Structure of Blood Vessels

- **Arteries** – Away from heart
  - Oxygen rich blood, carried to the body
- **Veins** – To the heart
  - Oxygen poor blood carried back to the heart

Arteries & Veins

- Arteries (A) and Veins (C) have 3 layers
  - Outer layer is covered in connective tissue mixed with elastic tissue. Middle layer consists of circular bands of elastic tissue and smooth muscle tissue.
  - Inner layer is one cell thick and consists of flat, smooth cells. The shape reduces friction as blood moves.
- Capillaries (B) have one layer that is one cell thick.

Movement

- Blood moves from **arteries** to deliver nutrients and remove wastes
- Blood moves into **capillaries**
  - Gas exchange
- Blood then moves from capillaries to the **veins**
- Returns to the heart
Arteries

- Elastic walls
  - During ventricle contraction - artery expands
  - Ventricle relaxation - artery snaps back
- Pulse
  - Rhythmic expansion/contraction of arteries

Veins

- Thinner walls
- Not elastic
  - Cannot contract
- Contraction of muscles keeps blood flowing
  - Blood flows back to the heart
- One way valves
  - Prevent blood from flowing backwards

Capillaries

- Smallest blood vessels
- Fine network
- Single layer of cells
- Gas exchange

Has your foot ever fallen asleep?
The Beating Heart

- Stimulus triggers heart to beat
- Bundle of specialized nerves called the **sinoatrial node** (SA) – Pacemaker
  - Stimulates contraction and relaxation of heart muscle
- Located in the wall of the **right atrium**

- Signal travels to another node—**atrioventricular (AV) node**
- The signal is then transmitted to the **bundle of His** that relay it to the **Purkinje fibres** which initiates the contraction of the right and left ventricles
- Voltage of electrical signals measured
- **Measured with a ECG**
Blood Pressure

- As blood passes through vessels in the body
  - Pressure against vessel walls
- Changes correspond to heart beat
- Ventricles contract = High blood pressure
- Ventricles relax = Low blood pressure

Blood Pressure

- Maximum pressure is called **systolic pressure**
- The lowest pressure before ventricle contracts is called **diastolic pressure**
- Recorded in millimetres of mercury (mmHg) with a spygmomanometer
  - Blood pressure cuff
- Measured as systolic/diastolic
  - Fraction
- Healthy is 120/80

- During exercise ventricles pump greater volumes of blood per unit of time
  - Increasing blood pressure
Cardiac Output and Stroke Volume

- Amount of blood pumped by heart = Cardiac Output
  - Measured mL/min
  - Level of oxygen delivered to the body
- Heart Rate = heartbeats per minute
- Stroke Volume = amount of blood forced out of heart with each beat
  - Average person has a stroke volume of 70mL resting and a resting heart rate of 70 beats per minute
- Cardiac output = heart rate x stroke volume
- What is the average cardiac output?

Cardiovascular Fitness

- Pg. 275 Table 8.1
- Which individual is the fittest?
- Who's heart is the least efficient?

Pathways of the Circulatory System

- **Systemic**
  - Oxygen rich blood from left ventricle travels to body tissues
  - Waste products move from tissues to blood
- **Pulmonary**
  - Transports oxygen-poor blood to the lungs
  - Gas exchange
  - Oxygen-rich blood returned to the heart
- **Coronary**
  - Provides blood to heart

Coronary Pathway

- Heart cannot use blood from chambers
  - Blood cannot diffuse
- Provides matter/energy to cardiac muscles
- Capillaries embedded across heart – Aorta
- Receive blood from two arteries
  - Right coronary artery
  - Left coronary artery