lowering the melting temperature of most solids).</i> <i>HS-ESS2-6. Use a model to describe cycling of carbon through the ocean, atmosphere, soil, and biosphere and how increases in carbon dioxide concentrations due to human activity have resulted in atmospheric and climate changes.</i> <i>HS-ESS3-1. Construct an explanation based on evidence for how the availability of key natural resources and changes due to variations in climate have influenced human activity.</i> <i>Examples of key natural resources include access to fresh water (such as rivers, lakes, and groundwater), regions of fertile soils (such as river deltas), high concentrations of minerals and fossil fuels, and biotic resources (such as fisheries and forests).</i> <i>Examples of changes due to variations in climate include changes to sea level and regional patterns of temperature and precipitation.</i> <i>HS-ESS3-2. Evaluate competing design solutions for minimizing impacts of developing and using energy and mineral resources, and conserving and recycling those resources, based on economic, social, and environmental cost-benefit ratios.</i> <i>HS-ESS3-3. Illustrate relationships among management of natural resources, the sustainability of human populations, and biodiversity.</i> <i>Examples of factors related to the management of natural resources include costs of resource extraction and waste management, per capita consumption, and the development of new technologies.</i> <i>Examples of factors related to human sustainability include agricultural efficiency, levels of conservation, and urban planning.</i> <i>Examples of factors related to biodiversity include habitat use and fragmentation, and land and resource conservation.</i> <i>HS-ESS3-5. Analyze results from global climate models to describe how forecasts are made of the current rate of global or regional climate change and associated future impacts to Earth systems.</i> <i>Climate model outputs include both climate changes (such as precipitation and temperature) and associated impacts (such as on sea level, glacial ice volumes, and atmosphere and ocean composition).</i> <i>HS-LS1-2. Develop and use a model to illustrate the key functions of animal body systems, including (a) food digestion, nutrient uptake, and transport through the body; (b) exchange of oxygen and carbon dioxide; (c) removal of wastes; and (d) regulation of body processes.</i>

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	d. I can play different roles in a group and accept ideas that don’t always align with my own e. I can support my ideas ethically by incorporating evidence from verified sources 4. Civically Engaged a. I can engage in activities that better my community and it's members b. I can communicate effectively and respectfully within diverse groups c. I can identify my place in the world, acknowledge and respect cultural differences, and recognize our shared humanity d. I can participate in school and community programs to build my knowledge around global issues and solutions e. I can take action to fulfill my civil responsibilities 5. Socially, Emotionally & Physically Well a. I can communicate my needs, ask question and advocate for others b. I can approach challenges with a positive mindset c. I can be empathetic and accepting of myself and others d. I can participate in fulfilling activities and interests and develop healthy habits in and out of the classroom		
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Content Objectives "I can . . . “ Statements	I can research, evaluate sources and present on a topic that is important to me		
Formative Practice	Student research		
Summative Assessment	Presentation		
Text, Materials, and Resources	Student Led		

