

# Chordate Diversity Worksheet. Due at the end of lab.

Name \_\_\_\_\_ GSI & Sect # \_\_\_\_\_ Station # \_\_\_\_\_

This worksheet forms part of the basis for the questions that will appear on the lab exam. In addition you should know information provided by your GSI. Enjoy, but do not torment, the live animals. Think about the big picture and focus on how these animals survive and reproduce in their natural environments. You do not need to proceed in numerical order through the stations, although they are organized so that you can do so. Mammals and bird questions are towards the end of the worksheet, and are located in 2097 VSLB. **You should look at the marine tank in both rooms (2095 & 2097 VLSB) as it will form the basis of station 30 on your lab exam.**

**Subphylum: Urochordates** (tunicate) -- make a drawing (on the left).

**Subphylum: Cephalochordates (Lancelet)** -- make a drawing (on the right).

## **FISHES (jawless fish: Myxini and Petromyzontida Jawed fishes: Chondrichthyes, Actinopterygii, Sarcopterygii)** The study of fish is called ichthyology.

### STATION ONE: FISH DIVERSITY

1A. Which of the extant groups of fish possess jaws?

Chondrichthyes, Actinopterygii and Sarcopterygii. The Myxini and the Petromyzontida lack jaws.

1B. What are two major difference between the sharks (Chondrichthyes) and the other jawed fishes (Actinopterygii and Sarcopterygii)?

Skeletal difference = *Chondrichthyes have a cartilaginous skeleton*

Modification of the gastrointestinal tract = *Chondrichthyes lack a swim bladder*

*Chondrichthyes have a cartilaginous skeleton (also, no swim bladder, placoid scales, wing like pectoral fins, scalelike teeth, blood with lots of urea, etc) whereas osteichthyes have bony skeletons and a swim bladder..*

### STATION TWO: SKELETAL SYSTEM

2. How do the vertebrae of terrestrial tetrapods differ from the vertebrae of fish? Look carefully at the interaction of one vertebra with the adjacent vertebra!

*Fish lack interlocking processes (due to buoyancy of water) whereas vertebrae of terrestrial animals are bulkier, stronger and interlock in comparison to animals of equal dimensions.*

STATION THREE: FISH JAWS

3. How do the teeth of Chondrichthyes (SHARKS) differ from those of a ray-finned fish?

*Elasmobranch teeth are modified scales that are continuously shed and replaced. There are also more rows of teeth present.*

Name a vertebrate group that lacks a jaw. Petromyzontiformes (Lampreys)

STATION FOUR: LOCOMOTION

4A. What is a homocercal tail?

*Symmetrical tail, bone extends outward.*

4B. Give one characteristic of the shark that provides buoyancy.

*Fatty deposits, swimming in some groups.*

4C. How is the swim bladder of a teleost an advantage over the system of buoyancy in a shark?

*Swim bladder can hold air & can be regulated to hold more or less which results in changes in density.*

STATION FIVE: SOME FISH ODDITIES

5. Which of the fish stories pictured seems the oddest to you?

STATION SIX: PHOTOGRAPHIC IMAGES ON THE COMPUTER.

**CLASSES AMPHIBIA AND REPTILIA (HERPETOLOGY)**

STATION ONE: AMPHIBIAN SKIN

1A. Why is the skin of amphibians (and probably most of the earliest tetrapods) moist?

*Moisture facilitate cutaneous respiration through the skin.*

1B. Why do you think the capacity to produce toxins has evolved in salamanders and frogs?

*Toxins provide a viable defense for an animal that is otherwise without defenses (amphibians are typically slow, small and lack a protective armor).*

STATION TWO: AMPHIBIAN SKELETON

2A. Look over the bullfrog skeleton. Note the **ilium**. Would you think that proportionately longer or proportionately shorter ilia would be associated with frogs that hop and jump rather than walk?

*The ilium would be longer in a hopper because this would allow more bone for muscle attachment.*

2B. Note the mudpuppy skeleton. In what ways do its limbs differ from the frog legs?

*Limbs are shorter and all of the same length.*

STATION THREE: REPTILIAN DIVERSITY

3A. Read the selections on lizards and snakes. List two major differences between the two orders (lizards and snakes):

- i. *snakes=no external ears, ovaries packaged sequentially; have 100-400 vertebrae, ribs not fused ventrally, able to change jaw articulation (cranial kinesis), no moveable eyelids*
- ii. *lizards = external ears, moveable eyelids, ribs fused, many belly scales*

3B. Read the article on the composition of a turtle “shell”. What is the shell made of?

*Bone!*

3C. Read the article on the composition of the armor of a crocodile. What is the armor of a crocodile derived from?

*Dermis (skin).*

#### STATION FOUR: SNAKES (SUBORDER SERPENTES)

4A. The ribs of snakes are not connected ventrally. What advantage might this give to snakes?

*This enables the snake to swallow huge prey.*

4B. What are two functions of snake venom?

- i. *immobilize prey*
- ii. *digest food since some toxins contain digestive enzymes.*

#### STATION FIVE: BODY MORPHOLOGY AND HABITAT

5A. Can you guess the habitat of the snakes shown here?

- i. *Green tree python (photograph only) = Arboreal (tree dwelling)*
- ii. *Emerald tree boa (photograph only) = Arboreal (tree dwelling)*
- iii. *Rosy boa = Terrestrial*
- iv. *Ball python = Terrestrial*

5B. Which of these snakes are most closely related? Does this agree with the obvious convergence in form and coloration of several of the snakes?

*Even though the tree python and tree boa are similar in morphology the 2 pythons are more closely related while the 2 boas are more closely related.*

#### STATION SIX: RELATIONSHIPS AMONG REPTILES

6A. What features of Archaeopteryx are surprisingly like those of living birds? (A plaster cast of Archaeopteryx can be found in the display case south of the Bioscience Library.)

*feathers*

What features are typical ancestral reptilian features?

*teeth & skeletal elements*

STATION SEVEN: PHOTOGRAPHIC IMAGES ON THE COMPUTER.

**AVES Reptilia (ORNITHOLOGY)**

STATION 1: THERMOREGULATION

1. Why do birds FLUFF their feathers on very cool mornings?

*This traps more dead air to create more insulation.*

STATION TWO: ADAPTATIONS FOR FLIGHT

2. What does the pigeon skeleton tell you about the bird's adaptations for flight? (WRITE SOMETHING MORE THAN "IT HAS WINGS") -- Note that reduced teeth, jaws, and skull are probably not flight adaptations, but more properly are considered feeding specializations! This is a false story that has been perpetuated in biology texts for decades.

- i. *light skeleton (hollow bones)*
- ii. *elimination of teeth*
- iii. *extensive fusion of bones for increased strength and weight reduction.*

STATION THREE: WINGS AND FLIGHT

3. Don't memorize wing types. Relate the shape to the mode of flight.

Compare and contrast the wing structure of birds and bats.

*Bat wings consist of membranes that stretch between the bones of the hands. In the case of birds the bones of the hands are very reduced and the bones of the arms make up the majority of the wing.*

How do the broad short wings of hawks relate to the habitat of hawks? (in relation to flying)

*This aspect provides high lift and low inertia. Hawks are able to soar and catch thermals while retaining maneuverability.*

STATION FOUR: FEET

4. How does the coot foot work?

*This foot permits efficient swimming because the flanges fold back when the foot is drawn forward (little resistance) but flare outward when the foot is moved backward (increase surface area) in the power stroke.*

STATION FIVE: BILLS

5. Which birds shown in the display use their bills as sieves? Which use them as probes? Which use them as nut-crackers?

*variable, probably ducks, avocets, mergansers*

Which use them as probes?

*variable, probably willet, plovers*

Which use them as nut-crackers?

*variable, probably parrot*

STATION SIX: NESTS

6. Which partner (male or female) builds the bird nest?

*Depends on the species but usually the female is in charge but the male might help.*

STATION SEVEN: PHOTOGRAPHIC IMAGES ON THE COMPUTER.

### **CLASS MAMMALIA (MAMMALOGY)**

STATION ONE: WHAT IS A MAMMAL?

1A. Name four anatomical-physiological features that characterize mammals:

- i      *insulation with hair or fur*
- ii     *mammary glands in female for lactation*
- iii    *specific jaw articulation*
- iv     *placenta, four chambered heart*

1B. Are all female mammals able to lactate?

*yes-- although not necessarily through a nipple.*

1C. What are some functions of mammalian hair?

- i.      *warmth (insulation)*
- ii.     *repel water, sun, snow, wind (protective)*
- iii.    *protection from thorns, species, & sex identification, etc*

1D. List one function of scent in mammals.

*many functions: communication, sex determination, defense, attraction*

STATION TWO: AQUATIC ADAPTATIONS IN MAMMALS

2. The blue whale, at about 150 tons adult mass, is the largest animal ever to have lived on the planet. The blue whale is a filter feeder which uses baleen to “filter” out food. What is baleen made of (hint: it’s the same material as your hair and fingernails...)?

*Baleen is 2 rows of fringed plates hanging from the upper palate made of toughened skin used to strain food (plankton) from water. It is made from keratin.*

STATION THREE: PRIMATES

3. List a few features that are common to the primates.

*Monkey: long back, short narrow rib cage, long narrow hip bone, tail aids in leaping, arms longer than legs therefore are knuckle walkers or on all fours.*

STATION FOUR: FEEDING IN MAMMALS

4. Look at the teeth in the skulls of a carnivore and of a herbivore. What do you notice about the differences between the number, types and locations of teeth?

*Dominance of molars in ungulates (well developed). Fewer teeth in upper jaw.  
Dominance of canines and pre-molars in carnivores (sharp teeth).*

STATION FIVE: CHIROPTERA (BATS)

5A. Bats have diverged into numerous feeding types. There are fruit-eating bats, nectar-feeding bats, insect-eaters, frog-eaters, blood-suckers, fish-eaters. Which bats are most likely to have a highly developed aptitude for echolocation? Which might be expected to have a highly developed sense of smell?

*Insect eaters use echolocation whereas fruit-eaters use smell.*

5B. How does an echolocating bat distinguish a fluttering leaf from a flying insect?

*Insect gives off a constant regular wing beat (sonic signal) whereas a falling leaf gives off a randomly distributed signal.*

5C. Contrary to popular opinion, bats are very beneficial. Name three ways that bats benefit the environment, and thus, humans. (Think about what you see in the pictures).

- i. *eat destructive insects (mosquitoes)*
- ii *pollinate flowers*
- iii *distribute seeds (via fruits that they ingest)*

STATION SIX: PHOTOGRAPHIC IMAGES ON THE COMPUTER.

Please look at the images and see if you can find members of each order given below. No, you don't need to memorize these groups or be able to recognize them. Just appreciate the diversity.