Animal Kingdom

Q. Which one is odd?
(a) Sea Anemone (b) Sea fan
(c) Sea Fur (d) Sea Mice
coelenterata → Mollusca

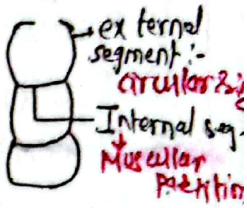
Q) Parapodia are found in:-
(a) Class: Oligochaeta (b) Polychaeta
(c) Hirudinea (d) Archi-anelida

Q) Which one is a true fish?
(a) Silver Fish - Arthropoda (b) Cray fish
(c) Globe Fish [CEE 2078] (d) Cuttle fish → Sepia → Mollusca
↳ Super class: pisces
↳ class → osteichthyes (bony fish)

Phylum: Annelida

ext & int दुवै दुवै
↳ True metamerically segmented body (Metamerism)

- external segment is represented by circular ring called:
  Annulus - एउटा
  Annuli - plural



- Internal segmentation is represented by muscular partition:-
  Septum / Septa
  एउटा plural
- Individual segment:→ Metamere / Somite

Q Which of the following annelid, body with fixed number of somites?
(a) Earthworm → (100 to 120) (b) Nereis (sandworm) → (80-100) seg.
(c) Leech → 33 segment (d) None

- Symmetry: Bilateral symmetry
- Grade of organization: organ-system
- Germ layers: Triploblastic
- Body plan (structural and developmental characters of animal)
  → Tube within a tube (Nemath to chordata)
  ↳ Digestive system with a long tube having both ingestion & egestion opening.
  ↳ Types:-

① Protostomes: 1st mouth then anus.
e.g. Nemath, annelida, arthropoda, mollusca

② Deuterostomes: 1st anus then mouth

Cell aggregate → porifera
↳ loose org. of cell but not org to form tissue

Blind sac → Coelentrata, platyhelmen
↳ Digestive tract मा एउटा मात्र opening भएको (egestion & ingestion)

• Locomotory organs:

Q. Common character found in pheretima and Nereis?

(a) Parapodia ✓ (b) Setae (c) Suckers (d) Clitellum

Classes	Locomotory organs
• Polycheta (hairs): Nereis	Setae: Numerous and long / arranged in parapodia (burrow मा फिर पोहर) (swimming) (pair in each segment)
• Oligocheta: Earthworm	setae: Small & few occur / arranged in cuticle (body wall का outermost covering)
• Hirudinia: Hirudinaria (cattle) Hirudo: Medicinal → leech	setae:- absent तर पानीमा swimming आफैंमा looping गर्छ → help of sucker
• Archi annelida: Polygordius	No parapodia, No setae, no sucker

→ On the basis of position and arrangement of setae (locomotory organs)

Phylum	Basis
(1) Protozoa	- Locomotory organelles
(2) Porifera	- Skeleton (i.e. spongin fibres & spicules) (mostly)
(3) Coelentrata	- On the basis of dominant of zooids (polyp & medusa)
(4) Platyhelmenthis	- ~~On th~~ mode of life, alimentary canal & cilia
(5) Nemathelmenthis	- receptors
(6) Annelids	- setae (locomotory organs
(7) Arthropoda	- No. of appendages - (mouth, legs, antenna) & Body divisible
(8) Mollusca	- shell and muscular feet
(9) Echinodermata	- Body forms, ~~spec shape~~ position of madreporite, (perforated pores) (mouth (oral), anus (aboral))

Classification

	Polycheta	Oligocheta	Hirudinea	Arachi-annelida
Development				

* **Body cavity:** Coelom → is the fluid filled cavity between body wall & gut wall

Q. Coelom of earthworm :-
(a) Enterocoelom (b) Acoelom (c) Shizocoelom (d) Pseudocoelom
↳ Nemath.

Q. Which of the following is not found in coelomic Fluid of earthworm?
(a) salt (b) Water (c) Haemoglobin (d) Protein
↳ respiratory pigment of earthworm.
↳ Rund dissolve in Blood plasma. so, blood is red.

Q. cells not found in coelomic Fluid of earthworm?
(a) Amoebocytes (b) Chloragogen cell (c) Chromophil cells (d) Leucocytes
↳ Pharynx मा हुन्छ,
↳ Salivary gland cells पनि भनिन्छ।

- Porifera, colentrates, Platyhelmenthis → Acoelomates
- Nemathelmenthis / Nematoda → Pseudocoelomate
- Annelida बाट True coleomate start हुन्छ

के के characters Annelida बाट start हुन्छ?
→ true coelomate
→ circulatory system
→ Hearts
→ Digestive glands

Q. In evolutionary history, true-coelom appear first time in phylum → Annelida
↳ True coelomate
↓ Term
Eucoelomate
True
↓
Shizocoelomate: eg. Earthworm, Nereis
but leech मा Haemocoelomates

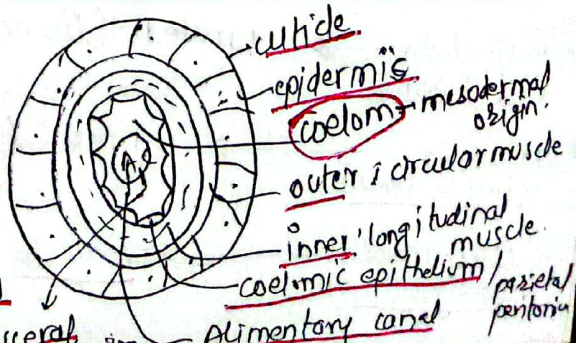
- Shizocoelomate → is formed from splitting of mesodermal layer.

- Coelom:- Between body wall and alimentary canal
cuticle, epidermis, Musculatures, Coelomic epithelium

Q. which of the following is not associated with body wall of Flatworms?
(a) Cuticle (b) Coelomic epithelium (c) Muscles (d) Epidermic

* पुरा phylum मा True coelom हुन्छ त्यो phylum मा coelomic epithelium हुन्छ।

- Shizocoelom → filled with shizocoelomic fluid
↳ Milky
↳ alkaline in nature
↳ contain: salt, protein, water and 4 types of cells.
↳ collectively called → Coleomocytes



Cells of coelom

① Amoebocytes: Phagocytes / Granulocytes

Imp

② Chloragogen cells :- Star like yellow cells

③ Circular nucleated cells :- leukocytes

④ Elongated fan shaped : mucocytes

- leech मा Haemocoelom हुन्छ — filled with Botryoidal tissue
  - Haemocoelom → blood cavity
  - open type circulatory system हुन्छ
    - Heart ले direct body cavity मा Blood pump गर्छ।

Q. Botryoidal tissue found in :—

(a) Hirudo (b) Earthworm (c) Nereis (d) Roundworm

leech → Triploblastic
- ecto
- meso → split to form botryoidal tissue — connective tissue — filled in Haemocoel
- endo

Note: In leech, the haemocoel is much reduced by Botryoidal tissue

Q. Botryoidal tissue of leech is :-

(a) connective tissue (b) Mesodermal in origin

[कुनै पनि Tissue को पहिले intro. आउछ त्यसपछि origin आउँछ।]

Reproductive system

Q. Trochophore larva is found in phylum Annelida & ... ?

(a) Arthropoda (b) Mollusca (c) Hemichordata (d) Echinodermata

- Trochophore
- Glocidium
- Velliger

→ larvae

- Bippanaria
- Doliolaria
- Auricularia
- Echinopleutus
- Aphiopleutus

* Sexes :-

Classes	Sexes
① Polycheta (Nereis)	separate :- (unisexual)
② Oligocheta (earthworm)	united (Bisexual) / Hermaphrodite
③ Hirudinia (cattle leech)	united : (Bisexual) / ..
④ Archiannelida (polygordius)	may be separate or united.

Separate :- unisexual / Dioceous

United : Bisexual / Hermaphrodite / Monoecious

Q) Which class of Annelida, ... found?

(a) Polycheta — unisexual.
(b) Oligocheta — 2 pairs of testes.
(c) Hirudinea — 11 pairs of testes, single pair of ovary
(d) Archiannelida

• Larval stage!

Q. Metamorphosis (egg → larva - adult) doesnot occur in :-

(a) Nereis
(b) Earthworm
(c) Mosquito — larva: Wriggler
(d) Housefly — larva: Maggot

class: polycheta: Indirect development. (larva भएको) → Trochophore larva.

class: Oligocheta: No larva → direct development.

class: Hirudinea: No larva → direct development

class: Archiannelida: May be direct or indirect development.
→ If larva present → Trochophore larva

Q. Trochopore larva:-

(a) Annelida
(b) Mollusca
(c) Both
(d) None

(a) Annelida
(b) Mollusca
(c) Echinodermata
(d) or Hemichordata

→ [Trochopore is very common larva. हो।]

• Trochophore larva लाई Mollusca या के भएर सम्झने → द्रौपदी larva (common)

Note!

Nereis (No clitellum) → Fertilization is external, takes place in water

Earthworm (permanent clitellum) → Fertilization is external, takes place in cocoon.

Leech (temporary clitellum) → Fertilization is internal, takes place in vagina.

(9, 10, 11) breeding season मा देखा पर्छ।

Clitellum → cocoon formation → Fertilization पुरा हुन्छ

So, leech या clitellum ले formation गरेको cocoon को काम → leech या Fertilization vagina मा हुन्छ → zygote/Fertilized egg बन्छ.
→ deposited in cocoon. → Further embryonic development को लागि मात्र।

Excretory system

Q. Annelids :- excretory organ is called Nephridia [IOM 2015]

Q. Nephridia of annelids (earthworm) are analogous to cockroach:-

(a) Flame cells — platy, excretion
(b) Coxal glands — spider & scorpion, excr.
(c) Malphigian tubules — (insecta), extr
(d) Pericardial glands — Mollusca, extr.

Nephridia

on the basis of size & number

Micronephridia
- small size
- each segment: many pairs
- e.g. Earthworm
  - Micronephridia
    - Types:
      - Septal → each seg. 80-100 pairs हुन्छ।
      - pharyngeal → each seg. 200 वटा हुन्छ।
      - Integumentary → each seg. 200-250 वटा हुन्छ।

Mega/Macronephridia
- large size
- each segment: 1 or 2 pairs
- e.g. Leech, Nereis.
  - total Nephridia → 17 pairs
    - location (6th to 22nd)
    - each seg → 1 pair

Q. Not associated with earthworm? [IOM 2017]
(a) Septal Nephridia (b) Pharyngeal Nephridia (c) Macro-Nephridia
(d) Integumentary Nephridia

Nephridia

Nature

Enteronephric/endonephric
जुन Nephridia ले waste product लाई Alimentary canal को part मा discharge गर्छ → enteronephric

exonephric/ectonephric
waste products लाई directly body बाहिर (skin) मा discharge गर्ने → exonephric

Q. Septal nephridia of earthworm poured waste into:—
(a) Buccal cavity (b) Pharynx (c) Both (d) Intestine

- Nereis → All exonephric nephridia
- Leech → All exonephric nephridia
- Earthworm →
  1. Pharyngeal nephridia:- Poured into buccal cavity & intestine → enteron
  2. Septal nephridia:- poured into intestine
  3. Integumentary:- poured into skin → exonephric (skin)

@SPent
pharyngeal
septal
enteronephric

Q. Terminal duct of septal nephridia opens into: [CEE 2078]
(a) Coelom (b) Intestine
(c) Paired septal excretory canal (d) Paired supra intestinal canal

- Septal Nephridia मा waste जाने correct seq → Coelom → Nephrostome (mouth) → Neck → Body → Terminal duct ← Paired septal excretory ← Paired supra-intestinal canal

Note:-

Earthworm	Vertebrates
(Ex) coelom found in Chloragogen cell → deamination of amino acid & formation of urea	
① Urea is formed by Chloragogen cells.	① Urea is formed by Liver. Note: chloragogen cells of earthworm are ~~non~~ analogous to vertebrates Liver. (Origin फर्क काम same)
② Urea is excreted by Nephridia	② Urea is excreted by Kidney. Note: Nephridia are analogous to vertebrates to kidney.

(protozoa – Nemath) – C.S X

Circulatory System: Start from this phylum.

Q. correct about circulatory system of earthworm?
(a) open type, Hemoglobin dissolve in coelomic fluid.
(b) closed type, Haemoglobin dissolve in coelomic fluid
(c) Closed type, Haemoglobin dissolved in corpuscles.
(d) Closed type, Haemoglobin dissolve in blood plasma

Q. In Pheretima, the haemoglobin is produced by:-
(a) Prostate glands (b) Accessory glands
(c) Blood glands (d) Lymph glands

Q. In earthworm, the haemopoiesis takes place in:-
(a) Prostate gland (b) Accessory glands
(c) Blood glands (d) Lymph glands

Relate with Earthworm
- Circulatory system comprises of:-
  ① Capillaries and blood vessels → closed type
  ② Circulatory organs called Hearts → 4 pairs → 7th (1 pair), 9th (1 pair), 12th (1 pair) & 13th (1 pair) [IOM]
  - → Dorsal position मा हुन्छ।
  - → Neurogenic
  - → tubular structure

Q. ~~Structure~~ In pheretima, structure Found in 7th and 9th segment:-
(a) Lateral Hearts → 7th & 9th
(b) Lateral-oesophageal Hearts → 12th & 13th

③ Blood / Fluid plasma
④ Blood glands → location:- 4th, 5th & 6th segment
- → Numbers → 3 pairs (1 pairs in each)
- → Function → produce blood cells & Haemoglobin
  - (phagocytic in nature)

Formation of blood cells is called ~~Blood~~ Haemopoiesis

⑤ Lymph glands: Location → 20th to upto last segment
Number → each segment 1 pair
produce → phagocytic, corpuscles called Amoebocytes

Note:

Phylum	Respiratory pigment	Circulatory system
① Annelida	Earth worm :- Haemoglobin	→ Closed type
	Nereis :- Chlorocruonin	→ Closed type
	Leech :- Haemoglobin	→ open type
② Arthropoda → Class :- Insecta (cockroach), Myriapoda (centipede)	absent	open type
② Arthropoda → Class: Crustacea (Crab), Arachinda (spider), Merostomata (Limulus) Horseshoe crab or, king crab	Haemocyanin	open type
③ Mollusca	Haemocyanin	open type except class: Cephalopoda (octopus) → Closed type
④ Echinodermata	R. Pigment → absent	open type

* Haemoglobin:- Iron containing red R. Pigment
* chlorocruonin:- Iron + vanadium → containing green pigment
* Haemocyanin: Copper containing blue pigment [IOM]

#Digestive system: comprises of: Alimentary canal + Digestive glands + Physiology of digestion

Q. Chromophil cells of pheretima serve to secrete :-
(a) Saliva (b) protease (c) Amylase (d) Mucus

• Alimentary canal: is straight tubular structure and complete.
complete → starts from Nemathelminthis but digestive gland starts from Annelida.

Note: Earthworm → Digestive glands

- Associated digestive gland / Accessory digestive gland
  - eg. Intestinal caeca
    - secrete amylase
- Embedded digestive gland
  - Calciferous gland (stomach) — Neutralize acidity of Humus, secrete lime
  - e.g. Chromophil cells (salivary gland cell) in pharynx — mucus, proteases

Humus: Earthworm को खाना
↳ org. component in soil which is formed by decomposition of plant & animal.

Embaded digestive glands

③ Gastric gland → Stomach
↳ secrete gastric juice → contains protease.

Note: leech: को saliva मा anticoagulant called Hirudin is present.

[जुन जन्तुमा Alimentary canal हुन्छ वा digestive tract मा हुन्छ त्यो लाई extracellular digestion हुन्छ]

→ protozoa + porifera → intracellular digestion
→ Coelentrata → Extracellular then followed by intracellular
→ बाकी सबै phylum मा Extracellular digestion

Nervous system: Developed N.S. यही बाट सुरु हुन्छ।

Q. ~~Earthworm~~ Common character Found in Earthworm, leech, centipede, cockroach is:-

ⓐ Jointed legs → Arthropoda
ⓑ chitinous exosketelon
ⓒ Dorsal nerve cord
ⓓ Ventral nerve cord

Non chordates/ Invertebrates	chordatas
Nerve cord → ventral, solid, double	Nerve cord: dorsal, hollow, double

Q. Nerve cord of earthworm [IOM 2014]
ⓐ dorsal and hollow
ⓑ Dorsal and solid
ⓒ Ventral and hollow
ⓓ Ventral and solid

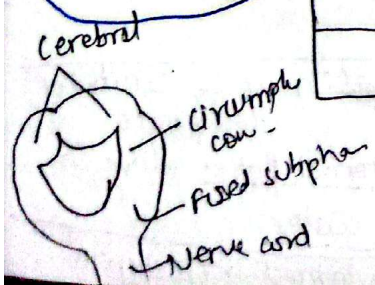
Nervous system [Annelids posses developed N.S]

Central N.S.
→ Anterior (3rd & 4th seg)
↳ Y-shaped - Nerve ring → Nerve arise (8-10) pairs.
2 pairs
→ Posterior → ventral Nerve cord → being fused so, appear as single but actually of 1 pair
↳ Thread like (5th to last seg)
~~but~~ invertebrates मा Nerve cord Alimentary canal को below मा हुन्छ।
but Nerves arises are → 3 pairs in each segment (5th to last)

Peripheral N.S

Autonomic N.S.
→ only sympathetic N.S.
parasympathetic N.S → absent

→ Nerve ring is formed by → Cerebral ganglia / suprapharyngeal ganglia (1 pair) - but nerves are (8-10) pairs
→ Fused sub-pharyngeal ganglia (1 pair) → but nerves are 3 pairs
→ Circumpharyngeal connectives (1 pair) - but nerves are 2 or 3 pairs
↳ joins both cerebral & sub-phar



Peripheral N.S :- Nerve arises from CN.S

Q. Sub-pharyngeal nerve in earthworm?
(a) 1 pair (b) 2 pairs (c) 3 pairs (d) 4 pairs
└ ganglia

~~Note~~:
Receptors: eye of earthworm → No eyes
└→ Earthworm :- (1) prostomium → मा lens हुन्छ → phagosome
(2) Buccal receptor → found in epithelium of buccal cavity
(3) Epidermal receptor (skin) → dorsal wall → photoreceptor
→ Ventral body wall → Thigmoreceptor (TS...)
light detect गर्दै ... vision ...
photoreceptor
guftatory
detect taste
smell - olfa...

Nereis

leech → 5 pairs of eyes :- 1st to 5th segment
→ annular receptor → Thigmoreceptor
└ ring मा हुन्छ

Q. Earthworm do not posses any special sense organs, still they are sensitive to:-
(a) light, taste, smell and touch

Nereis →



• All the nerves in Earthworm are mixed type (sensory and motor)

* Respiration → through moist skin
→ Respiratory pigment → Haemoglobin

Classification → On the basis of position and arrangement of seta / Locomotory organ

Class: polycheta	Class: oligocheta	Class: Hirudinea	Class: Archiannelida
Body → Body with distinct head, segmented body bears parapodia	→ Body lacks head and parapodia.	→ Lacks head and parapodia	→ with distinct head but lack parapodia └ usually absent
Clitellum :- absent	permanent clitellum, around (14, 15 & 16) seg.	→ Temporary clitellum around (9, 10, 11) seg. further embryonic development गर्छ।	→ absent
Setae → long & numerous arranged in parapodia	Few & small arranged in cuticle [perichaetine] - earthw. Lumbricine → Lumbricus	→ absent but move with the help of suckers	→ absent
Fertilization → sexes: seprate. └ external takes place in water	→ sexes: united takes place in cocoon └ external.	→ sexes: united - internal takes place in vagina	→ sexes: may be united or separate. → external takes place in water
Indirect → Trochopore	direct - no larva	direct - no larva	direct or indirect → Trochopore

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