

Unit 2: Water Quality Aquarium Science Honors

20 Class Meetings

Rev. June 2026

Essential Questions

- What water quality conditions need to exist for an aquarium to be healthy?

Enduring Understandings with Unit Goals

EU 1: Unchecked water quality parameters can lead to an unhealthy aquarium.

- Evaluate the water quality parameters in an aquarium.

EU 2: Various equipment and products are used to maintain optimal water parameters.

- Identify products that can stabilize water quality parameters in an aquarium.
- Analyze water quality based on the use of analytical equipment.
- Solve problems associated with incorrect/unbalanced water quality parameters.

Standards

Common Core State Standards

- **CCSS.ELA-LITERACY.RST.6-8.1** Cite specific textual evidence to support analysis of science and technical texts.
- **CCSS.ELA-LITERACY.RST.6-8.3** Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.
- **CCSS.ELA-LITERACY.RST.6-8.4** 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 6-8 texts and topics.

Next Generation Science Standards

- **MS-ETS1-3 Engineering Design** Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.
- **MS-LS2-3 Ecosystems: Interactions, Energy, and Dynamics** Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.

Unit 2: Water Quality
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ISAAC Vision of the Graduate Competencies

Competency 1: Write effectively for a variety of purposes.

Competency 2: Speak to diverse audiences in an accountable manner.

Competency 3: Develop the behaviors needed to interact and contribute with others on a team.

Competency 4: Analyze and solve problems independently and collaboratively.

Competency 5: Be responsible, creative, and empathetic members of the community

Unit Content Overview

- Importance of Water Changes and Testing Methods
 - Importance of water changes
 - Various methods of testing water quality parameters
- Nitrogen Cycle
 - New Tank Syndrome
 - Ammonia - Nitrogen cycle
 - Nitrite
 - Nitrate
 - Ammonia burns in fish
- pH
 - pH water parameters for freshwater and saltwater
 - pH water lab
 - How to adjust when necessary- Alkalinity
- Thermoregulation
 - Endo and ectothermic animals
 - Temperature control
 - Fish respiration lab
 - Chillers
 - Acclimation
- Phosphates
 - What is phosphate and how to manage it

Key Terms and Vocabulary:

Filtration, mechanical, biological, chemical, biomedica, nitrogen, nitrate, nitrite, ammonia, nitrosomonas, nitrobacter, cycling, “new tank syndrome”, water quality, parameters, ppt, ppm, pH, alkaline, basic, acidic, neutral, nitrification, buffer, range, alkalinity, reverse osmosis, semipermeable, deionization, thermoregulation, homeostasis, ectotherm, endotherm, metabolism, chiller, thermometer, heater, submersible, phosphate, acclimate, contamination

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Interdisciplinary Connections: Language Arts, Mathematics, Science

Daily Learning Objectives with *TWPS*

Students will be able to...

- Continuously monitor daily operations of aquaria
 - *What needs to be completed each day to make sure our fish are healthy?*
- Connect the nitrogen cycle to the aquarium environment
 - *How can the nitrogen cycle affect our animals?*
 - *What is the role of bacteria in the nitrogen cycle within an aquarium?*
- Explain why “new tank syndrome” happens to all aquarium systems
 - *What is new tank syndrome and why does it happen?*
- Explain the effect of pH on organisms’ health
 - *How can pH impact our organisms?*
 - *How can pH be measured and fixed if out of range?*
 - *How does alkalinity influence pH?*
- Explain the effect of temperature on organisms’ health*
 - *How can temperature impact our organisms?*
 - *How do organisms thermoregulate their body temperatures?*
 - *What are the differences between ectothermic and endothermic?*
- Understand the importance of reverse osmosis for saltwater systems
 - How does reverse osmosis work?
 - Why is it important to use reverse osmosis water for saltwater aquariums?
- Utilize their understanding of water quality to solve problems related to poor conditions
 - *How can water quality affect animal health?*
 - *How do you complete a water change for an aquarium?*
- Create a protocol that will allow an aquarist to keep track of water quality parameters
 - *How does frequent testing assist an aquarist to actively monitor water quality in an aquarium?*
- Assess the importance of various life support equipment to influence water quality
 - *What equipment is available to keep water parameters in range?*
- Analyze issues within an aquarium to identify potential problems
 - *What are some common problems that occur with aquariums that an aquarist should look for?*
- Explain how phosphate levels influence algae growth
 - *How can phosphate levels impact algae growth in an aquarium?*
- Create a solution to common problems affecting aquarium
 - *How can you create a solution when a problem occurs with your aquarium?*
- Communicate results of an aquarium investigation to the customer
 - *Explain to a customer the reason their fish died using the scenario given.*

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Instructional Strategies/Differentiated Instruction

- Daily Warm Up Activities
- Power Point Lecture with guided note-taking
- Flexible grouping
- Exit slips
- Graphic Organizers
- Creating authentic connections for students
- Rephrasing and restatement of information and concepts
- Student use of headphones
- Independent reading
- Outlining of text
- Aquarium Spotlight Organism of the Week
- Determining central ideas, paraphrasing
- Laboratory Experiences

Assessments

FORMATIVE ASSESSMENTS:

- Warm Up Activities
- Daily check-ins with students
- pH water quality check (weekly)
- pH water test lab
- Temperature and Salinity tests (daily)
- Nitrate, Nitrite, and Ammonia parameter checks (weekly)
- Homework/Reading checks
- Aquarium Spotlight Organism of the Week
- Aquarium Audit (Recording Keeping Logs)- ISAAC Teamwork Rubric 3
- Quarantine Procedure Discussion

SUMMATIVE ASSESSMENTS:

- Quiz for EU1
- Quiz for EU2
- Test for Stress Unit Task
- Unit Test (EU1 and EU2)

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Unit Task

Unit Task Name: Test for Stress

Description: Students will test 3 mystery water samples and use their knowledge of water quality parameters (EU1) to determine what is wrong with the water. Students will create a procedure to correct the water quality to be safe for a designated fish species using the various equipment within the aquarium science lab (EU2). They will then explain their process of solving the issue.

Evaluation: Teacher Created Problem Solving Rubric

Unit Resources

- Laptop
- Internet Access
- Aquarium Science Lab