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THE MAMMALIAN TRANSPORT SYSTEM



2. Amphibian

- 3-chambered heart: 2 atria & 1 ventricle (2 circuits of blood flow: pulmonary & systemic)
- Pulmonary circuit leads to the lung and skin, blood picks up O_2 as it flows through capillaries; O_2 -rich blood returns to left atrium of heart, and it is pumped to systemic circuit
- Systemic circuit carries blood to all organs except lungs; returns the blood to right atrium via veins

● Double circulation ensures vigorous flow of blood to the brain, muscles and other organs as the blood is pumped 2nd time after it loses pressure in the capillary beds of the lung

● Mixing of O₂-rich with O₂-poor blood in single ventricle

3. Reptiles

● 3-chambered, single ventricle partially divided by septum

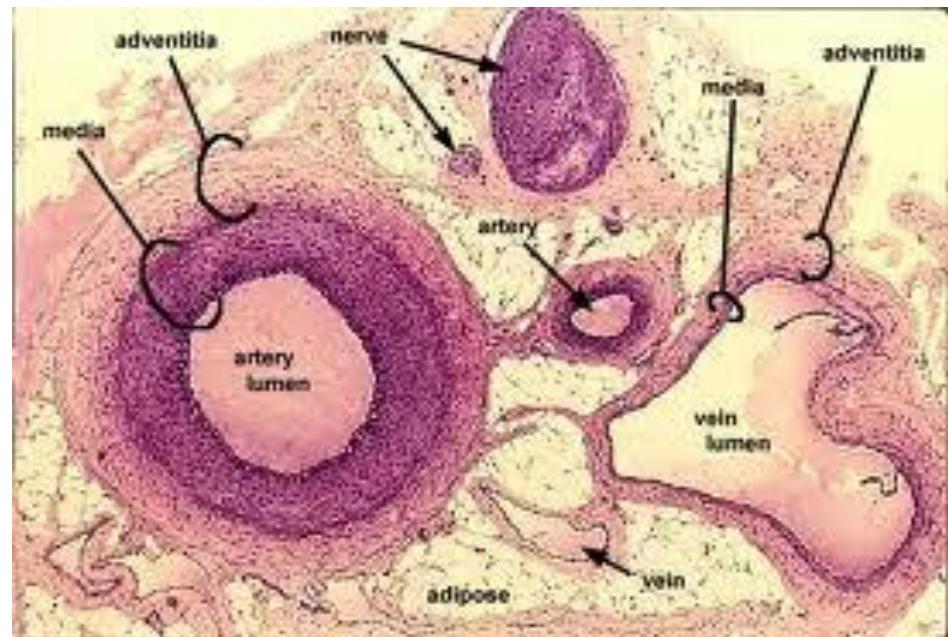
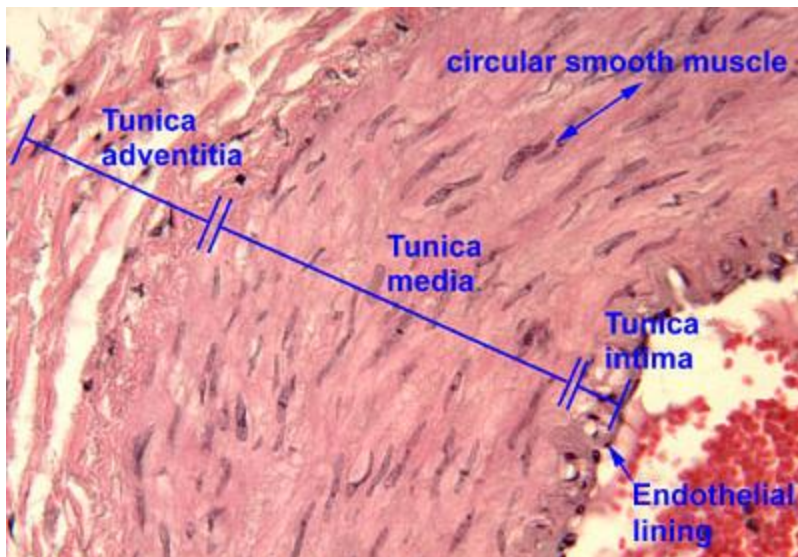
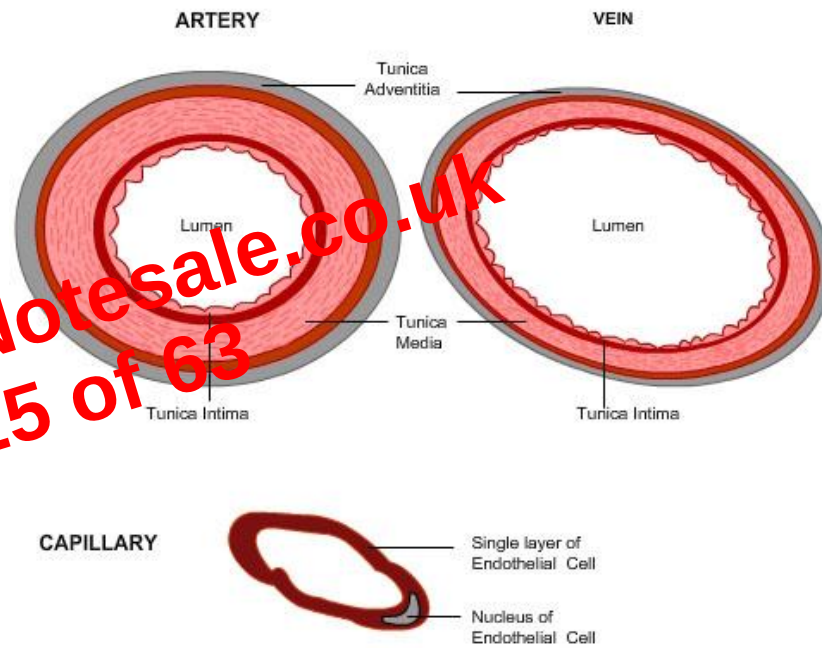
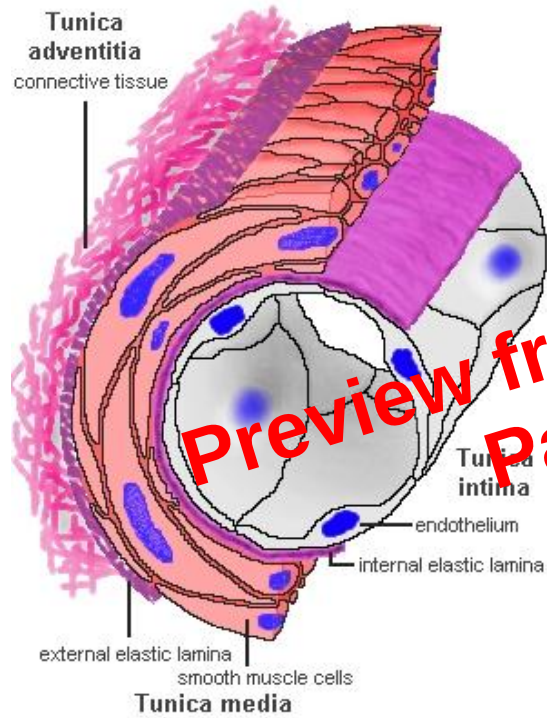
● Reducing mixing of O₂-rich with O₂-poor blood

4. Mammalian or bird

- 4-chambered, 2 atria & 2 completely separated ventricles
- Double circulation; heart keeps O₂-rich blood fully separated with O₂-poor blood
- Left side of heart handles only O₂-rich blood; right → O₂-poor blood
- Delivery of O₂ to all parts of body enhanced as
 - a) No mixing of O₂-rich with O₂-poor blood
 - b) Double circulation restores pressure after blood has passed through lung capillaries

[The Circulatory System - AS Biology Revision - OCR \(Unit 1.2.2\).flv](#)

- **Arteries** carry blood away from the heart to organs throughout the body
- Arteries branch into **arterioles**, small vessels that convey blood to capillaries
- **Capillaries** microscopic vessels with very thin, porous walls
- Network of these vessels (**capillary beds**) infiltrate each tissue
- Chemicals are exchanged between the blood and interstitial fluid surrounding the cells through thin walls of capillaries

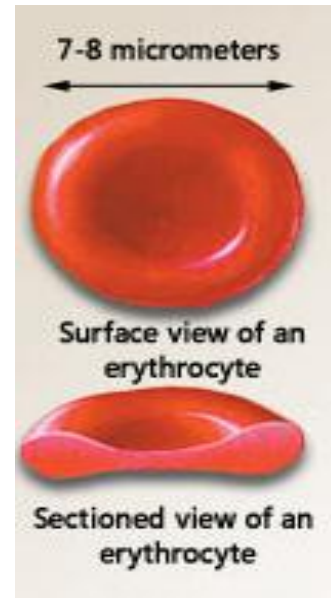


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- Diffusion takes place between cells and tissue fluid; providing every cell with substances carried by blood
 - Waste materials (CO_2 and urea) diffuse from cells → tissue fluid → blood ('go-between')
 - Blood at venule end of capillary bed: deoxygenated and waste products high
 - Hydrostatic pressure >> low at venule end:
 - loss of fluid at arteriole end
 - narrow vessels → increased friction
 - increased distance from heart

[Capillaries Biology Anatomy.flv](#)

STRUCTURE & FUNCTIONS OF ERYTHROCYTE

1. Contains hemoglobin (respiratory pigment-250 million molecules/cell); collects O_2 easily at lungs & releases at respiring tissues
2. No nucleus (> space for > hemoglobin & > O_2 can be carried)
3. Contains enzyme carbonic anhydrase (needed for transport of CO_2)
4. Round, disc-like shape (allows cell to be squeezed through narrow capillaries)



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5. **Flexible cell surface membrane** (helps cell to be squeezed through narrow capillaries; resist bursting due to changes of volume)
 6. **Biconcave** (increases surface area:volume; provides larger surface for diffusion of gases, speed up diffusion; resist bursting)
 7. **Thin cell surface membrane** (short diffusion distance)
 8. Act as **container** (enclosing hemoglobin, prevents it from filtered out and lost from body in kidney; keeps carbonic anhydrase close to hemoglobin, reacts >efficiently)

FACTORS INFLUENCING O_2 SATURATION IN HEMOGLOBIN

- Temperature
- Concentration of hydrogen ions in blood
- Presence of diphosphoglycerate/ diphosphoglyceric acid (product of glycolysis)
- Partial pressure of CO_2

