

Phylum Chordata

Vertebrates

1. Highly diverse group. Amphioxus, fish, birds, lizards, opossum, man
2. Habitat: ubiquitous. land, sea and air
3. Skeleton: 1) Endo-. 2) protect and supports, 3) more versatile than exo-, 4) axial includes cranium and notochord (vertebral column*), 5) appendicular includes limbs. **Exceptions:** Some have a dorsal notochord (a tough flexible rod anterior to posterior) throughout life. In others, the notochord becomes the vertebral column. These divide into **three subphyla:**
 1. Cephalochordata: notochord entire life. Aquatic
 2. Urochordata: (Also known as Tunicata) Have a notochord in larval life only. Aquatic
 3. Vertebrata: Notochord develops into vertebral column (backbone). Variety, land and sea, ocean floors to upper atmosphere.
4. Symmetry: bilateral
5. Organization: systems
6. Movement: mobile, swim, fly, walk, slither, crawl
7. Behavior/activity: taxes, innate, reflex, instinct, learning, abstract reasoning, moral awareness
8. Senses/nervous: 1) Brain, 2) dorsal spinal cord, 3) cranial nerves, 4) spinal nerves, 5) sense organs
9. Integument: scales, mucous, smooth skin, dry skin, epidermis
10. Musculature: innervated striated, cardiac, and smooth muscle tissues
11. Nutrition: 1) heterotrophic, 2) Carnivores, 3) Herbivores, 4) Omnivores
12. Digestion: One long tube (alimentary canal) with a variety of organs 1) mouth, 2) esophagus, 3) stomach, 4) intestines, 5) gall bladder, 6) pancreas, 7) digestive enzymes,
13. Respiration: simple diffusion across skin, gills, lungs
14. Circulatory: 1) closed, 2) 2, 3, and 4 chambered hearts
15. Excretory: kidneys and liver
16. Reproduction/Embryology: 1) Sexual, 2) oviparous (embryo develops inside egg outside of mother), 3) viviparous (embryo develops inside mother and born alive), 4) ovoviviparous (embryo develops inside egg, hatches inside mother and born alive, guppies)
17. Life cycle: Pharyngeal pouches: embryonic development folds in neck (pharynx region). Some have larval stages (frog)
18. Seven classes to know: 1) Agnatha, 2) chondrichthyes, 3) osteichthyes, 4) amphibia, 5) reptilia, 6) aves, 7) mammals

Class Agnatha (jawless fish)

1. lamprey and hagfish
2. Habitat: aquatic
3. Skeleton: cartilage, jawless
4. Symmetry: bilateral
5. Organization: slender, tubelike
6. Movement: 2 single dorsal fins for swimming
7. Behavior/activity: innate and reflex
8. Senses/nervous: 1) Brain, 2) dorsal spinal cord, 3) cranial nerves, 4) spinal nerves, 5) sense organs
9. Integument: smooth skin, no scales
10. Musculature: innervated striated, cardiac, and smooth muscle tissues
11. Nutrition: Parasitic carnivores
12. Digestion: alimentary canal system. 1) buccal funnel, 2) rasp like tongue in mouth
13. Respiration: oval gill slits
14. Circulatory: 1) closed, 2) 2 chambered heart
15. Excretory: kidneys and liver
16. Embryology: oviparous
17. Life cycle: larvae stage to adult
18. A threat to edible fish in Lake Eerie

Class Condrichthyes (cartilaginous fish)

1. sharks, rays, skates
2. Habitat: aquatic
3. Skeleton: cartilage
4. Symmetry: bilateral
5. Organization: streamlined or flat
6. Movement: dorsal and lateral fins for swimming
7. Behavior/activity: innate and reflex
8. Senses/nervous: 1) Brain, 2) dorsal spinal cord, 3) cranial nerves, 4) spinal nerves, 5) sight, smell, touch, taste, vibration
9. Integument: sandpaper like, tiny scales
10. Musculature: innervated striated, cardiac, and smooth muscle tissues
11. Nutrition: heterotrophic carnivores. Whale shark is omnivorous (zooplankton and phytoplankton)
12. Digestion: typical alimentary canal system. Replaceable, razor sharp triangular teeth in mouth
13. Respiration: gills
14. Circulatory: 1) closed, 2) 2 chambered heart
15. Excretory: kidneys and liver
16. Embryology: oviparous
17. Interesting facts
 1. Great White shark found with intact horse in stomach
 2. Electric ray can jolt prey with electricity

Class Osteichthyes (bony fish)

1. Ichthyes= fish Osteo=bone :bony fish
2. Habitat: aquatic
3. Skeleton: bony
4. Symmetry: bilateral
5. Organization: most slender, flat, streamlined, air bladder for floating
6. Movement: fins for swimming
7. Behavior/activity: innate and reflex
 1. schools of fish, porcupine fish
8. Senses/nervous: 1) Brain, 2) dorsal spinal cord, 3) cranial nerves, 4) spinal nerves, 5) sight, smell, taste, touch, vibration (no sound)
9. Integument: scales and mucous
10. Musculature: innervated striated, cardiac, and smooth muscle tissues
11. Nutrition: heterotrophic (carnivores, herbivores, and omnivores)
12. Digestion: typical alimentary canal system
13. Respiration: opercular gill
14. Circulatory: 1) closed, 2) 2 chambered heart
15. Excretory: kidneys and liver
16. Embryology: 1) oviparous, some viviparous 2) males often nurture the young, 3) catfish carries eggs in mouth (mouth brooding)
17. Interesting fish
 1. flounder has both eyes on side of head and lays on ocean floor

Class Amphibia

1. frogs, salamanders
2. Habitat: aquatic and terrestrial, "Double life." 75% of all toads and frogs live in tropical rain forests.
3. Skeleton: bony
4. Symmetry: bilateral
5. Organization: systems
6. Movement: mobile limbs
7. Behavior/activity: innate and reflex, hibernation and estivation
8. Senses/nervous: 1) Brain, 2) dorsal spinal cord, 3) cranial nerves, 4) spinal nerves, 5) sight, smell, taste, touch, sound
9. Integument: moist, mucous, highly vascularized skin. Sometimes poisonous

10. Musculature: innervated striated, cardiac, and smooth muscle tissues
11. Nutrition: carnivorous. Some are herbivorous during larval stage.
12. Digestion: typical alimentary canal system; Frogs use eyes to crush food so they blink when swallowing food.
13. Respiration: 1) gills, usually larval, 2) lungs not always used, 3) throat and mouth, 4) skin (90% for salamanders and frogs under water)
14. Circulatory: 1) closed, 2) 3 chambered heart, and mixed blood, 3) ectothermic
15. Excretory: kidneys and liver
16. Embryology: oviparous
17. Life cycles: larvae and metamorphosis, tadpoles, external gills on salamander
 1. mud puppy remains aquatic
 2. some salamanders retain gills until no water, then lungs

Class Reptilia

1. About 8,240 - 9,800 species of snakes, lizards, crocodiles, turtles
 1. Longest measured snake on record is a reticulated python, (33 feet). Pythons average as the longest snakes.
 2. Anacondas can reach lengths of pythons but are more massive in body weight. The longest on record is 28'44" but weighed 500 pounds.
 3. Titanoboa in Columbia, now extinct, has a skeleton that measures up to 40 feet.
 4. The king cobra is the largest venomous snake in the world (12 feet), and the only snake that lays eggs in a nest.
 5. The infrared heat receptors in the pits along the lips of most boas and pythons and the nostril-like cavities of pit vipers can detect heat difference of 0.4 degrees Fahrenheit.
2. Habitat: aquatic and terrestrial.
3. Skeleton: bony
4. Symmetry: bilateral
5. Organization: systems
6. Movement: mobile limbs, slither
7. Behavior/activity: innate and reflex
8. Senses/nervous: 1) Brain, 2) dorsal spinal cord, 3) cranial nerves, 4) spinal nerves, 5) sight, smell, taste, touch, sound
9. Integument: dry, scaly skin that must be shed, and claws on toes
10. Musculature: innervated striated, cardiac, and smooth muscle tissues
11. Nutrition: mostly carnivorous. Some turtles are herbivorous.
12. Digestion: typical alimentary canal system
13. Respiration: lungs
14. Circulatory: 1) closed, 2) 3 chambered heart, and mixed blood, 3) ectothermic
15. Excretory: kidneys and liver
16. Embryology: 1) oviparous, 2) amniotic egg : protective membrane in egg allows embryo to grow in a fluid-filled protective, porous shell, nourished on yolk.
17. Four orders: 1) squamata (snake and lizards), 2) testudinata (turtles), 3) crocodilia, 4) Sphenodontia (tuatara)
18. Dinosaurs]
 1. Dinosaur= "terrible lizard"
 2. most the size of a chicken, but many very large (80 tons)
 3. marine and terrestrial and aerial
 4. Plesiosaurus: marine dinosaur found by fishermen