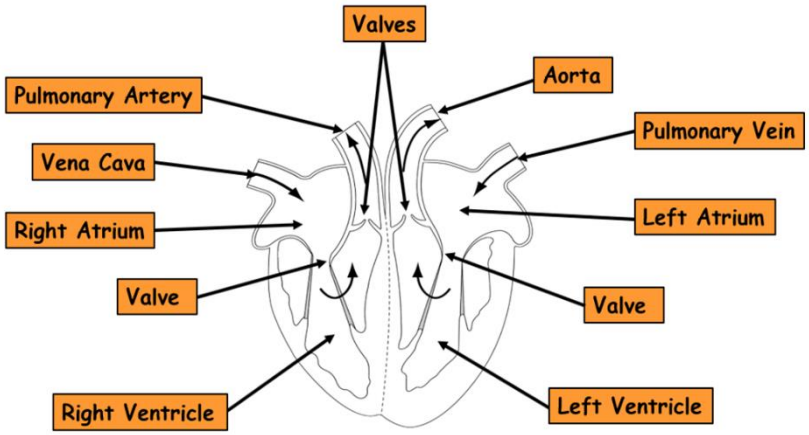
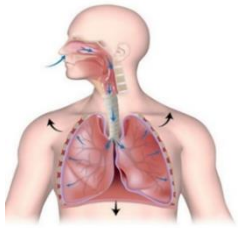
Paper 1: The structure and functions of the cardio-respiratory system (part 2)

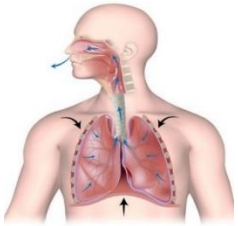
Structure of the heart:



The right atrium contracts (systole) ejecting deoxygenated blood through a valve and into the right ventricle.	The right ventricle is relaxed (diastole) and fills with deoxygenated blood	The right ventricle contracts (systole) pushing the deoxygenated blood through valves to the pulmonary artery	The pulmonary artery caries deoxygenated blood away from the heart to the lungs. The blood becomes oxygenated
The vena cava is the main vein bringing the deoxygenated blood back to the heart and into the right atrium	**The Cardiac Cycle** **The Pathway of Blood**		The pulmonary vein transports the oxygenated blood back to the heart and into the left atrium, which fills with oxygenated blood
The aorta carries oxygenated blood away from the left ventricle to the working muscles the blood then become deoxygenated	The left ventricle contracts (systole) pushing the oxygenated blood through valves to the aorta	The left ventricle is relaxed (diastole) and fills with oxygenated blood	The left atrium contracts (systole) ejecting oxygenated blood through a valve and into the left ventricle

Mechanics of breathing:





Inspiration

The **diaphragm** and **external intercostal muscles** contract. The external intercostal muscles raise the ribs upwards and outwards. This increases the volume of the chest cavity and causes air to rush into the lungs

Expiration

The **diaphragm** and **external intercostal muscles** relax, the internal intercostals contract. this lowers the ribs downwards and inwards. This decreases the volume of the chest cavity and causes the air to be forced out the lungs

Inhaling and exhaling during exercise:

<u>During inspiration</u>

The **pectorals** and **sternocleidomastoid** muscles raise the sternum allowing the lungs to expand further

<u>During expiration</u>

The rib cage is pulled down quicker due to the contraction of the **abdominal** muscles

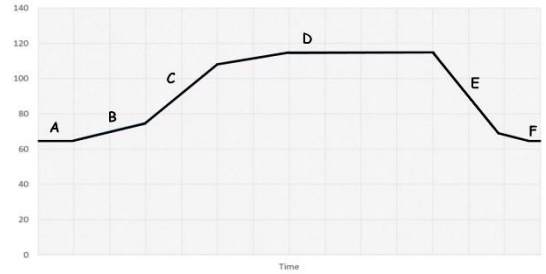
Cardiac Output = Stroke Volume X Heart Rate

Cardiac Output = amount of blood leaving the heart per minute

Stroke Volume = amount of blood ejected from the heart per beat

Heart Rate = the number of times the heart beats per minute

Interpreting heart rate graphs:



A = Heart rate is at its lowest at rest

B = Immediately before exercise resting heartrate will increase. This is called an **anticipatory rise;** this is due to the release of the hormone adrenaline.

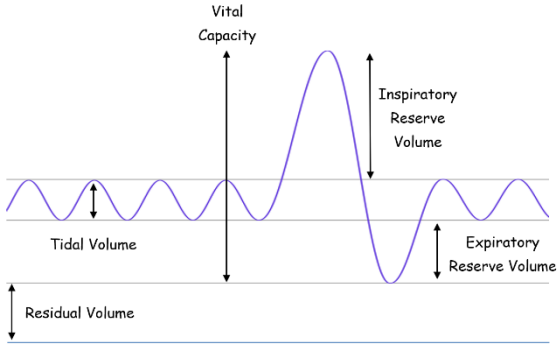
C = When you start to exercise the heart rate increases sharply. This is due to the demand of oxygen. **Cardiac output** increases

D = During continuous exercise heart rate levels because the heart rate is sustaining the amount of oxygen needed.

E = Immediately after exercise heart rate decreases sharply, this is because exercise has stopped and the demand for oxygen has reduced.

F = Heart rate slowly returns to its resting rate

Lung volumes:



Tidal Volume: The amount of air inspired (inhaled) or expired (exhaled) in a normal breath

Vital Capacity: The maximum amount of air the lungs can expire (breathe out) after the maximum inspiration (breathe in)

Expiratory Reserve Volume: The maximum volume of air that can be exhaled. In addition to tidal volume

Inspiratory Reserve Volume: The maximum volume of air that can be inhaled. In addition to tidal volume

Residual Volume: The amount of air that remains in the lungs even after a forced maximal exhalation

Tidal volume during exercise increases. Breathing rate and depth increase due to meet the demand of oxygen, carbon dioxide is also removed