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WORKSHEET 18

School: **Ba Sangam College**

Subject: **Biology**

Year: **13**

Name: _____

Strand	13.3 Biodiversity Change and Sustainability
Sub strand	B13.3.2.6 Kingdom Animalia
Content Learning Outcome	Describe the characteristics that classify organisms in this kingdom to different categories; and explore the increasing complexities of the different groups from simple organisms to complex chordates

Coelomates

Phylum Annelida (Segmented Worms)

General Characteristics

- Are bilaterally symmetrical.
- Have metameric segmentation where there is a repetition of organs and tissues at intervals along the body of an animal, thus dividing the body into a linear series of similar parts or segments (metameres).
 - Each segment is separated by a septum (pl. septa, cross wall)
- Circular and longitudinal muscles allow more efficient movement and flexibility
- Coelom is filled with fluid acting as hydrostatic skeleton which permits free movement of internal organs.
 - Have complete digestive system (mouth and an anus) and are protostomes.
 - Have paired nephridia (organ of excretion) in each segment.
 - Nervous system has pair of longitudinal cords. Brain is developed ganglion and found in the anterior end of the body.
 - Has closed circulatory system.
 - Found in wide variety of habitats such as soil, fresh water and salt water.

Classes of Annelida

1. Polychaeta (Poly = Many, chaetae = hairs/stiff bristles)
2. Oligochaeta (Oligo = few)
3. Hirudinea (no chaetae, ectoparasites)

CLASS Polychaeta (eg. Feather Duster worms, Clam worms, Christmas tree worms)

- Are marine annelids.
- Many chaetae (chitinous)

Movement:

- Each segment has paired parapodia for swimming or crawling.
- May burrow through peristalsis movement
- Some are sessile living in tubes (self-secreted) inside mud or sand substrate
- Many have incomplete inter-segmental partitions, and maybe absent in some

Gas exchange:

- Parapodia also functions as gills. Some also use their skin for gas exchange

Feeding:

- Motile polychaetes are predators or scavengers. Sedentary polychaetes feed on suspended particles or particles in sediment.

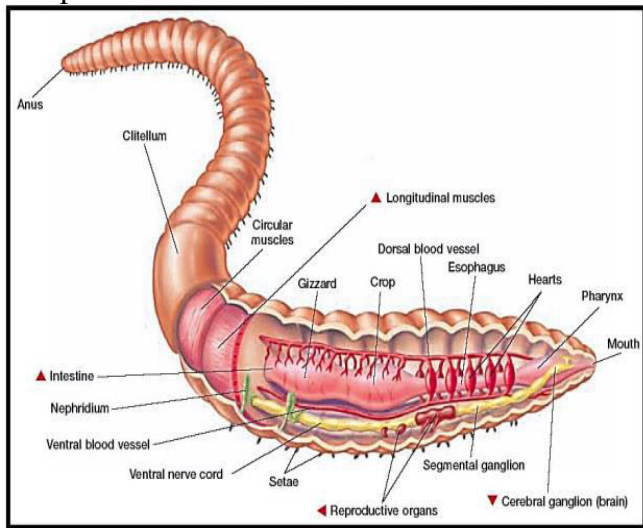
Reproduction:

- Dioecious - Mostly have two sexes: male, female.
- Segmentation allows regeneration.
- Posterior (tail) end of worm grows enlarged gonads and eyes; Often, the posterior end will then break off (epitokes) and swim away to reproduce.

- Usually on one or two days of the year, all epitokes of a species will congregate at the surface, with males swarming around females, shedding sperm. Females, once fertilized, shed all eggs into water.
- Epitokes of the Palolo worm are a delicacy in Samoa and Fiji.

CLASS Oligochaeta (eg. earthworms and freshwater worms)

- They are freshwater annelids.
- Lack a well-developed head and parapodia.
- Few setae present.
- Have more complete inter-segmented partitions



Reproduction

- Are hermaphrodites but cross fertilization occurs.
- Are monoecious. Immature sperm from testes mature in seminal vesicles and then pass into sperm ducts. Eggs are discharged by ovaries into the coelomic cavity; ciliated funnels carry them outside. Two pairs of seminal receptacles receive and store sperm during copulation.
- Earthworms mate at night during warm, moist weather. They mate by aligning in different directions with ventral surfaces together.
- Mucus secreted by the clitellum holds them together during copulation. Sperm travel to the seminal receptacles of the other worm along seminal grooves.

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- Fertilization and embryogenesis takes place in the cocoon; young worms emerge.

Nutrition

- Deposit feeders (earthworms)
- Most are Herbivores, but some are scavengers
- Have a specialised digestive tract which carry different functions.
 - Pharynx - Sucks decaying organic matter.
 - Crop – storage chamber.
 - Gizzard – grinds food.
 - Intestine – digestion by enzyme (extra cellular digestion).
 - Anus – egestion.
- **Movement**
 - Have circular and longitudinal muscles. Can elongate one part of the body while contracting another part, and vice versa – antagonistic movement.
 - Most burrow with peristalsis. Muscular contractions of body, using both longitudinal and circular muscles.
 - Use chaetae as anchors. Excretion Has a pair of nephridia present on each segment. Wastes from both the coelom and the blood capillary beds are discharged. Aquatic oligochaetes excrete toxic ammonia whereas terrestrial worms excrete the less toxic urea.

Nervous System

- Have both a central nervous system and peripheral nervous system.
- A pair of cerebral ganglia connects around the pharynx to the ganglia of the ventral nerve cord.
- Earthworms lack eyes but have many photoreceptors in the epidermis. Free nerve endings in the tegument are tactile.

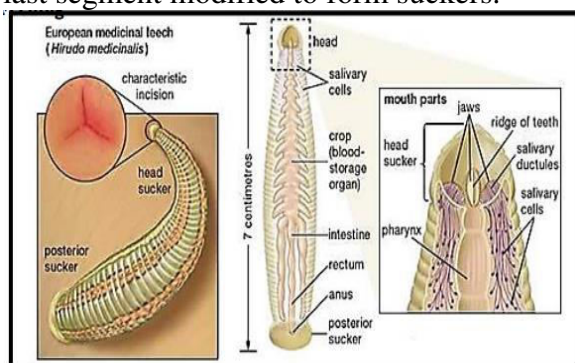
CLASS Hirudinea – eg. Leeches

- Are mostly freshwater, some marine.
- Lack chaetae, and a dorsoventrally flattened body.

- Leeches vary in colour: black, brown, red and olive green. Reproduction Leeches are hermaphroditic and cross-fertilize during copulation.

Movement

Have suckers on both ends with the first and last segment modified to form suckers.



- Many are blood-sucking ectoparasites and while a few are predators.
- The fluid feeders get attached to host by posterior sucker and uses anterior sucker to slit the skin or dissolve the skin with enzymes.
 - They secrete hirudin into the wound to stop coagulation of blood.
- No internal segmentation. No intersegment partitions. Gas exchange and excretion
- Some fish leeches have gills while others exchange gases across the skin.
- Excretion is carried out through nephridia.

Nervous System

- They have two brains.
- The epidermis contains free sensory nerve endings and photoreceptor cells.

Importance of Annelids

- Aerates the soil.
- Break down of organic matter.
- Adds nutrients to the soil.

Activity

1. The vascular lesions caused by leeches on the blood vessels of their host cause blood to coagulate naturally. How does the leech solve the problem of the ingested blood potentially coagulating inside its body?

2. What is the ecological role of earthworms?

3. What is the advantage of segmentation in annelids?

4. How is movement carried out in earthworms?

5. Explain the term metameric segmentation?

Phylum Arthropoda

General Characteristics of Arthropods

- Jointed appendages.
- Have an exoskeleton made of chitin which offers protection against predators and water loss. (Exoskeleton limits growth so it undergoes moulting which enables growth.
- Size is limited because chitin cannot support much weight.
- Bodies are segmented like annelids.
- Have Segments distinguished into head, thorax and abdomen.

Excretion

- Gills used by aquatic arthropods. – Malpighian tubules are used by terrestrial arthropods.
- Excrete solid uric acid waste from blood into the hind gut.

- Solid passes into the digestive tract where remaining water is reabsorbed as wastes pass on.
- Dry crystal uric acid wastes help in conservation of water.

Circulation

- Have open circulatory system.
- The heart contracts, blood is pumped out through the anterior and enters the haemocoel.
- Blood bathes the internal organs (exchange materials and returns through the Ostia).
- Gas exchange – Terrestrial arthropods use tracheal system while aquatic uses gills.

Reproduction

- Have separate sexes.
- Internal fertilization occurs and have separate sexes.
- Arthropods are believed to have evolved from annelids because both have trochophore larva.

Movement

- Have complex system of muscles enabling range of movement.

Nervous system

- Has a well-developed nervous system with dorsal brain and ventral nerve cord.

Reasons for the success of Arthropod

- Presence of exoskeleton
- The chitin prevents desiccation. Moulting allows the arthropod to grow larger.
- protects the soft tissue inside and supports the muscles
- provides protection against predation.
- Diversification of segmentation A large diversity/variation of body segmentation, ranging from Chelicerates (spiders, scorpions) with only two main body parts (cephalothorax and abdomen) whilst

Insecta (cockroaches, ants) have three main body parts (head, thorax, abdomen)

Diversification of appendages

- A large variety of appendages used for different purposes such as feeding, grasping prey, walking and jumping these enables them to occupy various ecological niches.

Advanced sensory system

- Compound eyes: able to detect light, colour and movement.
- This allows them to sense things such as flower colour
- Antennae: perceptive to signals such as pheromones for mating and for protecting against predators.

Presence of wings

- Evade the clutches of predators.
- They can range far and wide in search of food and habitat.

Presence of malpighian tubules

- To conserve water so that they can survive in dry habitats.

Internal fertilization

- Prevents wastage of gametes and ensures that the embryo is developed within the egg.

Life cycle involving metamorphosis

- Allows the animal to exploit different niches and food sources thus reduces competition.

SUBPHYLUM Trilobita – the extinct trilobites

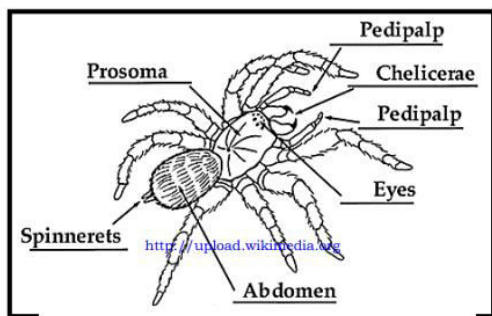
- Are hard-shelled, segmented creatures that existed over 520 million years ago.
- Trilobites were one of the first organisms to develop multiple appendages for moving around.
- Trilobites lived in marine waters.
- Some trilobites could swim, others burrowed or crawled around on muddy sea floors.
- Their body consisted of a head, thorax and abdomen made of fused segments.

SUBPHYLUM Chelicerata-(spiders, horseshoe crabs, sea spiders).

- The foremost appendages of their bodies are mouthparts called chelicerae that function in feeding.
- Body divided into cephalothorax consisting of head and thorax and abdomen.
- No antennae present.
- Have five pair of appendages of which first pair used for feeding (pedipalps) and other four pairs are walking legs.

CLASS Arachnida (Spiders, Scorpions, Daddy long legs and ticks)

- Four pairs of legs and four pairs of eyes.
- They have a cephalothorax (a head and thorax fused together)
- Lack antennae and perform respiration via book lungs (composed of many fine lamellae)



<http://www.smithlifescience.com/spiderinformation.htm>

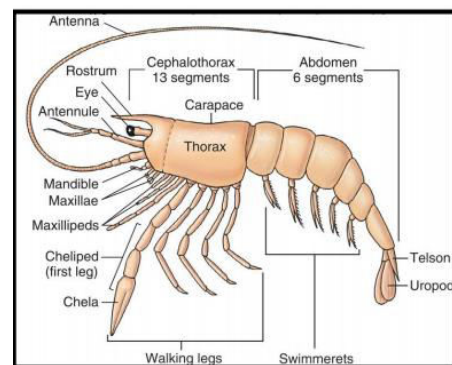
SUBPHYLUM Mandibulata - (crustaceans, insects, centipedes, millipedes).

- The anterior appendages are one or more pairs of sensory antennae.
- Have antenna.
- Mouthparts called mandible helps in chewing and feeding while some may help in piercing and sucking food.
- In many mandibulates, two extra pair of mouth parts known as maxillae are present which helps in manipulating food)

CLASS Crustacea (crabs, shrimps, lobsters, crayfish, water fleas, pill bugs, and sow bugs)

- Aquatic and few terrestrial forms.

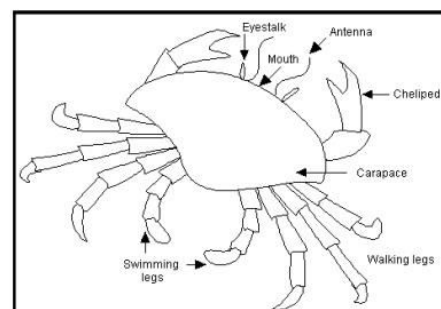
- A hard exoskeleton made of calcium carbonate.
- The head has two compound eyes, two pairs of antennae, and three pairs of mouthparts.
- A pair of green glands excretes wastes.
- The abdominal segments have swimmerets (swimming legs).
- The sexes are separate. Eggs are attached to the swimmerets of the female. The first pair is enlarged in the male and is used to deposit sperm to the female.
- It has open circulatory system with no heart and the "blood" is pumped by vessels into sinuses.
- The nervous system consists of a primitive ventral nerve cord and ganglia system



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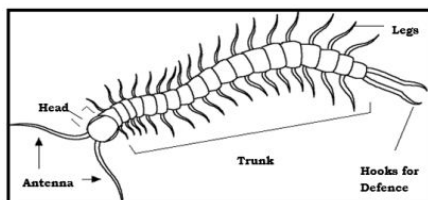
Eggs are attached to the swimmerets of the



CLASS Chilopoda (centipedes)

- Body has head (consist of two pairs of maxillae and one pair each of antennae) and trunk (15 -180 segments)
- Dorso- ventrally flattened and vary in length form 2cm-30cm.
- Are carnivores and the legs of the first segment are poison claws.

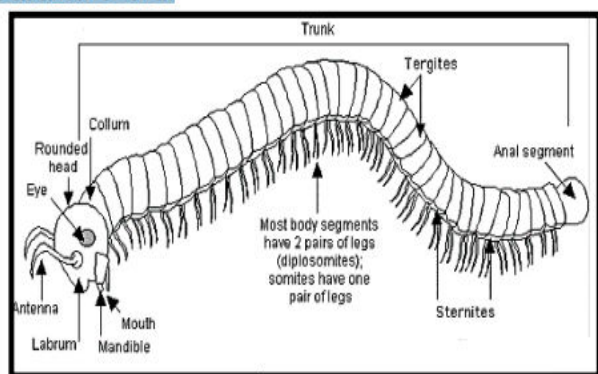
- Each of the other segments of the trunk bears one pair of legs.
 - They live on land and breathe through trachea.
 - Excretory organs called malpighian tubules. o Have genital organs which opens at the posterior end of the body.



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CLASS Diplopoda (millipedes)

- Have a long cylindrical body divided into a head and a trunk.
- Vary in length from 2mm – 20cm.
- Head consists of one pair of antennae, a pair of mandibles and a pair of maxillae.
- They feed on dead organic matter.
- Lack poisonous claws.
- First segment is legless, next few segments of trunk each bear one pair of legs, and following segments bear double pair of legs.
- Respiration is carried out through trachea.
- Excretion carried out through Malpighian tubes.
 - Genital duct opens at anterior end.
 - Have many legs of seventh segment in males specialised and is used to insert sperm in the female reproductive tract.



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CLASS Insecta (Cockroaches, bugs, ants, bees, butterflies)

- Is the dominant class of arthropods on earth.
- Have head, thorax and abdomen.
- Head bears a pair of antennae.

- Thorax has three segments, each having a pair of legs.
- Have six legs present.
- Most have two pairs of wings on thorax.
- Some are wingless e.g. fleas and silverfish.
- In insects such as flies and mosquitoes the hind wing are reduced to small organs that help in maintaining balance.
- Have tracheal system for respiration.
- Blood does not have oxygen carrying pigment thus is not red in colour.
- Undergo metamorphosis.

Activity

1. Considering the presence of segmentation (metameres) in their body, which previously studied phylum resembles arthropods?

_____ (2m)

2. List down the advantages of the exoskeleton?

_____ (2m)

3. How is the respiratory system of insects related to the agility of some species of this class of arthropods?

_____ (2m)

4. How are the three main classes of arthropods characterized according to body division and number of appendages?

_____ (2m)

5. Which class of arthropods is the most diverse animal group on the planet? How can this evolutionary success be explained?

_____ (2m)