

PENANG SANGAM HIGH SCHOOL
P.O.BOX 44, RAKIRAKI
LESSON NOTES

Year/Level: 12C/D

week 23

Subject: Biology

Strand	1 structure & life processes
Sub Strand	1.4 comparative form and function in plants and animals
Content Learning Outcome	describe the different methods of transport in vertebrates (fish, amphibians and reptiles)

Adaptive Value for a closed circulatory system

- Most animals have closed circulatory systems.
- Vessels contain their blood. Their blood never touches body cells directly.
- A closed system is necessary in larger animals for the following.
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1) Artery contraction can adjust the amount of blood flowing to each part of the body according to its activity level.

2) A large animal filled with blood would suffer great difficulty walking with so much fluid sloshing around. If it ever tripped and fell it would burst open.

3) Blood flow through a body cavity is too slow to supply enough oxygen to the cells of larger animals.

- For small organisms such as insects, the blood flow through a body cavity is fast enough to supply sufficient nutrients to their body cells.
- Additionally, insects do not rely upon their transport system to supply oxygen to their cells.
- Open circulation is not quick enough.
- Insects and spiders have a separate **tracheal system** that allows gases to diffuse directly to their cells.

Note

Insect blood has no haemoglobin therefore, it's not red in colour. It has greenish-yellow blood which contains nutrients and body wastes, but no oxygen.

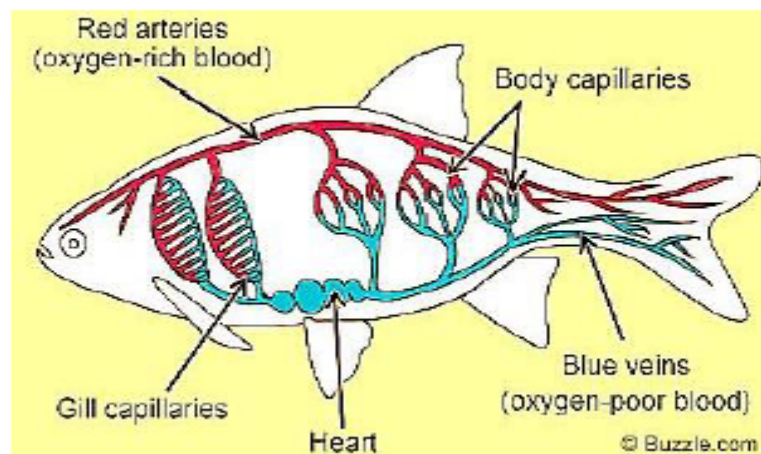
Transport in Vertebrates

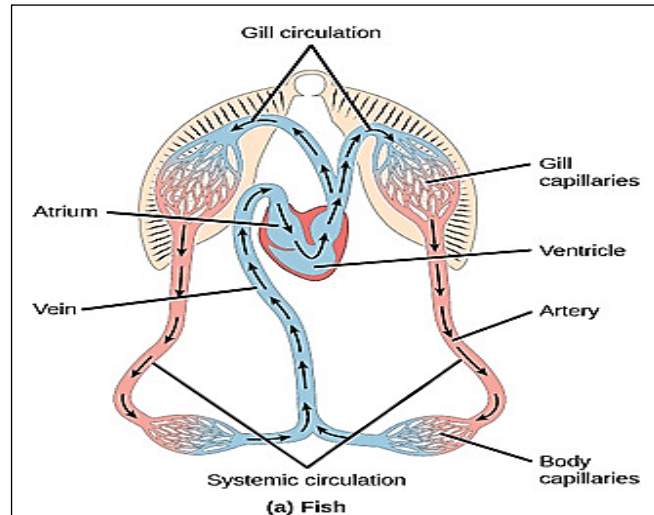
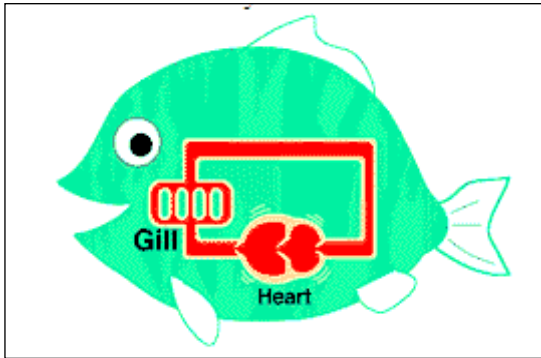
- Vertebrates' animals are generally larger and more active than invertebrates so they need more efficient transport systems.

- All vertebrates have a closed circulatory system with a chambered heart to pump blood.

Transport in Fish (closed, single – loop circulation)

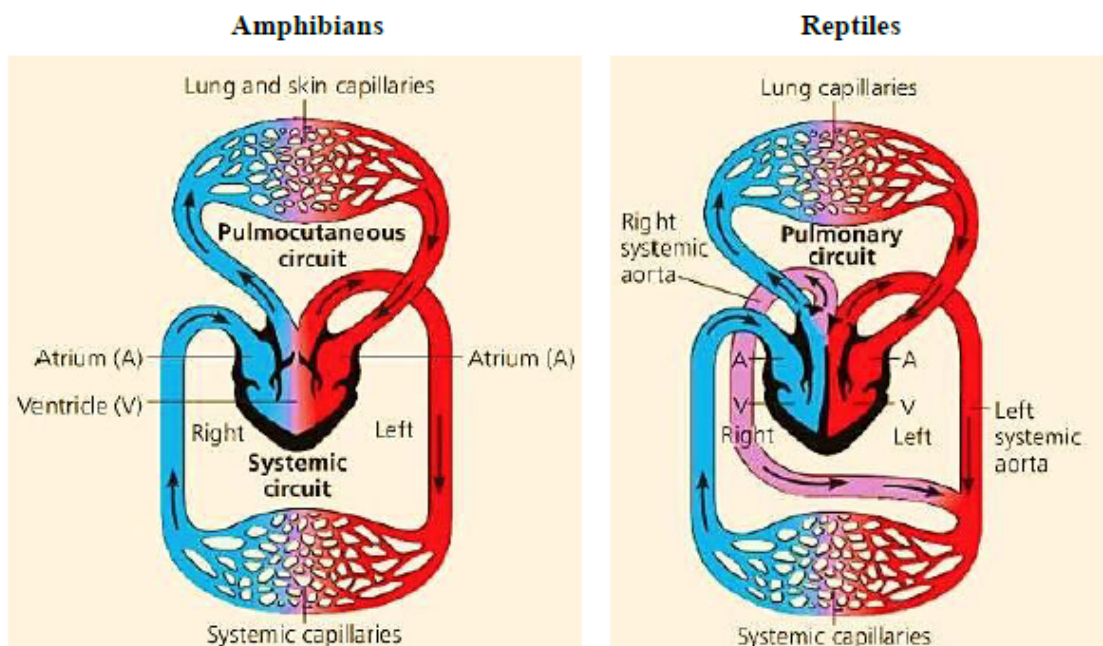
- Fish have the simplest circulation system with two chambers – one auricle and one ventricle.
- The heart pumps the blood in only one loop, from ventricle to gills to body cells back to the heart.
- A fish heart does not have to pump as hard like in land animal because water reduces the force of gravity.
- Fish blood can make it through the gills and the body without returning to the heart for a second push.





Transport in Amphibians and Reptiles - Closed, partial double-loop circulation.

- Amphibians (toads) and reptiles (snakes, lizards, etc) both have three- chambered heart with two auricles and one ventricle.
- They have a closed partial double loop circulatory system.
- A single ventricle pumps oxygenated blood to the body and deoxygenated blood to the lungs.
- This circulation is only a partial double loop because the two loops overlap.
- Oxygenated and deoxygenated bloods mix in the ventricle.



Adaptive Value

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- In amphibians and reptiles, oxygenated and deoxygenated blood mix in the single ventricle. Some of the blood that the heart pumps to the lungs is already oxygenated. Some it pumps to the body is deoxygenated.
- Since amphibians and reptiles are cold- blooded and generally less active than birds and mammals, they can manage with less efficient blood circulation.
- Additionally, most reptiles have at least a partial wall in their ventricle to separate the oxygenated and deoxygenated blood. This increases the efficiency of their transport system

ACTIVITY

1. What is the difference between open and closed circulation? Give an example of an organism with each kind of circulation.

2. Why don't large organisms have open circulation?

3. In animals with closed circulation, the blood does not actually touch the animal's cells. How do the materials move between the cells and the blood?

4. In spite of having only single loop circulation, a fish's circulatory system is able to supply cell nearly as quickly as the double-loop circulatory system of a mammal. Why?

5. Compare the transport system in an annelid and in a fish.