2.ANIMAL KINGDOM

1. The symmetry exhibited in cnidarians is -**a. Radial**
2. Sea anemone belongs to phylum - **c. Coelenterata**
3. The excretory cells that are found in platyhelminthes are - **b. Flame cells**
4. In which of the following organisms, self fertilization is seen- **d. Liver fluke**
5. Nephridia of Earthworms are performing the same functions as - **b. Flame cells of Planaria**
6. Which of the following animals has a true coelom ? - **b. Pheretima**
7. Metameric segmentation is the main feature of -**a. Annelida**
8. In *Pheretima* locomotion occurs with help of –
   c. circular, longitudinal muscles and setae
9. Which of the following have the highest number of species in nature?- **a. Insects**
10. Which of the following is a crustacean? -**a. Prawn**
11. The respiratory pigment in cockroach is –**Non of the above**
12. Exoskeleton of which phylum consists of chitinous cuticle? - **c. Arthropoda**
13. Lateral line sense organs occur in - **d. Fish**
14. The limbless amphibian is -**a. Icthyophis**
15. Four chambered heart is present in - **d. Crocodile**
16. Which of the following is not correctly paired? -**d. Whale – Ammonotelic**
17. Which of the following is an egg laying mammal? - **c. Ornithorhynchus**
18. Pneumatic bones are seen in - **b. Aves**
19. Match the
b.
20. In which of the following phyla, the adult shows radial symmetry but the larva shows bilateral symmetry? - **b. Echinodermata**
21. Which of the following is correctly matched? -**a. Physalia – Portugese man of war**
22. Why are spongin and spicules important to a sponge?
    - The sponges body is **supported** by a skeleton made up of calcareous and siliceous spicules or spongin or both.
23. What are the four characteristics common to most animals?
    - The basic fundamental features such as levels of organisation, diploblastic and triploblastic organisation, patterns of symmetry, coelom, segmentation and notochord.
24. List the features that all vertebrates show at some point in their development.
    - The chordates are characterized by the presence of notochord, solid ventral nerve cord and gill slits.
25. Compare closed and opened circulatory system
    - **Open type**: in which the blood remains filled in tissue spaces due to the absence of blood capillaries. (arthropods, molluscs, echinoderms, and urochordates) **Closed type:** in which the blood is circulated through

blood vessels of varying diameters (arteries, veins, and capillaries) as in annelids, cephalochordates and vertebrates.

26. Compare Schizocoelom with enterocoelom
- **Schizocoelomates** – in these animals the body cavity is formed by splitting of mesoderm. (e.g., annelids, arthropods, molluscs).
- **Enterocoelomate animals** the body cavity is formed from the mesodermal pouches of archenteron. (e.g., Echinoderms, hemichordates and chordates)

27. Identify the structure that the archenteron becomes in a developing animal.
- Eumetazoans have a true coelom called enterocoel, formed from the archenteron.

28. Observe the animal below and answer the following questions

a. Identify the animal-**Adamsia(Sea anemone)**

b. What type of symmetry does this animal exhibit?-**Bilateral Symmetry**

c. Is this animal Cephalized? -**No**

d. How many germ layers does this animal have?-**2Layers(Diploblastic)**

e. How many openings does this animal's digestive system have?-**One open only**

f. Does this animal have neurons? –**Primitive Nervous Systems**

29. Choose the term that does not belong in the following group and explain why it does not belong?- **radial symmetry (**chordates are bilaterally symmetrical.)

30. Why flatworms are called acoelomates?
- Animals which do not possess a body cavity are called acoelomates.
- Since there is no body cavity in these animals their body is solid without a perivisceral cavity, this restricts the free movement of internal organs. (e.g., Flatworms)

31. What are flame cells?
- Flatworms have Specialized excretory cells called flame cells.
- It helps in osmoregulation and excretion.

32. Concept Mapping - Use the following terms to create a concept map that shows the major characteristic features of the phylum nematoda:

Round worms→ pseudocoelomates→ digestive tract→ cuticle→ parasite→ sexual dimorphism

33. In which phyla is the larva trochopore found?
- Phylum Annelida Development is direct or indirect and includes a trochophore larva.

34. Which of the chordate characteristics do tunicates retain as adults?
- Dorsal tubular nerve cord is present only in the larval stage and a single dorsal ganglion is present in the adults.

35. List the characteristic features that distinguish cartilaginous fishes with living jawless fishes
- **Jawless fish:**All members of cyclostomata are primitive, poikilothermic, jawless aquatic vertebrates and are ectoparasites on some fishes.
- Mouth is circular without jaws and suctorial
- Examples: *Petromyzon* (Lamprey) and *Myxine* (Hag fish)

- **Cartilaginous fish:**They are marine fishes with cartilaginous endoskeleton. Notochord is persistent throughout life.
- Skin is tough covered by dermal **placoid scales'**
- Their jaws are very powerful.
- Examples: *Scoliodon* (Shark), *Trygon* (Sting ray), *Pristis* (Saw fish)

36. List three features that characterise bony fishes.
- Bony fishes includes both marine and freshwater living with bony endoskeleton and spindle shaped body.
- Skin is covered by ganoid, cycloid or ctenoid scales.
- Respiration is by four pairs of filamentous gills and is covered by an operculum on either side.
- Sexes are separate, external fertilization is seen and most forms are oviparous Examples: *Exocoetus* (Flying fish),

37. List the functions of air bladder in fishes.
- **Hydrostatic organ:**keeps equal weight of fish and volume of water.
- **Respiration:**Helps in exchange of Gases.
- **Sound production:**Helps to produce sound
- **Auditory function:**Helps to ear sounds
- **Sensory function:** Helps to obserbs pressure changes in water.

38. Write the characteristics that contributes to the success of reptiles on land.
- Reptiles are mostly terrestrial animals and their body is covered by dry, and cornified skin with epidermal scales or scutes.
- Reptiles have three chambered heart but four chambered in crocodiles.
- Most reptiles lay **cleidoic eggs** with extraembryonic membranes like amnion, allantois, chorion and yolk sac.
- Excretion by metanephric kidneys and are uricotelic. They are monoecious. Internal fertilization takes place and all are oviparous.
- Examples : *Chelone* (Turtle), *Testudo* (tortoise), *Hemidactylus* (House lizard),

39. List the unique features of bird's endoskeleton.
- The endoskeleton of bird is fully ossified (bony) and the long bones are hollow with air cavities (pneumatic bones).
- It helps to fly in air with low weight.

40. Could the number of eggs or young ones produced by an oviparous and viviparous female be equal? Why?
- The numbers of eggs produced by an oviparous mother will be more than the young ones produced by a viviparous mother because in oviparous animals, the development of youngones takes place outside the mother"s body.
- Their eggs are more prone to environmental conditions and predators.
- Therefore,to overcome the loss ,more eggs are produced by mothers so that even under harsh environmental conditions,some eggs might be able to survive and produce youngones.
- On the otherhand in viviparous organisms,the development of youngones takes place in safe conditions inside the body of the mother.
- They are less exposed to environmental conditions and predators.

Therefore,there are more chance of their survival and hence,less number of youngones is produced compared to the number of eggs.

EXTRA POINTS

Levels of organization:

1. Body symmetry
2. Nature of coelom(cavity)
3. Body plan
4. Pattern of development
5. Segmentation of the body
6. Presence/absence of notochord

1.Level of organization

- Cellular level - organ level
- Tissue level – organ system level (open and closed circulation)
- Complete/incomplete digestive system. (hydra)

2.Body symmetry

- A symmetry – Ex. Sponges
- Symmetrical → Bilatral symmetry(Annelids and Arthropods) and Radial symmetry Eg.Ctenophora, Coelenterate and Echinoderms)

3.Nature of Coelom(Body cavity)

- Coelomate – body cavity with ecto, endo and mesoderms - Ex. Annelids, Molluscs, Arthropods, Echinoderms, hemichordates and chordates.
- Pseudococlomate – no mesoderm, have only ectoderm and enderm layers - Ex. Aschelminthes (round worms)
- Acoclomate – no body cavity - Ex. Platyhelminthes (flat worms)

4.Body plan

- Cell aggregate plan
- Blind sac body plan

5.Embryonic germinal layers

- Diploblastic (Coelenterates) – only ectoderm and endoderm
- Triploblastic organization(Platyhelminthes to Chordates)- ectoderm, enderm and mesoderm
- **6.Segmentation**- Metameric segmentation – true segmentation(metamerism) – Ex. - Earthworm

7.Notochord

- It is a mesodermal origin – rod like structure – animals with notochord is chordates and without that are non-chordates.

CLASSIFICATION OF ANIMALS:

1.Phylum - Porifera - Ex. Sponges.

- Marine , asymmetrical, cellular level of organization
- Have water canal system
- Ostia → Spongocoel → Osculum
- Choanocytes/ collar cells line in the spongocoel
- Digestion is intracellular
- Skeleton made up of spicules/ sponging fibres
- Hermaphrodite –male and female organs present on the same body.
- Reproduce asexually by fragmentation
- sexually by gametes
- Fragmentation is internal and development is indirect
  Eg. Sycon, spongilla.

2.Phylum Coelenterata (cnidaria) - Ex. Hydra

- Aquatic /marine
- Sessile(fixed) /free swimming
- Radially symmetrical
- Have cnidoblasts/ cnidocytes, stinging capsule on tentacles
- Used for defense, anchorage and to capture the prey
- Tissuelevel of organization diploblastic
- Mouth on hypostome.
- Digestion extracellular and intracellular
- Corals have skeleton made of calcium carbonate.
- Exhibit 2 basic forms called polyp and medusa.
- Polyp is sessile cylindrical (hydra)
- Medusa is umbrella shaped free living (jelly fish)
- They show alternation ofgeneration (metagenesis) wherepolyp forms medusa asexually and
- medusa forms polyp sexually. Ex. Obelia
  Ex. - Hydra, Physalia, Sea anemone, Sea pen, Sea fan, Brain coral.

3.Phylum - Ctenophora (sea walnuts/comb jellies)

- Marine , radially symmetrical diploblastic
- Tissue level of organization
- Body bears 8 rows ciliated comb plates help in locomotion
- Digestion by intra and extra cellular
- Bioluminescence is well developed
- Sexes are not separate(monoecious)
- Reproduce by sexual reproduction
- Fertilizationis external and indirect development.
  Ex. - Pleurobrachia and ctenoplana

4.Phylum – Platyhelminthes (flat worms)

- Dorso-ventrally flattened body
- Endoparasites,bilaterally symmetrical
- Organ level of organization
- Triploblastic - acoclomate
- Hooks and suckers are present
- Flame cells for excretions
- Sexes are not separate - fertilizationis internal and development is through many larval stages
- Have high regeneration

capacity Ex.- Tape

worm,Planaria,Liver fluke

5.Phylum - Aschelminthes (round worms)

- Free living, aquatic, terrestrial parasitic
- Organ system level of body organization
- Bilaterally symmetrical andtriploblastic
- Pseudocoelomate
- Digestive system is complete (mouth and anus)
- Sexes are separate (dioecious)
- Fertilization is internal and development is direct.

Ex. Ascaris, Wuchereria (filarial worm) and Ancylostoma (hookworm)

6.Phylum – Annelida (annulus little ring)

- Aquatic/terrestrial
- Freeliving/ parasites
- Organ system level of body organization
- Bilaterally symmetrical
- Triploblastic
- Metamerically segmented – coelomate
- Metameres/body is segmented
- Marine Nereis possess parapodia
- Possess longitudinal and circular muscles help in locomotion
- Closed circulatory system
- Nephridiahelp in osmoregulation and excretion
- Dioecious(sexes are separate)
- Earthworm and leeches are monoecious
- Reproductionis sexual

Eg. Nereis, Pheretima (earth worm) and Hirudinaria (blood sucking leech)

7.Phylum – Arthropoda – (jointed legs)

- Largest phylum 2/3 are insects
- Organ system level of body organization
- Bilaterally symmetrical
- Segmented andcoelomate
- Chitinous exoskeleton.
- Body has head thorax and abdomen.
- Have jointed appendages(organs for locomotion)respiratory organs are gills/book gills/Book lungs / tracheal system

- Open circulatory system.
- Sense organs are antennae, eye, statocysts (balance organs)
- Fertilization isinternal.
- Excretion by malpighian tubules.
- Sexes are separate (Dioecious)
- Oviparous
- Development may be direct/ indirect
- Economic importance-
    - Honey bees (*Apis*)
    - Silkworm worm (*Bombyx*)
    - Vectors. Mosquito, Housefly
    - Aquatic –crab, prawn, lobster

7.Phylum - Mollusca: (soft bodied and shelled)

- Second largest phylum
- Terrestrial and aquatic
- Organ system level of body organization
- Bilaterally symmetrical
- Triploblasticand Coelomate
- Calcareous shell and unsegmented body with head muscular foot and visceral hump
- Soft spongy layer of skin forms a mantle over the visceral hump
- Gillsfor respiration and excretion
- Head has sensorytentacles
- Mouth has file like rasping organ for feeding radula
- Sexes are separate (Dioecious)
- Oviparous
- Indirect development

Eg. Oyster, snail, squid, devil fish

8.Phylum - Echinodermata: (spiny skinned)

- Spiny skin has exoskeleton which is calcarious ossicles
- Marine organ level of body organization
- Radially symmetrical
- Coelomate
- Triploblastic
- Mouth of the lower side and anus on the upper side.
- Have water vascular system, help in locomotion,to capture and transport of food andfor respiration
- Excretory system is absent
- Dioeciousand fertilization is external,development is indirectwith free swimming larva Ex. Starfish, sea urchin, sea lily, sea cucumber

9.Phylum – Hermichordata

- Under non chordate
- Worm like marine animals
- Organ system level oforganization
- Bilaterially symmetrical , triploblstic
- Coclomate – body has anterior proboscis , a collar and a long trunk
- Circulatory system is open type
- Respiration is through gills
- Excretory organ is proboscis gland

- Sexes are separate
- Fertilization is external
- Development is indirect

Ex. Balanoglossus

10.Phylum – Chordata

- Presence of notochord dorsal hollowspinal cord –nerve cord and paired pharyngeal gill slits
- Bilaterally symmetricalandtriploblastic
- Coelomate organ system level of organization
- Have post and tail
- Closed circulatory system

Chordates	Non chordates
1. Notochord present	1. Notochord is absent
2. Central nervous system is dorsal hollow and single	2. Central nervous system is ventral,solidand double
3. Gills are present	3. Gills are absent
4. Heart is ventral	4. Heart is dorsal
5. Tail is present	5. Tail is absent

Chordata -Urochordata,Cephalochordate and Vertebrata (protochordates)

Urochordata – notochord present in larval tail eg. Ascidia, salpa

Cephalochordate – notochord extends from head to tail eg. Amphioxus

1.Subphylum – Vertebrata:

- Possess notochord (replaced by vertebral column)
- All vertebrates are chordates but not all chordates are vertebrates(all vertebrates have vertebral column, but all chordates do not have vertebral chord).

- Ventral muscular heart
- Excretion by kidneys
- Fins / limbs for locomotion

a)Super class – Agnatha(without Jaw) Class – Cyclostomata

- Ectoparasites on some fishes.
- Elongated body with 6-15 pairsof gill slits
- Sucking circular mouthwithout jaw
- Body is devoid of scales – paired fins
- Cranium and vertebral column arecartilaginous
- Circulation is closed –mariebut migrate to fresh waterfor spawning
- After spawning they die
- Larvas, metamorphosis and return to the ocean

Ex. Lamprey,Hagfish

b)Super class - Gnathostomata(with jaw)

- Jaws are present
- Paired lateral

Appendages There are six classes:

Class – Chondrichthyes:

- Cartilage fish, endoskeleton is cartilage
- Body is stream lined
- Pelvic fins in male with claspers
- 5-7 pairs of gills.
- No operculum
- Mouth in ventral with teeth.
- Jaws are powerful
- Air bladder is absent
- Heart is 2chambered (I auricle and one ventricle)
- Some possess electric /poison stings
- Poikilothermous(cold blooded)
- Body has placoid scales
- Unisexual
- Viviparous and fertilization is internal

Eg. Shark, sting rays.

Class – Osteichthyes - boney fish

- Endoskeletonis bone. Skin is covered by cycloid scales.
- Fourpairs of gill slits with operculum, mouth is terminal, air bladder is present and help in buoyancy.

- Heart is two chambered (I auricle and I ventricle)

- Poikilotherms (cold blooded)
- Sexes are separate ,fertilization is externalandoviparous
  Ex. Angel fish, Clown fish, Rohu, Katla,Tilapia, Hippocampus.

Class – Amphibia - dual life

- Live on land and move to water for breeding
- Body has head and trunk
- Tail is in larval stage – two paires of limbs
- Digits without claws.
- Poikilotherms – eyes are with nictitating membranes
- Skin is smooth and moistwith mucous glands
- Tympanum is ear drum
- Heart is three chambered (two auricle and one ventricle)
- Respiration by gills in larva and by lungs and skin in adults.
- Digestive system
- Urinary tract and reproductive tract open in to a common cloacal chambers and the
- Opening is called cloacal aperture.
- Sexes are separate
- Oviparous
- Fertilization is externaland development is indirect with tadpole larva
  Ex. Toad, Frog

Class – Reptilia

- Skin is dry without glands.
- Covered by horny epidermal scales (scutes)
- Tympanum is small no external opening
- 12 pairs of cranial nerves
- Trunk bears two pairs of pentadactyl limbs with claws.
- Heart with three and half chambered (two auricle, one which is incompletely partitioned ventricle)
- OnlyCrocodiles have four chambered heart
- Respirationisby lungs.
- Fertilization is internal.
- Oviparous andeggiscovered by hard calcareoue shells
  Ex. Snake, Tortoise, Turtle, Viper, Lizard

Class – Aves

- Streamlined body andcovered with feathers
- Jaws are modified in to beaks, teeth absent , various shapes and sizesofbeaks
- Digestive system has two structures – cropand gizzard(grinding the food)
- Forelimbs form wings.

- Hindlimbs modified for perching,swimming, running, etc.
- Voice box called syrinx is present
- Respirationisby lungs.
- Skin is dry with oil glands, at the base of tail.
- Bones are pneumatic bones (air cavities) helps to make the body light.
- Homeiothermous
- Heart is 4 chambered
- Oviparous and eggiswith calcareous shells.
- Fertilization is internal.

Ex. Pigeon, Crow, Sparrow, Ostrich.

Class- Mammalia

- Aquatic/aerial/terrestrial
- Body has head, neck, trunkand tail
- Have mammary glands in females
- External ear(pinna)is present
- Skin has sweat glands and sebaceous glands
- Heart is 4 chambered
- Respiration is by lungs.
- Body has hair
- Excretion is by kidneys (ureotelic – urea)
- Sexes are separate
- Viviparous(give birth young ones)
- Few are ovoviviiparous – egg laying mammals (Platypus)
- Few are marsupials – pouched mammalswith brood pouches (Kangaroo)
- Ex. *Canis macaca, Camelus,Dolphin*.

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