Student Name: _____ **Course:** _____ **Grade:** ____

Field Trip to Birch Aquarium at Scripps Institution of Oceanography

INTRODUCTION: The purpose of this field excursion is to observe and study live marine life, their habitats, and the major environmental concerns that they face. This worksheet is divided into three parts: Part I questions cover the two major exhibits: Global Warming and Seahorses (Exhibit Gallery is to your left - south). Part II questions address the Hall of Fish aquarium tank exhibits (to your right - north). The Hall of Fish questions are ordered according to a counterclockwise circuit of the hallway loop. Part III questions address the outdoor tide pool exhibits (straight ahead, behind the building - west). This is designed as a self-guided tour - do it solo, or work as a student group. If you can't find certain information, track down the professor or docent.

PART I - THE EXHIBIT GALLARY

A. Global Warming Exhibit

1. What are four visible changes occurring on Earth's that are considered strong lines of physical evidence for global warming? 1) _____ 2) _____ 3 _____ 4_____

2. Climatologists collect two types of ancient earth material - Ice and Sediment - each holds a record of earth's paleoclimate. Note that one material holds recorded information indicating levels of ancient *atmospheric* CO_2, whereas the other material records ancient ground and water surface temperatures. More specifically, it's the fossils found in one of the above materials that record one of the two types of paleoclimate information listed above. Air bubbles contained in the second type of material record the other type of paleoclimate information. Match the correct earth material to what it contains, and to what type of paleoclimate data it stores?

Samples of Ancient *Polar Ice* contain _____, which record _____

Samples of Ancient *Sediment* contain _____, which record _____.

3. Scientists have collected ancient *atmospheric* CO_2, and surface temperature data that continuously covers the last 650,000 years. Carefully study the relationship between Earth's level of atmospheric CO_2 data and the average global temperature data over the last 600,000 years (shown on several large wall graphs).

Do the two data sets (CO_2 and Temp) move up and down together in lock-step fashion, i.e. somehow closely tied together? Or, do they appear to move independently of one another, i.e. apparently no direct relationship)?

_____

What does this tell us about how one factor relates to the other over time? For example, if CO_2 continues to go up dramatically, then what should you expect temperature to do?

_____

Is it possible to tell from the chart which factor controls the other factor? _____

4. Over the last 650,000 years, atmospheric CO_2 has never risen over what level? _____ ppm

5. What was the atmospheric CO_2 level at the start of the industrial revolution? _____ ppm

6. What is the current level of CO_2 concentration in our atmosphere? _____ ppm

7. How much has CO_2 in our atmosphere risen over the last 50 years? _____ ppm

8. What are the predicted levels of CO_2 in our atmosphere 50 years from now if we continue to burn fossil fuels at present rates? _____ ppm

9. How will increases of CO_2 in our ocean affect ocean acidity? _____

10. How will increases of CO_2 in our ocean affect carbonate shell production? _____

11. List three ways that you can reduce your carbon footprint.

a. _____ b. _____ c. _____

B. <u>Seahorse Exhibit</u>

1. What are seahorses exactly? _____

2. What are major types of habitats where seahorses call home? _____

3. What and how do seahorses eat? _____

4. What makes seahorses so unique in the animal world, in terms of their reproduction practices?

_____

5. What are the seahorse's natural enemies, and how do they protect themselves from them?

_____

6. How many seahorses are harvested every year? _____ Why are they harvested (used) for?

_____

7. What are some of the solutions to stabilize and increase seahorse numbers?

_____

PART I - THE HALL OF FISHES

A. THE SARDINE TANK – Front entrance (Tank #1)

1. Sardines often swim in schools with their mouths wide open. What are two reasons for this? (Hint: They use their gills for two purposes)

#1. _____ #2. _____

2. The California sardine fishery collapsed back in the 1950's. Reason(s) why it happened?

_____

B. WESTERN NORTH AMERICA COASTAL WATERS AND THE CALIFORNIA CURRENT

1. What two principle limiting physical factors in the marine environment affect marine productivity?

#1. _____ #2. _____

2. Classify/Describe the California Current within the North Pacific Gyre. Circle 3 correct choices.
Boundary or Transverse? Eastern or Western? Cold or Warm?

3. The California Current and adjacent coastal waters are a particularly rich marine ecosystem. Why?
(Hint: think about the physical limiting factors and their conditions along our coast)

_____

4. Where is the geographic boundary between the Northwest and Southern California marine ecosystems?
(Hint: Look for the "elbow" of California's coastline on the map - it's a major point)

Location. _____ Why there?_____

C. NORTHWEST COAST MARINE HABITATS – (Tanks 2 through 7)

1. List the several types of marine habitats displayed. Note the types of sea bottoms.

_____

2. List **three** of the most common types of marine life found in the Northwest Coast tanks.

#1. _____ #2. _____ #3. _____

3. Take a close look at Tank #5. What is so special about tank #5? _____
Describe what you see. What is the average lifespan of this amazing cephalopod?

_____

D. HUMAN IMPACT ON SOUTHERN CALIFORNIA MARINE ECOSYSTEMS

1. How many *millions* of gallons of sewage are pumped into the ocean off San Diego? _____ **Million gal. per Day**

Where does it all come from? _____

What's all in it? _____

2. What do you think are the most important environmental impacts on Southern California's offshore marine ecosystems? Include both natural and human-related impacts. Check out the information board on the wall opposite to tanks #6 and #7.

_____

3. What are some of the ways that San Diegans can lessen the above impacts on our ocean?

_____

E. SOUTHERN CALIFORNIA MARINE HABITATS – (Tanks 10 through 19)

1. List the several types of marine habitats displayed. Note the types of sea bottoms.

_____

2. List **three** of the most common types of marine life found in the marine habitats listed above.

#1. _____ #2. _____ #3. _____

3. How do Northwest Coast marine communities differ from the Southern California Coast's?

_____

F. GIANT KELP FOREST TANK (Tank #19)

1. Spend some time studying the abundant marine life in the very large kelp forest tank. Identify and count as many species of sea life as possible. So, how many species are there? _____

2. Name and describe (in some detail) one species in the kelp tank that you find most interesting.

_____

_____

3. List two ways that you think that a kelp forest promotes and sustains abundant and diverse sea life.

#1. _____ #2. _____

G. TROUBLED TROPICAL CORAL REEFS ECOSYSTEMS – (Tanks 20 through 33)

Find the Tropical Seas coral reef tanks/exhibits. Read and study the information listed on the wall boards.

1. List **three** of the most common types of marine life found in the tropical marine habitats.

#1. _____ #2. _____ #3. _____

2. How do warm-water marine communities differ from the previously observed cold-water communities?

_____

3. What are signs of an unhealthy coral reef system? _____

4. What are some threats or causes for the collapse of the coral reef systems worldwide?

_____

5. What are some of the ways that humans are providing relief to troubled coral reef systems?

_____

6. Why are coral reef ecosystems worldwide important and worth saving?

_____

PART III - THE OUTDOOR TIDEPOOL EXHIBITS

1. How many animal phyla do you recognize in the tidepools? _____ List at least three.

#1. _____ #2. _____ #3. _____

2. Do the tidepools have a dominant phylum? _____ If so, which one? _____

3. What types of challenging physical conditions must tidepool organisms deal with that are not commonly found in most other marine ecosystems? Think about things like tides and waves.

_____

4. What principle characteristics do these organisms possess that makes them so well-suited to the tidepool habitat? Think about the above challenging physical conditions of a tidepool that you listed.

_____

5. What animal species, that are no longer abundant in wild tidepools along our shoreline, do you recognize in this artificial tidepool habitat? Why have they vanished? How can they make a comeback?

_____

_____

PART IV - POST FIELD LAB REFLECTION

Write a two-point reflection of your field trip experience at the Birch Aquarium (about 150 words).

1) What did you learn on this trip? How does that relate with what you are learning in this course?

_____

_____

_____

_____

_____

_____

_____

2) What did you find most interesting or important? What did you find difficult or challenging?

_____

_____

_____

_____

_____

_____

_____