Phylum Chordata:

DR SMITA RAI

- Includes animals ; great differences in anatomy, physiology and habits
- Includes Vertebrata (Craniata) and Protochordata (Acraniata)
- Protochordates are small size and all are marine
- Vertebrates include all living animals, including huge sharks and whales
- Most chordates are free living and none is parasitic

Characters: Three primary characters exhibited by chordate animals at some time in their life history

1. Notochord:
2. Dorsal tubular nerve cord
3. Gill clefts also called gill slits or pharyngeal clefts.

Higher chordates also possess the following characters

1. **Ventral heart**: blood circulation by a muscular heart lying in the pericardial cavity.
2. **Hepatic portal system:** food laden blood comes from the alimentary canal thru a hepatic portal vein which capilarizes in liver.
3. **Red blood corpuscles:** respiratory pigment is haemoglobin
4. **Post anal tail**
5. **Cephalization:** head present
6. **Bilateral symmetry**
7. **Triploblastic condition**
8. **Ceolom present**
9. **metamerism**

Phylum Chordata

Group Protochordata (Acraniata)

Subphylum Hemichordata

Subphylum Urochordata or Tunicata

Subphylum Cephalochordata

Hemichordata: Notochord is short and anterior: nerve tissue is epidermis

- Exclusively marine worm like, soft bodied animals
- Body divide into proboscis, collar and trunk
- Numerous paired gill slits
- Blood vascular system is simple.
- Sexes are separate; development direct or indirect

Class 1. Enteropneusta

- Solitary and burrowing worm like; commonly called acron or tongue worm
- Body consists of proboscis, collar and trunk
- Epidermis ciliated and glandular
- Numerous gill slits and gonads
- Alimentery canal straight with terminal anus
- Two rows of hepatic caeca present
- Eg *Balanoglossus*

Subphylum Urochordata or Tunicata

- Exclusively marine; commonly called sea squirts
- Solitary or colonial
- Fixed or free swimming and pelagic
- Body is covered by cuticular tunic or test.
- Notochord in larva , absent in adults
- Numerous gill slits
- Ventral heart, simple and tubular
- Coelom absent
- Hermaphrodites

Class Ascidiacea

- Fixed or free swimming marine forms
- Simple or compound; solitary or colonial
- Test is permanent and well developed.
- Adults have no locomotory appendages or tail; no notochord
- Numerous gill slits
- Reproduction sexual and asexual

Eg *Herdmania*

Subphylum Cephalochordata

- Small fish like animals
- Notochord and nerve cord extend along entire body length
- Dorsal tubular neural tube without well defined brain
- Numerous Gill slits present
- Metamerism well marked
- Definite coelom present
- Excretory organs are nephridia
- Eg *Amphioxus*

Group Craniata or Vertebrata

Subphylum Agnatha

Subphylum Gnathostomata

Subphylum Agnatha

- Earliest known vertebrates
- Absence of jaws
- Teeth, paired appendages, exoskeleton absent
- Skull has membranous roof
- Vertebral column consists of persistent notochord with fibrous neural tube
- Large number of gill slits, 7-14 pairs
- 1 or 2 semicircular ducts in ear

- Long kidneys
- Genital ducts absent.
- Pineal apparatus well developed

Class Cyclostomata

- Body long rounded and eel like
- Skin soft smooth , without exoskeleton
- Mouth sectorial devoid of functional jaws.
- Nostril single and median
- Paired fins or lateral appendages are absent
- Skeleton cartilaginous; notochord persistent
- Heart is two chambered and aortic arches are many
- Single gonad; development direct or indirect … eg *Petromyzon*

Subphylum Gnathostomata

Class Pisces

- Aquatic, fresh water or marine, cold blooded
- Skin covered with scales, dermal denticles or bony plates
- Body elongated
- Paired or unpaired fins
- Tail is muscular and used for propulsion
- Endoskeleton cartilaginous or bony
- Respiration thru gills
- Swim bladder or air bladder present
- Two chambered heart
- Ten pairs of cranial nerves are present

- Kidney is mesonephros
- Gonads possess true gonoducts
- Sexes separate ; development indirect

Subclass Elasmobranchii

- Skin is covered with placoid scales
- Endoskeleton cartilaginous, often calcified
- Gill slits 5-7
- Air bladder & lungs are absent.
- Male possesses claspers

Eg Scoliodon

Subclass Teleostomi

- Endoskeleton more or less bony
- Single external gill slit
- Mouth is terminal
- Air bladder is present
- Cloaca and claspers are absent

Eg *Labeo*

Class Amphibia

- Cold blooded vertebrates
- Skin smooth or rough, rich in glands which keeps it moist
- Limbs tetrapodous
- RBCs are biconvex, oval and nucleated
- Heart has 2 atria and 1 ventricle
- Aortic arches are symmetrical
- Gills are present at some life stage
- Kidneys with persistant nephrostome
- Lateral sense organs are present
- Larvae pass thru aquatic stage before metamorphosing into adult.
- Eg Frog

Class Reptilia

- Cold blooded, terrestrial and aquatic
- Body covered with horny scales or scutes
- Skin is dry, glands are absent
- Limbs tetrapodous pentadactyle type
- Vertebrae are gastrocentrous
- Ribs form a true sternum
- Respiration by lungs
- Heart is divided into two auricles and incompletely divided ventricles
- RBCs are nucleated
- Kidneys without nephrostome

- Twelve pairs of cranial nerves
- Lateral sense organs are absent.
- Embryonic membranes (amnion and allantois) are present
- Fertilization is internal. Eggs are laid on land.
- Typical cloaca is present
- Eg *Varanus*

Class Aves

- Birds are warm blooded vertebrates with an exoskeleton of feathers.
- Fore limbs are modified into wings each bearing three clawless digits and provided with feathers for flight.
- Hind limbs are adapted for walking, perching, or swimming and bearing four toes
- No skin glands except oil glands on tail
- Bones are spongy, light in weight containing air cavities
- Skull is monocondylic
- Lower jaw is composed of five or six bones
- Modern birds have no teeth. A horny beak is present
- Cervical and free thoracic vertebrae are heterocoelus

- Sacral vertebrae is fused with lumber to form synsacrum.
- Posterior caudal vertebrae is fused to form pygostyle.
- Vertebral ribs are double headed
- Sternum is broad usually with longitudinal ventral keel for attachment of flight muscles
- Lungs are spongy and non –distensible
- Heart is four chambered
- RBCs are oval, nucleated and biconvex
- Renal portal system is vestigial, kidneys are metanephric
- Sexes are separate.
- Fertilization is internal; oviparous

- Embryo has amnion, allantois, and yolk sac
- Parental care is highly developed
- Eg pigeon

Class Mammalia

- Warm blooded animals
- Skin covered with hair
- Mammary glands in female
- External ear present
- Teeth heterodont
- Skull with two occipital condyles

- Lower jaw composed of single bone
- Possess seven cervical vertebrae
- Limbs are plantigrade, digitigrade, unguligrade
- Presence of muscular diaphragm b/w thoracic and abdominal cavities
- Heart is four chambered
- RBCs are non nucleated
- Brain with 4 optic lobes
- Kidney is metanephros
- Penis is always present
- Viviparous
- Eg rabbit