Thomas Adams Sixth Form

BTEC Sport

Transition Work Instruction Sheet

UNIT 1-

1) Visit the following website https://www.pearsonactivelearn.com/app/Home
   Log in using the details below.
   Username TASport
   Password Transition18

   Access the library and open the revision guide (tile with yellow background & elephant)
   If prompted you will need to allow this pop up before opening the document.
   Navigate to pages 30-34
   Once you have accessed the document you need to read the information and complete the next task.

2) Complete the exam based questions attached.

-At first attempt try to recall the information from memory

- When you have attempted this go back over the notes and add anything you missed for this question (do this in a different colour pen/colour font if done electronically)

UNIT 2-

This task is research based:

Read the scenario on the attached document, research any relevant information on line and produce the answer on the sheet attached.

This answer must be in continuous prose and should address:

1) Potential lifestyle factors (alcohol, diet, stress, and smoking) that may be causing the problems the client is suffering (lack of sleep)

2) Ways in which the client can improve his sleep

3) How will Physical Activity help him to improve the amount of sleep he gets?

If you have any queries or concerns with any of these tasks please email Liam Allen.

lja@thomasadams.net

Had a look ☐ Nearly there ☐ Nailed it! ☐

The cardiovascular system

You need to know the names and location of the main components of the cardiovascular system as these are vital in ensuring we can exercise.

The cardiovascular system

- The cardiovascular system is made up of the heart, blood vessels and the blood.
- Blood is circulated around the body due to the pumping action of the heart.
- The heart is a muscle and therefore requires a blood supply. Blood is transported to the heart muscle via the coronary arteries, which cover the surface of the heart.
- The valves in the heart prevent the backflow of blood within the heart.

Blood flow

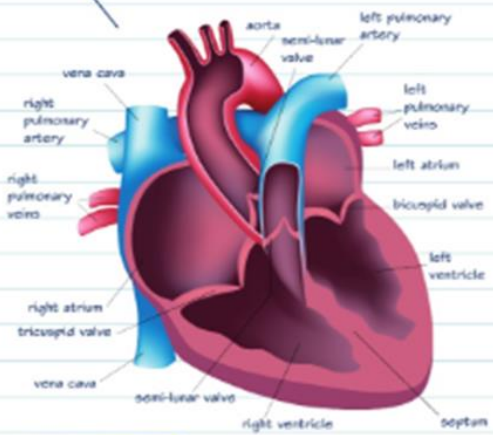
Deoxygenated blood passes from the **vena cava** to the **right atrium**. From here it travels through the **tricuspid valve** into the **right ventricle**. Deoxygenated blood leaves the right side of the heart, passing through the **semi-lunar valves** into the **pulmonary artery** to travel to the lungs.

Oxygenated blood from the lungs passes through the **pulmonary vein** to the **left atrium**. From here it travels through the **bicuspid valve** into the **left ventricle**.

Oxygenated blood leaves the left side of the heart, passing through the **semi-lunar valves** into the **aorta** to travel to the body.

The septum divides the heart into left and right sides, keeping the blood in these areas of the heart separated.

Internal anatomy of the heart



Blood flow is controlled by the pumping of the heart and the use of valves.

Now try this

Describe the passage of blood from the vena cava through the right side of the heart towards the lungs.

Had a look ☐ Nearly there ☐ Nailed it! ☐

Blood and blood vessels

You need to know about the components of blood and the structure and function of the different blood vessels.

Blood

Blood is composed of plasma, red blood cells, white blood cells and platelets. Blood travels around the body through the blood vessels.

Blood vessels

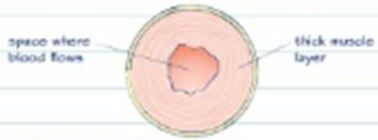
Each type of blood vessel is designed so that it can perform its function effectively. The blood vessel types you need to know are: arteries, arterioles, capillaries, venules and veins.

1 Arteries:

- always carry blood **away** from the heart
- always carry oxygenated blood, with the **exception** of the pulmonary artery, which takes deoxygenated blood away from the heart to the lungs
- are elastic, so they can accommodate changing volumes of blood passing through them
- have muscular walls that can contract to maintain blood pressure when there is a reduction in blood flow.

2 Arterioles

Arterioles link arteries with capillaries. They have similar properties and functions to arteries. However, they have thinner muscular walls as blood is not at such a high pressure as they are further from the force of contraction of the heart. Their muscular walls allow the arteriole to control blood flow into the capillary, vasodilating to increase blood flow during exercise and vasoconstricting to reduce blood flow when resting.

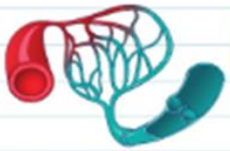


Arteries have thick muscular walls as the blood they carry is at high pressure. The pressure of the blood is high as it has just been expelled from the heart.

Links Go to page 30 to revise vasoconstriction and vasodilation.

3 Capillaries

Capillaries are one cell thick, allowing exchange of gases, nutrients and waste products between the blood in the capillary and the surrounding tissue. Blood pressure in the capillary is lower than in arterioles, but higher than venules.



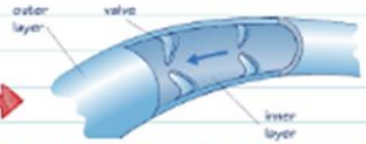
Capillaries link the arterioles and venules.

4 Venules

Although small, these are larger than capillaries. They carry deoxygenated blood and take the carbon dioxide from the capillary and transport it to the veins.

5 Veins

Return deoxygenated blood to the heart (with the exception of the pulmonary vein, which carries oxygenated blood). Blood flows slowly through veins. Blood is moved along the vein via the skeletal-muscle pump.



Blood in veins is under low pressure so they need valves to stop the back flow of blood.

Now try this

Which type of blood vessel controls blood flow to the capillaries?

Functions of the cardiovascular system

Many of the functions of the cardiovascular system are carried out by the components of the blood. You need to know the function of plasma, red blood cells, white blood cells and platelets, and how they support sport and exercise performance.

The functions of the cardiovascular system are:

- the delivery and removal of nutrients and waste
- thermoregulation
- vasodilation and vasoconstriction
- to clot blood
- to fight infection.

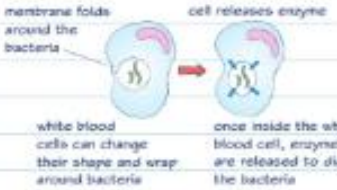
Plasma is needed to transport essential nutrients to the muscles so there is energy for exercise.

Functions of the blood

Plasma is the liquid part of blood. It is 90 per cent water. Plasma makes it possible to carry the blood cells, nutrients, gases and waste products around the body. Without plasma, these rugby players would not be able to:

- circulate the required oxygen, carried by the red blood cells, that is vital in energy production for exercise
- transport carbon dioxide and lactate, produced during exercise. Carbon dioxide is transported to the lungs to be breathed out of the body. Lactate is transported to the liver.

White blood cells



White blood cells keep the performer healthy by fighting infection so they do not need a break from training.

Platelets

Platelets prevent blood loss. During contact sports such as rugby and boxing, players may receive a cut. Blood will flow from a cut until the site is blocked. Platelets will gather, sticking to each other to form a plug at the site of the injury. The platelets also stimulate fibrin (a blood protein) to form a sticky net trapping red and white blood cells, so a clot is formed and the skin is resealed, stopping blood loss. As soon as blood loss is stopped, the player is allowed to re-join the game.

Thermoregulation

It is important that we keep our body temperature at, or close to, 37°C. This is so the reactions in our body, for example those required for energy production, can work at an optimum level. During exercise, when we need efficient energy production, we generate heat. The cardiovascular system helps us lose this excess heat through vasodilation.

The vessels do not move or increase in size; it is the space within the vessel that alters.

Vasoconstriction and vasodilation

Smooth muscle in the walls of the arterioles near to the surface of the skin relax, causing the arteriole to vasodilate. This increases blood flow through these vessels so that a greater amount of blood can pass near the skin and lose heat.

If we need to maintain heat, for example, if exercising in a cold environment, the blood vessels near the surface of the skin will vasoconstrict, reducing blood flow and heat loss.

Now try this

State **four** functions of the cardiovascular system.

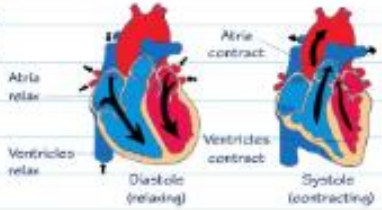
Cardiac cycle

You need to know about the cardiac cycle and its control to allow changes in heart rate during sport and exercise.

Blood movement through the heart

Blood movement through the heart is controlled by muscular contraction of the walls of the chambers of the heart and one-way valves.

The atria contract, forcing blood through the bicuspid and tricuspid valves, into the ventricles, which are relaxing so they can fill with blood. This is diastole.



The atria relax, the bicuspid and tricuspid valves close, the ventricles contract, forcing blood through the semi-lunar valves, out of the heart into the main arteries (the pulmonary artery or aorta). This is systole. During this time the atria are refilling with blood for the next cardiac cycle.

Cardiac cycle is the term given to the events that take place in the heart each time the heart beats. It includes diastole and systole.

Varying the cardiac cycle

Each heartbeat contains a cardiac cycle. The rate the heart beats is controlled by the nervous system. We need to regulate our heartbeat so our cardiovascular system can carry out its functions. The sympathetic nervous system causes the heart to increase during exercise, after exercise the heart rate slows down due to the parasympathetic nervous system.

We need to be able to vary heart rate depending on the intensity of exercise.

Control of the cardiac cycle

The sinoatrial node acts as a pacemaker; it initiates the heartbeat. It transmits electrical impulses causing the atria to contract. Each electrical impulse is detected by the atrioventricular node and passed to specialised cardiac muscle fibres called the bundle of His. These muscle fibres conduct the impulse throughout the muscular walls of the ventricles. The Purkinje fibres receive these electrical impulses and signal both ventricles to contract.

The sympathetic nervous system sends messages to the SAN to increase heart rate, for example during exercise.

Now try this

What effects do the sympathetic and parasympathetic nervous systems have on heart rate?

Responses

You need to know these five short-term responses of the cardiovascular system to exercise.

Changes in heart rate when exercising

- **Anticipatory rise** – an increase in heart rate just before the start of physical activity. It is caused by the release of adrenalin into the blood.
- **Increased heart rate** – to speed up oxygen delivery and carbon dioxide removal during exercise.

Resting, working and recovery heart rates, before, during and after exercise.

Increased blood pressure

Blood will be flowing at a faster rate due to the increase in heart rate. Also, the heart will contract more forcibly to squeeze more blood out. This will cause a temporary increase in systolic blood pressure.

Links Go to page 34 to revise blood pressure.

Increased cardiac output

Cardiac output is the amount of blood leaving the heart per minute. It is calculated by multiplying heart rate by stroke volume.

Stroke volume is the amount of blood leaving the heart per beat. If either heart rate or stroke volume increase, cardiac output will increase.

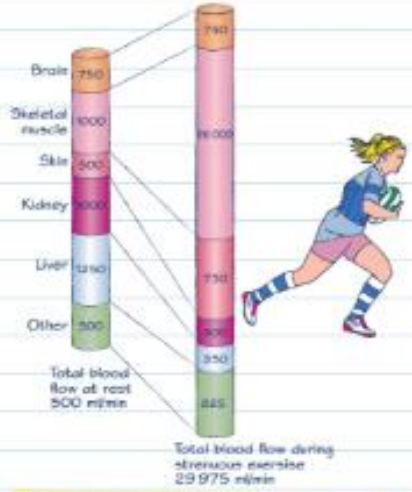
Redirection of blood flow

When we exercise we need more oxygen for greater energy production. This increase in energy production increases waste products that need removing from the body. The body satisfies these demands by:

- increasing cardiac output
- redirecting blood flow so that the majority of the circulating blood goes to the areas of the body that need it most.

This is achieved through vasodilation of arterioles supplying active areas and vasoconstriction of arterioles supplying inactive areas.

Links Go to page 30 to revise vasoconstriction and vasodilation.



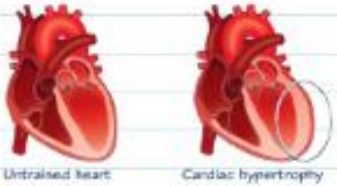
Increased cardiac output and redirection of blood flow allows a much greater flow of blood to the working muscles during exercise.

Now try this

Why does the body redirect blood flow during exercise?

Adaptations

You need to know the long-term adaptations of the cardiovascular system to regular exercise and the impact of these adaptations on subsequent performance.



Cardiac hypertrophy will increase the thickness of the left ventricle wall, allowing the heart to contract with greater force.

1 Cardiac hypertrophy

Hypertrophy means muscle cell enlargement, i.e. an increase in the size of a muscle. Cardiac hypertrophy means this increase is taking place in heart muscle.

2 Stroke volume increases

Stroke volume increases as the muscular walls of the heart undergo cardiac hypertrophy. Therefore, more blood can be ejected from the heart per beat. This is true at rest and during exercise.

3 Resting heart decreases

If we increase our resting stroke volume, we do not need the heart to beat as often to achieve the required cardiac output at rest.

4 Decreased heart rate recovery time

Heart rate remains elevated after exercise to aid recovery. However, due to an increased stroke volume, a high level of blood can still be circulated without the need for a very high heart rate. Therefore, heart rate will return to resting levels sooner.

5 Capillarisation

This is the development of the capillary network in the body. Capillary density is increased in skeletal muscle and around the alveoli in the lungs. The increase in capillary density means that a greater volume of blood can flow through the body, ensuring a good supply of oxygen and nutrients to the tissues, and removal of carbon dioxide.

7 Reduction in resting blood pressure

This is one of the reasons why exercise is said to be good for us. By dropping resting blood pressure, we reduce the risk of heart-related ill health. Several factors contribute to a drop in resting blood pressure:

- cardiac hypertrophy
- increased nitric oxide release, which vasodilates the blood vessels
- increased plasma volume.

6 Increase in blood volume

Blood volume is a measure of the amount of plasma and red blood cells circulating around the body. Initial increases in blood volume are due to an increase in plasma, although maintenance of training can also result in an increase in red blood cells. The increase in blood volume improves oxygen delivery and temperature regulation.

As the volume of blood plasma increases to a greater extent than the number of red blood cells within it, the viscosity of the blood will not increase; it may even reduce. If blood viscosity does reduce it will decrease its resistance to blood flow, therefore contributing to a reduction in resting blood pressure.

Viscosity – how thick a liquid is.

Now try this

Why does resting heart rate decrease if resting stroke volume increases?

Thomas Adams PE Department

BTEC LEVEL 3 Extended Certificate

Case Study Sheets

Answer

<u>Unit 2 : Fitness Training and Programming for Health, Sport and Well-being</u>

Preparation Task

Gary is an insurance broker who works long hours.

Gary finds that he struggles to stay awake during the work day and often calls in sick to catch up on sleep.

How can increasing his levels of physical activity help Gary with his issues at work?

Research this task online and complete the answer on the attached sheet in full prose (no bullet points allowed)

Complete 1 Side of the A4 Sheet Only

Think about the potential causes of his lack of sleep, ways he can improve his sleep and how doing so will improve his lifestyle.