ASSIGNMENT ANSWER

1. LONG TERM REGULATION OF BLOOD PRESSURE

There are several physiological mechanisms that regulate blood pressure in the long term, the first of which is the renin-angiotensin- aldosterone system (RAAS)

Renin-Angiotensin-Aldosterone System (RAAS)

Renin is a peptide hormone released by the granular cells of the juxtaglomerular apparatus in the kidney. It is released in response to:

* Sympathetic stimulation
* Reduced sodium- chloride delivery to the distal convoluted tubule.
* Decreased blood flow to the kidney.

Renin facilitates the conversion of angiotensinogen to angiotensin I which in turn converts to angiotensin II using angiotensin- converting enzyme (ACE)

Angiotensin II acts on the kidney to increase sodium absorption in the proximal convoluted tubule. It however promotes the release of aldosterone.

Aldosterone promotes salt and water retention by acting at the distal convoluted tubule to increase expression of epithelial sodium channels. Aldosterone increases the activity of sodium- potassium ATPase thus increasing the electrochemical gradient for movement of sodium ions.

Osmosis follows. This results in decreased water excretion and therefore increased blood volume and thus blood pressure.

ADH is the second mechanism by which blood pressure is regulated

1. Shorts note on:

* Pulmonary circulation: Also called Lesser circulation. Deoxygenated blood is pumped from the right ventricle into the lungs through the pulmonary artery. Exchange of gases between lungs and blood at the pulmonary capillaries. Oxygenated blood returns into the left atrium through the pulmonary vein.
* Circle of willis: It’s the joining area of several arteries at the bottom side of the brain. At the circle of willis, the internal carotid arteries that supply oxygenated blood to over 80% of the cerebrum.
* Splanchnic Circulation: Also called the mesenteric circulation. The splanchnic circulation consists of blood supply to the gastrointestinal tract, liver, spleen, and pancreas. It consists of two large capillary beds partially in series. The small splanchnic arterial branches supply the capillary beds, and then the efferent venous blood flows into the PV.
* Coronary Circulation: it’s the circulation of blood in the blood vessels that supply the heart muscle. Coronary arteries supply oxygenated blood to the heart muscle and cardiac veins drain away the blood once it has been deoxygenated.
* Cutaneous Circulation: it’s the circulation and blood supply of the skin. The skin is not a very metabolically alive tissue and has relatively small energy requirements, so its blood supply is different from that of the others.

1. Cardiovascular adjustments during exercise.

During exercise, there is an increase in metabolic needs of the body tissues particularly the muscles. Various adjustments in the body during exercise are aimed at:

* Supply of various metabolic requisities like nutrients and oxygen to muscles and other tissues.
* Prevention of increase in body temperature.

Effects of exercise on cardiovascular system include:

* On blood: mild hypoxia developed during exercise stimulates the juxtaglomerular apparatus to secrete erythropoietin. It stimulates the bone marrow and causes release of red blood cells.
* On blood volume: more heat is produced during exercise and the thermoregulatory system is activated. This in turn, causes secretions of large amount of sweat leading to fluid loss, reduced blood volume, etc.
* On cardiac output: cardiac output increases up to 20l/ minute in moderate exercise and up to 35l/ minute during severe exercise. Increase in cardiac output is directly proportional to the increase in the amount of oxygen consumed during exercise. During exercise, cardiac output increases due to the increase in heart rate and stroke volume.
* On venous return: venous return increases remarkably during exercise because of muscle pump, respiratory pump and splanchnic vasoconstriction.