MAST ACADEMY OUTREACH

ELEMENTARY SCHOOL PROGRAM

Adventures Aboard The Land SHARC (Science Hands-On And Related Careers)

Teacher Instructions/Answer Keys



MAST Academy

Maritime and Science Technology High School Miami-Dade County Public Schools

Miami, Florida

MAST ACADEMY OUTREACH LAND SHARC ELEMENTARY SCHOOL TEACHER INSTRUCTIONS/ANSWER KEY

TABLE OF CONTENTS

Teacher Instructions	i
Wet Lab Docks	
Physical Oceanographer: Under Pressure	1
Marine Biologist: Buoyancy: Sink or Swim	2
Marine Biologist: Who's Who in the Ocean	3
Marine Biologist: Sharks and Their Relatives	4
Chemical Oceanographer: Sands of Time	5
Communications Specialist: Every Picture Tells a Story	6
Computer Docks	
Marine Biologist: Coral Reefs: Living Communities	7
Marine Biologist: The Everglades Story	8
Marine Biologist: Sink the Reef	9
Marine Mammal Scientist: Ask the Experts About Whales	10



The "shark" symbol appears beside all <u>directions</u>, which are always enclosed within a callout. **READ ALL DIRECTIONS CAREFULLY.**



The "thinking" symbol appears beside all <u>critical thinking questions</u>. Teamwork will be required to answer these questions.

Land SHARC On-Site Package Teacher Instructions



If you have not already done so, show the Land SHARC Pre-site DVD to your students. Make a copy of the on-site package for each of your students. Distribute one package to each student the day of the Weather on Wheels visit. They will also need pencils or pens. Pencils will be provided only in an emergency.

Since there are ten lessons, divide the class into ten teams of equal size, and assign each team a number from 1-10. IF ESOL, ESE or other inclusion students are assigned to your class, make sure they are grouped with at least one student at grade-level reading ability. This grade-level student should be designated the team leader.





To save your student's photographs from lesson 6, you will need to provide **one** flash drive (USB drive).

Students are not to carry books, book bags, etc. to the Land SHARC. These will get in the way. Clipboards will be provided for all students.





When your students arrive at Land SHARC, a brief introduction will be given. Each team will then begin at the lesson with their assigned number. THE TEACHER MUST HELP SUPERVISE STUDENTS WORKING AT THE STATIONS SET UP OUTSIDE WEATHER ON WHEELS.

After the Land SHARC visit, grade the on-site activities, using the answer key provided in this packet. Total the points. This grade will be used to award certificates to students who score 80% or higher. A Certificate of Achievement Request Form, along with a Program Evaluation Form, will be sent to you following the Land SHARC visit.





Discuss the correct answers with your students. All questions that address "critical thinking skills" are preceded by the icon to the left.

WET LAB DOCK MARINE BIOLOGIST "UNDER PRESSURE" 11 points – 1 for each question, 1 for each fish in the table

Pressure affects creatures that live in the deepest parts of the ocean by pressing against their bodies. The pressure of water changes with depth.



To observe the effect of depth on water pressure, follow the directions on the table and answer the questions.

- 1. From which hole does the water come out the farthest? a. top hole (b. bottom hole
- 2. Is the water pressure greater at the top of the pitcher or the bottom of the pitcher? Explain your answer. At the bottom because the weight of the water is greater at the bottom

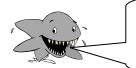




Read the following information and then answer the questions that follow.

Fish in the deepest parts of the ocean live in total darkness and give off light (bioluminescence.) Bioluminescence helps them attract prey. However, these fish may also attract predators. Therefore, bioluminescence is an advantage when attracting prey and a disadvantage when attracting predators.

4. What two things can be attracted to a fish that is bioluminescent? <u>prey and predators</u>



Marine biologists must make careful observations of animals when they study them in the ocean. Pretend you are a marine biologist. Look at the plastic models of deep-water fish in the aquarium. They are labeled A - F. Read the following descriptions and write the letter of the fish that matches the description in the table below.

Description	Letter	
The Dragonfish has a long scaleless body, strong jaws and needle-like teeth. The female		
has a long, slender, sensory barbel on her chin.		
The Gulper Eel is a distant relative of the river eel. It has tiny eyes and teeth and a large	Α	
umbrella shaped mouth.		
The Hatchetfish has light, luminescent skin on the bottom and darker skin on top. It has		
large, bulging eyes and an upward-slanting mouth.		
The Viperfish has a long body and extremely large teeth, especially the front two on the		
bottom of its mouth.		
The Anglerfish lures prey with a long, slender lure between its eyes.		
Loosejaws lives in the murky depths of all oceans. There are three rows of green,	F	
luminescent (glowing) spots running along its body.		



What out of the ordinary body parts do you see on the fish that would help them to adapt to deep water? Lures, barbells, bioluminescent skin and/or spots, large eyes and mouth, large teeth

WET LAB DOCK OCEAN ENGINEER "BUOYANCY: SINK OR SWIM" 9 points-1/2 for questions 1, 2, 4, 6; 1 for all other questions

Introduction

An object will float as long as it weighs less than the water it pushes out of its way, or displaces. When an object floats, it is said to have positive buoyancy. An object can be made of materials that are heavier than water, but there must be air or space inside the object for it to float. The amount of air or space inside the object is also called volume. When the air inside an object is replaced by weight, the object will sink and is said to have negative buoyancy. You will now do an experiment to find out how the amount of air or space (volume) in an object affects its buoyancy. On the table are four boats. Each boat weighs 10 grams. The experiment will involve finding out how much weight each boat will hold before it sinks. First, make two educated guesses or hypotheses about what you think will happen.

HYPOTHESIS 1: The (circle one) white green red or blue boat will hold the greatest amount of weight before sinking.

HYPOTHESIS 2: The (circle one) white green red or blue boat will hold the least amount of weight before sinking.

- 1. Carefully place the white boat in the container of water so that no water gets into the boat.
- 2. Carefully place washers (weights) one at a time in the center of the boat until it sinks.
- 3. In the data table below, record the number of washers it takes to make the bowl sink.
- 4. Take the white boat and washers out of the water and place them back on the poster.
- 5. Repeat steps 1-4 for the green, red, and blue boats.
- 6. Use information from the Introduction to answer the questions below.

DATA TABLE			
Boats	Number of washers for boat to sink		
White boat	3		
Green boat	5		
Red boat	7		
Blue boat	13 or more		

1. The boats had negative buoyancy when they (circle one) floated or sank.

- 2. Which boat held the greatest number of washers before sinking? white green red (blue)
- 3. Why did this boat hold the greatest number of washers? It has more volume or space or air in it.
- 4. Which boat held the fewest number of washers before sinking? (white) green red blue
- 5. Why did this boat hold the least number of washers? It has the least amount of volume or air or space in it.
- 6. The inside of the boats are not really empty. They have air inside of them. Which boat has the greatest amount of air inside of it? (circle one) white green red blue
- 7. As the amount of air or space (volume) inside a floating object increases, the amount of weight the floating object can hold (circle one) (increases) or decreases?
- 8. Was your first hypothesis (circle one) **supported** or **not supported?** Why was your hypothesis supported or not supported? <u>Answers will vary</u>.
- 9. Was your second hypothesis (circle one) **supported** or **not supported?** Why was your hypothesis supported or not supported? <u>Answers will vary</u>
- 10. If all the boats weigh the same, then why do they hold different amounts of washers? They have different volumes or different amounts of air or space in them.
- 11. Cruise ships can float because they have large ballasts. What do you think is inside the ballasts? air





WET LAB DOCK MARINE BIOLOGIST "WHO'S WHO IN THE OCEAN" 9 points - 1 for each drawing, 1 for each question



Choose any of the marine organisms (living things) and complete a marine data card for each. Questions are on the posters under the name of each marine organism.

MARINE DATA CARD	MARINE DATA CARD		
Name of Organism	Name of Organism		
Draw the organism here.	Draw the organism here.		
Drawing will depend on student choice.	Drawing will depend on student choice.		
Write your answer to the question here.	Write your answer to the question here.		
Questions and answers for each organism are	Questions and answers for each organism are		
below.	below.		
MARINE DATA CARD	MARINE DATA CARD		
Name of Organism	Name of Organism		
Draw the organism here.	Draw the organism here.		
Drawing will depend on student choice.	Drawing will depend on student choice.		
Write your answer to the question here.	Write your answer to the question here.		
Questions and answers for each organism are	Questions and answers for each organism are		
below.	below.		

Definition of important terms are part of "Words to Know" lesson in pre-site packet.

Horseshoe crab – The horseshoe crab has 10 appendages. What is another name for appendage? Leg

Sea Fan – Do you think this animal is mobile or sessile? Sessile

Starfish – Do you think the starfish's mouth is on the dorsal or ventral surface of its body? Ventral

Octopus – The prefix "octo" means eight. Why is this marine creature called an octopus? It has 8 legs.

Pencil Urchin – How do you think this marine creature protects itself? With its spines

Coral – Do you think this skeleton is from a solitary or a colonial animal? Colonial

Fiddler crab – What is the difference between the male and the female fiddler crab? The male has one large claw or the female body is larger than the male body.

Barnacle – Do you think this animal is mobile or sessile? Sessile



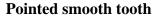
1. Marine biologists like to study interesting things about marine organisms. Pretend you are a marine biologist. Choose one of the organisms above. What would you like to find out about this organism? <u>Answers will vary.</u>

WET LAB DOCK MARINE BIOLOGIST "SHARKS AND THEIR RELATIVES" 8 points – 1 for each drawing, 2 for the table, 1 for each question

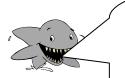
Shark teeth can be triangular in shape with serrated (rough) edges or pointed in shape with smooth edges. The function of the tooth is determined by its shape.

Look through one of the plastic magnifiers on the table by holding it away from you and looking through the top until the teeth are in focus. Draw each one in the table below.

Triangular serrated tooth







Using the shark jaw on the table, count the teeth in the first row of the upper jaw from left to right. Do the same for the lower jaw. Write these numbers in the first row of the table below.

Put your finger on one tooth in the front row of the upper jaw. How many teeth are lined up behind that front tooth.? Do the same for the lower jaw and write these numbers in the second row.

Multiply the number of teeth from left to right by the number of teeth from front to back to calculate an estimate of the total.

	Upper jaw	Lower jaw
	answers are approximations	answers are approximations
Number of teeth from left to right	29	32
Number of teeth from front to back	X 5	X 5
Total number of teeth in each jaw	145	160

1. To calculate an estimate of the total number of teeth on both jaws, what math computation do you have to do? <u>addition</u>

2. What is the estimated total number of teeth on the jaw? <u>305 – based on numbers in the table</u>

The skate and the stingray are related to sharks because they have skeletons made of cartilage but their body shapes are different from a shark's body shape.



Marine biologists study how organisms are related to each other. Look at the models of a stingray and skate and answer the questions to find out how they are related to each other and to sharks.

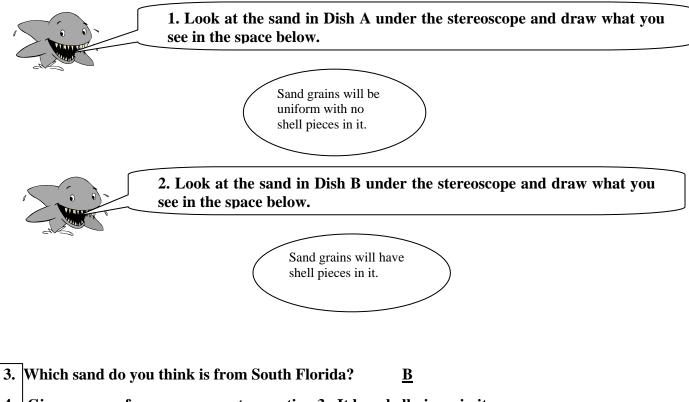


3. Name two ways the ray and the skate are similar. <u>Both flat, both have eyes on top, mouth on bottom and tails with spines</u>

4. In what two ways are the ray and the skate different from sharks. <u>shark is not flat, shark's</u> mouth is not on bottom, a shark has different shaped fins, a shark's tail is not spine-like.

WET LAB DOCK PHYSICAL OCEANOGRAPHER "SANDS OF TIME" 10 points – 1 for each drawing, 1 for questions 3 and 4, 2 for questions 5 – 7.

Not all sand is created equal! Sand from South Florida has shell pieces and sand grains in it while sand from other places may have only sand grains in it.



4. Give a reason for your answer to question 3. <u>It has shell pieces in it.</u>

Calcium carbonate (chemical formula $CaCO_3$) is found in living things such as clams and snails. Hydrochloric acid (chemical formula HCl) is used as a test for $CaCO_3$. If hydrochloric acid is put on a substance with calcium carbonate in it, you will see bubbling. You are going to test two sand samples to see if calcium carbonate is present. One is from South Florida with many shell pieces in it. The other sample is quartz sand with no shell pieces in it.



(A) quartz sand

Follow the directions on the table for the hydrochloric acid test and answer the questions. **PUT ON GOGGLES FOR SAFETY!**

1. Which test tube do you see bubbling? (Circle your answer)

OR (B) South Florida sand



- 2. Which sand has CaCO₃ in it? <u>B south Florida sand</u>
- 3. Where does the CaCO₃ in South Florida come from? <u>from the shells which were once</u> <u>living</u>

WET LAB DOCK COMMUNICATIONS SPECIALIST "EVERY PICTURE TELLS A STORY" 8 points – 4 for each

- 1. You will document your experience aboard the Land SHARC by using the digital camera to take two photos of any of the Land SHARC docks.
- 2. Look around and find something you want to photograph.
- 3. Write a story about each photograph. Use complete sentences in your story. Think about who or what is in your picture. If a person is in your photograph, what is he or she doing? If a computer is in your photograph, what is on the screen? If a piece of equipment or an instrument is in your photograph, what is it used for?

FIRST PHOTOGRAPH

 This is a photograph of
 Stories will vary.

SECOND PHOTOGRAPH

This is a photograph of ______ Stories will vary.

COMPUTER DOCK MARINE BIOLOGIST "CORAL REEFS: LIVING COMMUNITIES" 11 points – 1 for each part of each question

Before you is the command deck of your coral reef exploring submarine.



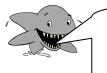
1. Turn on and put on headphones before you begin.

Click on the 5th lab icon from the left in the middle of the screen, called "Adaptations."
 Click on the seahorse in the aquarium on the left to see the video "Camouflage," then answer the following question.

Question 1 – Marine organisms use camouflage in order to (Circle the correct answer.)

- a. become energy efficient
- b. avoid becoming dinner

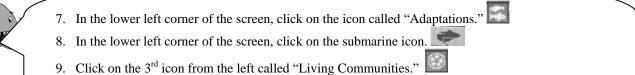
c. produce more offspring d. all of the above answers



- 4. In the lower right corner of the screen, click on the black arrow to go to "Becoming Invisible: Find the Creature."
 - 5. Starting with the photo at the upper left, click on each photo.
 - 6. Follow the directions on the screen and complete the matching questions for each photo.

Question 2 – Match each sea creature in the first column with its way of camouflaging by placing the appropriate number next to its name.

1. Looks like a sea whip 6 A. scorpion fish 2. Looks like a piece of debris **B.** lionfish 4 C. trumpetfish 3. Attaches other creatures to its shell 1 2 **D.** seahorse 4. Looks like a sunlight striped reef 7 E. octopus 5. Burrows in the sand 3 F. decorator crab 6. Looks like algae-covered coral 5 7. Changes skin texture, color and shape G. crab



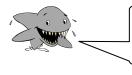
- 9. Click on the 3^{cd} icon from the left called "Living Communities." 110. Click on the top right aquarium called "Underwater Wonderland."
- **11. Do not watch the video.** At the bottom right side, click on the black arrow.
- 12. Move the mouse around the picture to see names of each marine creature shown.
- 13. Find 3 marine creatures you learned about in question 2. Write their names below.

Question 3 -

Creature 1 _scorpion fish

Creature 2 _octopus

Creature 3 lionfish



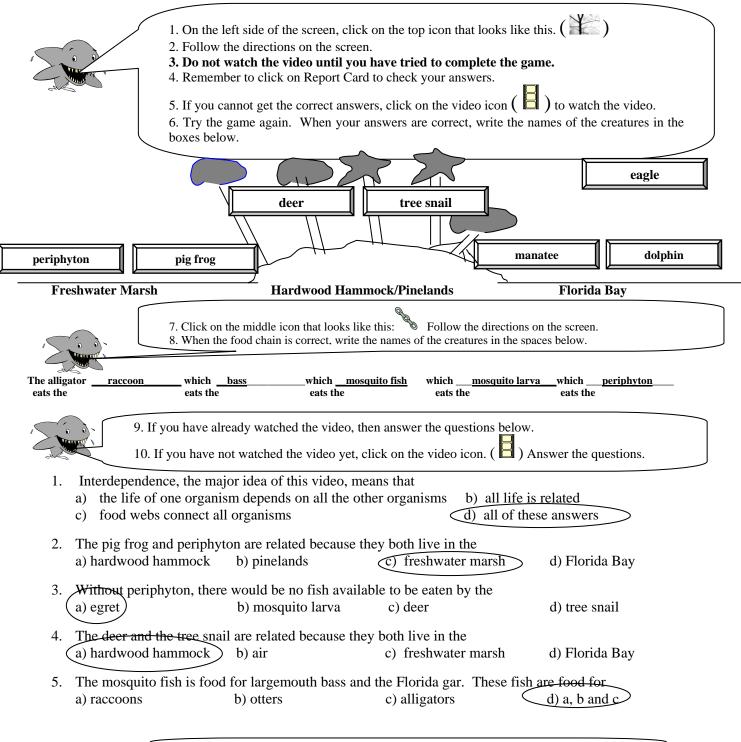
14. Click on the icon at the bottom left of the screen, called "Living Communities."

15. At the lower left of the screen, click on the sub icon. **16**. Turn off the headphones. Return them to the pegs on the wall.

COMPUTER DOCK MARINE BIOLOGIST

"THE EVERGLADES STORY" 11 points – 1 for each question, 2 for each diagram

In this lesson you will learn about Everglades habitats and food chains. First, you will play two environmental games.

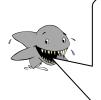


Click on the "Happy Face" at the bottom of the screen to return to the beginning of the lesson.

WET LAB DOCK MARINE BIOLOGIST

"SINK THE REEF" 10 points – 1 for each data table and questions 1-5, 2 for question 6

Artificial or man-made reefs are made by placing materials on the ocean bottom. In this lesson you will experiment with different artificial reef designs using concrete blocks. Their rough surface encourages the growth of corals, algae and barnacles which are food for many kinds of fish. Your objective is to see which design is the most effective for attracting fish.



- 1. Click on the word "Height" and choose 1 meter.
- 2. Click on the word "holes" and choose none.
- 3. Click on "spacing" and choose 5 meters.
- Click on "done" to determine the fish catch for this reef design.
 Record the height and the catch in the table below.
 - 6. Click on the word "height" and choose 2 meters.
 - 7. Click on "done" to find out how this changed the fish catch. Record the height and the fish catch below.
 - 8. Change the height and choose 3 meters.
 - 9. Click on "done" and record the height and the fish catch below.

Height	Holes	Spacing	Depth	Fish Catch
1	0	5 Meters	12 Meters	7
2	0	5 Meters	12 Meters	6
3	0	5 Meters	12 Meters	8

1. How did increasing the height affect the fish catch? <u>Increasing the height had no corresponding effect on catch.</u>



10.Click on "holes" and choose small. 11.Click on "done" and record the fish catch.

Height	Holes	Spacing	Depth	Fish Catch
3 Meter	Small	5 Meters	12 Meters	6
3 Meter	Large	5 Meters	12 Meters	8
3 Meter	combination	5 Meters	12 Meters	10

- 2. How did adding small holes affect the fish catch? <u>Fish catch decreased</u>
- 3. How did increasing the size of the holes affect the fish catch? Fish catch increased
- 4. How did adding a combination of holes affect the fish catch? Fish catch increased even more.

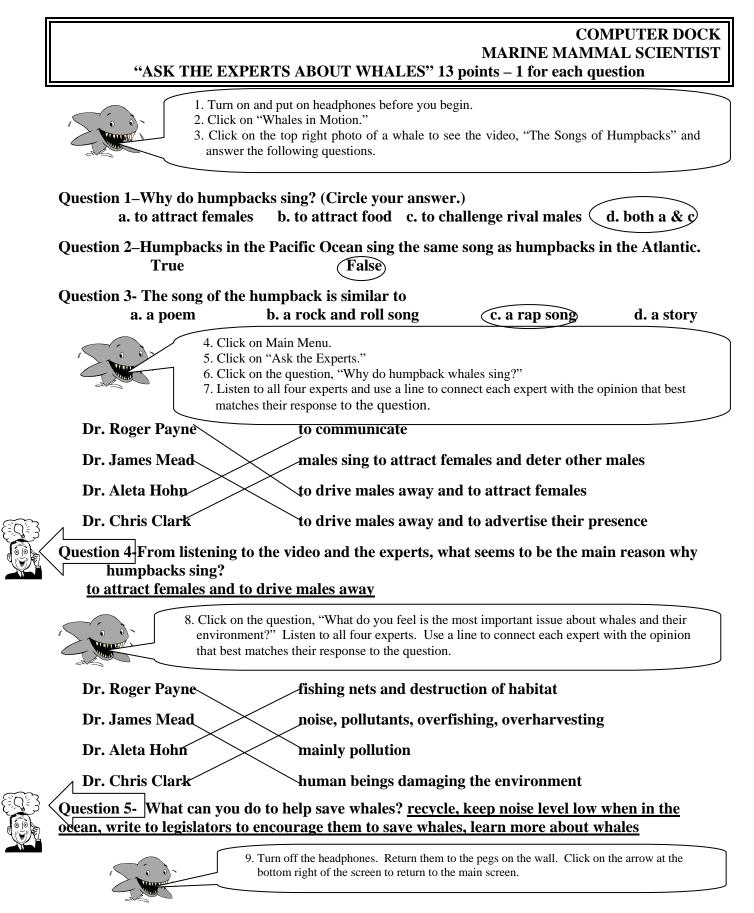
· · · ·	

13.Click on "spacing" and find the catch for 5, 10, and 15 meters. 14. Record the catch.

Height	Holes	Spacing	Depth	Fish Catch
3 Meter	Combination	5	12 Meters	10
3 Meter	Combination	10	12 Meters	16
3 Meter	Combination	20	12 Meters	16

5. How did increasing the spacing affect the fish catch? <u>Increasing the spacing to 10 meters increased the catch</u>, <u>but increasing to 20 meters had no additional effect</u>.

6. Now that you know how changing height, holes and spacing affects fish catch, how would you design an artificial reef so that it attracts the most fish? <u>A reef that is 3 meters high with a combination of small and large holes spaced</u> either 10 or 20 meters apart would attract the most fish.



The School Board of Miami-Dade County, Florida, adheres to a policy of nondiscrimination in employment and educational programs/activities and strives affirmatively to provide equal opportunity for all as required by:

Title VI of the Civil Rights Act of 1964 - prohibits discrimination on the basis of race, color, religion, or national origin.

Title VII of the Civil Rights Act of 1964, as amended - prohibits discrimination in employment on the basis of race, color, religion, gender, or national origin.

Title IX of the Education Amendments of 1972 - prohibits discrimination on the basis of gender.

Age Discrimination in Employment Act of 1967 (ADEA), as amended - prohibits discrimination on the basis of age with respect to individuals who are at least 40.

The Equal Pay Act of 1963, as amended - prohibits sex discrimination in payment of wages to women and men performing substantially equal work in the same establishment.

Section 504 of the Rehabilitation Act of 1973 - prohibits discrimination against the disabled.

Americans with Disabilities Act of 1990 (ADA) - prohibits discrimination against individuals with disabilities in employment, public service, public accommodations, and telecommunications.

The Family and Medical Leave Act of 1993 (FMLA) - requires covered employers to provide up to 12 weeks of unpaid, job-protected leave to "eligible" employees for certain family and medical reasons.

The Pregnancy Discrimination Act of 1978 - prohibits discrimination in employment on the basis of pregnancy, childbirth, or related medical conditions.

Florida Educational Equity Act (FEEA) - prohibits discrimination on the basis of race, gender, national origin, marital status, or handicap against a student or employee.

Florida Civil Rights Act of 1992 - secures for all individuals within the state freedom from discrimination because of race, color, religion, sex, national origin, age, handicap, or marital status.

School Board Rules 6Gx13- <u>4A-1.01</u>, 6Gx13- <u>4A-1.32</u>, and 6Gx13- <u>5D-1.10</u> - prohibit harassment and/or discrimination against a student or employee on the basis of gender, race, color, religion, ethnic or national origin, political beliefs, marital status, age, sexual orientation, social and family background, linguistic preference, pregnancy, or disability.

Veterans are provided re-employment rights in accordance with P.L. 93-508 (Federal Law) and Section 295.07 (Florida Statutes), which stipulate categorical preferences for employment.

REVISED 8/1/01