Assignment on Cardiovascular Physiology

1. **Discuss the long term regulation of mean arterial blood pressure,**

Mean arterial blood pressure is regulated by changes in cardiac output and systemic vascular resistance. In each cardiac cycle arterial blood pressure fluctuates between diastolic and systolic blood pressure. However, the body behaves from day to day as if it regulated the mean arterial blood pressure, which is the average between diastolic and systolic pressures.

Renin-Angiotensin- Aldosterone System:

It is an essential regulator of mean arterial blood pressure. The system relies on several hormones that act to increase blood volume and peripheral resistance. It begins with the production and release of rennin from juxtaglomerular cells of the kidney. They respond to decreased blood pressure, sympathetic nervous system activity, and reduced sodium levels within the distel convoluted tubules of the nephrons.

2. **Write short notes on:**
    a. **Pulmonary circulation**:

    It is the system of transportation that shunts de-oxygenated blood from the heart to the lungs to be saturated with oxygen before being dispersed into systemic circulation. Deoxygenated blood from the lower half of the body enters the heart from the inferior vena cava while deoxygenated blood from the upper body is delivered to the heart via the superior vena cava. Both the superior vena cava and inferior vena cava empty blood into the right atrium.

    b. **Circle of Willis**:

    The circle of Willis encircles the stalk of the pituitary gland and provides important communications between the blood supply of the fore brain and hindbrain. The circle of Willis begins to form when the right and left internal carotid artery (ICA) enters the cranial cavity and each one divides into two main branches: the anterior cerebral artery (ACA) and middle cerebral artery (MCA). The anterior cerebral arteries are then untied and blood can cross flow by the anterior communicating artery.

    c. **Splanchnic Circulation**:

    It describes the flow to the abdominal gastrointestinal organs including the stomach, liver, spleen, pancreas, small intestine and large intestine. It comprises three major

branches of the abdominal aorta, the celiac artery, superior mesenteric artery (SMA) and inferior mesenteric artery (IMA). The hepatic portal circulation delivers the majority of the flow to the liver.

d. **Coronary Circulation**:

It is part of the systemic circulatory system that supplies blood and provides drainage from the tissues of the heart. In the human heart, two coronary arteries arise from the aorta just beyond the semilunar valves during diastole, the increased aortic pressure above the valves forces blood into the coronary arteries and thence into the musculature of the heart. Deoxygenated blood is returned to the chambers of the heart via coronary veins, most of these converge to form the coronary venous sinus, which drains into the right atrium. The heart normally extracts 70 to 75 percent of the available oxygen from the blood in coronary circulation.

e. **Cutaneous Circulation**:

It is the circulation and blood supply of the skin. The skin is not a very metabolically active tissue and has relatively small energy requirements, so its blood supply is different to that of other tissues. Some of the circulating blood volume in the skin will flow through arteriovenous anastomoses (AVAs). The main fuction is to help in the regulation of body temperature.

3. Discuss the cardiovascular adjustment that occurs during exercise

There are three main Cardiovascular adjustments that occurs during exercise

a. Increased cardiac output:

Increased pumping capacity of heart enhancing delivery of oxygen and fuel to working muscles

b. Increased muscle blood flow:

Blood vessels in muscle dilate, increasing local blood flow

c. Decreased blood flow to kidneys, liver and gut:

Redirects or shunts blood flow to working muscles.

During exercise, increases in cardiac stroke volume and heart raise cardiac output, which coupled with a transient increase, elevate mean arterial blood pressure. However, long term exercise can promote a net reduction in blood pressure at rest. During exercise, the heart is subjected to intermittent hemodynamic stresses of pressure overload, volume overload, or both.

To normalize such stress and to meet the systemic demand for an increased blood supply, the heart undergoes morphological adaptation to recurrent exercise by increasing its mass. Primarily through an increased chamber wall thickness.