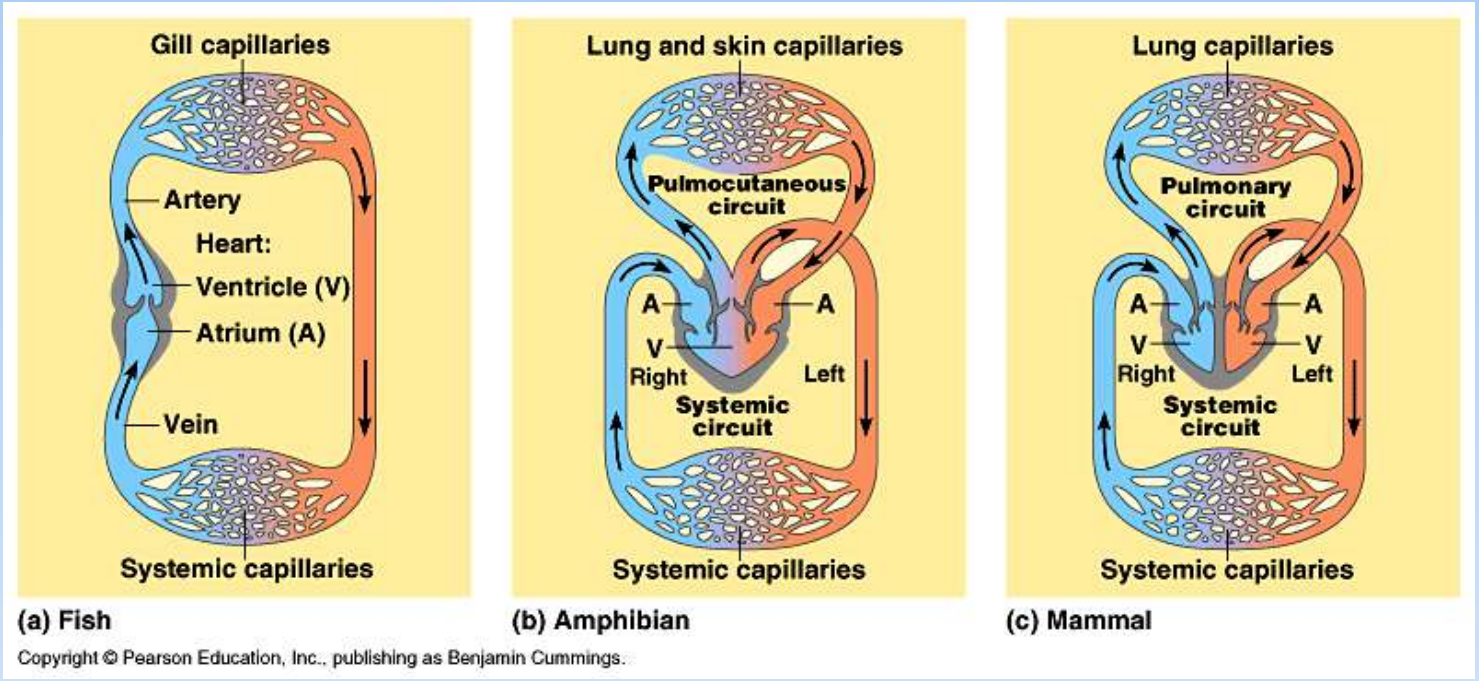

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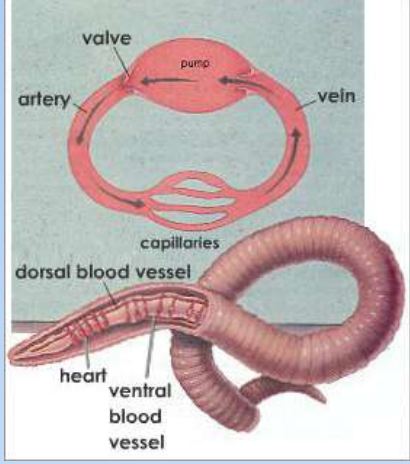
Circulation & Gas Exchange

Obj: TSW understand and demonstrate circulation & gas exchange through the use of heart models by drawing the pathway of blood. 47 NB

Internal Transport in Invertebrates

- Animals w/o a backbone – Invertebrates
  - Jellyfish (Cnidaria), planaria (flat worms), arthropods (grasshopper)
- Open Circulatory System
  - No distinction between blood & interstitial fluid
  - Hemolymph – body fluid
  - Chemical exchange happens at sinuses
  - Heart (pumps) hemolymph in contact with body tissues to exchange respiratory gases: O_2 & CO_2
  - When the heart relaxes, hemolymph enters the “heart” through pores called ostia.
  - O2 infiltrates insects body through air ducts called tracheae

Closed Circulatory System (Cardiovascular System)

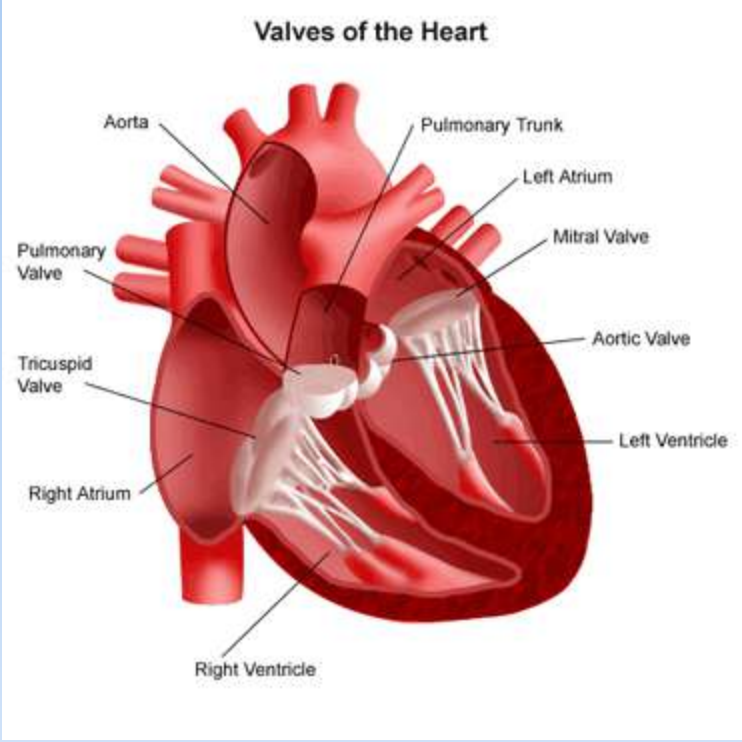


- Annelids (segmented worms) Vertebrates & some Mollusks have closed circulatory system
- Blood is confined to vessels (capillaries, venules, veins, arterioles, arteries)
- Evolutionary Perspective of Vertebrate Circulatory System: Fish-2 chambered heart, Amphibians – 3 chambered heart, Reptiles 3.5 chambered heart-partially divided septum. (crocodiles have a completely divided septum so the ventricle has 2 chambers)

The Heart

- Size of clenched fist, cardiac muscle
- Atria – thin walled compared to ventricle, pumps blood only a short distance to the ventricles.
- Ventricles – thicker and more powerful, especially the left ventricle.
- Heart Cycle (.8 sec) – systolic & diastolic
  - Systole – the heart muscle contract (ventricle) and the chambers pump blood
  - Diastole – ventricles are filling with blood, relaxation
- Pulse Rate = 65 – 75 beats / minute

Heart Valves & Heart Sounds



- 4 Valves – prevent backflow of blood when ventricles contract
- Atrioventricular Valves:
  - Tricuspic & Mitral Valve
- Semilunar Valves: Exits of the heart
  - Pulmonary & Aortic Valve
- “lub-dupp, lub-dupp, lub-dupp”
  - First heart sound, “lub” is the forceful contraction of the ventricular valve
  - Second heart sound, “dupp” is the recoil of blood against the semilunar valves

Heart Rate “Pulse” & Cardiac Output

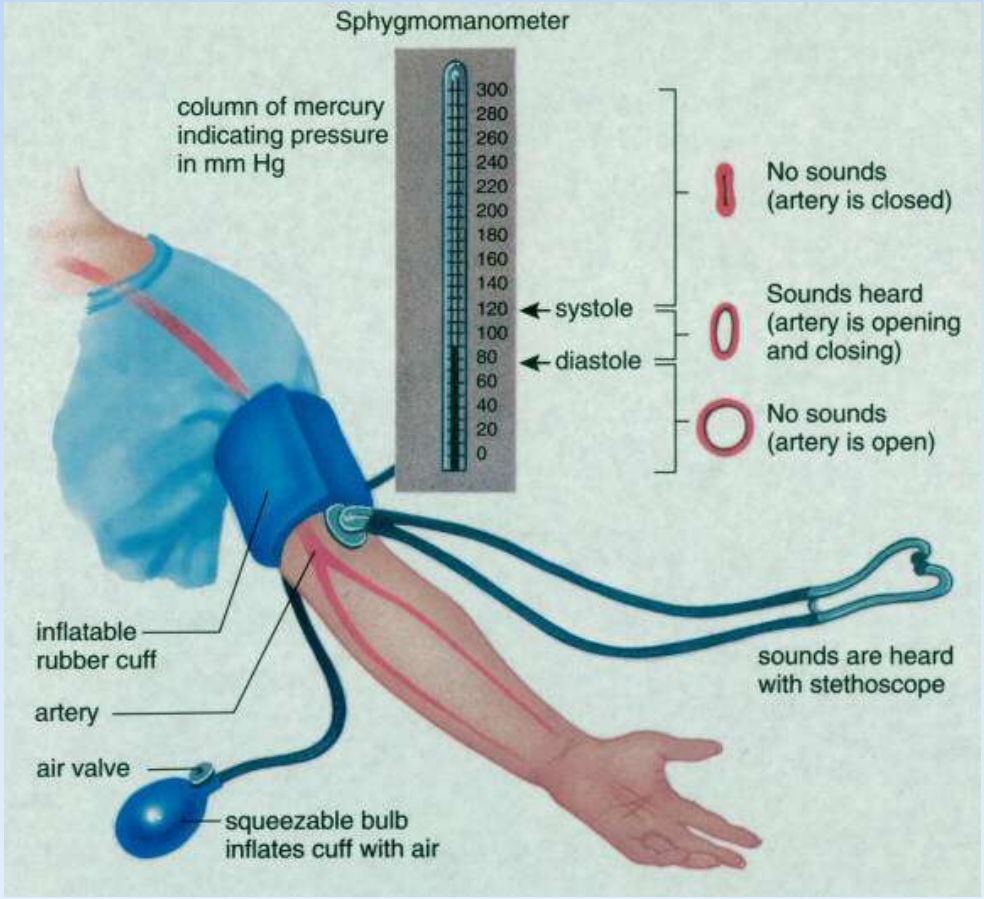
- Pulse – number of heartbeats / minute
  - Count the pulsations of arteries in your wrist or neck.
  - People who exercise regularly often have slower resting pulses than those who are less fit.
  - Inverse relationship between size & pulse.
    - Elephant= 25 beats/ minute
    - Tiny Shrew = 600 beats / minute
    - The metabolic rate per gram of tissue is proportionately grater for smaller mammals than for larger ones
    - Enhances the delivery of oxygen for Cellular Respiration
- Cardiac Output –volume of blood / minute, and is determined by heart rate and stroke volume

Excitation and control of the heart

- Heart cells are self- excitable (myogenic), they can contract w/o any signal from the nervous system. They have an intrinsic ability to contract
- Sinoatrial node (SA) or Pacemaker – controls the rate of contraction of the heart & is located in the wall of the right atrium
  - Initiate a wave of excitation that travels through the wall of the heart.
- EKG or ECG – recorded electrical current of the cardiac muscle during the heart cycle.

Blood Pressure

- Hydrostatic pressure that blood exerts against the wall of a vessel.



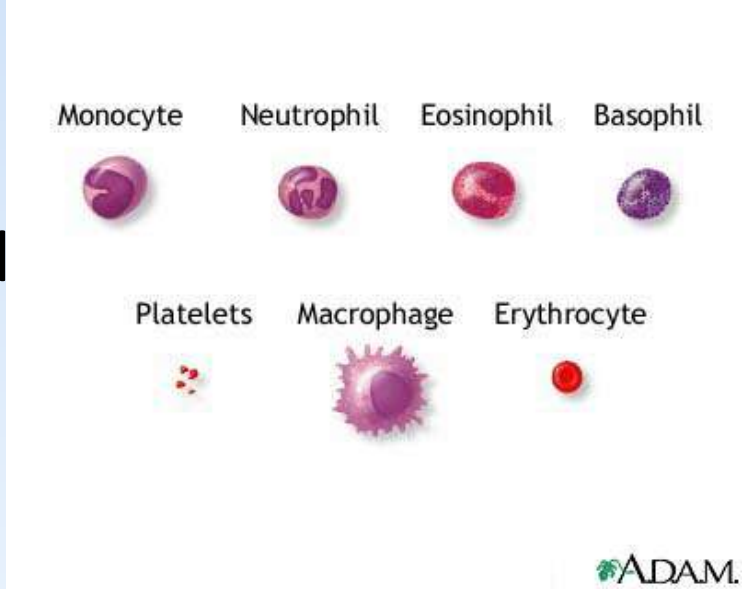
Composition of Blood

- *Red Blood Cells – transport Oxygen, biconcave disk (increases surface area) –erythrocyte, no nuclei, no mitochondria (ATP anaerobic metabolism), small
- White Blood Cells (Leukocytes) –

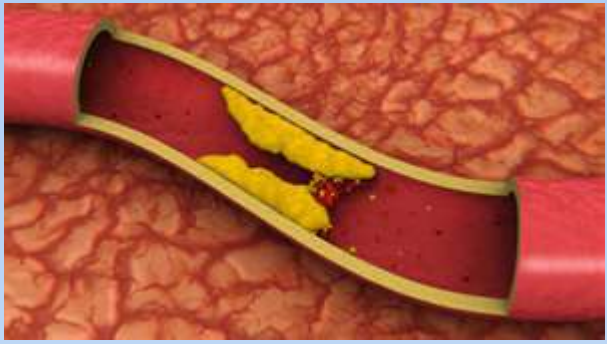
(Immune system- defense) 5 major types: monocytes, neutrophils, basophils, eosinophils & lymphocytes

- Platelets – no nucleus, not really a cell, help with blood clotting
- Pluripotent stem cells- come from

Red marrow of bones (ribs, vertebrae, Breastbone, pelvis) dev. into any blood cells



Cardiovascular Disease



- Disease of the heart & blood vessels
- Heart Attack or Stroke
- Atherosclerosis – blood clot plugging an artery
- Plaques – growths develop on the inner walls of arteries
- LDL – (bad Cholesterol) cholesterol travels in blood bound to protein and adds plaque to arteries.
- HDL – (good Cholesterol) reduce the depositing of cholesterol in arterial plaques

Quick Write

- Describe some examples for structure and function concerning the circulatory system P. 50 NB.
- Veins – valves
- Shape of heart
- Arteries – flexible
- Shape-Red Blood Cells- Concave