General Knowledge Today

General Science-3: Animal Kingdom

Target 2016: Integrated IAS General Studies

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Prelims MCQ Topics

Basic idea about the animals belonging to various taxonomic groups of animal Kingdom. Comparison of three classes of Arthropods, Cartilaginous and Bony Fish examples, Swim Bladder in Fishes, Amphibians – Adaptations to Terrestrial environments, Bird Adaptations for Flight, Common features of all mammals, Monotremes / Marsupials / Placentals

Introduction

Note: In UPSC or state level examinations, questions are not asked directly regarding classification of the animals in GS Paper. The questions are generally odd man out type, which are easy and low hanging fruits if you have basic idea about various taxonomical groups given in this module. Two Example questions are given here:

Q-1: Consider the following:

1. Sea Cow
2. Sea Horse
3. Sea Anemone

Which of the above is / are mammals?

{In this question Sea Cow (Dugong) is a mammal, while Sea Horse is a Fish. Sea Anemone is a Cnidarian; so correct answer is Only 1}

Q-2: Among the following organisms, which one does not belong to the class of other three? {CSE-2014}

1. Crab
2. Mite
3. Scorpion
4. Spider

{The above question is asking you to differentiate between Arachnids and Crustaceans among Arthropoda. This is discussed in this module}. Some more example Questions have been given in the end of this module.

Animal Kingdom

The kingdom Animalia is the animal kingdom. The kingdom Animalia is normally subdivided into invertebrates and vertebrates. There are nine phyla {Phyla is plural of Phylum} in Kingdom Animalia viz. Porifera (poriferans), Cnidaria (cnidarians), Platyhelminthes (flatworms), Nematoda (roundworms), Annelida (annelids), Mollusca (molluscs), Arthropoda (arthropods), Echinodermata (echinoderms) and Chordata (chordates).

Phylum – Porifera

Sponges are the members of Porifera, called so because they have pores all over their bodies. They are found in mostly in marine but also in freshwater. They have asymmetrical bodies. Most physiological activities take place at cellular level in them.

Phylum Cnidaria

Cnidarians include *Hydra, Corals, Sea Anemones, Jelly Fishes, Sea Pens* etc. They have tentacles to catch preys and special cells called Cnidoblasts that secret some poison in their prey.

Corals

Corals are Cnidarians that *live in colonies* in oceans. Individual coral in a colony is called Polyp. Many of them feed upon the small fish and plankton using the stinging cells in their tentacles. However, many others get their energy and nutrients come via a symbiotic relation with photosynthetic dianoflagellates called *Symbiodinium*. These dianoflagellates live within coral tissues. The symbiotic corals need sunlight to grow and that is why they best and grow in clear, shallow water.

Sea Anemones

Sea anemones are also predatory animals closely related to corals, jellyfish and Hydra. Some sea anemones form symbiotic relationships with dinoflagellates. They are sold worldwide as ornamental things for aquariums.

Phylum – Platyhelminthes

Platyhelminthes is a phylum of the *flatworms*. Most of these are endo-parasites in animals and humans. Common examples of Platyhelminthes include Tapeword, Liver fluke etc.

Phylum Nematoda

Phylum Nematoda is a group of Nematodes or Round worms. They live as freeliving, aquatic, terrestrial or as parasites in plants and animals. Common examples are Round worm, Filiaria worm, Hookworm etc.

Phylum – Annelida

Phylum Annelida is of Annelids or Ringed worms. The body is divided into several segments called metameres. Earthworms and Leeches are common examples of this group.

Phylum – Arthropoda

Arthropoda is the *largest phylum of animal kingdom* because around 2/3rd of all the named species on Earth belong to this phylum.

Ants, mosquitoes, flies, cockroaches, shrimp, crabs, spiders, scorpions etc. are examples of

arthropods. There are three main classes of arthropods as follows:

- **Insects:** This includes mosquitoes, cockroaches, ants, flies, bees, moths, grasshoppers, beetles and butterflies
- **Crustaceans:** This includes crabs, lobsters, shrimp and barnacles
- **Arachnids:** This includes scorpions, spiders and mites

Further, a few other classes are onychophorans (velvet worms), diplopods (millipedes) and chilopods (centipedes).

Key features of Arthropods

Members of this phylum are invertebrates; have an exoskeleton made of chitin, segmented body and articulated (jointed) legs.

Molting in Arthropods

Due to the presence of the exoskeleton, the growth of arthropods is periodical. During the growth period, the animal loses the exoskeleton, grows and develops a new exoskeleton. This process is called *ecdysis* or *molting*. We note here that the in the exoskeleton of arthropods, there is a layer of waterproof wax. This feature was fundamental in allowing primitive arthropods from the sea to survive on dry land without losing excessive water to the environment.

Malpighian Tubules

Another key feature of Arthropoda is that the excretion in these animals takes place through so called *Malpighian tubules.*

Extracorporeal digestion

The Arachnids (scorpions, spiders and mites) inject poison to paralyze or kill their prey by using structures called chelicerae. *The prey is partially digested outside the body of the arachnid by digestive enzymes injected together with the venom or afterwards.* After this extracorporeal digestion, they eat and digest their prey.

Respiration

In Crustaceans (crabs, lobsters, shrimp and barnacles), gills are found for respiration. In terrestrial insects, respiration is tracheal whereby gases flow inside small tubes on animal's external surface. Further, in arachnids (scorpions, spiders and mites) so called *Book Lungs* may also exist to aid in

respiration.

Blood and Circulation

All arthropods have a heart. The respiratory system is open (lacunar). Blood, also known as *hemolymph*, is pumped by the heart and enters into cavities (lacunas), irrigating and draining tissues. In place of Haemoglobin, respiratory pigment called Haemocynanin is found in arthropods. We note here that although the circulatory system of insects works at a sluggish pace, they are ableto perform extremely fast and exhaustive movements because of *separation of circulatory system from respiration. Gas exchange is carried out with great speed and efficiency by the tracheal system that puts cells in direct contact with air. Muscles can then work fast and hard.*

Embryonic development

In crustaceans, some species undergo direct development whereas others undergo indirect development. In insects, some species do not have a larval stage, whereas others go through indirect development beginning with an egg stage followed by a nymph stage. Moreover, other insects go through indirect development beginning with a larval stage. The transformation of a larva into an adult insect is called *metamorphosis*.

Insects have two common types of metamorphosis.

- Grasshoppers, crickets, dragonflies, and cockroaches have incomplete metamorphosis. The young (called a nymph) usually look like small adults but without the wings.
- Butterflies, moths, beetles, flies and bees have complete metamorphosis. The young (called a larva instead of a nymph) is very different from the adults. It also usually eats different types of food. There are four stages in the metamorphosis of butterflies, moths and housefly viz. egg, larva, pupa, and adult.

In some insects such as butterflies and silk moth, larva makes a cocoon (chrysalis, pupa) where it lives until transforming into the adult form. The period during which the larva is within its cocoon is a *time of intense biological activity* since the larva is being transformed into an adult insect.

Main Differences between the Classes of Arthropods

- Wings are found only in Insects (mosquitoes, cockroaches, ants, flies, bees, beetles and butterflies). There are no wings in Crustaceans (crabs, lobsters, shrimp and barnacles) and Arachnids (scorpions, spiders and mites).
- Crustaceans have *two pairs of antennae*; *insects have one pair*; *arachnids do not have antennae.*
- In crustaceans and arachnids, the head is fused with the thorax to form the cephalothorax. Their body is therefore divided into cephalothorax and abdomen. Insects have a head, thorax and abdomen.
- Most crustaceans have *five pairs of limbs. Insects have three pairs* and *arachnids have four pairs of limbs*.

Phylum – Mollusca

Phylum Mollusca is the *second largest animal phylum* after Arthropoda. They are terrestrial or aquatic (both marine and freshwater). Members of this phylum include snails, octopuses, squids, oysters etc.

Soft body of Molluscs

The word "mollusc" means "soft thing". Molluscs have soft bodies and this explains the name of the phylum. Since their body is soft, they are fragile and find it difficult to support their body in terrestrial environment. Many molluscs solve these problems by secreting a calcareous shell, which functions as exoskeleton and prevents dehydration.

Major classes

There are five main classes of Phylum Mollusca includes Bivalves, Gastropods, Cephalopods, scaphopods (tooth shells) and Polyplacophora (Chitons). Bivalves, Gastropods and Cephalopods are commonly known mollusc animals.

Bivalves

This group includes molluscs which have a *calcium carbonate* shell made of two, usually similar parts called valves. These two valves are joined together with the help of a ligament at a point called hinge. Members of this class include clams, oysters, cockles, mussels, scallops etc.

Gastropods

All kinds of snails and slugs, big or small, marine or freshwater or land snails are put in class Gastropoda. This class of Molluscs has an *extraordinary diversity of habitats*. They are found in gardens, woodlands, deserts, mountains, lakes, small ponds, estuaries, mudflats, beaches, abyssal depths of oceans etc. They are called *Gastropods because they have their feet in their ventral region.* Body of gastropods is divided into three main portions: the head, the visceral mass and the foot.

Cephalopods

Cephalopods (headfeet) are another class of molluscs which have a prominent head and a set of arms / tentacles (muscular hydrostats). These arms are modified feet. The Cephalopods are colloquially called *inkfish*, because of their ability to squirt ink. The Octopus, Squids and Cuttlefish are some of the common examples of Cephalopods.

Salient Notes on Molluscs

- Molluscs have a complete digestion system with mouth and anus. They also have extracellular digestion which is not found in any phylum below them in taxonomical hierarchy.
- A few molluscs have a tongue like structure that is used to scrape food. It is called Radula.
- Study of Molluscs is known as *Malacology* while that of Cephalopods is known as *Teuthology*.

- Aquatic molluscs respire through gills, while terrestrial molluscs have a primitive lung.
- Shell of Molluscs: The Molluscs, particularly bivalves and gastropods secrete an external Calcareous cell made of Calcium Carbonate. This secretion is done by mantle, a fold in their epidermis.

Ecological and Economic Importance of Molluscs

Molluscs play an important role in several food chains in ecosystems. Many marine molluscs are a part of a common human diet, such as octopuses and squids, which are very popular in Asia, and oysters and mussels, which are consumed all over the world. In addition to molluscs that are a part of the food industry, pearls made by oysters have a large commercial value.

Formation of Natural and Artificial Pearls

Pearls are made from small foreign particles that are deposited between the shell and the mantle of an oyster. These particles trigger a defense process in the organism and are gradually covered by layers of calcium carbonate secreted by the oyster, thus producing pearls.

In the artificial production of pearls, a small fragment of shell covered with mantle pieces is inserted between the shell and the mantle of an oyster and a pearl is formed around the graft.

Phylum – Echinodermata

Members of Echinodermata (Spiny bodied) have an endoskeleton of calcareous ossicles. Starfish, sea cucumbers (holothurians), sea urchins and brittle stars are examples of echinoderms. All echinoderms are marine animals. They live in salt water.

Salient notes on Echinoderms

Thorny Animals

In Latin, *Echino* means spiny. Echinoderms, as their name indicates are creatures with spines that stick out from an endoskeleton. Their endoskeleton is made of calcareous plaques that, in addition to spines, contain pedicellaria, small pincers used to clean the body and to help capture prey.

They suck their prey

The system that allows echinoderms to move and to attach to substrates is called the ambulacral system. In these animals, water enters through a structure called the madreporite, passes through channels and reaches the ambulacral feet along the under surface of the body. In the ambulacral region in contact with the substrate, there are tube feet which empty and fill with water, thus acting as suckers. The ambulacral hydrovascular system also carries out the tasks of circulatory and respiratory system.

Pentaradial Symmetry

Adult echinoderms have *Pentaradial symmetry*; the radial symmetry in these animals is present only in adults.

Aristotle's Lantern

Sea urchins have a teeth-like structure attached to the mouth and made of five teeth connected to ossicles and muscle fibers. This structure, known as Aristotle's lantern, is use to scratch food, mainly algae, from marine rocks.

Phylum – Chordata

Chordates are the most advanced animals in terms of evolution. Out of the 65000 species of Chordates, half belong to a class of bony fishes. All chordates posses a notochord *at one time in their life cycle (including embryonic development).* All Chordates have *branchial clefts* in the pharynx (in some species present only in the embryo). In humans, the branchial clefts located in the anterior region of the pharynx (also known as pharyngeal clefts) and are present only during the embryonic stage and disappear later.

Phylum Chordata has been divided into subdivisions viz. *Protochordates* and *Vertebrates.* In Protochordates, the notochord remains throughout the life while in vertebrates; it has been replaced

by spine in vertebrates. Balanoglossus, Amphioxus or Lancelet are notable examples of protochordates. Vertebrates are a well-known group of animals that includes mammals, birds, reptiles, amphibians, and fish.

Vertebrates

With currently 64000, species, majority of the members of Phylum Chordata belong to sub-phylum Vertebrata. All vertebrates possess notochord during the embryonic period only and later it is replaced by bony vertebral column. Further, the vertebrates have a ventral muscular heart with two, three or four chambers, kidneys for excretion and osmoregulation and paired appendages which may be fins or limbs.

Vertebrata has been divided into two divisions on the basis of jaws i.e. whether or not they have jaws. Those who lack jaws, have been placed in *Agnatha* while those possessing jaws have been placed in *Gnathostomata*. The Agnatha division has only one class called Cyclostomata whose members include Lampreys and Hagfishes. Lamprey are toothed (but jawless) vertebrates which have a sucking mouth. *Many of these are known for boring into the flesh of other fishes to suck their blood.* They can attack humans also. *Hagfishes are known as Ocean scavengers.*

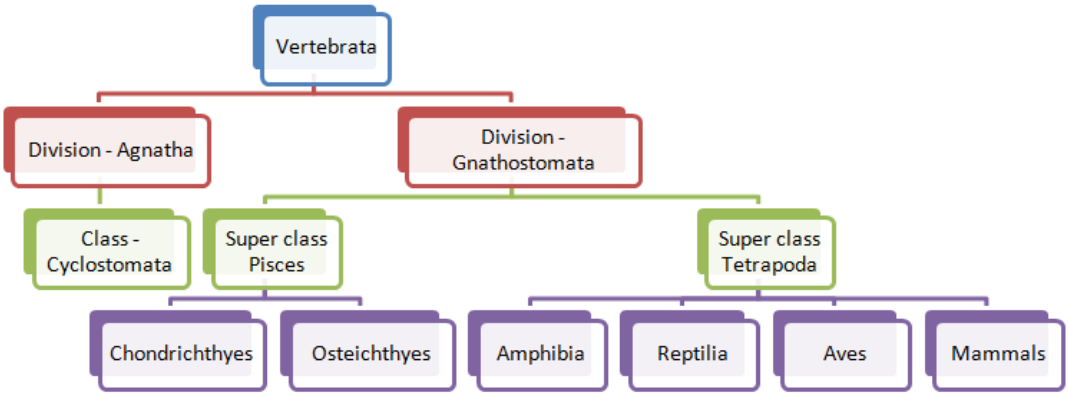
Agnatha (Jawless Chordates)

Leprey

Lemprey (as parasite on Fish)

Hagfish

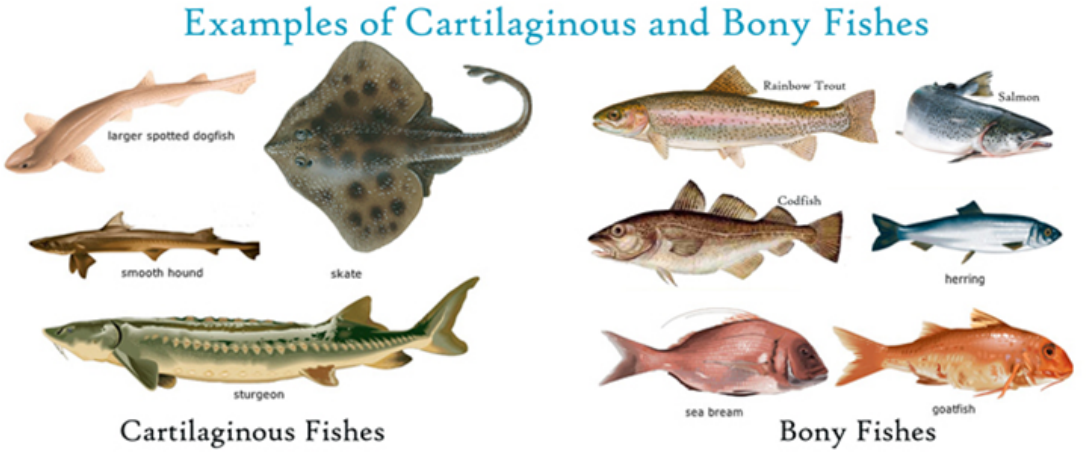
The Chordates that bear jaws have been placed in a division called Gnathostomata. It has been divided into two super-classes viz. Pisces (fishes) and Tetrapoda (that bear limbs). This division is shown in below graphics.



Class – Pisces (Fishes)

All the true fishes have been classified into two main classes as follows:

- **Chondrichthyes:** These are the fishes with soft cartilaginous skeletons. Examples are *sharks, rays, dog-fish, skates, sturgion*
- **Osteichthyes:** These are fishes with bony skeleton. Examples are Tuna, Sardines, Codfish, Salmon, Trouts, Herring etc.



Fish are all aquatic animals and, as a result, have a hydrodynamic and elongated body suitable for moving underwater, without limbs and with fins. This habitat is also related to their branchial respiration.

Gas Bladder / Swim Bladder

Bony fish have a specialized organ called a gas bladder, or swim bladder, whose interior can be filled with gas released from gas glands. The swim bladder works as a hydrostatic organ, since it produces variations in the relative density of the body, thus regulating the buoyancy and the depth of the fish

in water. Such swim bladders are not found in the Chondrichthyes. Due to this, *they must continuously move their body to keep swimming and to maintain their depth in water. This is the reason that Sharks need to move their body to swim while bony fishes do not.*

Further, when the swim bladder is filled with gas, it reduces the density of the body of the fish and, when it is emptied, this density is increased. As a result, this mechanism controls the depth of the fish under water.

Gills

Respiration in Fishes takes place via Gills, the highly vascularized organs specialized in gas exchange underwater. Apart from fishes, gills are also found in marine annelids, crustaceans, Molluscs, tadpole etc. *Gills are covered in bony fishes while not covered in cartilaginous fishes.*

Fish Heart

The Fish Heart has only two consecutive chambers called atrium and ventricle.

Excretion

Fish have Kidneys has excretory organs. While Bony fishes excrete ammonia, cartilaginous fishes excrete Urea as nitrogenous waste.

Lateral Line

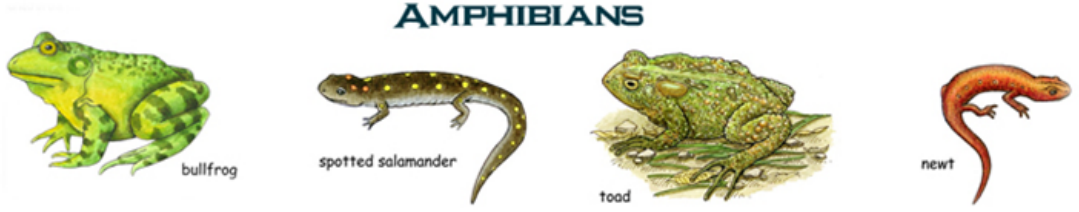
Lateral lines of bony fish are sensory organs that extend along both sides of their body. They contact the environment by a series of specialized scales that transmit information about pressure variation and vibrations in the surrounding water.

Class – Amphibia

Amphibians were the *first vertebrates to venture out onto land*. Early amphibians retained many fish-like characteristics but during the Carboniferous period amphibians diversified. Even today, Amphibians live a dual life. They are totally aquatic during their larval stage and partially terrestrial animals as adults. Because of this, they are considered intermediate organisms in the evolutionary passage of vertebrates from an aquatic to terrestrial. Amphibians are also the first tetrapod animals; that is, the first with two pairs of limbs, a typical feature of terrestrial vertebrates. The name "amphibian" comes from the double life (aquatic as larvae and partially terrestrial as adults) of these animals.

Common Amphibians

Bufo (Toad), Rana (Frog), Hyla (Tree frog), Salamandra (Salamander), Ichthyophis (Limbless Amphibia), Newt are some of the common frogs.



Salient Features

There are several features of amphibians that make them dependent on water to survive. These include a permeable skin; a body subject to dehydration, external fertilization, eggs without shells and a larval stage with branchial respiration.

Respiration

In the fishes, the gas exchange is carried out via the direct contact of water with the gills, while in adult amphibians; the gas exchange is carried out through their moist and permeable skin. This kind of respiration is called *cutaneous respiration*. Further, they also have lungs. During larval (tadpole) stage, they respire only through gills and this is the reason that frogs and other amphibians need water to survive.

Amphibian Heart

While the fish heart only has two chambers; amphibians have three chambers (two atrium and one ventricle).

Excretion

The adult amphibians have kidneys to excrete nitrogenous wastes as Urea. However, their larvae (Tadpole) are aquatic and excrete ammonia.

Reproduction in Amphibians

In most amphibians, fertilization is external. However, despite the external fertilization, amphibian males and females copulate to stimulate the release of sperm and egg cells. However, females release eggs in water and males also release the sperms in water only.

Amphibians to Higher Vertebrates: Adaptations to Terrestrial environments

Transition of vertebrates from aquatic environment to terrestrial environment needed to solve some problems. *Firstly,* they needed to avoid dehydration. This problem was solved by a thicker, impermeable skin which allows to less water. While Amphibians have semi-permeable skin which helps them in respiration also, higher vertebrates have impermeable skin. *Secondly,* they needed to eliminate waste with less amount of water available. We note here that Ammonia is highly soluble in water and essentially excretion of ammonia is feasible only in aquatic animals. When they are on ground, they need to save water. This was possible by excreting nitrogenous wastes as Urea or Uric Acid as they need less water to dissolve. In amphibians, while their larvae release ammonia (thus called Ammonotelic), the adult amphibians need economy of water and thus excrete Urea. In Birds, the system is even more efficient as they excrete Uric Acid which needs least water. *Thirdly,* they needed to protect themselves against the harmful solar radiation. This was done was skin pigments, feathers, hair, fur or whatever means to filter the harmful radiation. While amphibians have skin pigments, other higher vertebrates have other means for the same purpose. *Fourthly,* they needed to solve the problem of fertilization. Hitherto animals had a media (water) which allowed the mixing of

male and female gametes. In amphibians also male and female release the gametes in water. However, in higher vertebrates this problem was solved by internal fertilization.

Class – Reptilia

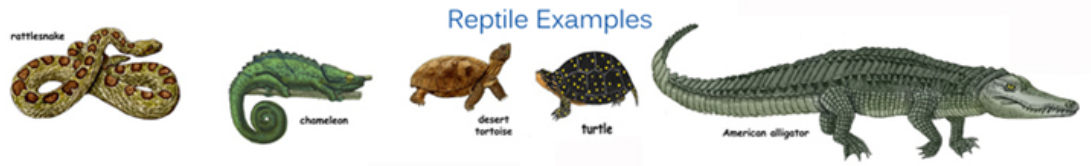
Reptiles are the first entirely terrestrial vertebrate class, totally independent from the aquatic habitat for survival. They have excellent evolutionary innovation to get them rid of water life. Their skin is keratinized and impermeable to water whereas amphibian skin is permeable. Due to keratinized skin, the hitherto cutaneous respiration became impossible and respiration became dependent on internal organs such as airways and lungs. Snakes and lizards shed their scales as skin cast.

Distribution and sub-groups

Reptiles are found in all continents except Antarctica. There are several sub-groups such as:

- **Testudines**: This includes some 400 species of turtles, terrapins and tortoises.
- **Sphenodontia:** This includes only two species of tuatara (found in New Zealand)
- **Squamata:** This is largest group of reptiles having some 9600 species of lizards and snakes
- **Crocodilia:** This group has some 25 species of crocodiles, gavials, caimans, and alligators.

Reptiles are both carnivorous and herbivorous. For example, snakes, crocodiles etc. are carnivorous while Iguanas are herbivorous.



Pulmonary Respiration

Since reptiles have no permeable skin, they need to respire using internal organs. Thus, like birds and mammals, reptiles also have pulmonary respiration.

Heart of Reptiles

Like amphibians, the reptile heart has three chambers (two atria and one ventricle). However, their heart is advanced from amphibians because ventricular separation (process of having two ventricles) appears in their heart. *Further, Heart is four-chambered in crocodiles.*

Greater mobility

Reptiles have larger and more powerful legs. The placement of the reptilian legs beneath the body (instead of at the side as in amphibians) enabled them greater mobility.

External Ear

Reptiles do not have external ear openings. ***Tympanum*** represents ear.

Body temperature

Fish, amphibians as well as Reptiles are hetero-thermic animals; which means that they are unable to maintain the body temperature. They are also called Cold blooded animals or poikilothermic or

ectothermic animals. This is the reason that

- Reptiles are rarely found in polar regions.
- They need an external heat source to warm their bodies.
- They are more active during the day, a period when they can use the sun's heat to warm their bodies.

Excretion

Evolution of reptiles happed around water economy. They excrete uric acid which is less toxic than both ammonia and urea and needs least water.

Reproduction

In reptiles, birds and mammals, fertilization is internal by means of copulation between male and females. Reptiles are oviparous and they lay eggs with shell. The embryo develops outside mother's body. Some reptiles also show ovovivipary in which mother keeps the eggs in its body until it hatches. However, it is different from vivipary as there is no trophic / placental connection between embryo and parent.

Further, the embryonic development is direct in reptiles, which means that there are no tadpoles or larvae.

Class – Aves

Sometime during the early Jurassic, two groups of reptiles gained the ability to fly and one of these groups later gave rise to the Aves (birds). They developed a range of adaptations that enabled flight such as feathers, anterior limbs transformed into wings, pneumatic bones and horny (corneous) beaks and endothermy i.e. birds are warm blooded animals.

Bird Adaptations for Flight

There are several features of birds that allow them to fly. *Firstly,* their anterior limbs have transformed into wings attached to a well-developed pectoral musculature. *Secondly,* they have lightweight bones with internal spaces filled with air. These bones are called pneumatic bones. This feature reduces the density of body of the animal, facilitating flight. *Thirdly,* they have no colon or bladder to accumulate feces or urine. Their excretion is Uric acid which requires least water and least storage place. Lastly, Birds have an aerodynamic body and lungs with specialized air sacs.

Heart of Birds

The heart of birds is more developed then reptiles and has 2 atria and 2 ventricles. There is no mixture of venous and arterial blood like mammals.

Excretion in Birds

Birds are uricotelic, meaning that, like reptiles, they excrete uric acid. This substance needs less water to be eliminated and it helps to reduce body weight, making flight easier.

Similarities between Birds and Reptiles

In terms of external coverage, birds are similar to reptiles in that they present impermeable

keratinized outside. In terms of reproduction, fertilization is internal in both and the embryo develops within a shelled egg. In terms of excretion, both excrete uric acid.

Reproduction in Birds

Birds reproduce sexually. Embryos develop within shelled eggs and embryonic development occurs outside the mother's body. The eggshell is made of calcium carbonate. The white, or albumen, is composed by albumin, a protein. The yolk is predominantly made up of lipids, but also contains proteins and vitamins.

Body Temperature Control in Birds

While Reptiles are heterothermic, as they do not control their body temperature; birds are the first homoeothermic (endothermic) animals, as they are able to maintain a constant body temperature. This is the reason that many birds live in regions of intense cold. Penguins are an example of birds that live in polar region.

Other important Facts

- Modern Birds don't have teeth. They possess beak.
- The digestive tract of birds has additional chambers, *the crop and gizzard*.

Class – Mammalia

Both birds and mammals have evolved from a reptile ancestor. In terms of evolution, mammals are most advanced organisms found in almost all habitats in Earth's biosphere including polar ice caps, deserts, mountains, forests, grasslands and dark caves.

Common features of all mammals

All mammals have six things in common. *Firstly,* all mammals are vertebrates and have a backbone. *Secondly,* all mammals have lungs and breathe dry air. *Thirdly,* all mammals are endothermic i.e. warm blooded. animals. *Fourthly,* all mammals have some fur or hair on their bodies. The hair or fur may differ in proportion. *Fifthly,* all mammals have two pairs of limbs. *Sixthly,* the most unique mammalian characteristic is the presence of milk producing glands (*mammary glands*) by which the young ones are nourished.

Monotremes / Marsupials / Placentals

Mostly female mammals give birth to the young ones but there are only a few mammals that lay eggs. On this basis, Mammals have been divided into three groups viz. Monotremes (prototheria), Marsupials (metatheria) and Placentals (Eutheria).

Monotremes (prototheria)

Monotremes or Prototherians are egg laying (oviparous) mammals. They are the *most primitive mammals*. Currently, only three species of Monotremes are extant viz. Duckbilled Platypus and two species of Echidnas. Monotremes *are found only in Australia and New Guinea*.

- The word "monotreme" means "one opening" which denotes that Monotremes have *only one*

cloaca that is used as anus, unitary tract as well as for reproduction.

- They lay egg which has leathery shell.
- The young ones get their milk from mammary glands found on mother's belly. No nipples are found in Monotremes.
- While platypus lays eggs on bank of stream; echidnas lay a single egg in a temporary protective pouch on mother's belly.
- *Monotremes don't have a placenta also.*

Marsupials (Metatheria)

Marsupials include kangaroos, wallabies, koala, possums, opossums, wombats, numbat etc. There are around 330 species of Marsupials distributed in three continents viz. Australia South America and North America (only two species are found north of Mexico).

Most (70%) are found Australia continent which includes Australia, New Zealand, New Guinea and neighbouring islands in the Pacific Ocean. Remaining is mostly found in South America and Central America.

Key Features

- The term marsupium means a pouch. Marsupials give birth to a relatively undeveloped

young, which often resides in the pouch with the mother for a certain time after birth. This also implies that they have a *relatively short gestation*

- Marsupials have different ecological niches, ranging from moles to insect eaters to plant eaters.
- They first evolved in South America some 100 million years ago when Australia, South America and Antarctica were joined together. Gradually, these three continents separated and the marsupials got isolated. They freely evolved in isolation.
- Most Marsupials are nocturnal and they have best sense of smell and hearing.
- Small Kangaroos are called wallabies. Red Kangaroo is largest Marsupial of the world. Further, Kangaroos are able to move more efficiently at high speed in comparison to low speed because of tendons in their hind legs and tail acts as pendulum.
- Kangaroos are able to withstand dry periods and little rainfall and can survive without water for many months.
- A male kangaroo is called a boomer, a female kangaroo a flyer, and a baby kangaroo a joey.

Placentals (Eutheria)

There are nearly 4000 described species in Placental mammals, of which most are rodents and bats.

The Placental mammals give birth to live young. Before birth, the embryo is nourished in mother's uterus via a specialized organ connected to uterus called placenta. We note that Marsupials also have a placenta but it is very short lived and does not make any substantial contribution in the nourishment of the foetus.

The placental animals have been divided into several orders as enumerated below:

- *Artiodactyls* are mammals with an even number of fingers in claws or paws like. These include cows, sheep and giraffes.
- *Perissodactyls* or *ungulates* (hooved), are large animals with an odd number of fingers on each paw, such as horses and rhinos.
- *Carnivorous* mammals are predators with canine teeth such as dogs, lions and tigers.
- *Cetaceans* are aquatic mammals without posterior limbs, such as whales and dolphins.
- *Edentates* are mammals with rare or absent teeth, such as sloths, armadillos and anteaters.
- *Lagomorphs* are small-sized mammals with three pairs of continuously growing incisor teeth specialized in gnawing, such as rabbits and hares.
- *Primates* are characterized by their large cranium and well-developed brain, such as humans and apes.
- Proboscideans are large animals whose nose and upper lip form a trunk (snout), such as elephants

- *Chiropterans* are flying nocturnal mammals, this group includes bats.
- *Rodents* are animals with two pairs of continuously growing incisor teeth, such as mice, rats, beavers and squirrels.
- *Sirenians* are freshwater aquatic mammals lacking of posterior limbs, such as dugongs (Sea Cows) and manatees.

Example Questions on Animal Taxonomy

Sample Questions for Module

1. Which among the following is closest to corals in terms of evolution of animals?

[A] Sea Cow

[B] Sea Horse

[C] Sea Lion

[D] Sea anemone

Answer: [D] Sea anemone

Sea anemones, Corals, jellyfish, tube-dwelling anemones, and Hydra are members of Phylum Cnidaria.

2. Which among the following is a matching set in taxonomy?

[A] Leech, Locust, Sea urchin, Lobster

[B] Star Fish, Jelly Fish, Cuttle Fish, Octopus

[C] Milliped, Crab, Centipede, Cockroach

[D] Round Worm, Earthworm, Flatworm, Silk worm

Answer: [C] Milliped, Crab, Centipede, Cockroach

3. Which among the following is / are warm blooded animals?

1. Mammals
2. Birds
3. Fishes
4. Reptiles

Choose the correct option from the codes given below:

[A] 1 Only

[B] 1 & 2 Only

[C] 1, 2 & 3 Only

[D] 1, 2, 3 & 4

Answer: [B] 1 & 2 Only

With a few exceptions, all mammals and birds are warm-blooded, and all reptiles, insects, arachnids, amphibians and fish are cold-blooded.

4. Which among the following is homologous to a human arm?

[A] Wing of an insect

[B] Leg of a lobster

[C] Lateral Fin of a whale

[D] Front leg of a reptile

Answer: [C] Lateral Fin of a whale

The lateral fin of the whale consists of the same bones as a human's arm, the radius, ulna, and humerus. These structures are considered to be homologous because the underlying structure is similar and, therefore, humans and whales share a common ancestor. The lobster's leg, the reptile's front leg, and the insect's wing are analogous to the human's arm. They have a common function but no common structure, and they do not share a common ancestor.

5. How Alligators are different from Crocodiles?

1. While Alligators and Crocodiles belong to same family of reptiles, their orders are different

2. While Alligators prefer a freshwater habitat, crocodiles prefer to live in brackish water or saltwater.

3. While the salt glands are non functional in Alligators, they work in Crocodiles

Select the correct option from the codes given below:

[A] Only 1 is correct

[B] Only 2 & 3 are correct

[C] Only 2 is correct

[D] 1, 2 & 3 are correct

Answer: [B] Only 2 & 3 are correct

Both these reptiles belong to same order Crocodilia, alligators are classified under Alligatoridae family, whereas crocodiles are members of the Crocodylidae family. In regards to the habitat comparison of alligators and crocodiles, both spend their life in and near water bodies and lay their eggs on land. But the difference is alligators prefer a freshwater habitat, while crocodiles prefer to live in brackish water or saltwater. Alligators have a broader 'U' shaped snout, whereas the snout shape of crocodiles is narrow and form a V towards the end.

The tooth placement is also a distinguishing feature to demarcate alligators and crocodiles. The jaw placement of an alligator is such that the upper jaw is wider and covers the lower jaw

completely. In case of a crocodile, the width of the upper and lower jaw are the same, hence, the teeth in the lower jaw become apparent after the mouth is closed.Dermal Pressure Receptors (DPRs) are small, black, sensory pits that help in detecting changes in the water pressure. Both in alligators and crocodiles, DPRs serve as an important organ for locating their prey. In alligators, DPRs are present only around the jaw, whereas in crocodiles, these sensory organs are present in nearly every scale of the body.

Both alligators and crocodiles have structurally modified salivary glands (salt glands) in the tongue. The crocodiles use these salt glands for excreting excess salt from the body, whereas in alligators, these salt glands are non functional. This is the reason as to why, a crocodile can tolerate saline water, whereas an alligator cannot. (Buzzle.com)

6. The birds not have respiratory trouble at the time of flying at high altitude. What is the reason for this?

[A] The size of lungs of birds is larger in comparison to their body

[B] At higher altitudes birds fly inactively

[C] Birds have extra air sacs

[D] None of the above is a correct reason

Answer: [C] Birds have extra air sacs

Because flying takes a tremendous amount of energy, birds need to get lots of oxygen. The air sacs in their lungs help them to keep fresh air flowing in, unlike mammals, where the "old" air within the trachea and mouth (which has low oxygen content and high CO2 levels) in inhaled each time. Birds eliminate this "anatomical dead space" problem by using air sacs.

7. Taxonomically, which among the following is closet to Sea Corals?

[A] Sea Lettuce

[B] Sea Horse

[C] Sea Anemone

[D] Sea Urchin

Answer: [C] Sea Anemone

As cnidarians, sea anemones are related to corals, jellyfish, tube-dwelling anemones, and Hydra.

8. Which among the following is most distantly related to other three animals?

[A] Walrus

[B] Sea Lion

[C] Seals

[D] Sperm whale

Answer: [D] Sperm whale

Seals, Walruses and Sea lions are Mammals belonging to a single taxonomic group (a clade) called Pinnipedia, which means fin footed. All of them are semi-aquatic marine mammals. They belong to the order Carnivora and their closest living relatives are bears.

They are characterized by modification of limbs to flippers. Pinnipeds are mammals with four flippers — one pair in front and one at the back.

They are warm-blooded, nurse their young, breathe air and have hair. The sea lion has small, tiny external ear flaps. Seals have no flaps.

The front flippers of sea lions are long, have no hair and nails. Seals' front flippers are short, blunt, covered with hair with nails on the ends.

Sea lions can turn their hind flippers forward to move on land but seals cannot do so.

9. Select species of animals enters into the state of animal dormancy to avoid damage from adverse season. Which among the following are included in such animals?

1. Polar Bear

2. Tortoises

3. Crocodiles

4. Salamanders

Select the correct option from the codes given below:

[A] Only 1 & 2

[B] Only 2, & 3

[C] Only 1, 2 & 3

[D] 1, 2, 3 & 4

Answer: [D] 1, 2, 3 & 4

Many animals go under the ground during winter. This process is called hibernation. During this period metabolic rate is reduced. In fact, it is a mechanism of survival. Amphibians like toad and frog undergo hibernation. Hybernation is also seen in female polar bears. Aestivation is an opposite process of hibernation. Some animals go under the ground during the dry season of summer. In zoology it is a state of inactivity and reduced metabolic activity that occurs during the dry season in species such as lungfish and snails.

10. From the point of view of evolution of living organisms, which of the following set of animals is a correct sequence of evolution?

[A] Whale, Kangaroo, Echidna

[B] Echidna, Whale, Kangaroo

[C] Kangaroo, Whale, Echidna

[D] Echidna, Kangaroo, Whale

Answer: [D] Echidna, Kangaroo, Whale

The correct sequence of the evolution would be Monotremes, Marsupials and Eutheria. Since, Whale is in subclass Eutheria, it is the latest in the evolution. So the correct sequence is Echidena (Monotreme), Kangaroo (Marsupials) & Whale (Eutheria).Echidna are the only surviving members of the Monotremata order and are the only living mammals that lay eggs.