Name: .....

Date: .....

Class: .....

IGCSE BIOLOGY EDEXCEL 9-1

CHAPTER WORKBOOK

Transport in Animals

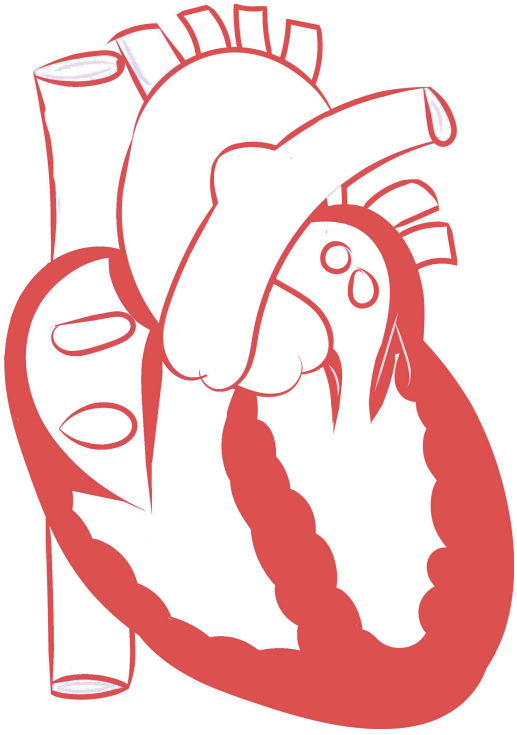

Image: Pixabay.com

Surface Area to Volume Ratio – The Need for a Transport System

1. Complete the table below to calculate the surface area to volume ratio of each cube.

Cube size	2 x 2 x 2 mm	3 x 3 x 3 mm
Surface area		
Volume		
SA:Vol		

2. State how surface area to volume ratio changes as the size of a cell changes.

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3. Explain the relevance of surface area to volume ratio for single-celled organisms.

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3. Outline how large organisms overcome the limits of surface area to volume ratio and cell size.

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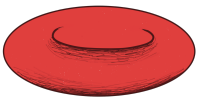
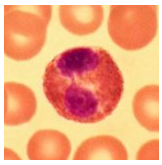
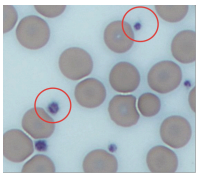
The Blood

1. Complete the table to name and summarise the function of each component.

Component		Function
		…… …… ……
		…… …… ……
		…… …… ……
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White blood cell image: Iceclanl [CC BY-SA 3.0 (https://creativecommons.org/licenses/by-sa/3.0)], from Wikimedia Commons
Platelets image: Graham Beards CC BY-SA 4.0, https://commons.wikimedia.org/w/index.php?curid=32208267

2. Describe and explain the adaptations of red blood cells for oxygen transport.

Feature	Description	Explanation (Why is this a useful feature?)
Shape	…… …… ……	…… …… ……
Nucleus	…… …… ……	…… …… ……
Haemoglobin	…… …… ……	…… …… ……

White Blood Cells and The Immune System

1. Complete the sentences below using the words in the box.

viruses	engulfing	enzymes
antibodies	disease	phagocytosis
immune	pathogens	correct
eating	specific	lymphocytes
increases	kills	phagocytes

White blood cells form part of the ……. system, which helps protect the body from harmful microorganisms and ……. (these are examples of ……. .) Two types of white blood cells are ……. and …… . Each lymphocyte targets a specific pathogen. Lymphocytes produce …….. which are specific to a type of pathogen and help destroy it. When a pathogen invades that body, a …….. lymphocyte (with the correct antibodies) must be found by the body. Once this happens, the number of antibodies quickly …….. and …….. the pathogen before it can cause …….. .

Phagocytes use a process called ……. to destroy cells. This word literally means "cell ……..". This involves ……. a pathogen and destroying it using …… .

2. Add labelled diagrams to the boxes below to outline phagocytosis.

Pathogens enter the body	**Pseudopodia surround the pathogen**
The pathogen is contained in a vesicle and enzymes digest it	**Harmless products are expelled from the phagocyte**

2. Add labelled diagrams to the boxes below to outline the actions of lymphocytes.

Lymphocytes produce antibodies specific to a pathogen's antigens		**Antibodies can cause pathogens to clump together**
Antibodies can act as markers for phagocytes	**Antibodies can cause cells to burst open**	**Antibodies can neutralise toxins produced by pathogens**

Triple Award	
	3. The following questions are about *immunity*. a) Outline the term *immunity*. …… …… …… b) Outline the role of memory cells. …… …… …… c) Explain how vaccines can be used to generate memory cells. …… …… …… d) Compare antibody production in primary and secondary immune responses. …… …… ……

Triple Award

Blood Clotting

1. Describe how blood clots form in response to a cut on the skin. Include all of the words in the box in your answer:

platelets	fibrin	fibrinogen
soluble	insoluble	mesh
red blood cells		trapped

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2. State **two** benefits of blood clotting.

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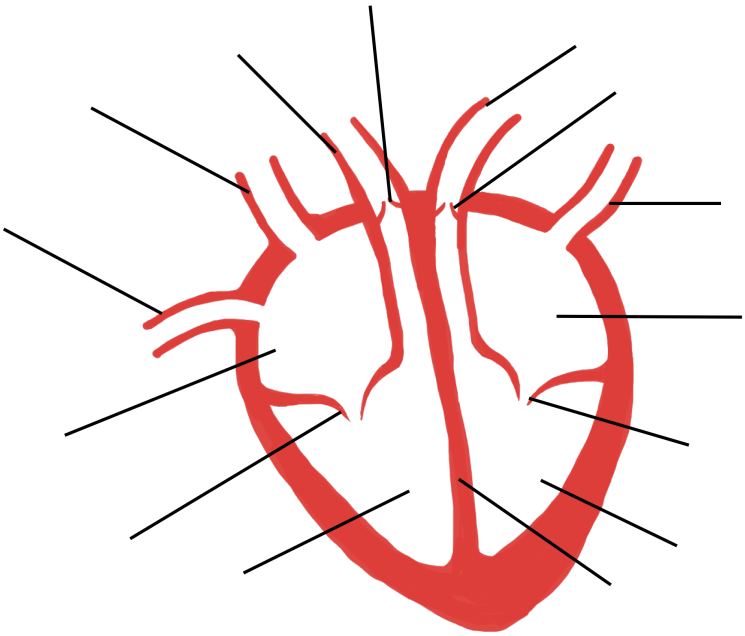
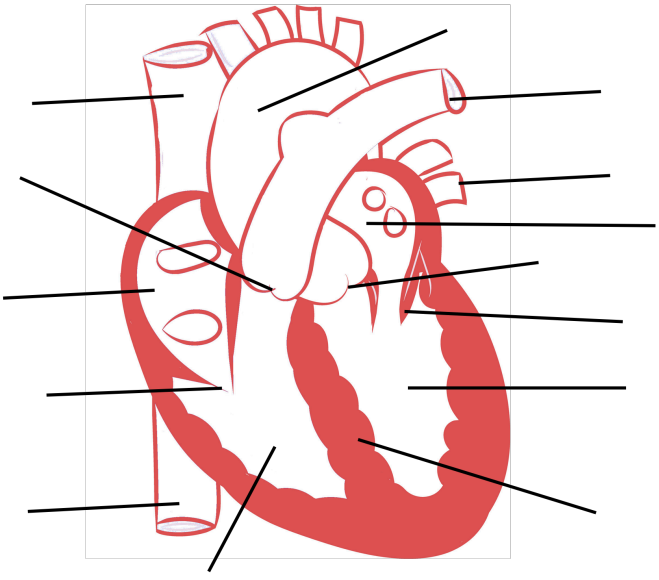
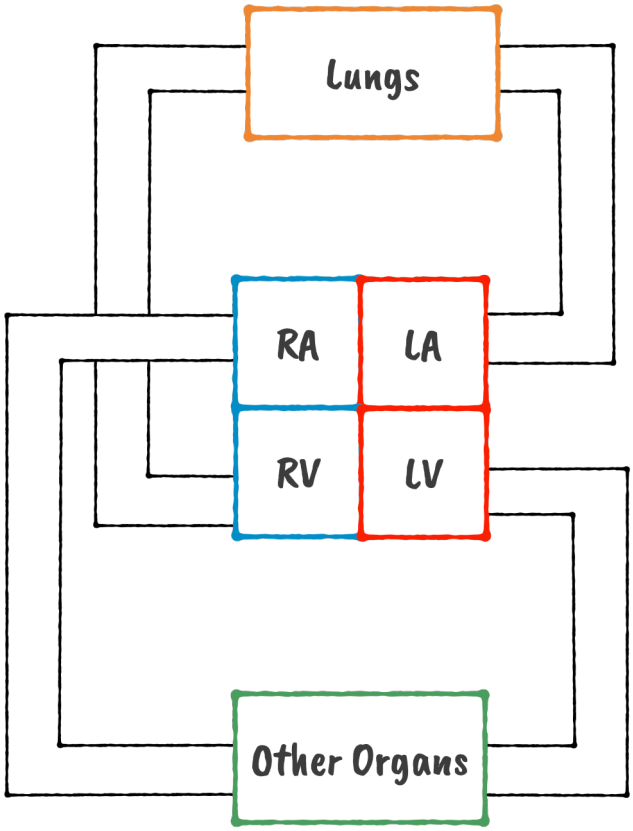
The Heart and Circulatory System

1. Below are two representations of a human heart. Add labels to both diagrams.





2. The diagram below is a schematic representation of blood flow in the human body.



a) On the schematic diagram:

i) Draw arrows to show the route blood takes through mammal bodies

ii) Label the four blood vessels:

- Aorta
- Pulmonary Artery
- Pulmonary Vein
- Vena Cava

iii) Use two different colours and a key to label *pulmonary circulation* and *systematic circulation*

b) Fill in the blanks below to describe the flow of blood through the heart.

Blood enters the heart through the superior and inferior ……. ……. . The muscles of the right …….. contract and blood goes past the …….. valve, and into the …….. ventricle. The muscle in the walls of this ventricle …….. and the blood is sent to the lungs via the …….. artery. From the lungs, blood enters the heart via the …….. vein, into the …….. atrium. The muscle of this wall then contracts, forcing blood past the …….. valves and into the left ventricle. The muscles of the walls of the left ventricle contract and blood leaves the heart via the …… .

The type of muscle in the walls of the heart is known as …….. muscle.

The 4 sets of valves in the heart are there to prevent …….. of blood.

3. Humans have a double circulatory system but some animals, such as fish, have a single circulatory system.

a) Draw diagrams to represent single and double circulatory systems.

Single Circulation	**Double Circulation**

b) Explain the advantage of a double circulatory system.

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4. In the space below, draw a systems diagram (using boxes and arrows) to show the route of blood throughout the body. Include the following (with labels):

- The heart (and its four chambers)
- The lungs
- The liver
- The Kidneys
- Digestive system
- *All blood vessels that connect them*

Heart Rate

1. The heart beats at around 70 beats every minute. However, it can change when a faster release of energy is required (i.e. during exercise).

a) State and explain the change in heart rate during aerobic exercise.

State (How does heart rate change when a person exercises?)	**Explain** (How does this result in a faster release of energy?)
……..….	……..…. ……..…. ……..…. ……..…. ……..….

b) A professional athlete may have a resting heart rate as low as 40 bpm. Suggest why professional athletes have resting heart rates lower than the average person.

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……..……

……..……

2. Adrenaline is a hormone released by the adrenal glands in response to anger or fear.

a) State the effect of adrenaline on heart rate.

……..……

b) Explain the benefit of this response.

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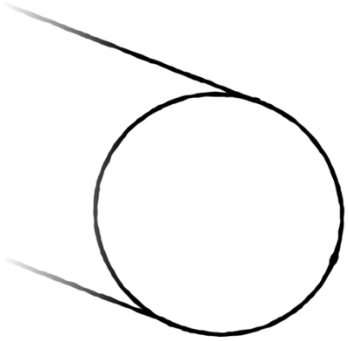
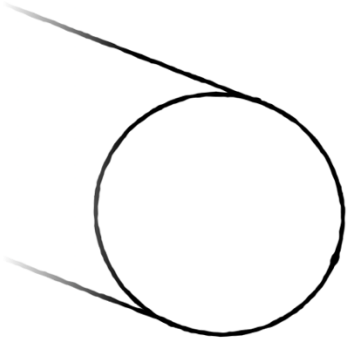
……..……

Blood Vessels

1. Complete the diagrams below to compare the structure of arteries and veins.

Label the following:

- Thick/Thin wall with elastic tissue and muscle fibres
- Large lumen
- Endothelium lining

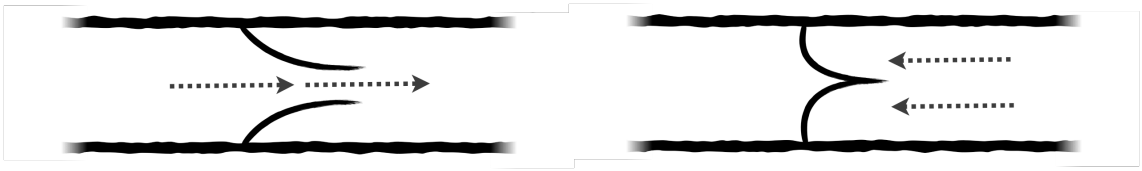
Artery	**Vein**
	

2. Complete the sentences below about arteries and veins with any appropriate words/phrases:

Arteries carry blood …….. ……. the heart. All arteries carry oxygenated blood except for the …….. artery which carries …….. blood to the …….. . They have a thick wall with …….. tissue that allows the vessel to …….. and recoil. This helps to maintain the …….. …….. . The wall also contains …….. fibres which can …….. (get wider) and …….. (get narrower) to control blood …….. .

The blood pressure in veins is …….. than in arteries. Veins therefore have thinner walls with less …….. tissue and …….. fibres.

4. The diagram below shows the valves found in veins.



a) Outline the purpose of valves in the veins.

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b) State why valves are not necessary in arteries.

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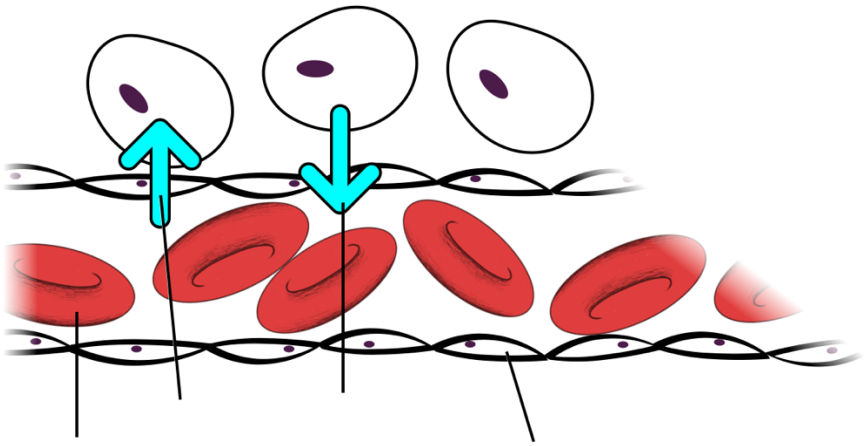
5. The diagram below represents a blood capillary.



a) Label the diagram with the following:

- diffusion of nutrients
- diffusion of carbon dioxide
- red blood cell
- capillary wall - one cell thick

b) Complete the sentences about capillaries with any appropriate words/phrases:

Capillaries carry blood to and from body tissues. Substances can ..... across the capillary wall because it is very ..... (only ..... cell thick). Capillary lumens are just wide enough for ..... blood cells to fit, so the cells are close to the capillary wall. This provides a ..... diffusion ..... for oxygen to diffuse to the body tissues.

Coronary Heart Disease

The heart pumps by contraction of cardiac muscle. The blood within the heart chambers does not supply the cardiac muscle directly. Instead, it is supplied by *coronary arteries*.

The coronary arteries can become blocked by fatty substances including cholesterol, reducing or preventing blood flow.

1.

a) Annotate the diagram to outline coronary heart disease. (*Label a blockage at a point on the coronary artery then shade and label an area deprived of oxygen*).

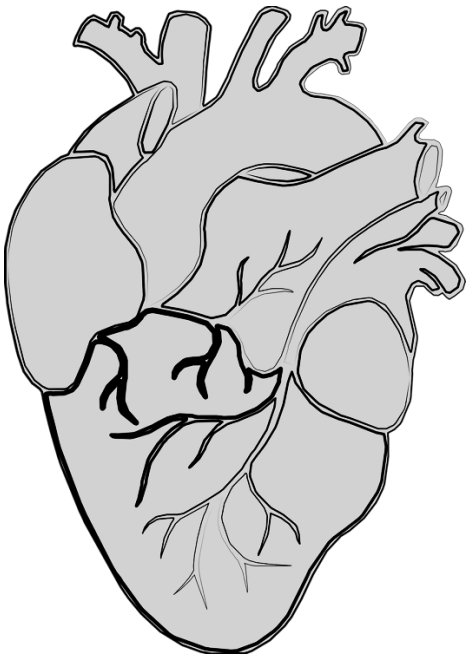


Image: pixabay.com

b) Summarise the consequences of coronary heart disease.

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c) Explain how the following factors influence the risk of a person suffering coronary heart disease.

Factor	How it influences the risk of CHD
Heredity	…… …… ……
Blood pressure	…… …… ……
Diet	…… …… ……
Smoking	…… …… ……
Stress	…… …… ……
Lack of exercise	…… …… ……