

Aquaculture

Exam Information	Description																				
Exam number 118	<p>The Aquaculture industry certification exam assesses learners' knowledge of the scientific method in the context of raising and breeding fish, including: fish ecology, anatomy and physiology, water quality, aquaponics, and commercial and recreational management operations. Learners are also tested on educational preparation and career opportunities in aquaculture.</p>																				
Items 38																					
Points 54	Exam Blueprint																				
Prerequisites None	<table> <tr> <th>Standard</th><th>Percentage of exam</th></tr> <tr> <td>1. The Role of Student Organizations (Optional)</td><td>0%</td></tr> <tr> <td>2. SAE in Agricultural Education</td><td>9%</td></tr> <tr> <td>3. Scientific Method</td><td>11%</td></tr> <tr> <td>4. History of Aquaculture</td><td>11%</td></tr> <tr> <td>5. Living Organisms and Their Environment</td><td>12%</td></tr> <tr> <td>6. Nutrition and Growth of Aquatic Animals</td><td>11%</td></tr> <tr> <td>7. Fish Anatomy and Physiology Concepts</td><td>24%</td></tr> <tr> <td>8. Health and Well-being of Aquatic Animals</td><td>11%</td></tr> <tr> <td>9. Fish and Plants in Aquaponics</td><td>11%</td></tr> </table>	Standard	Percentage of exam	1. The Role of Student Organizations (Optional)	0%	2. SAE in Agricultural Education	9%	3. Scientific Method	11%	4. History of Aquaculture	11%	5. Living Organisms and Their Environment	12%	6. Nutrition and Growth of Aquatic Animals	11%	7. Fish Anatomy and Physiology Concepts	24%	8. Health and Well-being of Aquatic Animals	11%	9. Fish and Plants in Aquaponics	11%
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Recommended course length One year																					
National Career Cluster Agriculture, Food & Natural Resources																					
Performance standards Included (Optional)																					
Certificate available Yes																					

Standard 1

Students will explain the role of student organizations in agricultural education.

Objective 1 Discuss the history and organization of student organizations as they relate to the complete program of agricultural education.

1. Explain the interrelationship of classroom and laboratory instruction, supervised agricultural experience, and student organizations.
2. Describe how, when, and why student organizations were organized.
3. Identify key historical events within student organizations.
4. Identify the mission and strategies, colors, motto, emblem and parts of the emblem, and organizational structure of student organizations.
5. Recite and explain the meaning of student organizations' creed.
6. Discuss the meaning and purpose of a program of activities and its committee structure.
7. List student organizations' officers and discuss the role of each.

Objective 2 Identify opportunities in student organizations.

1. Describe student organizations' opportunities that develop leadership skills, personal growth, and career success.
2. Summarize major state and national activities available to student organizations' members.

Objective 3 Describe student organizations' degrees, awards, and career development events CDEs.

1. List and explain student organizations' degree areas.
2. Identify student organizations' proficiency awards.
3. List and discuss various team and individual CDEs.

Standard 1 Performance Evaluation included below (Optional)

Standard 2

Students will explain the role of supervised agricultural experience (SAE) programs in agricultural education.

Objective 1 Examine the responsibilities and benefits associated with an SAE.

1. Explain the meaning and benefits of an SAE.
2. Explain the characteristics of an effective SAE program and the responsibilities of those involved.

Objective 2 Determine the types of SAE programs.

1. Compare entrepreneurship SAEs and placement SAEs.
2. Describe research/experimentation SAEs.
3. Describe exploratory SAEs.

Objective 3 Plan an SAE program.

1. Identify the steps in planning an SAE program.
2. Describe the function of a business/training plan and/or agreement in an SAE program.
3. Develop a short-range plan and a long-range plan for an SAE program.
4. Relate classroom and laboratory instruction to an SAE program.

Objective 4 Maintain and use SAE records.

1. Explain the importance of keeping records on an SAE program.
2. Explain how SAE records are organized.
3. Follow approved procedures to make entries in SAE records.

Standard 2 Performance Evaluation included below (Optional)

Standard 3

Students will outline the steps of the scientific method.

Objective 1 Identify experimental design components.

1. Identify a problem.
2. Formulate a question and hypothesis.
3. Design and conduct a controlled experiment.
4. Collect/document and analyze data.
5. Draw conclusions based on the experimental data.

Objective 2 Explore various examples of scientific work.

1. Identify individual steps of the scientific method within real-world examples.
2. Summarize how scientific knowledge is gained.

Standard 3 Performance Evaluation included below (Optional)

Standard 4

Students will explain the history, importance, and scope of aquaculture.

Objective 1 Discuss the history of aquaculture.

1. Discuss how the history of aquaculture helped develop civilization.
2. Identify major innovations and milestones in the advancement of aquaculture.

Objective 2 Discuss the importance of aquaculture with respect to economic development.

1. Correlate aquaculture with the characteristics of geography, temperature, oxygen levels, culture, and climate.
2. Identify various uses of aquaculture (e.g., food, medicine).

3. Identify and describe major areas or types of aquaculture, (e.g., marine, invertebrate and fresh water).
4. Identify and describe major types of aquaculture systems, (e.g., open, semiopen and closed systems).

Objective 3 Interpret trends in the aquaculture industry.

1. Identify trends in the aquaculture industry.
2. Determine the implications of trends on aquaculture production.

Objective 4 Determine career opportunities in the aquaculture industry.

1. Identify the nature of career opportunities in the aquaculture industry.
2. Develop a career plan to acquire needed education and skills for entering a career in the aquaculture industry.
3. Demonstrate personal and job skills for success in entering and advancing in a career in the aquaculture industry.

Standard 4 Performance Evaluation included below (Optional)

Standard 5

Origins of Law-Students will analyze the relationship between ethics and the law and explain the origin of today's law.

Objective 1 Summarize how energy flows through an aquatic ecosystem.

1. Identify the trophic levels of an energy pyramid.
2. Arrange components of a food chain according to energy flow.
3. Compare the quantity of energy at each level of an energy pyramid.

Objective 2 Explain relationships between matter cycles and organisms.

1. Use diagrams to trace the movement of matter through a cycle (i.e., carbon, oxygen, nitrogen, water) in the context of aquatic ecosystems.
2. Evaluate the impact of personal choices (e.g., human impact on greenhouse gases, oil spills) in relation to the cycling of matter within an aquatic ecosystem.

Objective 3 Describe how interactions among organisms and their environment help shape ecosystems.

1. Categorize relationships among living things according to predator-prey, competition, and symbiosis.
2. Investigate an aquatic ecosystem using methods of science to gather quantitative and qualitative data that describe the ecosystem in detail.

Standard 5 Performance Evaluation included below (Optional)

Standard 6

Students will apply principles of nutrition to ensure the proper growth, development, reproduction, and economic production of aquatic animals.

Objective 1 Compare and contrast the digestive systems of aquatic animals.

1. Describe the structure and function of the herbivore digestive system.
2. Describe the structure and function of the carnivore digestive systems.
3. Describe the structure and function of invertebrate digestive systems.

Objective 2 Explain the role of nutrition in aquatic animal productivity.

1. List essential nutrients, (protein, vitamins, minerals, fiber, and fat) and describe the importance of each.
2. Compare and contrast common feedstuffs, including the source of the feed, in the diets of various aquatic animals. (i.e. clams, crustaceans, fish, amphibians)
3. Discuss the meaning and use of feed additives.

Objective 3 Provide appropriate nutrition for aquatic animals.

1. Using the Pearson Square, calculate balanced rations for aquatic animals.

Standard 6 Performance Evaluation included below (Optional)

Standard 7

Students will describe fish anatomy and physiology concepts.

Objective 1 Explain fish classification.

1. Explain the classification scheme currently used in biology.
2. Discuss the concept of binomial nomenclature.
3. Compare and contrast the hierarchical classification of various fish species (trout, bass, catfish, and carp) to the “family” level.

Objective 2 Describe the anatomical features of various fish species and their functions.

1. Outline major fish body systems with their respective functions.
2. Identify major external and internal fish organs with their respective functions.
3. Compare and contrast various modes of fish reproduction.
4. Identify the four orientation planes on a fish: dorsal, ventral, anterior and posterior.

Objective 3 Describe the life cycle of a fish.

1. Determine the correct sequence of the life cycle of a fish.
2. Determine the physiological difference at each stage of the life cycle: egg, sac fry, fry, fingerling, juvenile, adult.

Standard 7 Performance Evaluation included below (Optional)

Standard 8

Students will be able to recognize and manage the health and well-being of aquatic animals.

Objective 1 Summarize the role of animal well-being in the animal industry.

1. Explain the meaning and importance of animal well-being.
2. Utilize safe practices in working with animals.
3. Relate concepts of animal welfare and animal rights to animal well-being.

Objective 2 Apply animal anatomy and physiology to maintain aquatic animal health.

1. Discuss common diseases, parasites, and physiological disorders of aquatic animals. (e.g., Fungal – cotton wool, egg fungus; Bacterial – fin rot, dropsy; Viral – herpes, pox; Parasitic – Ick, Anchor worm.)
2. Design and implement an aquatic animal health plan to promote efficiency of production.

Objective 3 Provide for the health and well-being of agricultural animals.

1. Prescribe and implement prevention and treatment for animal diseases, parasites, and other disorders.
2. Perform simple health checks on animals.
3. Diagnose species-specific illnesses and disorders based on symptoms and problems caused by diseases, parasites, and physiological disorders.

Standard 8 Performance Evaluation included below (Optional)

Standard 9

Students will explain the inter-relatedness of fish and plants in the context of aquaponics.

Objective 1 Describe aquaponic techniques.

1. Outline the ecological inter-relatedness of fish and plants.
2. Explore types of aquaponic systems (e.g., gravel bed/media based, nutrient film technique, deep water culture-DWC).
3. Hypothesize how altering the autotroph-to-heterotroph ratio would influence an aquatic ecosystem.
4. Explore economic factors regarding various aquaponic systems (i.e., scale-up, commercial, hydroponic types).
5. Investigate the rate at which photosynthesis occurs in an aquatic ecosystem by altering one factor, e.g. light, temperature, and nutrient levels.

Objective 2 Relate water monitoring to aquaculture.

1. Understand the importance of the following water quality parameters: pH, ammonia, nitrates, dissolved oxygen, chlorine, and turbidity.

2. Determine and document pH, ammonia, nitrate, and nitrite levels in a fish tank over time.
3. Demonstrate basic methods used to adjust basic water parameters i.e. water change, pH adjustment, de-chlorination, and oxygenation.

Standard 9 Performance Evaluation included below (Optional)

Aquaculture

Performance assessments may be completed and evaluated at any time during the course. The following performance skills are to be used in connection with the associated standards and exam. To pass the performance standard the student must attain a performance standard average of 8 or higher on the rating scale. Students may be encouraged to repeat the objectives until they average 8 or higher.

Student's Name: _____

Class: _____

Performance standards rating scale

0	Limited skills	2	→	4	Moderate skills	6	→	8	High skills	10
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Standard 1 – The Role of Student Organizations

Score:

- Students will be able to recite and explain the meaning of a student organization creed.

Standard 2 – SAE in Agricultural Education

Score:

- Students will develop a plan for a successful SAE.

Standard 3 – Scientific Method

Score:

- Students will be able to design and conduct a controlled experiment that investigates an aquatic ecosystem using methods of science to gather quantitative and qualitative data.

Standard 6 – Nutrition and Growth of Aquatic Animals

Score:

- Students will be able to correctly use the Pearson Square to determine optimal feed rations for their animals bearing in mind such factors as species, age, and condition, and implement their findings in the feeding of their animals

Standard 8 – Health and Well-being of Aquatic Animals

Score:

- Students will be able to optimize their animals' health by designing and implementing an animal health plan.

Standard 9 – Fish and Plants in Aquaponics

Score:

- Students will be able to determine, document, and make appropriate corrective adjustments to various water parameters such as pH, and ammonia, nitrate, nitrite, and oxygen levels.

Performance standard average score:

Evaluator Name: _____

Evaluator Title: _____

Evaluator Signature: _____

Date: _____