

Standards Correlations for Aquaculture Infusion Units

AIU

Task No.	Task	Task Definition	Process/Skill Questions	SOL Correlations	AFNR Correlations
Introducing the Aquaculture Industry					
AIU-1	Investigate the history and development of the aquaculture industry.	Investigation should include <ul style="list-style-type: none"> • definition of <i>aquaculture</i> • origin of aquaculture (e.g., Chinese, Egyptian, and Roman aquaculture) • international aquaculture • the aquaculture industry in the United States (U.S.) and Virginia • development of the aquaculture industry within agriculture • types of aquaculture <ul style="list-style-type: none"> ○ freshwater ○ marine (saltwater) ○ warm water ○ cold water. 	<ul style="list-style-type: none"> • Why is the aquaculture industry a necessity? • What is the difference between fish-culture and capture/commercial fisheries? • What is the history of aquaculture? 	English: 6.4, 6.6, 7.4, 7.6, 8.4, 8.6, 9.3, 9.5, 10.3, 10.5, 11.3, 11.5, 12.3, 12.5 History and Social Sciences: Govt 9, 14, 15	CS.01.01.01.a
AIU-2	Describe the importance of developing a sustainable aquaculture industry in terms of economics and its effect on the environment.	Description should include the economic and environmental purposes of a sustainable aquaculture industry in Virginia, in the United States, and worldwide: <ul style="list-style-type: none"> • Food production for human consumption • Rebuilding of populations of threatened and endangered species • Habitat restoration • Wild stock enhancement • Production of baitfish 	<ul style="list-style-type: none"> • What is <i>sustainability</i>? • What are five strategies for sustainable fish farming? • What are the economic implications of the aquaculture industry? • What would happen if the aquaculture industry did not 	English: 6.6, 7.6, 8.6, 9.5, 10.5, 11.5, 12.5 History and Social Sciences: Govt 9, 14, 15	CS.02.02.03.b CS.03.02.02.b

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		<ul style="list-style-type: none"> Fish culture for zoos and aquariums <p>Description should also include the major aquatic species in Virginia and the United States and their economic importance.</p>	exist?	Science: BIO.8	
AIU-3	Explain state, federal, and international agencies' laws and regulations as they apply to aquaculture.	<p>Explanation should include the role of</p> <ul style="list-style-type: none"> federal, state, and local laws and regulations with respect to <ul style="list-style-type: none"> invasive species environmental degradation unintended consequences the effects of effluent ground water usage U.S. Department of Agriculture (USDA) <ul style="list-style-type: none"> Natural Resources Conservation Service (NRCS) U.S. Food and Drug Administration (FDA) Environmental Protection Agency (EPA) U.S. Fish and Wildlife Service (USFWS) U.S. Army Corps of Engineers (USACE) Virginia Occupational Safety and Health (VOSH) program safety laws and regulations riparian rights. 	<ul style="list-style-type: none"> What Virginia regulatory agencies oversee aquatic life? How do regulatory laws work to protect the environment? How does a non-native species affect the environment? What are the legal consequences for violating the law? 	<p>English: 6.4, 6.6, 7.4, 7.6, 8.4, 8.6, 9.3, 9.5, 10.3, 10.5, 11.3, 11.5, 12.3, 12.5</p> <p>History and Social Sciences: Govt 9, 14, 15</p> <p>Science: BIO.8</p>	<p>CS.03.04.03.a</p> <p>NRS.02.01.02.a</p>
AIU-4	Explain the importance of managing water quality.	<p>Explanation should include</p> <ul style="list-style-type: none"> dissolved gases and oxygen aeration carbon dioxide (CO₂) testing alkalinity clarification 	<ul style="list-style-type: none"> Why is it important to consider water quality as a whole rather than as a sum of its various parts? How do temperature and salinity affect dissolved oxygen? 	<p>English: 6.6, 7.6, 8.6, 9.5, 10.5, 11.5, 12.5</p> <p>Science: BIO.8, CH.4, CH.1</p>	AS.08.02.01.a

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		<ul style="list-style-type: none"> • hardness • water source disinfection <ul style="list-style-type: none"> ○ ozone ○ ultraviolet (UV) light • oxygen enhancement • nitrogen forms such as <ul style="list-style-type: none"> ○ ammonia (NH₃) ○ ammonium (NH₄) ○ nitrite (NO₂) ○ nitrate (NO₃) ○ nitrogen gas (N₂) ○ sulfuric acid (H₂SO₄) • phosphorous • total dissolved solids (dissolved solids and wastes) • temperature • salinity and specific gravity • pH (alkalinity, acidity) • dissolved oxygen (DO) cycle • ammonia cycle (N) • carbon dioxide (CO₂) cycle • pH cycle • system-specific water management practices (avoid overfeeding, monitor DO, control unwanted organisms, prevent runoff from entering facility, add water to improve quality) • stress caused by diminished water quality (shock, chronic, acute stress). 			
AIU-5	Identify hazards associated with the aquaculture industry.	<p>Identification should include</p> <ul style="list-style-type: none"> • explaining the importance of personal protective equipment (PPE) 	<ul style="list-style-type: none"> • What might be a hazard associated with handling fish (e.g., getting “finned”)? • What are chemical hazards 	English: 6.6, 7.6, 8.6, 9.5, 10.5, 11.5, 12.5	CS.03.03.03.a

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		<ul style="list-style-type: none"> demonstrating the use of PPE describing hazards in a wet environment <ul style="list-style-type: none"> falls drowning electrical hazards comparing heat and cold hazards identifying dehydration identifying work-related neck and upper-limb disorders identifying respiratory problems identifying allergies listing parasites summarizing zoonotic diseases explaining chemical hazards. 	<p>in an aquaculture lab?</p> <ul style="list-style-type: none"> Why is it important to be able to identify zoonotic diseases? 	Science: CH.1	
AIU-6	Explore careers in the aquaculture industry.	<p>Exploration should include</p> <ul style="list-style-type: none"> supplies and service production inspection and monitoring (e.g., lab support) marketing research and development feed and supplies construction consulting training and education entrepreneurship. 	<ul style="list-style-type: none"> What level of education is needed for various career opportunities in aquaculture? What types of skills are needed in an aquaculture business? What aquaculture careers are available locally? 	<p>English: 6.6, 7.6, 8.6, 9.5, 10.5, 11.5, 12.5</p> <p>History and Social Sciences: Govt 9, 14, 15</p>	<p>CS.01.01.01.a</p> <p>CS.05.01.01.a</p>
Identifying Aquaculture Crops					
AIU-7	Identify the characteristics of aquatic animal species (vertebrates and	<p>Identification should include environmental requirements of various species including</p> <ul style="list-style-type: none"> marine freshwater 	<ul style="list-style-type: none"> How are freshwater and marine species similar? How are they different? What are the environmental requirements for warm- 	English: 6.4, 6.6, 7.4, 7.6, 8.4, 8.6, 9.3, 9.5, 10.3, 10.5, 11.3, 11.5, 12.3, 12.5	

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	invertebrates).	<ul style="list-style-type: none"> ○ warm-water ○ cold-water • aquatic reptiles (alligators, turtles) • mollusks <ul style="list-style-type: none"> ○ bivalves (clams, mussels, oysters, scallops) ○ gastropods (snails, conches, abalones) • arthropods <ul style="list-style-type: none"> ○ crustaceans (lobsters, crabs) • echinoderms (sea urchins, sea cucumbers) • annelids <ul style="list-style-type: none"> ○ worms (leeches). 	<p>water vs. cold-water species?</p> <ul style="list-style-type: none"> • What characteristics make certain species appropriate for cultivation? 	Science: BIO.4, BIO.8	
AIU-8	Identify the characteristics of aquatic plant species.	<p>Identification should include environmental requirements of various species including</p> <ul style="list-style-type: none"> • aquatic plants (algae and macrophytes) <ul style="list-style-type: none"> ○ saltwater ○ brackish water ○ cool and warm freshwater ○ algae ○ ornamentals. 	<ul style="list-style-type: none"> • How are freshwater and marine species similar? How are they different? • What are the environmental requirements for warm-water vs. cold-water species? • What characteristics make certain species appropriate for cultivation? 	<p>English: 6.6, 7.6, 8.6, 9.5, 10.5, 11.5, 12.5</p> <p>Science: BIO.4, BIO.8</p>	
AIU-9	Diagram the anatomical parts of finfish, crustaceans, and mollusks.	<p>Diagramming should include</p> <ul style="list-style-type: none"> • morphology, anatomy, and physiology of aquaculture organisms • anatomical features by species <ul style="list-style-type: none"> ○ internal <ul style="list-style-type: none"> ▪ skeletal ▪ muscular ▪ digestive 	<ul style="list-style-type: none"> • What are the differences between morphology and physiology? • What are the differences between scientific names and common names? • What are the external anatomical parts and their functions? 	<p>English: 6.4, 6.6, 7.4, 7.6, 8.4, 8.6, 9.3, 9.5, 10.3, 10.5, 11.3, 11.5, 12.3, 12.5</p> <p>Science: BIO.4</p>	

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		<ul style="list-style-type: none"> ▪ excretory ▪ respiratory ▪ circulatory ▪ nervous ▪ sensory ▪ reproductive ○ external (finfish) <ul style="list-style-type: none"> ▪ mouth ▪ nares ▪ operculum ▪ gills ▪ pelvic fin ▪ pectoral fin ▪ anal fin ▪ caudal fin ▪ dorsal fin ▪ lateral line ▪ eye ▪ vent • scientific names • common names • life cycle. 	<ul style="list-style-type: none"> • What are the differences between a vertebrate and an invertebrate? 		
Comparing Types of Aquaculture Operations					
AIU-10	Explain the types of aquaculture operations.	<p>Explanations should include the purpose and function of</p> <ul style="list-style-type: none"> • hatcheries <ul style="list-style-type: none"> ○ spawning facilities ○ egg management ○ brood fish (brood stock) management ○ fry and fingerling management ○ phases of fingerling production 	<ul style="list-style-type: none"> • What are the advantages and disadvantages of each type of aquaculture operation? • What are brood fish? • Why is it important to maintain a continuous stock of high quality brood fish? 	English: 6.6, 7.6, 8.6, 9.5, 10.5, 11.5, 12.5	

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		<ul style="list-style-type: none"> • grow-out facilities <ul style="list-style-type: none"> ○ species selection ○ water quality ○ water oxygenation ○ disease prevention ○ feeding ○ regulations ○ discharge of effluent/environmental concerns • harvesting (topping, total) • marketing <ul style="list-style-type: none"> ○ assembling ○ grading ○ hauling ○ processing (e.g., minimal, medium, value added) ○ packaging ○ storing ○ wholesaling ○ retailing ○ advertising ○ change of ownership • available markets <ul style="list-style-type: none"> ○ personal use ○ recreation ○ food ○ processors ○ live haulers ○ fee fishing ○ direct to restaurants ○ aquarist trade • baitfish industry • ornamental fish production and management. 	<ul style="list-style-type: none"> • What is effluent? • What is a therapeutant? • What are some factors that determine species selection? 		

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AIU-11	Identify the types of aquatic structures and equipment used in aquaculture operations.	<p>Identification should include</p> <ul style="list-style-type: none"> • ponds • cages • flow-through systems (raceway) • recirculating systems. 	<ul style="list-style-type: none"> • What are the advantages and disadvantages of each system? • Why are specific aquatic structures selected for a particular species? 	English: 6.6, 7.6, 8.6, 9.5, 10.5, 11.5, 12.5	
AIU-12	Explain pond culture.	<p>Explanation should include</p> <ul style="list-style-type: none"> • types of ponds (e.g., watershed, levee, excavated) • site selection water sources/availability <ul style="list-style-type: none"> ○ soil characteristics (clay content) ○ climate ○ topography (drainage, flooding) ○ runoff • source and materials • engineering/construction requirements <ul style="list-style-type: none"> ○ address given formulas and case situation ○ determine the size for a fish pond including acreage, shape, capacity, and depth maintenance ○ address dam inspection and repair ○ address the repair and maintenance of plant cover and clean water ○ address best practices for pond fertilization • species selection/suitability for pond culture <ul style="list-style-type: none"> ○ catfish ○ striped bass ○ crawfish ○ drum ○ carp ○ shrimp 	<ul style="list-style-type: none"> • What could happen if a pond were constructed in a flood zone? • What are the consequences of poor site selection? • Why use a pond over another aquatic system? • Why is maintenance important? • What are some causes of crop loss in ponds? • What are some preventative measures for reducing crop loss in ponds? • How are fish acclimated to a new aquatic environment? • What are the consequences of not following BMPs? • What are some forms of stress fish might experience (e.g., physical, chemical, perceived stressors)? • Why is record keeping and training personnel 	<p>English: 6.6, 7.6, 8.6, 9.5, 10.5, 11.5, 12.5</p> <p>Math: 6.7, 6.13. 7.2, 7.3, 7.4, 7.11, 7.12, 8.6, 8.9, 8.10, 8.14, 8.17, A.1, G.9, G.13, G.14</p> <p>Science: ES.8, ES.7, CH.4, BIO.8</p>	AS.01.02. AS.02.01.

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		<ul style="list-style-type: none"> • preventive controls/biosecurity <ul style="list-style-type: none"> ○ best management practices (BMPs) for ponds • advantages of ponds • disadvantages of ponds • stocking densities based on species and pond size <ul style="list-style-type: none"> ○ communication <ul style="list-style-type: none"> ▪ delivery ▪ buyer ▪ management ○ water quality awareness/requirements <ul style="list-style-type: none"> ▪ temperature ▪ pH ○ importance of recording pond maintenance ○ necessary supplies for harvesting <ul style="list-style-type: none"> ▪ nets ▪ buckets ▪ truck-to-pond ○ access to a pond and the necessary equipment to prepare the pond for stocking according to BMPs • factors in production <ul style="list-style-type: none"> ○ feeding methods used with ponds (e.g., hand, mechanical, natural) <ul style="list-style-type: none"> ▪ types of feed (e.g., floating, sinking, neutral buoyancy pellets) ▪ frequency of feed ▪ amount of feed ○ oxygen management (aeration devices). 	<p>important?</p> <ul style="list-style-type: none"> • Why might a pond require oxygen supplementation? 		
AIU-13	Explain cage culture.	<p>Explanation should include</p> <ul style="list-style-type: none"> • factors in site selection (e.g., depth of water, water quality, prevailing winds, natural currents) 	<ul style="list-style-type: none"> • What types of problems are associated with putting a cage in a pond vs. an ocean? 	English: 6.6, 7.6, 8.6, 9.5, 10.5, 11.5, 12.5	AS.01.02. AS.02.01.

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		<ul style="list-style-type: none"> • species suitability • source and materials <ul style="list-style-type: none"> ○ rearing aquaculture species inside confined enclosures (to include cages, net pens, baskets, etc.) in freshwater and marine environments ○ types of cages (i.e., fixed, floating, submersible, and submerged) ○ cage requirements (vary by species and location) • engineering/construction (to incorporate cage design requirements) • cage maintenance <ul style="list-style-type: none"> ○ clean fish cages in accordance with BMPs (routine scrubbing) ○ use anti-fouling materials ○ arrange and secure fish cages in the pond • preventive controls/biosecurity <ul style="list-style-type: none"> ○ BMPs for cages • advantages of cage culture • disadvantages of cage culture • stocking densities based on species and cage size • factors in production • species selection for cage culture <ul style="list-style-type: none"> ○ salmon ○ catfish ○ tilapia ○ trout ○ striped bass ○ red drum ○ bluegill ○ carp • feeding methods for cages (feeding ring). 	<ul style="list-style-type: none"> • What are the consequences of poor site selection? • Why is security an issue? • Why is maintenance important? • What are some causes of crop loss? • What are some preventative measures for reducing crop loss in cages? • What are some of the environmental impacts caused by cage culture in different environments? • How important is the feeding ring in cage culture? • What are the causes, consequences, and solutions of fish cage fouling? • What are the benefits of proper cage maintenance? • How can you reduce stress on a species when cleaning the cage? • How does fouling reduce water flow? • How is water quality affected when fish are 	<p>Science: ES.8, ES.12, ES.10, BIO.8</p>	

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AIU-14	Explain flow-through systems (raceways).	<p>Explanation should include</p> <ul style="list-style-type: none"> • site selection <ul style="list-style-type: none"> ○ water sources/availability (management) ○ climate ○ topography • species suitability • essential materials • engineering/construction <ul style="list-style-type: none"> ○ address given formulas and a case situation ○ determine the size for a flow-through system including shape, capacity, depth, and construction ○ design requirements • maintenance • preventive controls/biosecurity <ul style="list-style-type: none"> ○ BMPs for flow-through systems • advantages of flow-through systems • disadvantages of flow-through systems • species selection <ul style="list-style-type: none"> ○ trout ○ salmon ○ catfish ○ striped bass ○ tilapia • stocking densities based on species and size of flow-through system • factors of production. 	<p>overfed?</p> <ul style="list-style-type: none"> • What could happen if a flow-through facility were constructed in a flood zone? • What are the consequences of poor site selection? • Why use a flow-through system over another system? • Why is maintenance important? • What are some causes of crop loss? • What are some preventative measures for reducing crop loss in flow-through systems? • What are some water quality issues associated with a flow-through system? 	<p>English: 6.6, 7.6, 8.6, 9.5, 10.5, 11.5, 12.5</p> <p>Math: 6.7, 6.13, 7.2, 7.3, 7.4, 7.11, 7.12, 8.6, 8.9, 8.10, 8.14, 8.17, A.1, G.9, G.13, G.14</p> <p>Science: ES.8, ES.12, BIO.8</p>	<p>AS.01.02.</p> <p>AS.02.01.</p>
AIU-15	Explain recirculating	<p>Explanation should include</p>	<ul style="list-style-type: none"> • What are the advantages and disadvantages of using 	<p>English: 6.6, 7.6, 8.6, 9.5, 10.5, 11.5,</p>	<p>AS.01.02.</p>

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	systems.	<ul style="list-style-type: none"> • design of recirculating systems (e.g., silo, circular tanks) • site selection <ul style="list-style-type: none"> ○ water sources/availability ○ access to energy ○ effluent • species suitability • essential components • aeration • removal of particulate matter • biological filtration • engineering/construction <ul style="list-style-type: none"> ○ address given formulas and a case situation ○ determine the size for a flow-through system including shape, capacity, depth, and construction • maintenance • preventive controls/biosecurity (BMPs) • advantages of recirculating systems • disadvantages of recirculating systems • stocking densities based on species and size of recirculating system • factors of production. 	<ul style="list-style-type: none"> • a recirculating system vs. using a pond or raceway system? • Why is maintenance important? • What are some causes of crop loss in recirculating systems? • What are some preventative measures for reducing crop loss in recirculating systems? 	<p>12.5</p> <p>Math: 6.7, 6.13. 7.2, 7.3, 7.4, 7.11, 7.12, 8.6, 8.9, 8.10, 8.14, 8.17, A.1, G.9, G.13, G.14</p> <p>Science: BIO.8</p>	AS.02.01.
AIU-16	Define aquaponics.	<p>Definition should include aquaponics is a food production system that couples aquaculture (raising aquatic animals such as fish, crayfish, snails, or prawns in tanks) with hydroponics (cultivating plants in water) whereby the nutrient-rich aquaculture water is fed to hydroponically-grown plants, where nitrifying bacteria convert ammonia into nitrates, and detailing the types of aquaponics systems, such as</p> <ul style="list-style-type: none"> • Nutrient film technique (NFT) • Deep Water Culture (DWC) 	<ul style="list-style-type: none"> • What are the benefits of aquaponics? • What makes aquaponics a sustainable approach? • Why is maintenance important in an aquaponics system? • What are the benefits of raising ornamental crops? • What plants could be 	<p>English: 6.4, 6.6, 7.4, 7.6, 8.4, 8.6, 9.3, 9.5, 10.3, 10.5, 11.3, 11.5, 12.3, 12.5</p> <p>Science: BIO.4, ES.12, BIO.8</p>	<p>PS.02.01.01.a</p> <p>PS.01.02.01.a</p>

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		<ul style="list-style-type: none"> • Media Bed • Decoupled. <p>Definition should include</p> <ul style="list-style-type: none"> • site selection <ul style="list-style-type: none"> ○ water sources/availability (management) ○ climate ○ topography ○ location/facility (e.g., greenhouses, warehouses) ○ environmental factors • essential equipment (e.g., lighting, water quality test kits, irrigation systems) • maintenance • preventive controls/biosecurity <ul style="list-style-type: none"> ○ BMPs for aquaponics • advantages of aquaponics • disadvantages of aquaponics • species selection <ul style="list-style-type: none"> ○ tilapia ○ ornamental (e.g., koi) • stocking densities • factors of production. 	<p>successfully grown in a freshwater, brackish water, and/or saltwater aquaponics system?</p>		
AIU-17	Select an aquaculture system for a given crop.	<p>Selection should include knowledge of</p> <ul style="list-style-type: none"> • regulation and policy <ul style="list-style-type: none"> ○ permitting • availability of an area 	<ul style="list-style-type: none"> • How might a cost-benefit analysis help in the selection of an aquaculture system? 	<p>English: 6.6, 7.6, 8.6, 9.5, 10.5, 11.5, 12.5</p> <p>History and Social</p>	<p>AS.01.02.</p> <p>AS.01.02.01.c.</p>

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		<ul style="list-style-type: none"> ○ water rights ○ land ownership ● suitability of an area <ul style="list-style-type: none"> ○ water availability, quality, and temperature ○ environmental factors (e.g., water source and effluent) ○ light ○ cost effectiveness ○ available labor ○ available market. 		Sciences: Govt 9, 14, 15 Science: BIO.8	AS.02.01. AS.02.02.01.b.
Maintaining the Aquaculture Operation					
AIU-18	Describe aquaculture equipment.	Description should include equipment related to <ul style="list-style-type: none"> ● water sources ● aeration ● harvest ● water quality management ● feeding ● filtration ● transportation ● effluent disposal ● crop disposal (e.g., composting) ● emergency systems and contingency plans. 		English: 6.1, 6.2, 7.1, 7.2, 8.1, 8.2, 9.1, 10.1, 11.1, 12.1	ESS.04.01.02.c
AIU-19	Record operation data.	Recording should include <ul style="list-style-type: none"> ● maintenance of structures and equipment ● importance of water quality management 	<ul style="list-style-type: none"> ● Why is it important to keep records? ● What are the components of a complete and an 	English: 6.7, 6.8, 7.7, 7.8, 8.7, 8.8, 9.6, 9.7, 10.6, 10.7, 11.6,	BS.02.01.01.b

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		<ul style="list-style-type: none"> ○ prevention of oxygen depletion ○ turbidity ○ aquatic plant control methods ○ temperature ○ chemicals, compounds, and elements detrimental to water quality ○ methods for managing the pH cycle ○ general guidelines for water chemistry management ○ importance of nitrogen compounds in water quality management ● feed (e.g., type, amount, storage) ● stocking activity ● fish weight gain and loss ● production data ● financial information. 	incomplete record?	11.7, 12.6, 12.7 Science: CH.1, BIO.8	
AIU-20	Describe technologies used in aquaculture operations.	<p>Description should include</p> <ul style="list-style-type: none"> ● integrated monitoring and operations systems ● sensors <ul style="list-style-type: none"> ○ water quality ○ air temperature, humidity ○ disease management ● emergency notification systems ● camera systems ● automated feeding systems ● drones (UAVs) ● biosecurity equipment ● sorting and grading equipment ● emerging technologies <ul style="list-style-type: none"> ○ AI decision making tools 	<ul style="list-style-type: none"> ● What cybersecurity threats might affect an aquaculture operation? ● What is nanobubble technology? 	English: 6.6, 7.6, 8.6, 9.5, 10.5, 11.5, 12.5	CS.01.02.02.b.

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		<ul style="list-style-type: none"> ○ robotics ● cybersecurity considerations. 			
AIU-21	Measure water quality in an aquaculture operation.	<p>Measurement should include</p> <ul style="list-style-type: none"> ● oxygen ● temperature ● total ammonium nitrogen (TAN) ● nitrites ● chlorides ● nitrates ● phosphorous ● alkalinity ● hardness ● pH ● CO2 ● chlorine and chloramines. 	<ul style="list-style-type: none"> ● In what types of systems would CO2 be a concern? ● What is TAN? ● What positive and negative effects can algae have on fish development? 	<p>English: 6.4, 7.4, 8.4, 9.3, 10.3, 11.3, 12.3</p> <p>Science: CH.4, CH.1, BIO.8</p>	AS.02.02.01.b.
Feeding Aquatic Species					
AIU-22	Feed various species in an aquaculture system.	<p>Feeding should include</p> <ul style="list-style-type: none"> ● feed selection (e.g., nutritional requirements across the life stages and among species, feed size) ● methods for preparing feed and feeding finfish in ponds, cages, tanks, and raceways ● relationship between feeding and dissolved oxygen (DO) ● importance of choosing appropriate aquaculture feeds from reputable sources ● importance of choosing quality and quantity of rations ● importance of planning the feeding schedule ● calculation of the cost of feed ● calculation of the amount of feed needed for a given species 	<ul style="list-style-type: none"> ● What factors influence feed selection? ● What are advantages and disadvantages of live feed vs. commercial feed? ● How are feeds similar and different from each other? ● What happens if one species is given food intended for another? ● What are the parameters for proper feed storage and why are they important? ● Why is it important that 	<p>Math: 6.1, 6.5, 6.12, 6.13. 7.2, 7.3, 7.11, 7.12, 8.14, 8.17, A.1</p>	AS.03.01.01.a.

Task No.	Task	Task Definition	Process/Skill Questions	SOL Correlations	AFNR Correlations
		<ul style="list-style-type: none"> • calculation of the feed conversion ratio (FCR) • importance of ensuring proper feed storage • impacts on effluent. 	<p>fish rapidly consume all of the feed?</p> <ul style="list-style-type: none"> • What methods are used to distribute feed to fish? 		
Maintaining a Healthy Stock in an Aquaculture System					
AIU-23	Identify common health problems of fish.	<p>Identification should include types of fish disease and common stressors of fish that contribute to infectious and non-infectious diseases. They are</p> <ul style="list-style-type: none"> • stressors <ul style="list-style-type: none"> ○ chemical (e.g., poor water, pollution, diet, and metabolic waste) ○ biological (e.g., density, microorganisms, macroorganisms) ○ physical (e.g., temperature, light, sounds , and gases) ○ procedural (e.g., handling, shipping, and treatments) • infectious diseases <ul style="list-style-type: none"> ○ bacterial <ul style="list-style-type: none"> ▪ clinical signs <ul style="list-style-type: none"> ▪ behavioral (e.g., lack of appetite, lethargy) ▪ physical (e.g., lesions, discoloration, hemorrhaging) ▪ contributing factors ▪ prevention ○ viral <ul style="list-style-type: none"> ▪ clinical signs (e.g., behavioral, physical) ▪ contributing factors 	<ul style="list-style-type: none"> • What are some behavioral signs of a fish in distress? • If a fish has lesions, what is the likely culprit? • What are some examples of unusual fish behavior that may indicate disease? • What are three management practices that prevent stress? 	<p>English: 6.6, 7.6, 8.6, 9.5, 10.5, 11.5, 12.5</p> <p>Science: BIO.8, BIO.4</p>	AS.02.02.01.a

Task No.	Task	Task Definition	Process/Skill Questions	SOL Correlations	AFNR Correlations
		<ul style="list-style-type: none"> ▪ prevention ○ parasitic <ul style="list-style-type: none"> ▪ clinical signs (e.g., behavioral, physical) ▪ contributing factors ▪ prevention ○ fungal <ul style="list-style-type: none"> ▪ clinical signs (e.g., behavioral, physical) ▪ contributing factors ▪ prevention • non-infectious diseases <ul style="list-style-type: none"> ▪ clinical signs (e.g., behavioral, physical) ▪ contributing factors (e.g., water quality issues) ▪ prevention 			
AIU-24	Identify methods for prevention and treatment of fish health problems.	<p>Identification should include</p> <ul style="list-style-type: none"> • BMPs for preventing disease • stress reduction measures <ul style="list-style-type: none"> ○ regulating water quality (e.g., temperature, pH, oxygen) ○ managing stocking densities ○ avoiding poor nutrition ○ avoiding excessive handling • general guidelines for treatment of fish diseases <ul style="list-style-type: none"> ○ methods <ul style="list-style-type: none"> ▪ dips/baths ▪ flushes ▪ injections ▪ vaccines ▪ indefinite • biosecurity 	<ul style="list-style-type: none"> • What are some indicators that fish are under stress? • What is biosecurity? • How is biosecurity used to prevent disease introduction? • How can biosecurity be improved? • How can stress cause fish disease? 	English: 6.6, 7.6, 8.6, 9.5, 10.5, 11.5, 12.5	AS.01.02.01.b.

Task No.	Task	Task Definition	Process/Skill Questions	SOL Correlations	AFNR Correlations
		<ul style="list-style-type: none"> ○ minimize pathogen introduction (access control) ○ ensure proper treatment of water • environmental conditions <p>and treatment in accordance with veterinary consultation.</p>			
Harvesting Fin Fish, Crustaceans, and Mollusks					
AIU-25	Harvest crop.	<p>Harvest should include</p> <ul style="list-style-type: none"> • methods of harvesting <ul style="list-style-type: none"> ○ seining (ponds) ○ draining (ponds) ○ crowding and collecting (tanks) ○ trapping (natural ponds and streams) ○ hooking ○ cage (oysters, clams, mussels) • time of harvest • cooling method (and validation of the process) • type of equipment used • written instructions for harvest • sanitation (equipment and personnel) • storing aquatic crops <p>in accordance with BMPs.</p>	<ul style="list-style-type: none"> • What is meant by the validation of a cooling method? • Why is proper cooling critical for quality? • Why is sanitation important to maintain quality? • What should be cleaned and sanitized? • How should equipment be cleaned and sanitized? 	English: 6.7, 6.8, 7.7, 7.8, 8.7, 8.8, 9.6, 9.7, 10.6, 10.7, 11.6, 11.7, 12.6, 12.7	
AIU-26	Create a post-harvest plan.	<p>Creation of a post-harvest plan should include</p> <ul style="list-style-type: none"> • using equipment • fish handling • proper storage practices (e.g., first-in, first-out [FIFO], allergen control, temperature) • sanitation (equipment and personnel) 	<ul style="list-style-type: none"> • What is Hazard Analysis and Critical Control Points (HACCP)? • What does FIFO mean? • What can be done to ensure refrigeration of the aquatic crop in the event of a power outage? Why is this 	English: 6.1, 6.2, 7.1, 7.2, 8.1, 8.2, 9.1, 10.1, 11.1, 12.1	CS.01.01.01.a

Task No.	Task	Task Definition	Process/Skill Questions	SOL Correlations	AFNR Correlations
		in accordance with BMPs.	critical?		
Marketing Aquaculture Products					
AIU-27	Develop a marketing plan.	<p>Developing the marketing plan should include</p> <ul style="list-style-type: none"> • importance of developing a marketing plan (market research and analysis) • determination of market goals • identification of possible market outlets for the product <ul style="list-style-type: none"> ○ processing markets ○ recreational markets ○ retail markets ○ restaurant markets • factors in selecting an appropriate market and implementing marketing strategies (i.e., wholesale vs. direct-to-consumer vs. retail) <ul style="list-style-type: none"> ○ profitability ○ need for equipment ○ accessibility ○ species of aquatic crop ○ quantity ○ size and maturity ○ quality • cost of marketing <ul style="list-style-type: none"> ○ transportation ○ grading ○ harvesting ○ packaging ○ storing ○ advertising • development of plans to reach the marketing goals 	<ul style="list-style-type: none"> • Why is it important to have a marketing plan? • How does seasonality affect an aquaculture product's marketing plan? • Why is sanitary transport important? • What are some scientific skills required to maintain quality of fish and fish products? 	English: 6.1, 6.2, 7.1, 7.2, 8.1, 8.2, 9.1, 10.1, 11.1, 12.1	ABS.05.03.02.c.

Task No.	Task	Task Definition	Process/Skill Questions	SOL Correlations	AFNR Correlations
		<ul style="list-style-type: none"> • process of marketing promotion • quality control procedures (e.g., sanitary transport of product) • activities associated with marketing <ul style="list-style-type: none"> ○ product tracing ○ grading ○ transporting ○ processing ○ packaging ○ storing ○ wholesaling ○ retailing • evaluation of the marketing plans. 			
AIU-28 (O)	Prepare aquaculture products for market.	<p>Preparation of finfish, crustaceans, and mollusks for market should include</p> <ul style="list-style-type: none"> • processing the product <ul style="list-style-type: none"> ○ receiving and weighing the live product at the processing plant ○ holding product alive until processed ○ stunning ○ de-heading ○ eviscerating ○ skinning ○ chilling ○ product form ○ sizing ○ grading ○ freezing or ice packing ○ packaging ○ warehousing 	<ul style="list-style-type: none"> • How does processing maintain quality control? • What causes off-flavor in catfish? • What are the key elements of marketing an aquaculture product? • What are five activities that are part of marketing? • What are two product characteristics that affect buying decisions? • What are six quality control functions? • What is a food allergen plan, and how is it implemented? 	<p>English: 6.6, 7.6, 8.6, 9.5, 10.5, 11.5, 12.5</p> <p>History and Social Sciences: Govt 9, 14, 15</p>	ABS.05.03.03.c.

Task No.	Task	Task Definition	Process/Skill Questions	SOL Correlations	AFNR Correlations
		<ul style="list-style-type: none"> ○ icing ○ shipping the finished product • quality control procedures • preparing carriers for hauling • sanitary transport of foods (STF) • loading finfish, crustaceans, and mollusks • ensuring proper temperatures for shipment of product • HACCP <p>in accordance with the aquaculture product marketing plan, international, federal, and state guidelines.</p>			