The animal kingdom is divided into invertebrates and vertebrates. Invertebrates make up about 98% of all animals, while vertebrates, which have a backbone or notochord, make up only 2% of animals in the phyla Chordata. All animals share similar characteristics, such as being heterotrophic and multicellular, lacking cell walls, and having differentiated tissues. Symmetry is the arrangement of an animal's body parts, with radial symmetry meaning body parts are arranged in a circle around a central point, while bilateral symmetry means the body has two similar halves. The gut is the digestive tract, which enables animals to digest food outside of their cells. Animals without a gut, digest food inside their cells. The phyla Porifera comprises asymmetrical animals without tissues or a body cavity, while cnidarians have radial symmetry and differentiated cells organized into two layers of tissues and nerves. Worms, mollusks, arthropods, and echinoderms are other phyla that are explained in the text. The phylum Chordata has three subphyla: Tunicata, which includes salps and sea squirts, Cephalochordata, which includes lancelets, and Vertebrata which includes fish, amphibians, reptiles, birds, and mammals. The surviving amphibians are frogs, toads, and salamanders, while reptiles include turtles, crocodilians, snakes, and lizards. Birds have feathers, beaks, and unique skeletal adaptations, as well as a specialized breathing system. Mammals, which have hair/fur and mammary glands, are very diverse in their morphology and habitats.

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| **Main Ideas** | **Notes** |
| Animal Diversity |  |
| Kingdom Animalia | - Kingdom Animalia is divided into two main groups: - Invertebrates - Vertebrates - Invertebrates - An animal without a backbone. |
| Kingdom Animalia | - Vertebrates |
| Characteristics of Animals | - All animals share the following characteristics: - They are heterotrophic. - They are multicellular eukaryotes. - They lack cell walls. - Most animals: - Are motile. - Have differentiated tissues. |
| Typical Animal Life Cycle |  |
| Body Plan and Symmetry | - The arrangement of an animal’s body parts is called its symmetry. - Animals that do not have an orderly body plan are called asymmetrical. - Radial symmetry means that the body parts are arranged in a circle around a central point. |
| Body Plan | - The gut is the digestive tract. - It enables an animal to digest food outside of its cells. - In animals without a gut, food is digested inside of their cells. |
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| Phylum Porifera | - These ‘pore bearing’ organisms are commonly known as sponges. - They are typically asymmetrical and lack tissues or a body cavity. - Adult sponges are sessile but their larvae are motile. |
| Phylum Cnidaria | - This phylum includes jellyfish, sea anemones, coral, and hydra. - They have radial symmetry and no body cavity. They can be sessile or motile. - Cnidarians have differentiated cells that are organized into two layers of tissues and nerves that form a network. |
| Worms! | - Flatworms - Flatworms (planarians) belong to the Phylum Platyhelminthes and are the simplest animals having bilateral symmetry. - The have a sac-like gut but no body cavity. They secrete digestive enzymes onto their food and suck it into their gut. - Roundworms  - Roundworms belong to the Phylum Nemotoda and  - are the simplest animals with a complete gut that  - runs from mouth to anus. - Segmented Worms - Segmented worms (earthworms) belong to the Phylum Annelida and have bodies divided into individual segments. - They all show bilateral symmetry and have a true |
| Phylum Mollusca | - Snails, clams, and squids are all members of this phylum. - Mollusks have bilateral symmetry and a true body cavity. - The body of a mollusk typically has a foot, gut, mantle, and shell. |
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| Phylum Arthropoda | - This phylum includes insects, spiders, and crustaceans.  - Arthropods have segmented bodies, jointed limbs, an exoskeleton, and well-developed organ systems. |
| Phylum Echinodermata | - The echinoderms include starfish, sea urchins, and sea cucumbers. - They have radial symmetry, a body cavity, an internal skeleton and spiny skin. |
| The Water Vascular System |  |
| Animalia Phylogenetic Tree |  |
| Protostomes vs Deuterostomes |  |
| Phylum Chordata | - All chordates have a notochord.  - There are three subphyla: - Tunicata – includes salps and sea squirts - Cephalochordata – includes lancelets |
| Phylum Chordata |  |
| Subphylum Vertebrata | - All vertebrates have a body cavity that holds the body systems. - The thoracic cavity that holds the heart and lungs. - The abdominal cavity that holds the digestive, excretory, and reproductive organs. - Vertebrate organs are made of four types of tissue: - Epithelial - Nervous - Muscle |
| Types of Animal Tissue |  |
| Class Agnatha, Osteichthyes, and Chondrichthyes | - Class Agnatha are the jawless fish. Only two groups still exist today, the lampreys and the hagfish. - 2 chambered hearts |
| Class Agnatha, Osteichthyes, and Chondrichthyes | - Class Chondrichthyes are the cartilaginous fish. Members include sharks, rays, skates, sawfish, and chimaeras.  - 2 chambered hearts |
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| Class Agnatha, Osteichthyes, and Chondrichthyes | - Class Osteichthyes are the bony fish. They comprise the largest class of vertebrates. - All fish are ectothermic organisms with fins, gills, and two-chambered hearts. Most are oviparous (lay eggs). |
| Class Amphibia | - The surviving amphibians include frogs, toads, and salamanders. - Most amphibians are ectothermic, (mostly) tetrapod (4 limbs), oviparous (egg laying) organisms with three-chambered hearts. They inhabit a wide range of habitats. They can be aquatic, terrestrial, or arboreal. |
| Amphibian Life Cycle |  |
| Class Reptilia | - Reptiles include turtles, crocodilians, snakes, and lizards. |
| Class Aves | - Birds are endothermic, oviparous organisms with a four-chambered heart. They are the largest class of tetrapods. |
| Avian Breathing System |  |
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| Class Mammalia | - Mammals are endothermic, tetrapod, (mostly) viviparous organisms (live young) with four-chambered hearts, hair/fur, and mammary glands. - The earliest mammals appeared about 200 million years ago. - Oviparous mammals include the echidna and the platypus. - The viviparous mammals can be loosely categorized as placental or marsupial. |
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