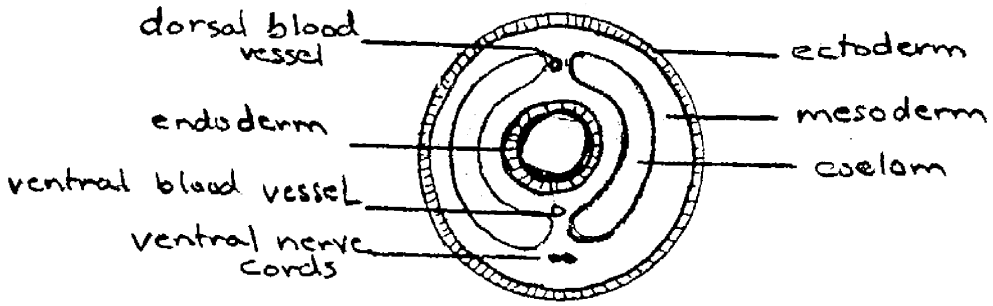
PHYLUM ANNELIDA

1) General Information – ringed, segmented worms
   Meaning – "ring" form the Latin word annulus
   Examples – earthworms, leeches
   Habitat: terrestrial, fresh/marine H_2O

2) Characteristics
   1. a *true coelom* (body cavity) lined by mesoderm
   2. externally visible *body segmentation*
   3. a *closed* circulatory system

- Contains coelom, this is located between the body wall and intestine, it is lined by mesoderm and filled with fluid
- Developed the first circulatory system with 5 pairs of "hearts" (aortic arches), dorsal, and ventral blood vessels and capillaries
- Bilateral symmetry with 3 cell layers (ecto- /endo- / mesoderm)
- Cephalized with nervous tissue, nerve cords, and primitive brain
- Complete digestive system (including mouth, anus, digestive organs and intestine with a typhlosole)
- Excretory system with the development of nephrida that removes nitrogenous wastes and excess H_2O from coelomic cavity
- Contains mucous glands for easier movement and to keep itself moist thereby facilitating gas exchange by diffusion
- Each segment has 4 bristles called setae which help to move and anchor the worm
- The body is divided into segments each containing a portion of the coelomic cavity

Cross section



3) Classes
   1) *Polychaeta* – polychaete worms: marine, flattened bodies, body segments with paired paddle-like appendages (parapodia)
   2) *Oligochaeta* (earthworms) – few hairs, small head for burrowing, may have a saddle-like swelling (clitellum) which secretes a mucus cocoon in which the fertilized eggs are deposited ("oligo" refers to hair)
   3) *Hirudinea* (leeches) – often aquatic, bodies with suckers – many are ectoparasites feeding on blood

Life activities of Earthworm:

1) Locomotion

- Uses longitudinal and circular muscles and fluid pressure in the coelom and the setae to help burrow and move
- Contraction of the circular muscles of anterior (front) cause worm to lengthen; setae (paired bristles) then anchor the worm to the soil while the longitudinal muscles contract causing worm to shorten, thereby pulling the posterior (behind) part of its body forward

2) Ingestion, Digestion and Elimination

- Complete digestive system i.e. mouth → anus
- Eat the organic material in the soil
- Process:

1. **Mouth** – ingests food (enters mouth)
2. **Pharynx** draws food into mouth (sucks in & swallows food)
3. **Esophagus** has 3 attached glands (calciferous glands) that remove excess calcium from blood, secrete $CaCO_3$ to help dissolve food
   - Underlies aortic arches of the circulatory system
4. **Crop** – stores food temporarily
5. **Gizzard** - contains sand grains which help grind up food by muscular contractions
6. **Intestine** - enzymes break down the nutrients – digests food chemically into particles small enough for absorption into blood.
   - Typhlosole increases surface area for absorption of nutrients; nutrients enter capillaries
7. **Anus** - Undigested food enters the anus, solid wastes (castings) pass out through anus

3) Excretion (liquid wastes)

- Nephrida: filter excess H_2O and nitrogenous wastes
  Excess H_2O is reabsorbed into blood vessels
- Excretory organs called nephrida (1 pair per segment) remove dissolved nitrogenous waste. Nephrida are composed of a ciliated funnel tubule in the coelom of one segment and an excretory pore on the ventral surface of the next segment and so in a sense occupy 2 segments
- Nephrida filter waste from the coelomic cavity of the preceding segment. This waste passes through a long, blood-vessel-surrounded tube (much like our kidneys) and is eventually deposited outside through an excretory pore.

4) Circulatory System

- Composed of a closed circulatory system (contained in vessels)
  - This allows more effective delivery of nutrients to the tissues which in turn allows for increased activity and size
- Blood flows in blood vessels to all parts of the body
- 5 pairs of hearts → capillaries → to all body organs
  - blood containing O_2 from skin capillaries flows forward through the dorsal vessel
  - at the head end, 5 aortic arches (hearts) aid in pumping the blood to the ventral vessel
  - the ventral vessel carries the blood from the head end backwards to the body tissues CO_2 / O_2 & nutrient/waste exchange occurs in the capillaries
- blood contains Hb (hemoglobin), food, and dissolved gases

5) Earthworm Respiration

- via diffusion through the moist skin - moist skin & mucus facilitate gas exchange by diffusion into the capillaries and blood (mucus glands excrete mucus)
- O_2 is carried by Hb (pigment in blood)
- Earthworms are pink because many of their blood capillaries (which contain hemoglobin) are close to their body surface for effective CO_2 /O_2 exchange

6) Nervous System

- Paired ventral nerve cord which swells into ganglia (mass of nerve cell bodies acting as primitive brain) at head

7) Earthworm Reproduction

- Sexual cross-fertilization via sperm exchange between hermaphrodites (swap sperm and cross-fertilize)
- Between segments 32-37 there is a swelling called a *clitellum* which secretes a mucus cocoon for fertilized eggs

Biology 11 – Worm test outline

Study your "questions package" as well as your notes on the following points. Remember the text reference for this unit is chapters 30 and 31.

Platyhelminthes – know examples (i.e. *Planaria*)

- Body systems present / absent
- Organs of excretion = flame calls
- Tissue layers present
- Nervous system
- Bilateral symmetry
- Head of tapeworm = scolex
- Ingestion in planaria
- Reproductive segment of tapeworm = _____-
- 2 unique features of Phylum

Aschelminthes – know examples i.e. *Ascaris*, roundworms

- one-way (*complete)* digestive system (mouth & anus)
- psuedocoelom (know functions)
- 2 unique features

Annelida – know examples i.e. earthworm

- reproduction
- coelom
- gizzard for grinding food
- closed circulatory system
- respiration through skin (diffusion)
- movement of earthworm
- typhlosole increases surface area for digestion
- 2 unique features

PLUS: Parasitic adaptations (5) – list & describe
Diagrams → *Planaria* & Earthworm (from worksheet)