	COELOMATES	PSEUDOCOELEMATE	ACOELOMATE
1- LAYER	Have A True body Cavity or Coelom. Three layers.	Fluid filled Cavity b/w layers of Mesoderm.	No Body Cavity.
2- Mesoderm.	Found in which Outer layer → Parital layer under Body wall. Inner layer → Visceral layer cover Alimentary Canal.	Not True Cavity formed b/w Mesoderm & it develops from Blastocoel Not from Archenteron.	Mesoderm form loose tissue called Mesenchyma or Parenchyma.
3- System.	No	No Reproductive & Excretory System.	Excretory and Nervous System are develop.
4- Examples.	Phylum ANNELIDA TO CHORDATA.	Phylum Aschelminthes	Platyhelminthes
5- Exceptional.	Alimentary Canal lined by Mesoderm.	Covered External → Muscles Covered Internal → Cuticle of intestine.	→ Gut is Sac like → No Transport System.

Jamal Shah TRK CHARACTERS	Phylum Porifera	Phylum Coelenterata	Phylum Platyhelminthes	Phylum Aschelminthes	Phylum Mollusca	Phylum Annelida	Phylum Arthropoda	Phylum Echinodermata	[illegible]
Other Name or Meaning	Latin Word Pori -> Pores Foramen -> Bearing	Greek Word Coelom -> Hollow Teron -> Intestine	Plat -> Flat Helminthes -> Worm	Thread OR Round Worm	Latin Word Soft Body.	Greek Ring worm	Greek word Jointed legs	Greek word Spine skin	
HABITAT	Aquatic & Marine	Marine & freshwater As well.	Both Land & Water.	Both Land & Water.	Marine & freshwater	Marine & Freshwater.	Land & water	Exclusively Marine.	
Layers	Diploblastic	Diploblastic	Triploblastic	Triploblastic	Triploblastic	Triploblastic	Triploblastic	Triploblastic	
EXCRETORY ORGANS	No But by diffusion		Flame Cells	Two Longitudinal Canals.	Paired Nephridia	Nephridia	Malpighian Tubules		Develop
SKELETON	All made of Calcareous, Silicon, Spongin (Spicules present)	Coral have $CaCO_3$ skeleton.	Absent		Calcareous Shells		Chitinous Exoskeleton.	Made of Spines.	

	P	C	Pl	Ne	Mo	An	Ar	Ec	He
12. Respiration	General Body Surface			Surface layer	Aquatic – Gills, Terrestrial – lungs		Terrestrial – Trachea system, Aquatic – gills	Gills, [illegible]	Gill slits
13. Larva		Planula larva			Glochidium larva	Trochophore larva		Bipinnaria larva	Tornaria larva
13. Fertilization			Internal				Internal	External	
14. Locomotion	Sponges sessile, larva motile	Sessile or free floating	Free living form motile, cilia	Contraction & relaxation of muscles	Move with muscular foot	Setae or parapodia, muscles & [illegible]	Pair appendages or pair wings	Move with tube feet	
15. EXCEPTIONAL CHARACTERS	[illegible] Spongin [illegible] Choanocytes	① Obelia has Blastostyle ② Asexual reproduction more common	① Regeneration ability in Planaria ② [illegible] parasitic (e.g. Taenia) (tapeworm)	① Ascaris lay 200000 eggs per day ② A. lumbricoides is an endoparasite	[illegible] ② Second largest phylum	① Hermaphrodite ② Cross fertilization is common ③ [illegible]	① Articulated body legs ② Sensory organs are eyes & antennae ③ Largest phylum	[illegible]	① Adapted in deuterostome ② Notochord is absent ③ Cleavage holoblastic & radial

Blood Pigment.	Digestive Mode of Nutrition	Nervous System	Segmentation	Symmetry.
Spongiocoel.	Intra & Extra cellular digestion. Bos. dead decay matter	Nerve Scattered & Nervous System		Bilateral Symmetry
	Intra & extra cellular. Collect Coelenteron for digestion. Gastrovascular [illegible]			Radial Symmetry
	Free living → Present. Poorly developed → Trematoda. Absent → Cestoda.	Anterior Cerebral Ventral Ganglia & 2 & 3 Cords	Unsegmented or Superficial segmented.	Bilateral Symmetry
Absent Dissolved Haemoglobin	In form of Alimentary Canal. Free living or Parasite	Nerve ring encircle Pharynx.	Non-Segmented.	Bilateral Symmetry
Haemocyanin Oxygenated → Blue Deoxygenated → Colourless	Complete have both Mouth & Anus.	Three Pairs of Orange ganglia [illegible]		Bilateral Symmetry
Chlorocruorin Oxygenated → Green.	Complete Both Anus & Mouth.	Develop	Metamerically Segmented	Bilateral Symmetry
Haemolymph No Pigment.	Complete Feeds on Plant & Animals	Highly Developed Cerebral Ganglia & Double Nerve Cord.	Metamerically Segmented.	Bilateral Symmetry
	Coiled-tube Opening of Mouth & Anus. Mollusc shells [illegible]	Concentrated Cerebral Ganglia	Larva → Bilateral Adult → Radial.	Bilateral Symmetry
	Straight Complete.			

Phylum	Examples	Special Characters
1. Porifera	Sycon (Marine Sponge) Spongilla (Fresh water) Leucoselenia (Tubular Marine). Euplectella or Venus Flower basket	=> Family Cladorhizidae contain Predatory Sponges. =) 5000m beneath sea. =) Large about size of dog. =) Asexual Reproduction → Budding & Gemmule formation. =) Sexual => Amoebocytes Sperm + ova
2. Coelenterata	Hydra, Jelly Fish Sea Anemone Corals Physalia Pelagica.	=> Ectodermal cell give rise to Nematocyst. =) huge Volume of Calcium Carbonate in Sea is of Coral reef. =) Jelly Fish are fast Moving Coelentrate. =) Polymorphism & Zooids: Polyp (tube like), Medusae (umbrella like). =) Polyps form → Blastostyle =) Medusa develop → eggs, sperm → Planula larva
3. Platyhelminthes.	Turbellaria (Planaria) Trematoda (Liver Fluke) Cestoda (Tape worm) Planaria (Dugesia), Taenia solium. Liver Fluke (F. hepatica)	=) First Triploblastic Metazoa. =) Free Living => Ectoderm Ciliated Parasitic => Cilia Absent & Cuticle Present. => Digestive System → Trematod ; Poorly develop → Cestoda => Complete Absent =) Hermaphrodite. =) Fertilize egg develop in Planaria, Tapeworm New Species; Liver Fluke larva. Platyhelminthes → 15000 Tape worm (15 – 5 meter)
4: Nematoda.	Ascaris lumbricoides Female (8–16 inch) ^ Male (6–12 inch) Enterobius Vermicularis (Pin worm)	=) Circular Muscle Not Present =) Whipping Movement. =) Ascaris → Reddish tinge. =) Male: Testis long, Ejaculatory duct. Female: Two uteri form Vagina Spine called Penial setae. Female Ascaris have 27 Million eggs at any time =) No Respiratory or Circulating System =) Parasitic form Cause Economic losses
5. Mollusca.	=) Octopus (Octopus bairdi) =) Cuttle fish (Sepia Officinalis) =) Squid (Loligo peali) =) Oyster (Ostrea lurida) =) Slug (Limax Maximus) =) Garden Snail (Helix Aspersa)	=> Shell Secreted by Mantle. =) Kidney & Anus open in Mantle Cavity. =) Tongue called Radula. =) Hemocoelic chamber. =) Ovaries Colour → Red. =) Fertilization Perform in gills =) Shells & pearls used in Allopathic & Unani Medicine =) Octopus & Cuttle fish => Eatenable.

6- ANNELIDA	[illegible] (Chaetopoda Pheretima) [illegible] Hirudinaria [illegible]	=> Body Cylindrical → earthworm => Seta → Earthworm Parapodia → Nereis => Hermaphrodite. Dorsoventral => Nereis. => Different Digestive System. => Nereis have gill under Parapodia. => Leech parasite => Nephridia Open Exterior Nephridiopore. → [illegible]
7. Arthropoda.	INSECT SPIDER SCORPION Crustacean Termite	=> Exo. Cover as wall by Chitin. => Body => 3 parts. => Blood Carry Food (NOT oxygen) To All body => Trachea Communicate Exterior through Spiracles. Apterygota: Collembolan, Wingless. Hemi: Cockroach, wasp. Holo: Flies, Moth, beetles, Butterfly. Excretory: Insect → M. Tubules; Crustacean → green gland or [illegible] gland. => Onychophora → Link b/w Annelid & Arthropod. 7 species, 10 genera. Metamorphosis: [illegible] changes in stage b/w Egg is [illegible] Stage & moulting. [illegible]
8. ECHINODERMATA	Brittle Star (Ophiothrix fragilis) Asterias Rubens => Star Fish. Arbacia punctulata (Sea Urchin) Thyone briareus (Sea Cucumber)	=> Five Arms Present. => Arm radiate from Central body. => Inner lining body => Peritoneum. => All Carnivorous. Respiration: Papulae → Star Fish; Peristomial gills → Sea Urchin; Brittle Star, Genital bursae. Cloacal Tract → Sea Urchin. => Autotomy allow Animal to leave Arm behind & Escape from Enemy in Brittle Star.
9- Hemi Chordata	Saccoglossus Kowalevskii (Acorn worm) Balanoglossus.	Related to Chordate. Body => unicellular Epidermis + Mucous Secreting Cell. => Single Glomerulus Excretory System. => Brain Occur in Mesosome. => Notochord is Absent. => Larva Resemble Bipinnaria larva of Echinoderm.
10- Chordate.	Urochordate - Ciona intestinalis, Molgula. Cephalochordata: Branchiostoma (Amphioxus)	Chordates: Low => Notochord. High => Vertebral Column. Gills in Embryonic often closed in Adult. Urochord: => Notochord => Larva, Adult Absent. => Tunicate Related to Cellulose. Cephalochordates: => Notochord in Adult. => Sea lancelet. => Filter Feeder. => Hollow Nerve Cord.

11 1 2 3 4 5 6 7 8

KINGDOM ANIMALIA

"CORAL REEFS"

Four types of Corel reef are there.

★→ ① **Fringing Reef:**

→ Also Called Shore Reef.
→ Simplest type.
→ Extend from Coast to few meters and Some ½ Kilometres.

★→ **Plateform Reef:**

→ Also Called Table Reef.
→ Flat Structure without lagoon
→ They May Appear b/w Coast & Barrier Reef.

★→ **Barrier Reef:**

→ No Connection with land.
★★→ Strip of Sea Water b/w this Reef & Main land Called Lagoon.
→ This Strip May be about 180 feet to 3 Mile wide

★→ **GREAT BARRIER REEF:**

→ Found in Australia which is 1250miles(2012 Km long)

★→ **"Advantages Of Reefs"**

→ Eonomically important.
→ Many invertebrates living in reefs Provide Food to FISHES.
→ Provide good breeding habits for FISHES & Mainhain POPULATION.
→ They been brightly Colourful used as Ornament for manufacturing jewelery.

SJS	CLASS Pisces (Fishes)	CLASS Amphibia	CLASS Reptiles	CLASS Birds (Aves)	CLASS Mammals (SJS)
1- Study	Ichthyology	Batrachology	Herpetology	Ornithology	Mammology
2- Heart & its pair	2 Chamber & Pair of Aortic Arch	3 - Chamber & Pair of Aortic Arch	4 - Chamber Pair of Aortic Arch	4 - Chambers Right Aortic Arch	4 - Chamber Left Aortic Arch
3- Chamber	1 atrium & 1 Ventricle.	Two Auricle & 1 Ventricle	Two Auricle. System Arches Ventricle.	Two Auricle & Two Ventricle.	Two Auricle & Two Ventricle
4- Ancestor		Fishes	Amphibian.	Reptiles	Reptiles
5- Respiration	Through gills.	Through ~~lungs~~ gills.	Through Lungs	Through lungs with air sacs	Through Lungs
6- Egg yolk.			Called lowest Amniotes Amnion & other extra embryonic Membrane.	Amniotes and have all four embryo membrane.	Amniotes & have extra Membrane
7. Fertilization.	External	External	Internal -	Internal & Sexual dimorphism occur	Internal & Sexual dimorphism is pres[ent]
8. Glands.		Glandular	Not glandular. Uropygial gland at tail	& Preen gland	Glandular.
9- Age		Dominant in Dipnoi Period.	Dominant in Age of reptile & flourished in Mesozoic period.		Dominant in [illegible]
10- Habitat.	They are aquatic	Aquatic & terrestrial.	Terrestrial but some have aquatic life		Mostly terrestri[al]
11. Exceptional Characters.	=> Largest Class. => 2900 Species + 48% of Vertebrate.	=> Caecilian are legless. => Webbed feet. => Tadpole larva. => Cold - blooded Animal.	=> Oviparous. => Crocodile heart [illegible] Septa or partition. => Gills appear in Embryonic stage	=> All have left Ovary duct Except Eagle. => Oviparous => Webbed feet.	=> Pentadactyle [illegible] => Ancestor [illegible] => [illegible]

* Sub Class Dipnoi => (Lung Fishes) — when Normal Condition like Raining they come out & Shed life with which they Respire through "Gills" like lung fish.
- Three Species left in World.
- Respire through Swim Bladder (Lung)

PROTOZOA	PARAZOA	METAZOA.
Single Cell body	Simple Multicellular	Many Cells.
Separate Kingdom as Protista.	Evolved from Protozoa.	Arrange into tissue, Organ & Organ System.
	Not differentiated into Tissues & Organs.	Coelentrata to Chordates
Example - Amoeba, Paramecium, Plasmodium, Trypnosoma.		

Syed Jamal Shah BMETTE

CLASS AMPHIBIA	REPTILES
Latin Word	True land Vertebrates
Tadpole larva	No larva Stage
"Nectures" gill Retain throughout life.	Exoskeleton in form of "Nails" & Epidermal Scales & digital claws.
"TetraPod" => have Two Pectoral & Pelvic limb.	No keratin in Turtle "Tortoise".
Circulatory System Not Perfect	Hemoglobin Present
Frog, Toad, Salamanders (tortoise) Newt, Nectures (tail)	Gill slits but No "Gills"

→ Excretory organs are Metanephric Kidney.

- Modern Reptiles are the descendants of Dinosaurs of Jurassic & Cretaceous Period.
  (145-136 million year back) (136-65 Million Year)
- Lizard, Snake, Tortoise, Turtle, Tuatara (Sphenodon Punctatum) → New Fossil of New Zealand

FLIGHTLESS BIRDS	FLYING BIRDS.
Called Running birds.	Strong wings for fly.
Not hollow bone & No Sternum Keeled.	Sternum Keel.
	Hollow bones.
Tail feathers are irregular arrange.	Tail feathers → steering bird in flight
Ostrich, emu, Kiwi, Cassowary, Penguin	Pigeon, Sparrow, Parrot, Eagle, Owl.

Jayed Ismail Shah

Pakistan Me Mashe May Ena Parking

575

	Prototheria Or Monotremes	Metatheria Or Marsupials	Eutheria Or Placenta
1. Also Called	Egg laying Mammals Or Ovi-Viviparous	Pouched Mammals.	Placental Mammals (True Mammals)
2. Teeth.	Adult → Teeth are absent & Beak is present.		Teeth are Present in Jaw.
3. Cloaca	Cloaca (Cloacal opening) instead of separate opening for Reproductive System		Cloaca Absent & ... genital duct open separately
4. Placenta	Absent	Absent	Present
5. Nourishment	Nourish by teats on Ventral side of body	Teats of Mammary gland present in pouch from where it got Nourishment.	Mammary gland with develop teat.
6. Development	Occur in Uterus.	Occur in Marsupium till Maturance.	Occur in Uterus.
7. Exceptions.	→ Body Temp varies 25-28°C. → Primitive Mammals. → Insectivorous & Nocturnal. → ...	→ Baby Come Out in Immature Form → Mostly Found in Australia Except Specie Opposum → Body Cover with hairs. → Terrestrial or Arboreal (living in tree)	→ High Degree of evolution. → Placenta are of different types. → Divided into Sixteen orders.
8. Examples.	Duck Bill Platypus (Ornithorhynchus) Spiny Ant eater (Tachyglossus)	Kangaroo, Opposum, Koala.	Man, whale, Elephant. Horse, Rat, Mice, Bat, Dolphin

	Phylum Cyclostomata (Agnatha)	Class Chondrichthyes (Cartilaginous fishes)	Class Osteichthyes (Bony)
1- Scales	Absent	Placoid Scales	Dermal Scales on skin No Placoid Scales
2- Gills	6 To 14 Pairs & No Operculum	5 To 7 Pairs Without Operculum	Gills Present & Cover by Operculum
3- Mouth.	Ventral Sucking Mouth	Ventral Olfactory Sac (Not Connect with Mouth Cavity)	Terminal. Jaw with or without Teeth
4- Heart	One Auricle	Pair of Aortic Arches.	Two Chamber. 1 atrium & Ventricle
5- Sexes	Separate in Lamprey & Hag fish are Hermaphrodite.	Separate.	Separate & gonad Pair.
6- Digestive	Lack Stomach	J- Shaped Stomach.	
7- Swim Bladder	Absent	Absent	Present
8- Nature		Viviparous	Viviparous & Ovi-Viviparous & ovi-parous
9- Skeleton	Cartilagenous	Endoskeleton is Cartilagenous	Bony skeleton.
10- Examples	Petromyzon Marinus (Lamprey) & Maxine Glutinosa (Hag fish)	Formula to Remember: SCSC Shark, Ray, Skates, Chimaeras.	
11. Exceptional Characters.	→ Long Larval Period in Lamprey. → EEL like body.	→ Shark are largest living Vertebrate. → Heterocercal tails in which Dorsal lobe > Ventral lobe.	→ Brain Consist of 10 pairs of Cranial [illegible] → Blood Contain Hemoglobin. → Successful group of fish.

Sayed Jan Shah