Class Reptile

What Is a Reptile?

A reptile is a vertebrate that has dry, scaly skin, lungs, and terrestrial eggs with several membranes.

These characteristics enable reptiles to live their entire lives out of water.

Scaly, dry skin prevents the loss of body water in dry environments – must be shed as it grows.

Evolution of Reptiles

Reptiles were the first vertebrates that were not dependent on water for reproduction.

The first reptile fossil dates back to the Carboniferous Period.

Form and Function in Reptiles

Tough, scaly skin and the ability to control body temperature are two adaptations to terrestrial life.

Adaptations that have contributed to the success of reptiles on land are:

- well-developed lungs
- a double-loop circulatory system
- a water-conserving excretory system
- strong limbs
- internal fertilization
- shelled, terrestrial eggs

Body Temperature Control

Reptiles are ectotherms.

Ectotherms are animals that rely on behavior to control body temperature.

To warm up, they bask in the sun or stay under water at night.

To cool down, they move to the shade or take shelter in underground burrows.

Feeding

Reptiles eat a wide range of foods.

Respiration

Reptile lungs are spongy, allowing for a larger area of gas-exchange.

Many reptiles have muscles around the ribs that expand and collapse the chest cavity.

Most reptiles have two lungs, but certain species of snakes have just one lung.

Circulation

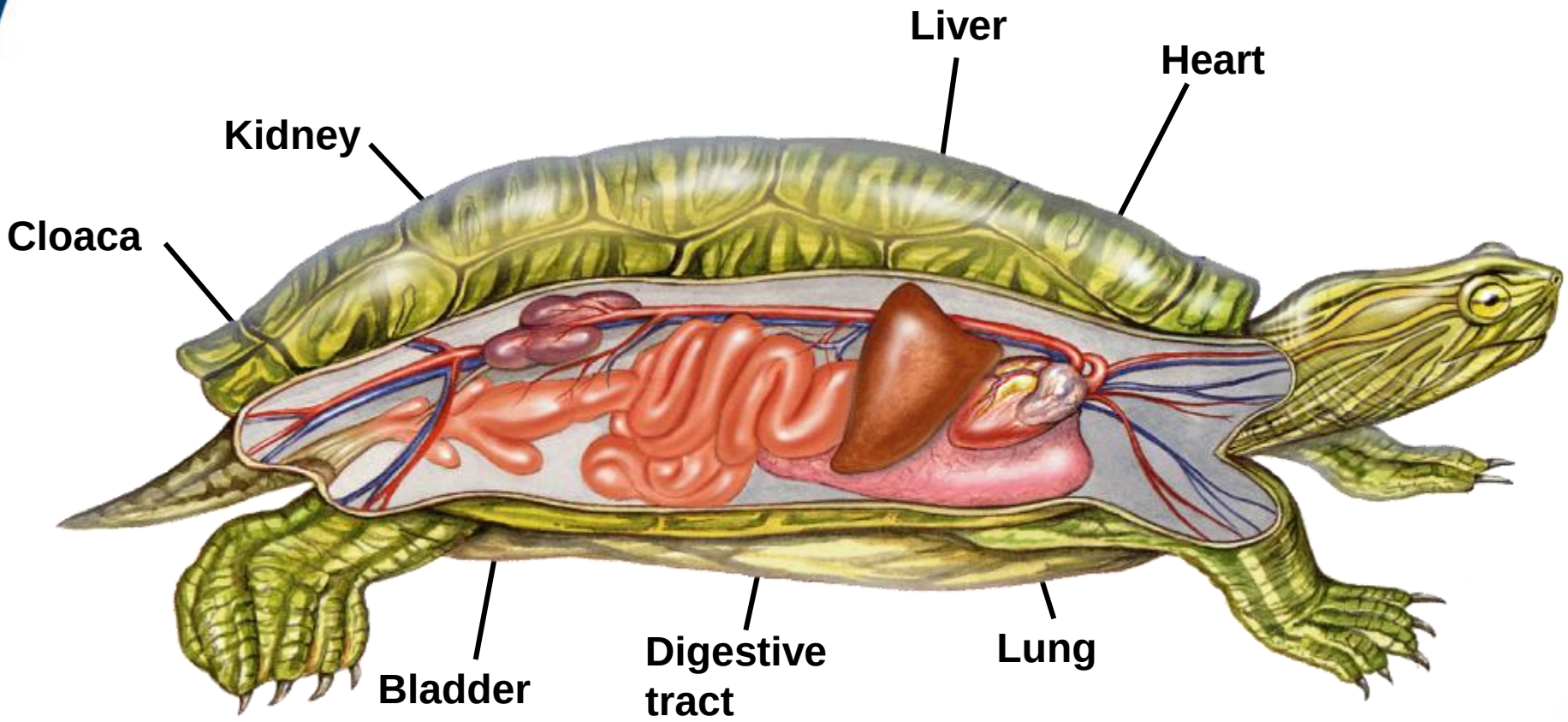
Reptiles have a double-loop circulatory system:

- One loop brings blood to and from the lungs.
- One loop brings blood to and from the rest of the body.

Reptile hearts have two atria and either one or two ventricles.

Most reptiles have one ventricle with a partial septum that separates oxygen-rich and oxygen-poor blood.

Crocodiles and alligators have two atria and two ventricles.



Excretion

Urine is produced in the kidneys.

- In some reptiles, urine flows in tubes directly into a cloaca.
- In others, a bladder stores urine before it is expelled.

Other reptiles convert ammonia into uric acid.

In the cloaca, urine is reduced to crystals of uric acid that form a pasty white solid.

By eliminating solid wastes, a reptile can conserve water.

Response

Reptilian brains are similar to amphibians.

Their cerebrum and cerebellum are more developed than other parts of the brain.

Reptiles that are active in the day have complex eyes and see color well.

Many snakes also have an extremely good sense of smell.

Most reptiles have sensory organs in the mouth that detect chemicals when reptiles flick their tongues.

Reptiles have simple ears with an external eardrum and a single bone that conducts sound to the inner ear.

Snakes can also pick up vibrations in the ground through bones in their skulls.

Some snakes can detect the body heat of their prey.

Movement

- Reptiles with legs have large strong limbs.
- Some have legs that are rotated further under the body, enabling them to carry more body weight.

The legs and feet of many aquatic turtles have developed into flippers.

Reptiles' backbones help accomplish much of their movement.

Reproduction

- Most reptiles are oviparous, laying eggs that develop outside the mother's body.
- All reptiles reproduce by internal fertilization, in which the male deposits sperm inside the female's cloaca.

After fertilization, the female's reproductive system covers the embryo with several membranes and a leathery shell.

The shell and membranes protect the embryo and prevent the egg from drying out.

This type of egg, an amniotic egg, is one of the most important adaptations to life on land.

An amniotic egg has four membranes—the amnion, the yolk sac, the chorion, and the allantois.

Groups of Reptiles

The four surviving groups of reptiles are:

- **lizards and snakes**
- **crocodilians**
- **turtles and tortoises**
- **tuataras**

Class “Aves” - Birds

What Is a Bird?

Birds are reptilelike animals that maintain a constant internal body temperature.

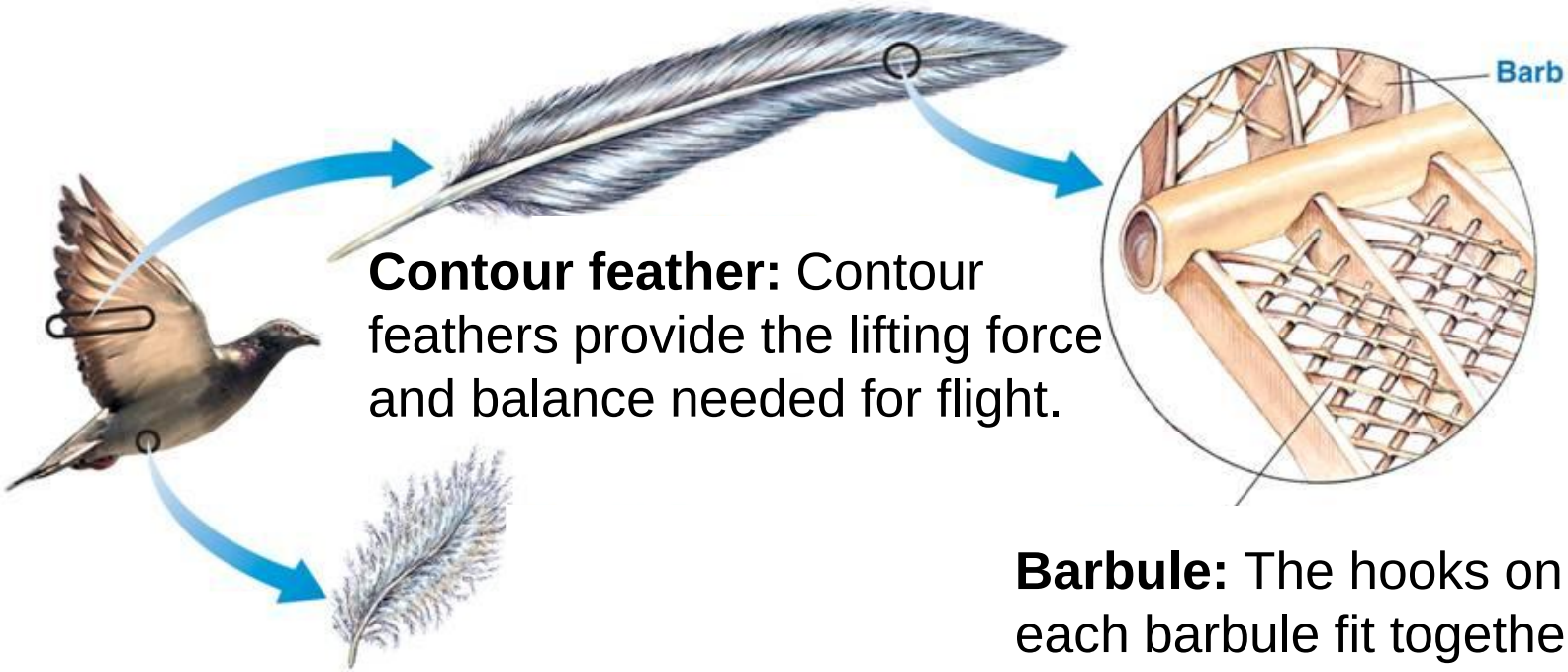
Birds have an outer covering of feathers; two legs that are covered with scales and are used for walking or perching; and front limbs modified into wings.

Feathers separate birds from all other living animals.

Feathers are made mostly of protein and develop from pits in the birds' skin.

Feathers help birds fly and also keep them warm.

The two main types of feathers are contour and down.



Contour feather: Contour feathers provide the lifting force and balance needed for flight.

Barbule: The hooks on each barbule fit together, holding them flat.

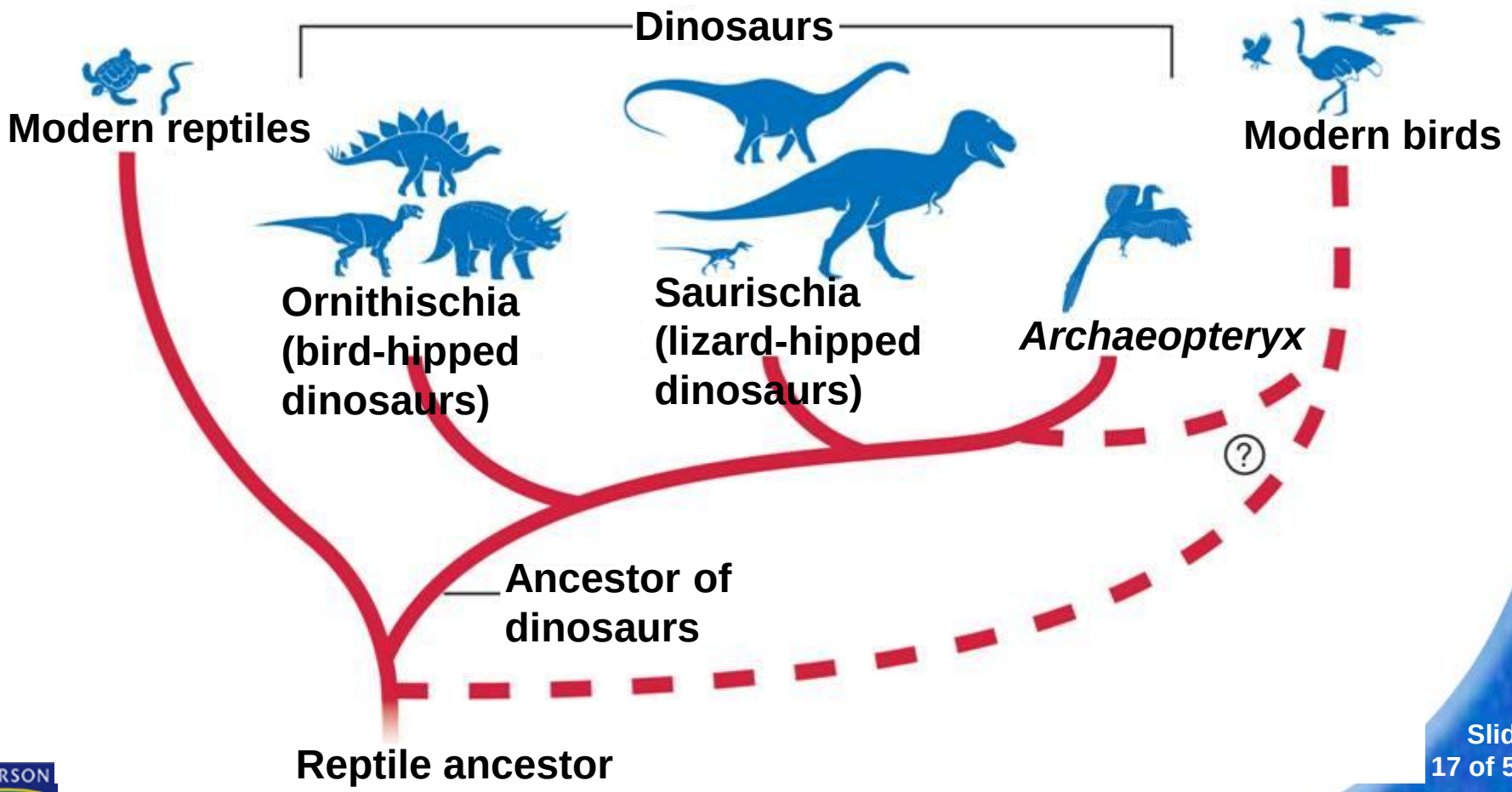
Down feather: Down feathers trap air close to the body and keep the bird warm.

Evolution of Birds

Paleontologists agree that birds evolved from extinct reptiles.

- Embryos of birds and reptiles develop within amniotic eggs.
- Both excrete nitrogenous wastes as uric acid.
- Bones that support the limbs, and other skeleton parts, are similar in both groups.

Evolution of Birds



Form, Function, and Flight

Birds have a number of adaptations that enable them to fly, including:

- highly efficient digestive, respiratory, and circulatory systems
- aerodynamic feathers and wings
- strong, lightweight bones
- strong chest muscles

Body Temperature Control

Birds generate their own body heat and are called **endotherms.**

Endotherms have a high rate of metabolism.

Metabolism produces heat.

Feathers insulate a bird enough to conserve most of its metabolic energy, allowing it to keep warm.

Birds need to eat a lot of food to produce the heat energy they need to maintain metabolism.

Feeding

Birds' beaks, or bills, are adapted to the type of food they eat.

- Insect-eating birds have short, fine bills that pick ants and insects off leaves and branches, or can catch flying insects.
- Seed-eaters have short, thick bills.
- Carnivorous birds shred their prey with strong hooked bills.

Most birds have a crop - a structure at the lower end of the esophagus in which food is stored and moistened.
Birds that eat meat or fish have an expandable area in which large amounts of soft food can be stored.

Birds that eat insects or seeds have a muscular organ called the gizzard that helps in the mechanical breakdown of food.

Respiration

Birds have a highly-efficient way of taking in oxygen and eliminating carbon dioxide.

Air enters **air sacs**.

It flows through the lungs where gas exchange takes place – in one direction.

constantly exposes the lungs to oxygen-rich air.

maintains a high metabolic rate.

provides efficient extraction of oxygen, which enables birds to fly at high altitudes where the air is thin.

Circulation

Birds have four-chambered hearts and two circulatory loops.

There is complete separation of oxygen-rich and oxygen-poor blood.

Oxygen-poor blood from the body is pumped to the lungs.

Oxygen-rich blood returns from the lungs and is pumped to the rest of the body.

Excretion

Excretion in birds is similar to that of most living reptiles.

Nitrogenous wastes are removed from the blood by the kidneys, converted to uric acid, and deposited in the cloaca.

Most of the water is reabsorbed, leaving uric acid crystals in a white, pasty form.

Response

Birds have well-developed sense organs, which are adaptations that enable them to coordinate the movements required for flight.

Birds' brains can quickly interpret and respond to signals.

The cerebrum controls behavior and is large.

The cerebellum coordinates the movement of the wings and legs; it is larger in birds than in reptiles.

Birds have well-developed eyes which allow them to see color very well.

Most bird species can hear quite well.

Taste and smell are not well developed in most birds.

Movement

Some birds, such as ostriches and penguins cannot fly.

Most birds, however, can fly.

The skeletal and muscular systems of flying birds exhibit adaptations that enable flight.

Bones are thinner than those of Reptiles.

Large breast muscles allow for powerful wing control.

Reproduction

Both male and female reproductive tracts open into the cloaca.

Mating birds press their cloacas together to transfer sperm from male to female.

Some male birds have a penis

Bird lay amniotic eggs that have hard outer shells.

Most birds incubate their eggs until the eggs hatch.

Groups of Birds

There are nearly 30 different orders of birds.

The largest order of birds is the passerines, or perching birds.

Other groups of birds include: pelicans, parrots, birds of prey, cavity-nesting birds, herons, and ostriches.

Class Mammalia

All mammals have two notable features: hair and mammary glands.

In females, mammary glands produce milk to nourish the young.

In addition to having hair and the ability to nourish their young with milk, all mammals:

breathe air.

have four-chambered hearts.

are endotherms that generate their body heat internally.

Evolution of Mammals

Mammalian fossils are characterized by a lower jaw with a large, teeth-bearing bone connected directly to the skull by a joint, and distinctive features of the limbs and the backbone.

The first true mammals appeared during the late Triassic Period, about 220 million years ago.

These mammals were very small and probably nocturnal.

There are now **19 mammal orders** (including Artiodactyla, Carnivora, Chiroptera, Marsupialia, Primates…etc)

- 10 of these orders exist in North America

Form and Function in Mammals

The mammalian body has adapted in varied ways to a great many habitats.

Body Temperature Control

Mammals are endotherms.

A high rate of metabolism helps mammals generate body heat.

Mammals have external body hair that helps them keep warm.

Subcutaneous fat, which is a layer of fat located beneath the skin, also helps conserve body heat.

Many mammals have sweat glands that help cool the body.

- If its body temperature gets too high, the mammal sweats.
- Evaporation of sweat then cools the body.
- Some mammals pant to cool down.
- These are examples of homeostatic mechanisms

Feeding

- Because of its high metabolic rate, a mammal must eat a lot of food to maintain homeostasis.

A mammal's digestive tract breaks down and absorbs the type of food that it eats.

Carnivores have a short intestine because enzymes quickly digest meat.

Herbivores have a longer intestine because tough, fibrous plant tissues take longer to digest.

Respiration

All mammals use lungs to breathe.

A **diaphragm** is a large, flat muscle at the bottom of a mammal's chest cavity that helps in breathing.

When an animal inhales, chest muscles lift the rib cage up and out. The diaphragm pulls the chest cavity down.

The combined actions of the chest muscles and diaphragm increase the volume of the chest cavity.

The increase in volume pulls air into the lungs.

When an animal exhales, chest muscles lower the rib cage. The diaphragm relaxes, and the volume of the chest cavity decreases.

Air is then pushed out of the lungs.

Circulation

The mammalian circulatory system has two loops and a four-chambered heart.

The right side of the heart receives oxygen-poor blood from the body and pumps it to the lungs.

The left side receives oxygen-rich blood from the lungs and pumps it to the rest of the body.

Excretion

Kidneys extract nitrogenous wastes from the blood in the form of urea.

Urea, other wastes, and water combine to form urine.

From the kidneys, urine flows to a urinary bladder, where it is stored until it is eliminated.

The kidneys of mammals help maintain homeostasis by filtering urea from the blood, as well as by excreting excess water or retaining needed water – allowing them to live in tough habitats

Response

Mammals have well-developed brains with three main parts:

- cerebrum—controls thinking and learning
- cerebellum—controls muscular coordination
- medulla oblongata—regulates involuntary body functions

The cerebrum has a well-developed outer layer called the cerebral cortex, which is the center of thinking and other complex behaviors.

Some behaviors, such as reading, are possible only with the human cerebral cortex.

Mammals other than humans also exhibit complex behaviors.

Mammals rely on highly developed senses (smell and hearing) to detect and respond to stimuli from their external environment.

All mammalian ears have the same basic parts, but they differ in their ability to detect sound.

- Dogs, bats, and dolphins detect sounds at higher frequencies than humans can.
- Elephants detect sounds at much lower frequencies.
- The ability to distinguish colors varies among species.
- Color vision is most useful to animals that are active during the day.

Chemical Controls

Mammals have endocrine glands that regulate body activities by releasing hormones.

Hormones are substances produced in one part of an organism that affect another part of the same organism.

Hormones are carried by the blood to the organs that they affect.

Movement

Mammals have backbones that flex vertically and side to side.

Shoulder and pelvic girdles are streamlined and flexible, permitting both front and hind limbs to move in many ways.

Variations in limb bones and muscles permit a variety of movements.

Reproduction

Mammals reproduce by internal fertilization.

The male deposits sperm inside the reproductive tract of the female, where fertilization occurs.

All newborn mammals feed on their mother's milk.

Parental care ensures that young will survive and reproduce, however the duration and intensity of parental care varies among different species.