Name _____ **Instructor** _____ **Lab Section**_____

Objectives:

- To observe and appreciate the displays and public information at the Museum of Natural History
- To observe the diverse and interesting adaptations that animals have evolved in order to survive and reproduce in their environment.

Background material may be found in:

- Chapter: 15.6
- Chapter: 18 (all sections)
- Chapter: 19.1-19.8

Biology: Concepts & Connections, 8th ed

The purpose of this exercise is to introduce you to the beauty and diversity of life in the present and past and to focus your attention on the adaptations that each organism has evolved in order to survive and reproduce in nature. Our emphasis will be on animal and habitat diversity, adaptations, and biological conservation.

Meet your instructor at the Blue Whale Skeleton in front of the museum (next to the parking lot). You will begin your lab here, answering the questions below regarding this exhibit. Once inside the museum, you will make observations and answer questions from many of the museum's "Halls". A map of the museum can be found on page 12.8. With a little knowledge of the general biology of each specimen, you should be able to relate how its color, form, shape, behavior, etc. is adapted to its natural environment.

BLUE WHALE SKELETON (outside in front of the museum)

What is the genus and species name of the blue whale? _____

Whales are endothermic (sometimes referred to as "warm-blooded"), air-breathing mammals, features they share with humans. In what ways does this skeleton resemble a human skeleton?

_____

_____

What structures are missing from this skeleton that you would expect to find in a human skeleton?

_____

_____

Are these differences between whale and human skeletons related primarily to differences in locomotion, or to some other differences in ways of life? Explain.

_____

_____

Whales are the largest animals ever to have lived on earth, and the Blue Whale is the largest whale species. Although this particular whale was not one of the largest of blue whales, it was still huge.

How long was this whale? _____ Blue whales can reach lengths of up to 105 ft, and weigh as much as 200 tons (400,000 lbs). How much did this whale weigh when it was alive? _____

Do you think that a creature of this weight could ever have lived out of water? _____

In reference to the question above, **Why, or why not?**

HALL OF FOSSILS AND PALEONTOLOGY

This hall presents the diversity of life in past ages as shown by the fossils left behind. Most of the fossils in this room were found locally, as you will see if you read the cards under each one, yet many of these fossils represent forms very different from those seen here today. This suggests that the environment has changed greatly over time, even in this limited area.

The various exhibits in this hall should prepare you to answer the following questions. Start at the exhibit "Scale of Geologic Time".

What is a **fossil**? _____

_____

_____

How long has there been life on earth? _____

If the entire geological timetable were condensed into a single year, how long would humans have existed on Earth?

_____

There is evidence that mammoths once lived in the Santa Barbara region, including the Channel Islands. What is that evidence?

_____

List the two species of mammoth that once lived in this area:

1._____ 2. _____

According to the dating of the fossil, how long ago did mammoths live here?_____

Where did the smallest species of these mammoths live? _____

Move toward the other end of the Hall. What and when was the "Golden Age of Mammals"?_____

_____

What feature does the giant fossil bird at the end of the hall have that is not seen in modern birds?_____

_____

What does this suggest about the evolutionary relationship between birds and reptiles (such as dinosaurs)?

_____

_____

MARINE HALL

As you move into the Marine Hall from the Hall of Fossils, you will see a room with displays of the many different marine invertebrate phyla. Invertebrates are animals that do not have a backbone. Phylum is the classification level just below that of Kingdom. All of these specimens are in the kingdom Animalia. **Phyla displayed include Cnidaria, Porifera, Annelida plus three other "worm" phyla, Arthropoda, Mollusca, and Echinodermata.** At each exhibit, try to observe how the adaptations of the organisms shown help them to survive in their particular habitats, and notice how many different habitats there are in and around the sea.

Browse the exhibits of marine invertebrate phyla. Pick two different phyla to study more closely. For each, provide the phylum name, **three distinguishing characteristics** of organisms in that phylum, and **two examples of specific animals** in that phylum.

1. Phylum Name: _____

   Characteristics: _____

   _____

   _____

   Specific organisms: _____ _____

2. Phylum Name: _____

   Characteristics: _____

   _____

   _____

   Specific organisms: _____ _____

What is the largest **invertebrate** displayed in this Hall (hint: look up!)?_____

What is its length?_____ What are its closest relatives?_____

Vertebrates are animals with backbones. Fish are the most abundant vertebrates in the marine environment (other marine vertebrates include mammals, such as dolphins and seals).

Look at the display of **Chondrichthyes** and **Osteichthye**s; what are two major differences between these two groups of fish?

1._____

2._____

Based on the numbers of different phyla and species presented in this Hall, do you think vertebrates or invertebrates are more numerous in the ocean environment? _____

As you move further into the Marine Hall, peruse the exhibits of the Sandy Beach, Tide Pool, and Kelp Forest habitats, and answer the question at the top of the next page.

Most species living in the ocean move about by crawling, walking, or swimming. However, many marine species are sessile (sedentary) organisms. **Sessile organisms are permanently attached to a substrate** (such as rock), and do not move about. Give three examples of sessile marine organisms.

1. _____ 2. _____ 3. _____

What do these permanently attached organisms eat? _____

Does the diversity of marine habitats help to explain the diversity of organisms found in the sea? _____

SANTA BARBARA GALLERY: BIODIVERSITY, CLIMATE, & HABITATS

Read the wall titled ***Life Abounds in Santa Barbara*** to answer the following questions.

Santa Barbara lies within the **California Floristic Province (CFP)**. What is the significance of the CFP, with respect to biodiversity and conservation?

Diversity refers not only to the numbers of different species and ecosystems, but also to variation within a species. Observe the display of variation in the Calico Scallop *Argopecten ventricosus*, as well as in the moth *Caenurgia togataria*, found on this wall.

a. In what ways do individuals within these species vary? List *at least three* traits that are highly variable.

b. Recalling lessons from your Natural Selection lab, why is variation within a species important?

Observe the display of some of Santa Barbara's local insects. Insects are a tremendously diverse group of organisms, occupying many different habitats and displaying a variety of lifestyles. They are by far the most diverse class of organisms known. Among the insects, beetles stand out as a particularly diverse group.

a. According to the wall display, how many species of beetles have been described? _____

b. What percentage of all known animal species are beetles? _____

Move to the central area of this hall, focused on Changing Climate and Biodiversity at Risk. Read the display that begins **"*The science is clear - *"**

List 4 effects of climate change that we are now witnessing throughout the world. For each one, note if you personally have observed or been affected by this in the past year.

Effect:	**Your personal observations/experiences?:**
a. _____	_____
b. _____	_____
c. _____	_____
d. _____	_____

The accelerating increase in global temperatures that has occurred over the past several decades is linked to increasing levels of greenhouse gas emissions as human populations grow and use more resources such as fossil fuels.

What can humans do to slow down the rate of climate change?

Habitats: Move to habitat displays at the end of the hall. Note the California Condor soaring overhead.

The Santa Barbara area is rich in habitat diversity. Within a single day, one can experience the unique microclimates and biodiversity of over 10 different habitat types. Choose 6 habitats features in this hall, and list one notable feature of each.

Habitat	Notable feature

Look at the relief map in the middle of the room. Which are the two most extensive habitats in Santa Barbara County?

1._____ 2._____

Which habitats do you suspect are most vulnerable to loss due to human activities? List at least 2.

Do you think there is any connection between the diversity of habitats in Santa Barbara County and the designation of this area as a biodiversity hot spot? Explain.

MAMMAL HALL

This hall depicts some of the many mammal species that live, or once lived, in the Santa Barbara region. As mammals ourselves, this is our home turf. Visit the Human Mammal display, which notes that like all other mammals, we have a "**four-chambered heart, hair, a constant body temperature, and mammary glands**." All mammals are endothermic ("warm-blooded") air-breathers, have fur or hair at some stage of their lives, and nourish their young with milk from the mother's mammary glands. Some are carnivores, some are herbivores, some swim, and some fly, making mammals a very diverse group.

Which **two** of the two characteristics listed in the paragraph above distinguish mammals from other vertebrates (that is, which ones are unique to mammals, and not found in fish, amphibians, reptiles, or birds?)

1._____

2._____

Of the greater than 30 species of mammals shown in this hall, several have suffered from habitat loss due to human development, hunting, or other impacts. Which species, once common in California, is now **extinct**?

_____

Several other local mammal species have suffered large population declines, but have recovered to some extent. List two species that have come back from the brink of loss in California. For each, indicate what lead to their decline.

Species	Reason for Decline
1. _____	_____
2. _____	_____

Compare the Harbor Seal (*Phoca vitulina*) with the California Sea Lion (*Zalophus californicus*) across the hall. What differences do you see (look at the ears and the hind legs)?

_____

_____

Marine mammals, such as whales, seals, and sea otters, face the great challenge of maintaining a constant body temperature while often living in very cold waters. How do **seals and sea lions** keep themselves warm?

_____

What adaptation do Southern Sea Otters (*Enhydra lutris nereis*) have to help them stay warm in the cold ocean?

_____

Sea Otters are a "keystone species" in California's kelp forests, meaning they greatly affect ecosystem structure, despite being in low numbers. Based on the information given in the display about sea otters, in what way(s) do you think these animals impact their community?

_____

DENNIS M. POWER BIRD HALL

The specimens in the Bird Hall are arranged ecologically by habitat preferences and foraging strategies. This makes it more intuitive to see the similarities between disparate species of birds

QUESTIONS

Birds have many different kinds of feeding strategies. List all the feeding strategies you can find in the bird hall.

_____ _____

_____ _____

_____ _____

_____ _____

Draw the heads and bills of a nectivore, insectivore, carnivore and granivore. Be sure to label which is which and give the name of the bird you sketched below.

How does the shape of the bill relate to a bird's feeding strategy?

_____

_____

Why do vultures and condors, which eat carrion (dead, rotting carcasses), have naked heads, whereas hawks and eagles have fully-feathered heads?

_____

_____

What features are shared by the hawks and owls?

_____

_____

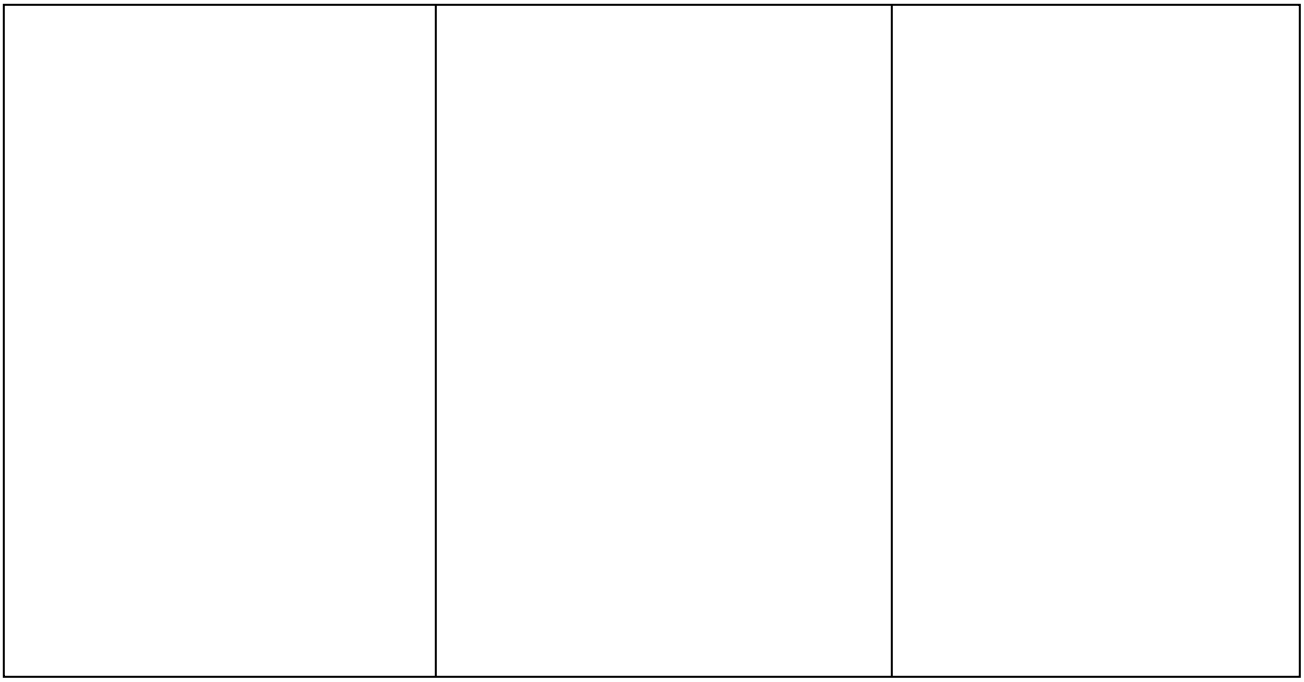
How does this relate to their method of capturing prey? Assuming that they capture similar prey, do they compete directly in nature or does some difference in their behavior isolate them from direct competition? What is that difference?

_____

_____

_____

Sketch the foot of a surface diver, a hawk and a warbler.



Surface diver hawk warbler

Give three reasons for the differences in the feet you sketched above.

1._____

2._____

3._____

The back part of the bird hall has dioramas with backgrounds painted by noted local artist Ray Strong. Do you recognize any of the locations depicted? Each habitat shows a few of the bird species found there. Enjoy the beauty of each scene, and the adaptations of the birds within. Note how the form of each bird (color, wing shape, leg length, bill form) fits its specific habitat.

California Condors are the largest birds in North America.

Look at the "PLAINS and MOUNTAINS San Raphael Wilderness, Los Padres National Forest" exhibit for information on condors. What factors drove the California Condor to the brink of extinction?

_____

_____

What efforts were made to save the species?

What threats do those condors now living in the wild still face?

_____

Location of the Santa Barbara Museum of Natural History:

The Santa Barbara Museum of Natural History is located at 2559 Puesta Del Sol, Santa Barbara. You can get there by any route you wish. One route can get you there from SBCC by taking 101 North to the Mission Street Exit. Turn right on Mission Street, and then turn left where Mission dead ends on Laguna and then right onto Los Olivos. Go by the Santa Barbara Mission. Follow the signs to the Museum. If you get to Foothill you have gone too far. There is plenty of free parking. The lab begins right outside the Museum at the blue whale skeleton in front. Maps of museum halls are available at the entrance to the building.