**Topic 6.2: The Blood System**

**Essential Idea: The blood system continuously transports substances to cells and simultaneously collects waste products.**

​**Statements & Objectives:**

**6.2.U1 Arteries convey blood at high pressure from the ventricles to the tissues of the body.**

State the function of arteries.

**(State**: Give a specific name, value or other brief answer without explanation or calculation)

Outline the role of elastic and muscle tissue in arteries.

(**Outline** Give a brief account or summary.)

State the reason for toughness of artery walls.

**(State**: Give a specific name, value or other brief answer without explanation or calculation)

**6.2.U2 Arteries have muscle cells and elastic fibres in their walls.**

Describe the structure and function of the three layers of artery wall tissue.

**(Describe**: Give a detailed account)

**6.2.U3 The muscle and elastic fibres assist in maintaining blood pressure between pump cycles**.

Describe the mechanism used to maintain blood flow in arteries between heartbeats.

**(Describe**: Give a detailed account)

Define systolic and diastolic blood pressure.

(**Define** Give the precise meaning of a word, phrase, concept or physical quantity.)

Define vasoconstriction and vasodilation.

(**Define** Give the precise meaning of a word, phrase, concept or physical quantity.)

**6.2.U4 Blood flows through tissues in capillaries with permeable walls that allow exchange of materials between cells in the tissue and the blood in the capillary.**

Describe the structure and function of capillaries.

**(Describe**: Give a detailed account)

Describe the cause and effect of diffusion of blood plasma into and out of a capillary network.

**(Describe**: Give a detailed account)

**6.2.U5 Veins collect blood at low pressure from the tissues of the body and return it to the atria of the heart.**

State the function of veins.

**(State**: Give a specific name, value or other brief answer without explanation or calculation)

Outline the roles of gravity and skeletal muscle pressure in maintaining flow of blood through a vein.

(**Outline** Give a brief account or summary.)

**6.2.U6 Valves in veins and the heart ensure circulation of blood by preventing backflow.**

Outline the structure and function of a pocket valve.

(**Outline** Give a brief account or summary.)

**6.2.U7 There is a separate circulation for the lungs.**

Draw a diagram to illustrate the double circulation system in mammals.

(**Draw** :Represent by means of a labeled, accurate diagram or graph, using a pencil. A ruler(straight edge) should be used for straight lines. Diagrams should be drawn to scale. Graphs should have points correctly plotted(if appropriate) and joined in a smooth curve.)

Compare the circulation of blood in fish to that of mammals.

Explain the flow of blood through the pulmonary and systemic circulations.

(**Explain**: Give a detailed account including reasons or causes)

Explain why the mammalian heart must function as a double pump.

(**Explain**: Give a detailed account including reasons or causes)

**6.2.U8 The heart beat is initiated by a group of specialized muscle cells in the right atrium called the sinoatrial node.**

Define myogenic contraction.

(**Define** Give the precise meaning of a word, phrase, concept or physical quantity.)

Outline the role of cells in the sinoatrial node.

(**Outline** Give a brief account or summary.)

**6.2.U9 The sinoatrial node acts as a pacemaker**.

State the reason why the sinoatrial node is often called the pacemaker.

**(State**: Give a specific name, value or other brief answer without explanation or calculation)

**6.2.U10 The sinoatrial node sends out an electrical signal that stimulates contraction as it is propagated through the walls of the atria and then the walls of the ventricles.**

Describe the propagation of the electrical signal from the sinoatrial node through the atria and ventricles.

**(Describe**: Give a detailed account)

**6.2.U11 The heart rate can be increased or decreased by impulses brought to the heart through two nerves from the medulla of the brain.**

Outline the structures and functions of nervous tissue that can regulate heart rate.

(**Outline** Give a brief account or summary.)

Describe factors that will increase heart rate.

**(Describe**: Give a detailed account)

Describe factors that will decrease heart rate.

**(Describe**: Give a detailed account)

**6.2.U12 Epinephrine increases the heart rate to prepare for vigorous physical activity.**

Outline conditions that will lead to epinephrine secretion.

(**Outline** Give a brief account or summary.)

Explain the effect of epinephrine on heart rate.

(**Explain**: Give a detailed account including reasons or causes)

**6.2.A1 William Harvey’s discovery of the circulation of the blood with the heart acting as the pump.**

Outline William Harvey’s role in discovery of blood circulation.

(**Outline** Give a brief account or summary.)

**6.2.A2 Causes and consequences of occlusion of the coronary arteries.**

Describe the cause and consequence of atherosclerosis.

**(Describe**: Give a detailed account)

Outline the effect of a coronary occlusion on heart function.

(**Outline** Give a brief account or summary.)

**6.2.A3 Pressure changes in the left atrium, left ventricle and aorta during the cardiac cycle.**

Explain the pressure changes in the left atrium, left ventricle and aorta during the cardiac cycle.

(**Explain**: Give a detailed account including reasons or causes)

Explain the relationship between atrial and ventricular pressure and the opening and closing of heart valves.

(**Explain**: Give a detailed account including reasons or causes)

Explain the atrial, ventricular and arterial pressure changes as illustrated on a graph of pressure changes during the cardiac cycle.

(**Explain**: Give a detailed account including reasons or causes)

Identify the time of opening and closing of heart valves on a graph of pressure changes during the cardiac cycle.

(**Identify** Provide an answer from a number of possibilities. Recognize and state briefly a distinguishing factor or feature.)

**6.2.S1 Identification of the blood vessels as arteries, capillaries or veins from the structure of their walls.**

Compare the diameter, relative wall thickness, lumen diameter, number of wall layers, abundance of muscle and elastic fibres and presence of valves in arteries, capillaries and veins.

(**Compare** Give an account of the similarities and differences between two (or more) items or situations, referring to both (all) of them throughout.

Given a micrograph, identify a blood vessel as an artery, capillary or vein.

(**Identify** Provide an answer from a number of possibilities. Recognize and state briefly a distinguishing factor or feature.)

**6.2.S2 Recognition of the chambers and valves of the heart and the blood vessels connected to it in dissected hearts or in diagrams of heart structure.**

Label a diagram of the heart with the following structure names: superior vena cava, inferior vena cava, pulmonary semilunar valve, aorta, pulmonary artery, pulmonary veins, aortic semilunar valve, left atrioventricular valve, left ventricle, septum, right ventricle, left atrium, right atrium and right atrioventricular valve.

(**Label** Add title, labels or brief explanation(s) to a diagram or graph.)

**6.2.NOS Theories are regarded as uncertain- William Harvey overturned theories developed by the ancient Greek philosophy Galen on movement of blood in the body.**

Outline Galen’s description of blood flow in the body.

(**Outline** Give a brief account or summary.)

Describe how Harvey was able to disprove Galen’s theory.

**(Describe**: Give a detailed account)

**Key Terms**

vena cava

chambers

nutrients

superior

venule

oxygenated

systemic circulation

medulla

capillaries

hormones

cardiac muscle

​vasoconstriction

pocket valve

atherosclerosis

vessel

vena cava

inferior

vein

deoxygenated

coronary arteries

cardiac nerve

capillary bed

carbon dioxide

indefatigable

vasodilation

double pump

cardiac cycle​

diffusion

valve

atrium

aorta

artery

semilunar valve

sinoatrial node

vagus

smooth muscle

Purkinje fibres

​Pacemaker

​lumen

diastolic​

blood

artrioventricular valve

pulmonary artery

pulmonary vein

pulmonary circulation

atrioventricular node

adrenaline

autonomic nervous system

coronary occlusion

​systolic

gravity muscle pressure

skeletal muscle pressure

​double circulation

myogenic contraction

oxygen

ventricle

arteriole

circulation

RBC

Myogenic

CHD

Plasma

Oxygen

Heat

Epinephrine

William Harvey

​micrograph