VCE PHYSICAL EDUCATION
UNIT ONE

CARDIOVASCULAR SYSTEM
Circulatory System

- Made up of:
  - Heart
  - Blood Vessels
  - Blood
Functions

- Circulate blood to the body
- Transport water, oxygen & nutrients to the cells
- Transport wastes away from the cells
- Helps maintain core body temperature
- Helps fight disease

What is an example of the wastes taken away from the cells?
The Heart

- It is about the size of your fist!
- Designed to pump blood throughout the circulatory system.
- How many times do you think it beats at rest?
- What is your maximum heart rate?
The Heart - Features

- 4 chambers
  - Left & Right Atrium
  - Left & Right Ventricle

- Valves separate the atrium from the ventricles & prevent back flow.

- Septum divides the heart down the middle.
Blood

- Each person has 4 - 5 litres.

- Made up of:
  - Blood Cells (45%)
  - Plasma (55%)

- Blood cells include:
  - Red Blood cells
  - White Blood cells
  - Platelets
Blood

- **Red Blood Cells**
  - Gives blood the red colour
  - Produced in bone marrow
  - Contains haemoglobin which carries oxygen to the tissues.

- **White Blood Cells**
  - Fight infections
  - Are produced in bone marrow, lymph nodes & spleen.
Blood

- Platelets
  - Helps to form blood clots to stop bleeding.

- Plasma
  - Is 90% water
  - Clear yellowish colour
  - Carries nutrients
  - Transports waste products
Blood Vessels

- Carry blood around the body
- Smaller as they move away from the heart
Arteries

- Carries oxygenated blood away from the heart to the body
- Aorta is the biggest artery
- Strong elastic walls
- Have a pulse
Veins

- Carry deoxygenated blood and waste products back to the heart.
- Blood tends to be reddish-blue
- Vena Cava is the largest
- Walls are thin and less elastic than arteries
- Have valves to prevent blood from flowing backwards
Veins

- Skeletal muscle helps push blood through veins

This large vein is situated between muscles. As the muscles contract, the vein is squeezed, forcing blood towards the heart - the muscle pump effect.
Capillaries

- They link arterioles to venules.
- Thinner than human hair.
- Transfer oxygen, nutrients, carbon dioxide & wastes with muscles or tissues.
Capillaries

- Arteriovenous oxygen difference (a-vO$_2$)
  - The difference between oxygen concentration in the arteries and the veins.

- What do you think happens during exercise?
The Heart

- The contraction (emptying) phase of atria & ventricles is known as SYSTOLE

- The relaxation (filling) phase of atria & ventricles is known as DIASTOLE
The Heart

- Pulse is when the ventricles contract
  - Where can you measure your pulse?
Blood Pressure

- The pressure within the arteries that is caused by the pumping action of the heart.
- Important to assess the heart, kidney & vessels.

**Normal Blood Pressure:**
- Systolic mmHg = 120 mmHg
- Diastolic mmHg = 80 mmHg

- What do you think high or low blood pressure is?
What are some factors that can affect our heart rate?
Blood Flow

- **Systemic Circulation:**
  - Blood pumped to the body from the heart.

- **Pulmonary Circulation:**
  - Blood pumped to lungs from the heart.

https://www.youtube.com/watch?v=JA0Wb3gc4mE
Blood Flow

1. Oxygen enters the mouth.
2. Enters the bloodstream in the lungs.
3. Travels down the Pulmonary Veins to the heart.
4. Left Atrium to the Left Ventricle into the Aorta.
Blood Flow

5. Aorta carries blood to the body.

6. Oxygen leaves the blood at muscles & tissues. Replaced with carbon dioxide.

7. Travels up veins to the Vena Cava back to the heart.
Blood Flow

8. Right Atrium to the Right Ventricle.
10. Carbon Dioxide Exhaled out of the mouth.
Test Your Knowledge!!
Blood in the Heart

- Oxygenated blood enters the Left Atrium.
- Deoxygenated blood enters the Right Atrium.
Blood in the Heart

- Atrium contracts and the valves open forcing the blood into the Ventricles.
Blood in the Heart

- Ventricles contract together and force blood out into the Aorta (to the body) & Pulmonary vein (to the lungs).
Terms

- **Stroke Volume (SV)**
  - Is the quantity of blood pumped out of the heart per beat

- **Cardiac Output (Q)**
  - Is the quantity of blood pumped out of the heart per minute
  - \( Q = SV \times HR \)
Responses to Physical Activity

- Our bodies will respond differently to exercise. Some better than others!

- What are the immediate responses & the training responses?
Poor Lifestyle

- Lifestyle habits can harm our Cardiovascular System

- Can you list some?