PHYSICAL EDUCATION 2014

Unit 1
Key Topic Test 1 – Cardiorespiratory Systems

Recommended writing time*: 45 minutes
Total number of marks available: 45 marks

SOLUTIONS
SECTION 1: Multiple-choice questions (1 mark each)

Question 1

Answer: B

Explanation:

Blood exits the heart through the ventricles. Blood from the right side of the heart travels towards the lungs to be reoxygenated, travelling through the pulmonary artery.

Question 2

Answer: A

Explanation:

The amount of oxygen used by the muscles (oxygen uptake) increases, as does the amount of air inspired and expired in one minute (ventilation)

Question 3

Answer: C

Explanation:

The intercostal muscles are located in-between the ribs, and contract during inspiration to help move the chest cavity outwards. When the diaphragm contracts, inspiration is initiated as this creates pressure changes in the chest cavity. Relaxation of the diaphragm and intercostals allow expiration to occur.

Question 4

Answer: C

Explanation:

The alveoli-capillary interface is located in the lungs. Capillaries cover the sac-like aveoli and this is the site of gas exchange. Oxygen enters the bloodstream from the alveoli, and carbon dioxide exits the bloodstream from the capillaries.
Question 5

Answer: D

Explanation:
During exercise, there is an increase in oxygen requirements for the skeletal muscles. Blood is redistributed from other parts of the body to meet this demand.

SECTION 2: Short-answer questions

Question 1

a. Red blood cells. Students may also refer to haemoglobin.

b. The primary function of white blood cells is to fight disease-causing organisms.

c. Plasma is made up of over 90% water.

d. Oxygenated blood is rich in oxygen. Deoxygenated blood is oxygen-poor, and usually carbon dioxide rich.

1 + 1 + 1 + 2 = 5 marks

Question 2

Systemic circulation refers to the pathway blood travels from the heart to the body and back to the heart. Oxygenated blood exits the heart via the aorta and travels to muscles and organs. Oxygen is exchanged for carbon dioxide at the capillaries and then deoxygenated blood travels back to the right side of the heart through veins.

Pulmonary circulation refers to the pathway blood travels from the heart to the lungs, and back to the heart. Deoxygenated blood exits the heart via the pulmonary artery and travels to the lungs where carbon dioxide is exchanged for oxygen. The oxygenated blood then travels back to the heart.

4 marks

Question 3

a. Arteries are large, thick-walled blood vessels that carry blood away from the heart.

b. Veins are blood vessels that carry blood towards the heart. They are thin-walled and contain one-way valves to help blood return to the heart.

c. Capillaries are very small blood vessels that connect the arteries and veins. They are the site of gas exchange between the cells and the cardiovascular system.

3 marks
Question 4
Vasodilation is the process of blood vessels dilating (increasing internal diameter). When blood vessels close to the surface of the skin vasodilate, the amount of blood passing through them increases. This allows for the heat to escape from the body, radiating outwards.

2 marks

Question 5
Valves in the veins allow for blood to move in only one direction. Once blood has passed through, it cannot go backwards, and advances towards the heart. When muscles contract, veins are squeezed and force blood against gravity towards the heart.

2 marks

Question 6
a.
   i. 120
   ii. Systolic blood pressure is the pressure exerted on the arterial walls. It is created as a result of the heart contracting.

b. A blood pressure reading of 140/90 mm Hg or higher.

3 marks

Question 7
a.
   i. B
   ii. Subject B has a lower heart rate throughout the activity. This indicates that their heart is more efficient (increased stroke volume), meaning that it does not have to beat as often to deliver the same amount of oxygen to the body.

b. Heart rate increases with exercise intensity. This is because as the energy demands increase, the heart must beat harder to deliver more oxygen to the working muscles.

1 + 2 + 2 = 5 marks

Question 8
a. Cardiac output = stroke volume x heart rate

b. During exercise, the body requires more energy and therefore oxygen. If the heart beats harder to eject more blood (stroke volume) and more frequently (heart rate), oxygen, and therefore energy demands, can be met.
Question 9
a. a-VO₂ difference is the difference in oxygen levels in arteries and veins.

b. Oxygen demands during rest are lower than that required during exercise. When we exercise, more oxygen is extracted from the blood, creating a bigger difference in the amount of oxygen in the arteries compared to the veins.

1 + 2 = 3 marks

Question 10
a. Ventilation is the amount of air inspired and expired in one minute.

b. The diaphragm contracts (moves down), triggering inspiration. Air will always move from high pressure to low pressure. The widening chest cavity decreases the air pressure inside the lungs, causing air from outside the body to be sucked into the chest cavity. When the diaphragm relaxes, the size of the chest cavity decreases, creating a higher pressure inside than out, and the air is forced to leave the lungs.

1 + 4 = 5 marks

Question 11
a. Mouth
b. Trachea
c. Alveoli
d. Diaphragm
e. Bronchus
f. Bronchiole

6 marks