



## WORKSHEET 10

School: Ba Sangam College

Subject: Biology

Year: 12

Name:

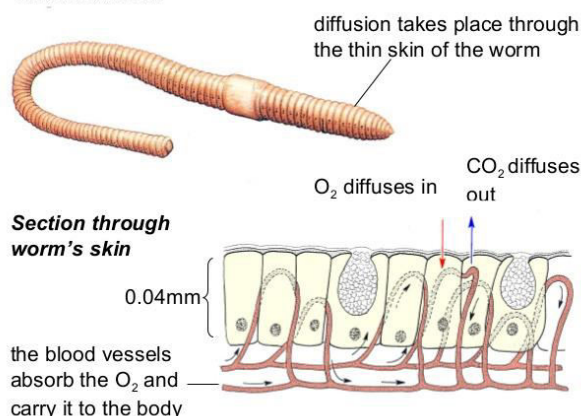
Strand	1 – Structure and Life Processes
Sub strand	1.4 – Comparative Form and Function in Plants and Animals
Content Learning Outcome	Examine the method of gas exchange and the associated problems with exchange of gases in organisms in aquatic and terrestrial habitats.

### Gas Exchange in annelids – diffusion through the skin

- Exchange gases between air and blood by direct diffusion by their **moist skin**- (secrete moistening fluid by mucus gland and live in damp places).
- Skin dries up (desiccation) -----O<sub>2</sub> cannot diffuse into blood-----organism suffocates and dies -----impose threat to worms.
- Burrow into soil to avoid drying up-----avoiding exposure to air and sunlight.

Earthworm

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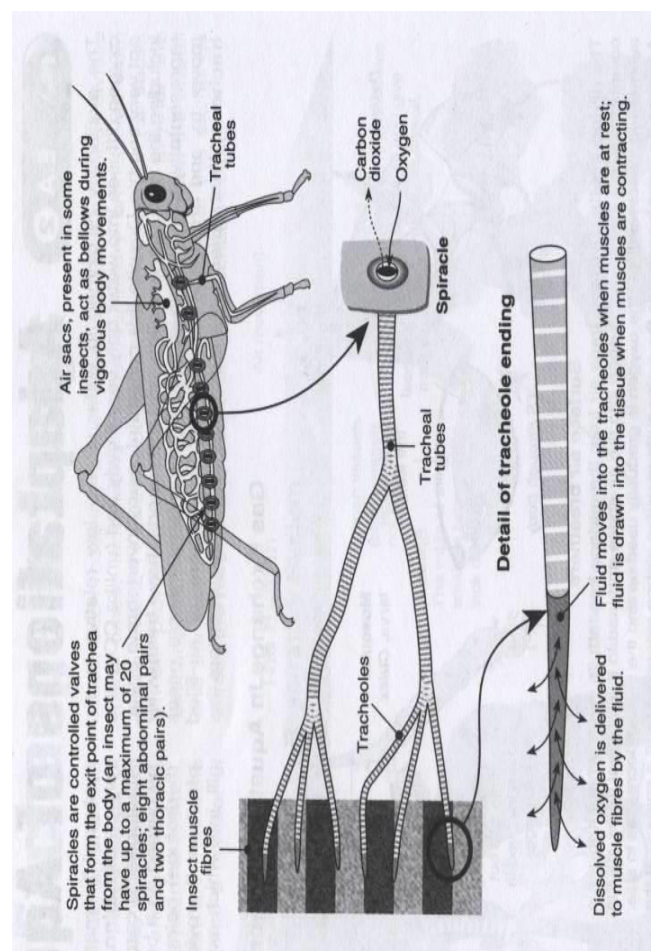
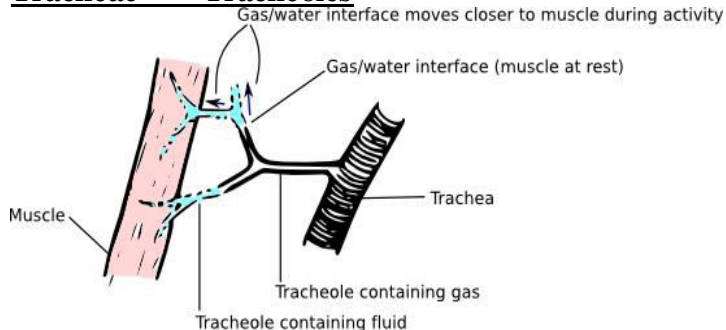


- Trachioles pass nearby every cell in an insects body----- are moist and thin----- allows faster diffusion.

### Steps of Gas Exchange in Insects

Outside air -----spiracles (openings)-----

Tracheae-----Tracheoles



### Gas Exchange Insects - Diffusion through a tube system.

- Cannot survive gas diffusion through skin:
  - Live above ground and cannot keep the skin moist.
  - Active animals----- direct diffusion----- will not provide enough O<sub>2</sub> to their body cells.
- Blood do not transport O<sub>2</sub> to body cells.
- Air diffuses in and out through air pipes- **Trachea** and **Trachioles** (are found on underside of insects called spiracles).
- Reduce water loss from trachea -----insects partially close their spiracles---- when inactive.

### Adaptation of insects for water conservation

In order to reduce water loss from the moist walls of the trachea most insects;

- partially close their spiracles-----inactive.
- trachioles pass the cells -----prevents loss of moisture.
- trachioles -----thin and moist at all times -  
-----faster diffusion of gases between the trachioles and the body cells.
- Larger, flying insects----- pump their abdomen in and out to aid the movement of air into their spiracles.

### Adaptive Value

- Gas exchange through a tube system is not suitable for larger and active animals (body volume of larger animals).
- They need oxygen to be actively pumped to body cells.
- Insects are quite small, so the gases do not have to diffuse very far to reach each of their body cells.

## Gas Exchange In Vertebrates

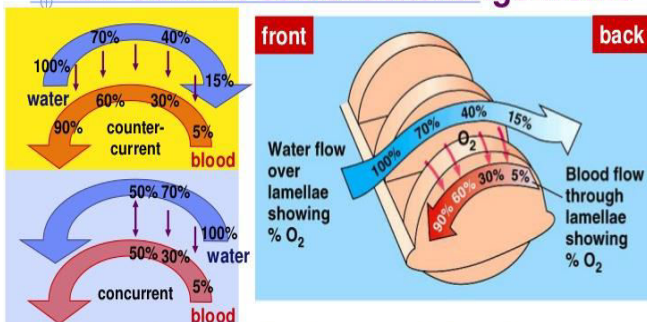
- Vertebrate animals----- active----- specialised respiratory organ---- to meet their energy demand.
- Breathe in air (oxygen) into their body.
- They adjust to the speed of gas exchange-- ---eg: running increases breathing rate and sleeping decreases breathing rate
- Gas are transported in the blood in animals except in insects.

## For Effective Gas Exchange Vertebrates Respiratory Surfaces:

- be well supplied with blood capillaries
- be thin and moist at all times
- have a large surface area.

## Gas Exchange In Fish

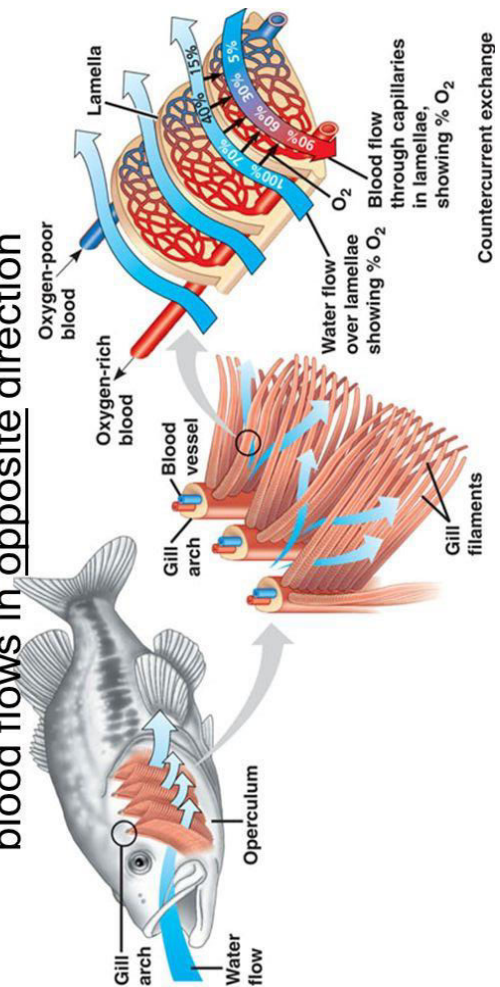
## How counter current exchange works



- **Blood & water flow in opposite directions**
  - ◆ maintains diffusion gradient over whole length of gill capillary
  - ◆ maximizing  $O_2$  transfer from water to blood

# Counter current exchange system

- Water carrying gas flows in one direction, blood flows in opposite direction



## Essay Writing

**All organisms, even those with specialised gas exchange systems, depend upon diffusion to exchange oxygen and carbon dioxide across the respiratory surfaces.**

With reference to the statement given above, discuss the following:

- **four** important adaptations to assist diffusion; (2 marks)
- the **four** methods of gas exchange with an example of an organism that uses each method; (4 marks)
- a benefit of each gas exchange method to the organisms mentioned above. (2 marks)