Biology 2201 ***Vertebrates*** Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Phylum Chordata includes all creatures that have a spinal cord, gill slits (sometime during their lives) and an internal skeleton made of bone or cartilage. Within this phylum is a group of creatures known as the vertebrates. A vertebrate has the added feature of a spine or backbone that is divided into separate pieces called vertebrae.

**- There are key anatomical features that distinguish each Class of vertebrates. They are described below.**

**Endoskeleton and Appendages – all vertebrates have an internal skeleton (endoskeleton)**

* **Agnatha** have a cartilage skeleton and no fins and no jaws
* **Chondricthyes** have a cartilage skeleton with fins and have jaws
* **Bony Fish** have a bone skeleton and fins and have jaws
* **Amphibians** bone skeleton and paired appendages called limbs adapted to walking and swimming
* **Reptiles** bone with have front and back limbs that are better adapted to walking on land than swimming because they are directed more downward to lift the animal off the ground
* **Birds** Bone skeleton BUT the bones are hollow making them lighter, this is a flight adaptation. Have front and back BUT the forelimbs are modified into wings that aid in flight. Birds stand on their hind limbs only, this is a condition known as bipedal.
* **Mammals** - bony skeleton and have front and back that are modified to the many functions

**Respiratory Systems**

* **All Fish Classes** breath with the use of gills
* **Amphibians** breath with the use of moist skin, and/ or simple lungs (sacs) or (gills)
* **Reptiles** breath with well developed lungs
* **Birds** Breath with well-developed lungs that have associated AIR SACS. **These air sacs allow oxygen rich air to be in the lungs when the bird is both inhaling and exhaling. We can’t !!!**
* **Mammals** very well developed lungs and have a **muscular diaphragm** that assists in breathing

**Heart and Circulation**

(Note- atria are hollow muscular spaces in the heart where blood enters from the body or breathing organs)

(Note- ventricles are hollow muscular spaces in the heart that squeeze blood out to the body parts)

* **All Fish classes** have a 2 chamberedheart (1 atria and 1 ventricle)
* **Amphibians** have a 3 chambered heart (2 atria and 1 ventricle)
* **Reptiles** have a 4 chamber **incomplete** heart (2 atria and **almost** 2 ventricles)
* **Birds and Mammals** have a 4 chamber complete heart (2 atria and 2 ventricles)
* An **incomplete heart**, has a partial wall between the two ventricles so blood mixes between them.
* In a two-chambered heart of a **fish** and four-chambered heart of a **bird or a mammal** low oxygen blood from the body does not mix with high oxygen rich blood from the lungs.
* In **amphibians and most reptiles,** high oxygen blood meets low oxygen blood before it goes to the rest of the body and loses some of the oxygen it has so it is not as good as it could be when going to body cells.

**Temperature Regulation**

* **All fish Classes as well as Amphibians and Reptiles** are ectothermic or cold blooded
* **Birds and Mammals** are endothermic or warm blooded.

**Note: Temperature Regulation in living creatures is determined by the interaction of ; I) the amount of insulation II) the amount of heat released by cell activities and reflex and voluntary behaviours (ex. Shivering)**

**Reproduction and Development**

* **Agnatha and the Bony Fish** have external fertilization and external development, need water
* **Chondrichthyes** some may show internal fertilization and development, need water
* **Amphibians** External fertilization and Development, need water
* **Reptiles** have internal fertilization and external development in leathery eggs, don’t need water
* **Birds** have internal fertilization and external development in shelled eggs, don’t need water
* **Mammals** have **internal** fertilization and exhibit **differing methods of development up to birth**
* Monotrenes show **internal** fertilization and **external development** in eggs (platypus)
* Marsupials have **internal** fertilization and **some internal development** followed by **external development in a pouch** on the mother after birth (kangaroo)
* Placental Mammals show internal fertilization and internal development up to birth

**Note: Many types of vertebrates show varying degrees of parental care after birth but only mammals have body parts (mammary glands) specifically for care of babies**

* 1. What are the three features that define Phylum Chordata?

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2. Complete the following table.

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|  | **Agnatha** | **Chondrichthyes** | **Bony Fish** | **Amphibians** | **Reptiles** | **Birds** | **Mammals** |
| **Jaws? (Y or N)** | **No** | **Yes** | **Yes** | **Yes** | **Yes** | **Yes** | **Yes** |
| **Lungs or Gills?** | **Gills** | **Gills** | **Gills** | **Some have Gills** **Some have lungs** |  |  |  |
| **Skeleton Material(S)** |  |  |  |  |  |  |  |
| **Limb type?** |  |  |  |  |  |  |  |
| **Shelled Egg?** **(Y or N)** |  |  |  |  |  |  |  |
| **Need Water to Reproduce?****(Y or N)** |  |  |  |  |  |  |  |
| **Have Feathers?****(Y or N)** |  |  |  |  |  |  |  |
| **Mammary Glands and Hair? (Y or N)** |  |  |  |  |  |  |  |
| **# of Heart Chambers?** |  |  |  |  |  |  |  |
| **Can Regulate Body Temp?** |  |  |  |  |  |  |  |

* 1. What do vertebrates have that makes them special Chordates?

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* 1. What one feature distinguishes Vertebrate animals and Invertebrate animals from each other?

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5. a) Describe the heat output from metabolism for a creature that is ectothermic compared to one that is

 endothermic?

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b) Who are the ectothermic classes?

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c) Who are the endothermic classes?

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d) ectothermic means: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ endothermic means

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6. What is different about the eggs of birds, reptiles and monotremes compared to other animal eggs?

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7. How are Bony Fish, Chondrichthyes and Agnatha all different? How are they all the same?

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|  | Bony Fish | Chondrichthyes | Agnatha |
| **All Have** |  |  |  |
| **Differences** |  |  |  |

8. What can birds do that no other vertebrate can do that gives them a very efficient respiratory system ?

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9. How is the body of a bird adapted to help them fly? (three ways)

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10. What physical feature does a mammal have which indicates that they provide a lot of care to their young?

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11. Why is the design of the heart of birds and mammals more efficient than the heart of other vertebrates?

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12. Name the three different types of mammals in terms of their method of development during reproduction?

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13. Animals live in the water, in the air and on land. What are the features that each of the following has that are

 adaptations for where they live?

1. creatures that must live in water \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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 c) creatures that must live on land \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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 d) creatures that live on land and in the air \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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14. What are two benefits of having a shelled egg compared to not having a shell for an animal that reproduces on land?

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15. Relate the body covering of various vertebrates to their habitat?

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16. What is the difference between internal fertilization and external fertilization?

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17. Why do animals have such a variety of means of locomotion while plants do not and yet there are lots of types of plants?

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18. What is the advantage of a four chambered heart over a three chambered heart?

19. What is the advantage of a three chambered heart over a two chambered heart?

20. Describe the lifecycle of a frog and the role of metamorphosis? (page 193 in text)