**Transport of Blood Gases Questions**

**Bohr Shift**

* Explain the causes of the Bohr Shift and how it increases oxygen delivery to the working muscles (3 marks)
* Where is myoglobin found in the body **and** what is its role during exercise? (2 marks)
* During a 400 metre hurdles race, the curve shifts to the right. Explain the causes of this change to the curve **and** the effect that this change has on oxygen delivery to the muscles.(4 marks)
* Explain how oxygen is taken up by haemoglobin from the lungs and released

at the muscle site. *(3 marks)*

**Blood Vessels, Pressures and Velocity**

* Describe **two** characteristics of veins which assist the transport of blood.

(*2 marks)*

* State **three** characteristics or functions of arteries.(3 marks)

***During a game, the blood pressure of a player increases***.

* What factors determine the ‘blood pressure’ in arteries? *(3 marks)*
* State **two** ways in which carbon dioxide is transported by the blood.

*(2 marks)*

**Venous Return**

* Describe how running affects the venous return mechanism (3 marks)

***Running helps the ‘venous return’ mechanism.***

* Explain how the venous return mechanism works. *(3 marks)*

**Vascular Shunting**

* Explain how redistribution of blood occurs during exercise. *(3 marks)*
* Explain why blood flow to the brain remains the same during rest **and** during maximum effort. *(2 marks)*
* Using **Table 1**, explain why performers should not eat immediately before exercise.
* When a performer is running, blood is redirected to the working muscles. Explain how this *redistribution* of blood is achieved. (3 marks)

**AVO2 diff**

* What do you understand by the term A-VO2 diff and why does it increase during exercise ? (2 marks)

***During a game, a player’s arterio-venous oxygen difference (a-vO2 diff) will increase.***

* What is the significance of this increase in a-vO2 diff to the player?

*(3 marks)*

**Transport of Blood Gases Answers**

**Bohr Shift**

**Explain the causes of the Bohr Shift and how it increases oxygen delivery to the working muscles (3 marks)**

* Exercise increases temperature
* Exercise causes increased CO2/acidity in blood/lower pH
* Curve shifts to the right
* More oxygen *disassociates* from haemoglobin/ reduced affinity for oxygen

**Where is myoglobin found in the body and what is its role during exercise? (2 marks)**

A. In muscle

B. Stores/supplies/carries oxygen

**During a 400 metre hurdles race, the curve shifts to the right. Explain the causes of this change to the curve and the effect that this change has on oxygen delivery to the muscles.(4 marks)**

A. Increase in (blood/body) temperature

B. Increase in blood carbon dioxide concentration (pCO2)

C. Increase in blood acidity/increase in hydrogen ions/decrease in pH

D. Bohr shift

E. Resulting in less saturation/reduced affinity of haemoglobin with oxygen

F. An increase in oxygen release/ oxyhaemoglobin dissociation to muscles/muscles receive more O2

**Blood Vessels, Pressures and Velocity**

**Describe two characteristics of veins which assist the transport of blood.**

**(*2 marks)***

*A. Thinner muscle/elastic tissue layer*

*B. Valves*

*C. Wider lumen/diameter*

*D. Blood at low pressure*

**State three characteristics or functions of arteries.(3 marks)**

A. (Thick) Elastic walls

B. (Small) lumen

C. (Smooth) muscle layer

D. Carrying blood away from the heart/ to tissues/muscles

E. Cushion and smooth out/recoil/pulse/ withstand pumping action/pressure/ velocity from heart

**Venous Return**

**Describe how running affects the venous return mechanism (3 marks)**

* Venous return increases
* Skeletal pump- increased muscle contractions compress veins and push blood to heart
* One way valves in veins prevent backflow
* Respiratory pump- greater breathing movements alter pressure in thoracic cavity and compress veins- assist flow back to the heart
* Running- heart beats faster- suction pump of the heart #

**Explain how oxygen is taken up by haemoglobin from the lungs and released**

**at the muscle site. *(3 marks)***

:

A. Forms oxyhaemoglobin/Hb O2

B. At lungs - high partial pressure of O2/ blood – low partial pressure of O2;

C. Haemoglobin becomes saturated;

D. At muscles - low partial pressure of Oxygen/ O2/ blood - high partial

pressure of O2;

E. Hence oxygen dissociates from haemoglobin;

F. Mention of myoglobin.

**Running helps the ‘venous return’ mechanism.**

**Explain how the venous return mechanism works. *(3 marks****)*

A. Muscle/skeletal pump/respiratory pump/ suction pump;

B. One-way/pocket valves in veins/give direction;

C. Contraction of leg muscles compresses veins;

D. Breathing mechanism/inspiration increases pressure compresses veins;

E. Suction pressure of heart/heart draws up blood;

**During a game, the blood pressure of a player increases.**

**What factors determine the ‘blood pressure’ in arteries? *(3 marks)***

A. Contraction of the heart/stroke volume/ejection fraction/heart rate;

B. Increased blood flow/cardiac output/Q;

C. (Peripheral) resistance/friction/ elasticity of walls;

D. Blood viscosity/sweating/loss of fluid;

E. Blood vessel length/distance from the heart;

F. Blood vessel diameter/size/ vasoconstriction/vasodilation/cross sectional area/lumen size;

G. Health factor/atherosclerosis/diet/ stress/drugs/hereditary;

H. Age/level of fitness/intensity of exercise;

**State two ways in which carbon dioxide is transported by the blood.**

***(2 marks)***

A. As bicarbonate/hydrogen carbonate ions/ carbonic acid;

B. Dissolved in plasma;

C. Combined/attached with plasma proteins/haemoglobin / forms

carbaminohaemoglobin

**Vascular Shunting**

**Explain how redistribution of blood occurs during exercise. *(3 marks)***

*A. Increase in CO2 levels/acidity/ decrease in O2 levels/pH/ chemoreceptors*

*B. Movement of joints/tendons/ mechanoreceptors/proprioceptors*

*C. Vasomotor centre/medulla*

*D. Autonomic/sympathetic nervous system/(nor)adrenaline*

*E. Pre-capillary sphincters/rings of circular/smooth muscle*

*F. Vasodilation to areas needing blood/muscles*

*G. Vasoconstriction of areas not needing so much blood/kidneys/liver/ gut*

**Explain why blood flow to the brain remains the same during rest and during maximum effort. *(2 marks)***

*A. Brain function maintained during exercise*

*B. Oxygen/nutrients required*

**Using Table 1, explain why performers should not eat immediately before exercise.**

*A. During exercise, less blood goes to the gut/change from 1250cm3 to 375cm3*

*B. But, blood/oxygen needed in gut for digestion of food*

*C. Less blood/oxygen available to muscles*

**When a performer is running, blood is redirected to the working muscles. Explain**

**how this *redistribution* of blood is achieved. (3 marks)**

Increased metabolic activity/increased carbon dioxide/increased lactic acid/drop

in pH in the blood/increased acidity

2. Detected by chemoreceptors

3. Message to medulla/vasomotor control centre

4. Autonomic/sympathetic system/adrenaline/noradrenaline produced

5. Pre-capillary sphincters/arterioles

6. Vasoconstriction – to organs

7. Vasodilation – to muscles

**AVO2 diff**

**What do you understand by the term A-VO2 diff and why does it increase during exercise ? (2 marks)**

* Difference between oxygen content of arterial and venous blood/ how much O2 is extracted/ used by muscles.
* More O2 is extracted by muscles/lungs
* O2 is used/needed for energy/ATP production/respiration

**During a game, a player’s arterio-venous oxygen difference (a-vO2 diff) will increase.**

**What is the significance of this increase in a-vO2 diff to the player?**

***(3 marks)***

A. Difference between oxygen content of arterial and venous blood

B. More oxygen is needed/extracted by the muscles;

C. Used/needed for energy/ATP production;

D. Endurance/stamina/aerobic exercise;

E. Leads to improved performance;

F. Increased oxygen diffusion at lungs/alveoli/muscle;

G. More oxygen in blood;

H. More CO2 in blood/produced;