**Topic 2**

**Exercise Physiology**

**Structure and Function of the Ventilatory System**

**List the principal structures of the ventilatory system.**

* Nose, Mouth, Pharynx, Larynx, Bronchi, Bronchioles, Lungs, Alveoli

**Outline the functions of the conducting airways.**

* Low resistance pathway for air flow
* Defense against chemicals and other harmful substances that are inhaled
* Warming and moistening the air

**Define the terms pulmonary ventilation, total lung capacity (TLC), vital capacity (VC), tidal volume (TV), expiratory reserve volume (ERV), inspiratory reserve volume (IRV) and residual volume (RV).**

* Pulmonary Ventilation
* Total Lung Capacity (TLC)
* Vital Capacity
* Tidal Volume
* Expiratory Reserve Volume
* Inspiratory Reserve Volume
* Residual Volume

**Explain the mechanics of ventilation in the human lungs.**

* Actions of the diaphragm and intercostal muscles
* Relationship between volume and pressure
* What accessory muscles are important during strenuous exercise

**Describe nervous and chemical control of ventilation during exercise.**

* What happens when respiratory centre detects increased blood acidity levels (low pH) due to increased carbon dioxide content of blood?
* Neural control of ventilation
  + Lung stretch receptors
  + Muscle proprioceptors
  + Chemoreceptors

**Outline the role of hemoglobin in oxygen transportation.**

**Explain the process of gaseous exchange at the alveoli.**

**Structure and Function of the Ventilatory System**

**State the composition of blood.**

* Cells (erythrocytes, leucocytes, and platelets)
* Plasma
* Transport vehicle for electrolytes, proteins, gases, nutrients, waste products and hormones

**Distinguish between the functions of erythrocytes, leucocytes and platelets.**

**Describe the anatomy of the heart with reference to the heart chambers, valves and major blood vessels.**

* Names of the four chambers
* Names of the four valves (Bicuspid, Tricuspid, Aortic, Pulmonary)
* Four major blood vessels (Vena Cava, Pulmonary Vein, Aorta, Pulmonary Artery)
* What is involved with Pulmonary Circulation/Systemic Circulation? What path does blood follow?
* Coronary arteries supply heart with blood

**Describe the intrinsic and extrinsic regulation of heart rate and the sequence of excitation of the heart muscle.**

* Heart has its own pacemaker
* Influence of sympathetic and parasympathetic nervous system as branches of autonomic nervous system
* Influence of adrenaline on the heart
* Electrical impulse generated by sinoatrial node (SA) travels across the atria to the atrioventricular node to the ventricles

**Outline the relationship between the pulmonary and systemic circulation.**

**Describe the relationship between heart rate, cardiac output and stroke volume at rest and during exercise.**

* CO= SV x HR
* Stroke volume expands and heart rate increases during exercise

Analyse cardiac output, stroke volume and heart rate data for different populations at rest and during exercise.

* Males/Females
* Trained/Untrained
* Young/Old

Explain cardiovascular drift.

* Increased body temperature results in lower venous return to the heart
* As we sweat blood volume decreases
* Lower stroke volume means heart rate must increase to maintain cardiac output
* Blood viscosity

**Define the terms systolic and diastolic blood pressure**

**Analyse systolic and diastolic blood pressure data at rest and during exercise.**

**Discuss how systolic and diastolic blood pressure respond to dynamic and static exercise.**

**Compare the distribution of blood at rest and the redistribution of blood during exercise.**

* Movement of blood in favour of muscles

**Describe the cardiovascular adaptations resulting from endurance exercise training.**

* Increased left ventricle volume
* Results in an increased stroke volume and lower resting and exercise heart rate
* Increased capillarization
* Increased arterio-venous oxygen difference

**Explain maximal oxygen consumption.**

* VO2 Max
* Capacity of oxygen transport system
* Sometimes referred to as maximal aerobic power/aerobic capacity

**Discuss the variability of maximal oxygen consumption in selected groups.**

* Trained and untrained
* Males and females
* Young and old
* Athlete and non-athlete

**Discuss the variability of maximal oxygen consumption with different modes of exercise.**

* Cycling vs Running vs arm ergometry (hand bike)