Harris Academy Greenwich

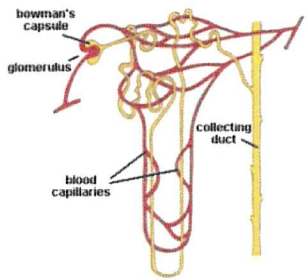
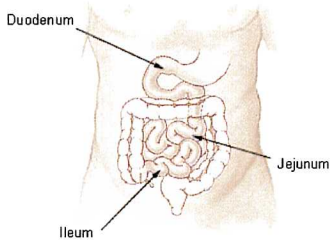
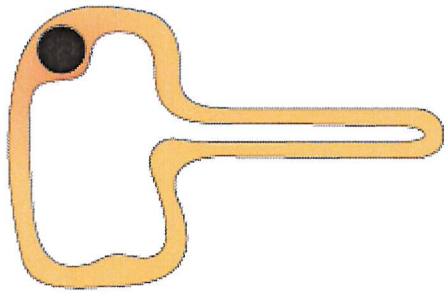
Biology B3

Revision Pack 2014

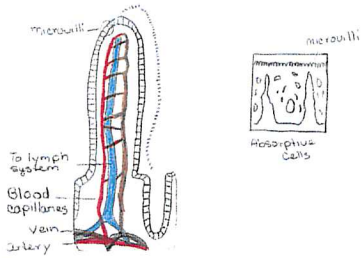
Student Name: _____

B3 Examination 'hints and tips'

Candidates should:

B3.1 Movement of molecules in and out of cells
B3.1.1 Dissolved substances
Define the term 'diffusion'.
Define the term 'osmosis' and explain what a partially permeable membrane is.
Be able to explain why a long distance runner should choose an isotonic drink rather than cola.
Define the term active transport. Explain why active transport requires energy.
Label diagrams to show where active transport occurs in humans and plants and what is transported.         

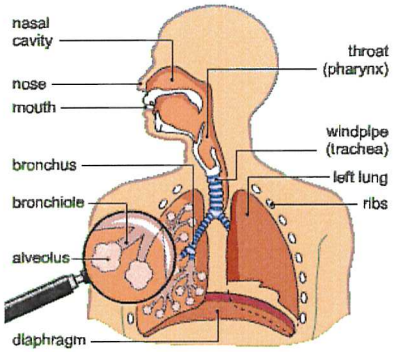
Be able to describe two adaptations of the villi which help the small intestine to function.

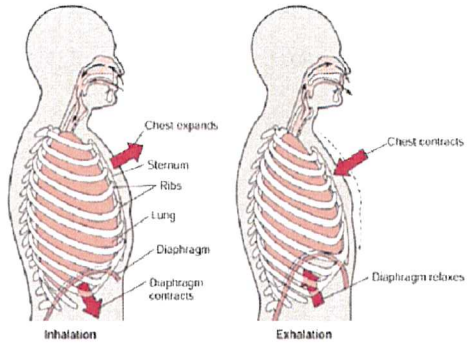


Explain why some food molecules are absorbed by diffusion (often after fasting) and others by active transport.

B3.1.2 Gaseous exchange

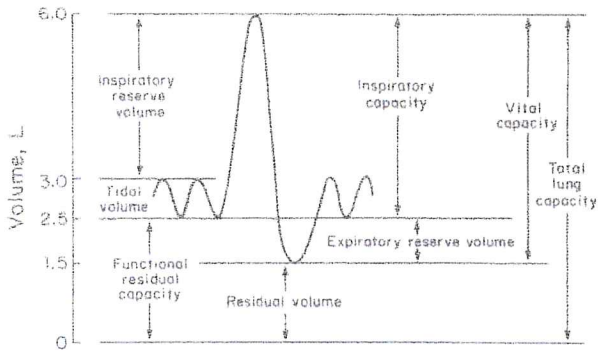
Be able to identify the main parts of the breathing system on a diagram. For example, add labels to a diagram for alveolus, diaphragm, rib and trachea.

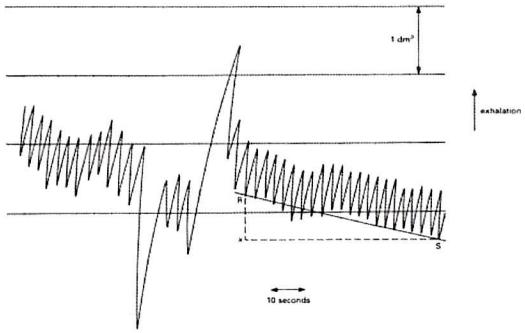




Explain the changes that occur to bring about ventilation of the lungs in terms of relaxation and contraction of muscles, movement of the ribcage and diaphragm, changes in volume and pressure in the thorax. (use diagram above right to help)

Interpret spirometer traces.





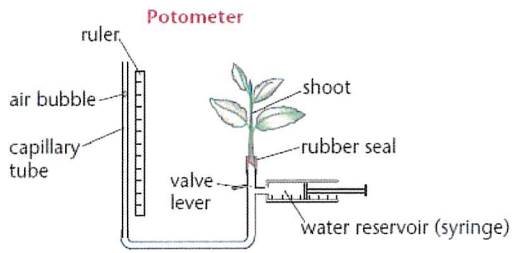
Evaluate the development and use of artificial aids for breathing

B3.1.3 Exchange systems in plants (best taught alongside B3.2.3 Transport systems in plants)

Be able to suggest how having more stomata on the lower surface (rather than upper side) of the leaf helps the plant to survive better.

Define the term transpiration.

Write a method to explain how a potometer can be used to measure the rate of water uptake by a shoot.

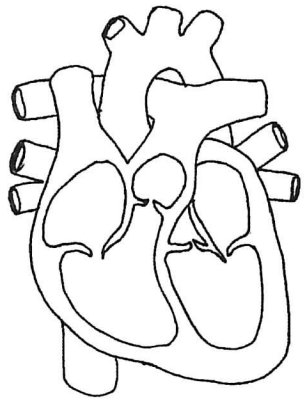


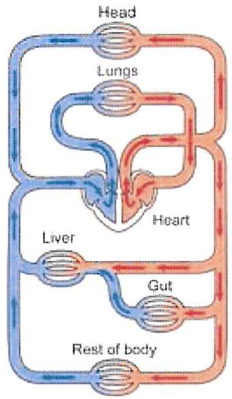
Explain why windy conditions increase water loss.

B3.2 Transport systems in plants and animals

B3.2.1 The blood system

Label a diagram of the heart showing 4 chambers, vena cava, pulmonary artery, pulmonary vein and aorta.





Describe the flow of blood from the body, through the heart and lungs and back to the body.

Describe problems associated with the heart and explain how they can be treated.

Hole in the heart -

Irregular heart beat –

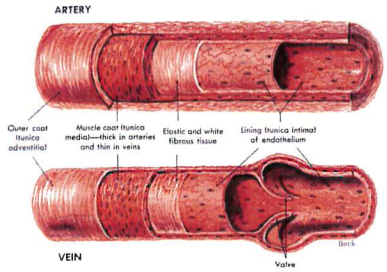
Damaged valves –

Coronary heart disease -

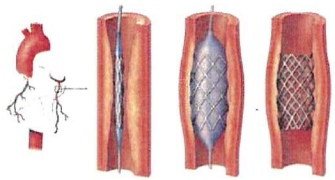
Evaluate the use of heart valves.

Evaluate the use of artificial hearts.

Be able to recognise veins and arteries from diagrams of blood vessels.



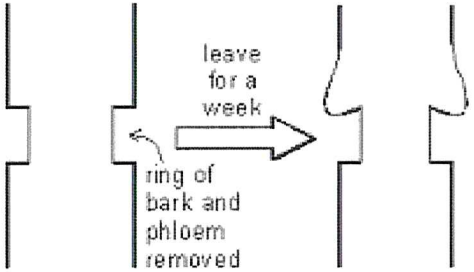
Describe what a stent is and what it is used for.

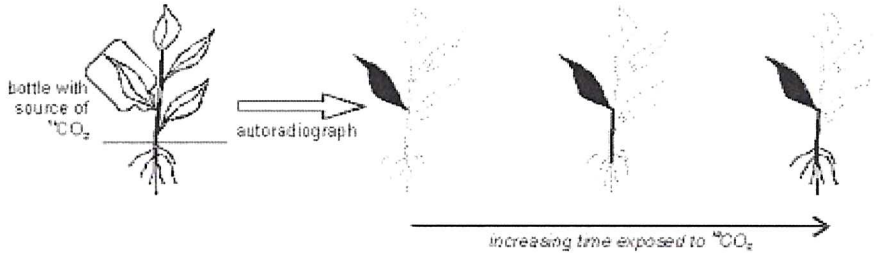


Evaluate the use of stents.

B3.2.2 The blood
Draw diagrams of red blood cells, white blood cells and platelets. Explain the structure and function of red blood cells, white blood cells and platelets.
Explain why the reversible reaction between oxygen and haemoglobin is important. How does the saturation level of haemoglobin affect this reaction in high and low carbon dioxide concentrations? Why is this important?
Evaluate the use of artificial blood products. Plasma / saline PFCs Haemoglobin only (no rbc)
B3.2.3 Transport systems in plants
Explain the function of xylem and phloem.
Name the process by which water vapour is lost from a leaf.

Interpret results of ringing experiments and radioactive isotopes.





B3.3 Homeostasis

B3.3.1 Give examples of waste products that have to be removed and explain where they are excreted from the body.

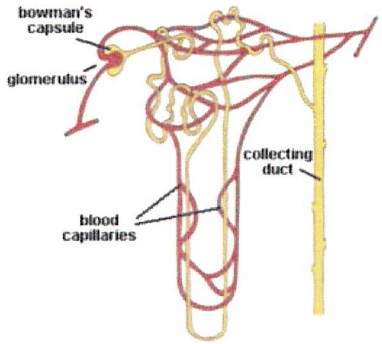
Name where urea is made (and what it is made from) and where it is excreted from the blood..

Name the organ which stores urine.

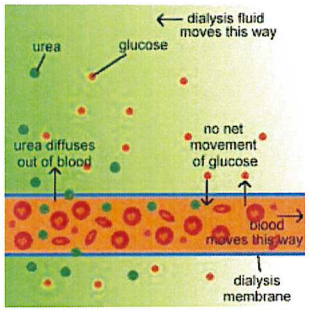
Be able to name two substances which will pass through the filter from blood plasma into the filtrate.

Be able to explain why protein is not found in the urine of a healthy person.

State which substances are reabsorbed back into the blood and explain how this happens.



Explain how a kidney machine works in terms of the partially permeable membrane and composition of the dialysis fluid.



Be able give two advantages of a kidney transplant rather than dialysis treatment.

Be able to give one disadvantage of having a kidney transplant.

B3.3.2 Temperature control

State how body temperature is monitored

Describe how body temperature is controlled on a hot day.

Describe how body temperature is controlled on a cold day.

Explain why the kangaroo rat does not sweat.

Explain why this could be dangerous for the animal.

B3.3.3 Sugar control
Be able to give one way other than using insulin of treating diabetes. Be able to state which organ controls blood glucose concentration. Be able to describe how insulin reduces the concentration of glucose in the blood. Compare and contrast Type 1 and Type 2 diabetes. Evaluate modern methods of treating diabetes.
B3.4 Humans and their environment
B3.4.1 Waste from human activity
List the problems associated with an increasing human population.
Describe how water can be polluted
Give examples of air pollutants and where they come from

Describe how acid rain is formed.

Write a method to investigate the effect of sulfur dioxide on seed germination.

Describe what herbicides and pesticides are used for.

Describe the uses of DichloroDiphenylTrichloroethane (DDT) and why it was banned.

B3.4.2 Deforestation and the destruction of areas of peat

Be able to explain why peat free composts are of increasing importance.

Be able to give two reasons why deforestation increases the amount of carbon dioxide in the atmosphere.

Explain how deforestation could lead to an increase in methane in the atmosphere.

B3.4.3 Biofuels

Be able to give some effects of global warming

Be able to explain the greenhouse effect using the words or phrases “absorb” and “re-radiate heat”.

Be able to explain the link between carbon dioxide emissions and the greenhouse effect.

State where most carbon dioxide is found on our planet.

Define the term ‘biofuel’.

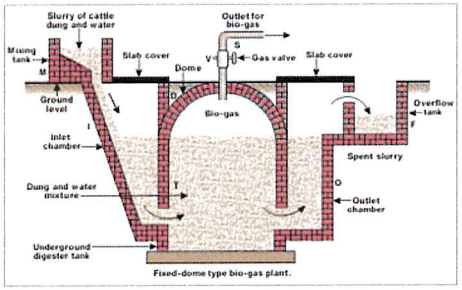
Write the equation for the production of ethanol using yeast.

Explain the advantages and disadvantages of growing crops for biofuels.

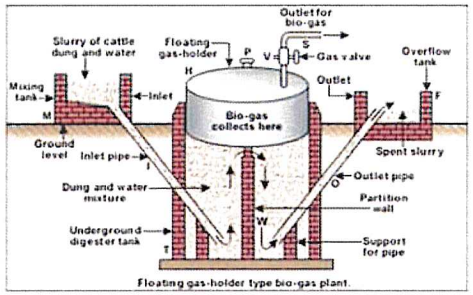
Define the term ‘biogas’.

State how biogas is produced..

Evaluate the use of fixed and floating drum biogas generators.



Fixed-dome type bio-gas plant.



Floating gas-holder type bio-gas plant.

Be able to explain how the output from a biogas generator is affected by climatic conditions, such as India and the UK.

Be able to use data from a table to calculate the yearly profit from a biogas generator.

Be able to state the main useful gas in biogas.

B3.4.4 Food production

Be able to suggest one reason why calves raised indoors grow faster than those raised outdoors.

Be able to suggest one reason why some people prefer to buy meat from animals that have been kept outdoors.

Explain why some fish stocks are declining and why this is a problem.

Describe ways that fish stocks can be conserved.

Describe how Fusarium is grown to produce mycoprotein that can be eaten.

Evaluate the use of mycoprotein as a food.

Topic: B3 1 Exchange of materials

Name:

Date	Specification Content	☺	😐	☹	Comments
B3.1 Movement of molecules in and out of cells					
	The cells, tissues and organs in plants and animals are adapted to take up and get rid of dissolved substances. Different conditions can affect the rate of transfer. Sometimes energy is needed for transfer to take place. **You should use your skills, knowledge and understanding to:** • Evaluate the development and use of artificial aids to breathing, including the use of artificial ventilators. • Evaluate the claims of manufacturers about sports drinks. • Analyse and evaluate the conditions that affect water loss in plants.				
B3.1.1 Dissolved substances					
	a) Dissolved substances move by diffusion and by active transport.				
	b) Water often moves across boundaries by osmosis. Osmosis is the diffusion of water from a dilute to a more concentrated solution through a partially permeable membrane that allows the passage of water molecules.				
	c) Differences in the concentrations of the solutions inside and outside a cell cause water to move into or out of the cell by osmosis.				
	d) Most soft drinks contain water, sugar and ions.				
	e) Sports drinks contain sugars to replace the sugar used in energy release during the activity. They also contain water and ions to replace the water and ions lost during sweating.				
	f) If water and ions are not replaced, the ion / water balance of the body is disturbed and the cells do not work as efficiently.				
	g) Substances are sometimes absorbed against a concentration gradient. This requires the use of energy from respiration. The process is called active transport. Active transport enables cells to absorb ions from very dilute solutions.				

Topic: B3 1 Exchange of materials

Name:

Date	Specification Content	☺	😐	☹	Comments
	h) Many organ systems are specialised for exchanging materials. The effectiveness of an exchange surface is increased by: • Having a large surface area. • Being thin, to provide a short diffusion path. • Having an efficient blood supply (in animals). • Being ventilated (in animals for gaseous exchange).				
	i) Gas and solute exchange surfaces in humans and other organisms are adapted to maximise effectiveness.				
	j) The size and complexity of an organism increases the difficulty of exchanging materials.				
	k) In humans: • The surface area of the lungs is increased by the alveoli. • The surface area of the small intestine is increased by villi.				
	l) The villi provide a large surface area with an extensive network of capillaries to absorb the products of digestion by diffusion and active transport.				
B3.1.2 Gaseous exchange					
	a) The lungs are in the upper part of the body (thorax), protected by the ribcage and separated from the lower part of the body (abdomen) by the diaphragm. **You should be able to recognise these structures on a diagram.**				
	b) The breathing system takes air into and out of the body so that oxygen from the air can diffuse into the bloodstream and carbon dioxide can diffuse out of the bloodstream into the air.				

Topic: B3 1 Exchange of materials

Name:

Date	Specification Content	☺	😐	☹	Comments
	c) To make air move into the lungs the ribcage moves out and up and the diaphragm becomes flatter. These changes are reversed to make air move out of the lungs. The movement of air into and out of the lungs is known as ventilation. **You should be able to describe the mechanism by which ventilation takes place, including the relaxation and contraction of muscles leading to changes in pressure in the thorax.**				
B3.1.3 Exchange systems in plants					
	a) In plants: • Carbon dioxide enters leaves by diffusion. • Most of the water and mineral ions are absorbed by roots.				
	b) The surface area of the roots is increased by root hairs and the surface area of leaves is increased by the flattened shape and internal air spaces.				
	c) Plants have stomata to obtain carbon dioxide from the atmosphere and to remove oxygen produced in photosynthesis.				
	d) Plants mainly lose water vapour from their leaves. Most of the loss of water vapour takes place through the stomata. • Evaporation is more rapid in hot, dry and windy conditions. • If plants lose water faster than it is replaced by the roots, the stomata can close to prevent wilting.				
	e) The size of stomata is controlled by guard cells, which surround them.				

AQA GCSE Biology 2014 Summary Notes / Unit 3

B3.1 Movement of molecules in and out of cells

The cells, tissues and organs in plants and animals are adapted to take up and get rid of dissolved substances.

Different conditions can affect the rate of transfer. Sometimes energy is needed for transfer to take place.

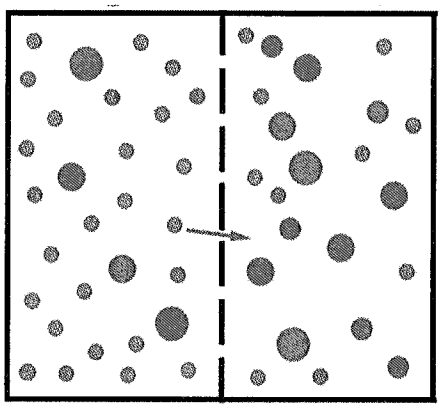
Candidates should use their skills, knowledge and understanding to:

- Evaluate the development and use of artificial aids to breathing, including the use of artificial ventilators
- Evaluate the claims of manufacturers about sports drinks
- Analyse and evaluate the conditions that affect water loss in plants.

B3.1.1 Dissolved Substances

Dissolved substances move by diffusion and by active transport.

Water often moves across boundaries by osmosis. Osmosis is the diffusion of water from a dilute to a more concentrated solution through a partially permeable membrane that allows the passage of water molecules.



Differences in the concentrations of the solutions inside and outside a cell cause water to move into or out of the cell by osmosis.

Most soft drinks contain water, sugar and ions. Sports drinks contain sugars to replace the sugar used in energy release during the activity. They also contain water and ions to replace the water and ions lost during sweating.

Substances are sometimes absorbed against a concentration gradient. This requires the use of energy from respiration. The process is called active transport. Active transport enables cells to absorb ions from very dilute solutions.

Many organ systems are specialised for exchanging materials. The effectiveness of an exchange surface is increased by:

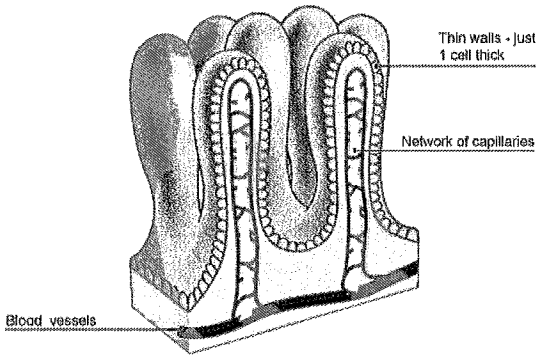
- Having a large surface area
- Being thin, to provide a short diffusion path
- (In animals) having an efficient blood supply
- (In animals, for gaseous exchange) being ventilated.

Gas and solute exchange surfaces in humans and other organisms are adapted to maximise effectiveness.

The size and complexity of an organism increases the difficulty of exchanging materials.

In humans:

- The surface area of the lungs is increased by the alveoli
- The surface area of the small intestine is increased by villi.



The villi provide a large surface area with an extensive network of capillaries to absorb the products of digestion by diffusion and active transport.

If water and ions are not replaced, the ion / water balance of the body is disturbed and the cells do not work as efficiently.

B3.1.2 Gaseous Exchange

The lungs are in the upper part of the body (thorax), protected by the ribcage and separated from the lower part of the body (abdomen) by the diaphragm.

The breathing system takes air into and out of the body so that oxygen from the air can diffuse into the bloodstream and carbon dioxide can diffuse out of the bloodstream into the air.

To make air move into the lungs the ribcage moves out and up and the diaphragm becomes flatter. These changes are reversed to make air move out of the lungs. The movement of air into and out of the lungs is known as ventilation

B3.1.3 Exchange Systems in Plants

In plants:

- Carbon dioxide enters leaves by diffusion
- Most of the water and mineral ions are absorbed by roots.

The surface area of the roots is increased by root hairs and the surface area of leaves is increased by the flattened shape and internal air spaces.

Plants have stomata to obtain carbon dioxide from the atmosphere and to remove oxygen produced in photosynthesis.

Plants mainly lose water vapour from their leaves.

Most of the loss of water vapour takes place through the stomata.

Evaporation is more rapid in hot, dry and windy conditions.

If plants lose water faster than it is replaced by the roots, the stomata can close to prevent wilting.

The size of stomata is controlled by guard cells, which surround them.

B3 REVISION – CHAPTER 1 – EXCHANGE OF MATERIALS

Describe active transport:

How is it different to diffusion:

Label the structures of the thorax

A:

B:

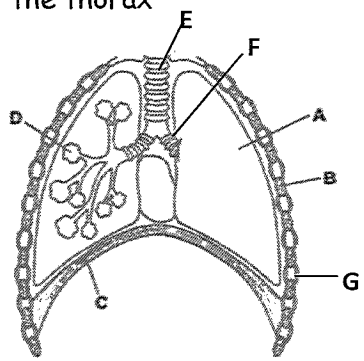
C:

D:

E:

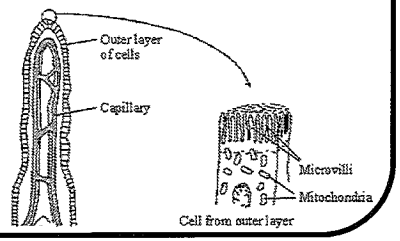
F:

G:



Draw a picture to explain how osmosis works:

Describe the how nutrients are absorbed in the gut



Describe gas exchange in the lungs during inspiration:

Describe gas exchange in the lungs during exhalation:

Describe the effects of osmosis in animal cells:

Describe the effects of osmosis in plant cells:

Explain how gaseous exchange takes place in plants:

Describe transpiration:

KEY WORDS:

Partially permeable	Capillaries	Vacuum
Osmosis	Breathing	Trachea
Active transport	Breathing systems	Villi
Solute	Thorax	Evaporation
Exchange surface	Abdomen	Cuticle
Ventilated	Diaphragm	Guard cells
Gaseous exchange	Intercostal muscle	Root hair cells
Alveoli	Negative pressure	Transpiration
	Positive pressure	Whitling

ASSESSMENT:

Topic: B3 2 Transporting materials Name:

Date	Specification Content	☺	😐	☹	Comments
B3.2 Transport systems in plants and animals					
	Substances are transported around the body by the circulatory system (the heart, the blood vessels and the blood). They are transported from where they are taken into the body to the cells, or from the cells to where they are removed from the body. Modern developments in biomedical and technological research enable us to help when the circulatory system is not working well. Plants have separate transport systems for water and nutrients. **You should use your skills, knowledge and understanding to:** • Evaluate data on the production and use of artificial blood products. • Evaluate the use of artificial hearts and heart valves. • Evaluate the use of stents.				
B3.2.1 The blood system					
	a) The circulatory system transports substances around the body.				
	b) The heart is an organ and pumps blood around the body. Much of the wall of the heart is made from muscle tissue.				
	c) There are four main chambers (left and right atria and ventricles) of the heart.				
	d) Blood enters the atria of the heart. The atria contract and force blood into the ventricles. The ventricles contract and force blood out of the heart. Valves in the heart ensure that blood flows in the correct direction. Blood flows from the heart to the organs through arteries and returns through veins. There are two separate circulation systems, one for the lungs and one for all other organs of the body.				
	e) Arteries have thick walls containing muscle and elastic fibres. Veins have thinner walls and often have valves to prevent back-flow of blood.				
	f) If arteries begin to narrow and restrict blood flow stents are used to keep them open. **You should understand the importance of stents, particularly with reference to the coronary arteries.**				
	g) In the organs, blood flows through very narrow, thin-walled blood vessels called capillaries. Substances needed by the cells in body tissues pass out of the blood, and substances produced by the cells pass into the blood, through the walls of the capillaries.				

Topic: B3 2 Transporting materials **Name:**

Date	Specification Content	☺	😐	☹	Comments
B3.2.2 The blood					
	a) Blood is a tissue and consists of a fluid called plasma in which red blood cells, white blood cells, and platelets are suspended.				
	b) Blood plasma transports: • Carbon dioxide from the organs to the lungs. • Soluble products of digestion from the small intestine to other organs. • Urea from the liver to the kidneys.				
	c) Red blood cells transport oxygen from the lungs to the organs. Red blood cells have no nucleus. They are packed with a red pigment called haemoglobin. In the lungs haemoglobin combines with oxygen to form oxyhaemoglobin. In other organs oxyhaemoglobin splits up into haemoglobin and oxygen.				
	d) White blood cells have a nucleus. They form part of the body's defence system against microorganisms.				
	e) Platelets are small fragments of cells. They have no nucleus. Platelets help blood to clot at the site of a wound.				
B3.2.3 Transport systems in plants					
	a) Flowering plants have separate transport systems: • Xylem tissue transports water and mineral ions from the roots to the stem and leaves. • The movement of water from the roots through the xylem and out of the leaves is called the transpiration stream. • Phloem tissue carries dissolved sugars from the leaves to the rest of the plant, including the growing regions and the storage organs.				

B3.2 Transport Systems in Plants and Animals

Substances are transported around the body by the circulatory system (the heart, the blood vessels and the blood).

They are transported from where they are taken into the body to the cells, or from the cells to where they are removed from the body.

Modern developments in biomedical and technological research enable us to help when the circulatory system is not working well. Plants have separate transport systems for water and nutrients.

Candidates should use their skills, knowledge and understanding to:

- evaluate data on the production and use of artificial blood products
- evaluate the use of artificial hearts and heart valves
- evaluate the use of stents.

B3.2.1 The Blood System

The circulatory system transports substances around the body.

The heart is an organ and pumps blood around the body. Much of the wall of the heart is made from muscle tissue.

There are four main chambers (left and right atria and ventricles) of the heart.

- Blood enters the atria of the heart.
- The atria contracts and force blood into the ventricles.
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- Valves in the heart ensure that blood flows in the correct direction.
- Blood flows from the heart to the organs

through arteries and returns through veins.

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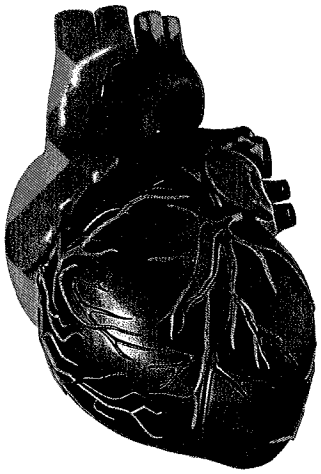

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In the organs, blood flows through very narrow, thin-walled blood vessels called capillaries.

Substances needed by the cells in body tissues pass out of the blood, and substances produced by the cells pass into the blood, through the walls of the capillaries.

B3.2.2 The Blood

Blood is a tissue and consists of a fluid called plasma in which red blood cells, white blood cells, and platelets are suspended.

Blood plasma transports:

- Carbon dioxide from the organs to the lungs
- Soluble products of digestion from the small intestine to other organs
- Urea from the liver to the kidneys.

Red blood cells transport oxygen from the lungs to the organs. Red blood cells have no nucleus.

They are packed with a red pigment called haemoglobin. In the lungs haemoglobin combines with oxygen to form oxyhaemoglobin.

In other organs oxyhaemoglobin splits up into haemoglobin and oxygen.

White blood cells have a nucleus. They form part of the body's defence system against microorganisms.

Platelets are small fragments of cells. They have no nucleus. Platelets help blood to clot at the site of a wound.

B3.2.3 Transport Systems in Plants

Flowering plants have separate transport systems:

- Xylem tissue transports water and mineral ions from the roots to the stem and leaves

- The movement of water from the roots through the xylem and out of the leaves is called the transpiration stream

- Phloem tissue carries dissolved sugars from the leaves to the rest of the plant, including the growing regions and the storage organs.

B3.3 Homeostasis

Humans need to remove waste products from their bodies to keep their internal environment relatively constant.

People whose kidneys do not function properly may die because toxic substances accumulate in their blood. Their lives can be saved by using dialysis machines or having a healthy kidney transplanted.

Water and ion content,
body temperature and blood glucose levels must be kept within very narrow ranges.

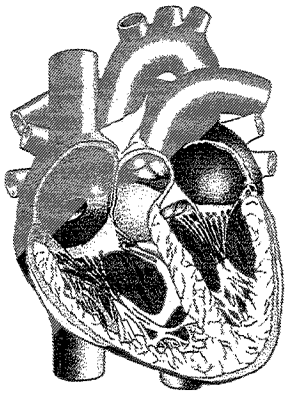
Candidates should use their skills, knowledge and understanding to:

- Evaluate the advantages and disadvantages of treating kidney failure by dialysis or kidney transplant

- Evaluate modern methods of treating diabetes.

B3 REVISION – CHAPTER 2 – TRANSPORTING MATERIALS

Label the structures of the heart



Describe how the structure of each blood vessel helps it carry out its function:

Artery:

Vein:

Capillary

State the parts that make up blood:

What substances are transported by the blood:

Describe what artificial blood is and why it is used instead of real blood:

Describe what an artificial heart is and why it is used instead of a real heart:

Explain the function of:
Red blood cells:

White blood cells:

Transport in plants

KEY WORDS:			
Transport system	Oxygenated	Pulmonary artery	Urine
Blood circulation system	Arteries	Aorta	Biconcave discs
Blood vessels	Veins	Valves	Pigment
Heart	Coronary arteries	Stents	Haemoglobin
Blood	Atria	Plasma	Oxyhaemoglobin
Double circulation	Vena cava	Red blood cells	Transfusion
	Deoxygenated	White blood cells	Donors
	Pulmonary vein	Plasma	Phloem
	Ventricles	Urea	Xylem

ASSESSMENT:

Topic: B3 3 Keeping internal conditions constant

Name:

Date	Specification Content	☺	😐	☹	Comments
B3.3 Homeostasis					
	Humans need to remove waste products from their bodies to keep their internal environment relatively constant. People whose kidneys do not function properly may die because toxic substances accumulate in their blood. Their lives can be saved by using dialysis machines or having a healthy kidney transplanted. Water and ion content, body temperature and blood glucose levels must be kept within very narrow ranges. **You should use your skills, knowledge and understanding to:** • Evaluate the advantages and disadvantages of treating kidney failure by dialysis or kidney transplant. • Evaluate modern methods of treating diabetes.				
B3.3.1 Removal of waste and water control					
	a) Waste products that have to be removed from the body include: • Carbon dioxide, produced by respiration and removed via the lungs when we breathe out • Urea, produced in the liver by the breakdown of amino acids and removed by the kidneys in the urine, which is temporarily stored in the bladder.				
	b) If the water or ion content of the body is wrong, too much water may move into or out of the cells and damage them. Water and ions enter the body when we eat and drink.				
	c) A healthy kidney produces urine by: • First filtering the blood. • Reabsorbing all the sugar. • Reabsorbing the dissolved ions needed by the body. • Reabsorbing as much water as the body needs. • Releasing urea, excess ions and water as urine.				
	d) People who suffer from kidney failure may be treated either by using a kidney dialysis machine or by having a healthy kidney transplanted.				

Date	Specification Content	☺	😐	☹	Comments
	e) Treatment by dialysis restores the concentrations of dissolved substances in the blood to normal levels and has to be carried out at regular intervals.				
	f) In a dialysis machine a person's blood flows between partially permeable membranes. The dialysis fluid contains the same concentration of useful substances as the blood. This ensures that glucose and useful mineral ions are not lost. Urea passes out from the blood into the dialysis fluid.				
	g) In kidney transplants a diseased kidney is replaced with a healthy one from a donor. However, the donor kidney may be rejected by the immune system unless precautions are taken.				
	h) Antigens are proteins on the surface of cells. The recipient's antibodies may attack the antigens on the donor organ as they do not recognise them as part of the recipient's body.				
	i) To prevent rejection of the transplanted kidney: • A donor kidney with a 'tissue-type' similar to that of the recipient is used. • The recipient is treated with drugs that suppress the immune system.				
B3.3.2 Temperature control					
	a) Sweating helps to cool the body. More water is lost when it is hot, and more water has to be taken as drink or in food to balance this loss.				
	b) Body temperature is monitored and controlled by the thermoregulatory centre in the brain. This centre has receptors sensitive to the temperature of the blood flowing through the brain.				
	c) Also temperature receptors in the skin send impulses to the thermoregulatory centre, giving information about skin temperature.				
	d) If the core body temperature is too high (HT only): • *Blood vessels supplying the skin capillaries dilate so that more blood flows through the capillaries and more heat is lost. (HT only)* • *Sweat glands release more sweat which cools the body as it evaporates. (HT only)*				

Date	Specification Content	☺	😐	☹	Comments
	e) *If the core body temperature is too low (HT only):* • *Blood vessels supplying the skin capillaries constrict to reduce the flow of blood through the capillaries. (HT only)* • *Muscles may 'shiver' – their contraction needs respiration, which releases some energy to warm the body. (HT only)*				
B3.3.3 Sugar control					
	a) The blood glucose concentration of the body is monitored and controlled by the pancreas. The pancreas produces the hormone insulin, which allows the glucose to move from the blood into the cells.				
	b) *A second hormone, glucagon, is produced in the pancreas when blood glucose levels fall. This causes glycogen to be converted into glucose and be released into the blood. (HT only)*				
	c) Type 1 diabetes is a disease in which a person's blood glucose concentration may rise to a high level because the pancreas does not produce enough of the hormone insulin.				
	d) Type 1 diabetes may be controlled by careful attention to diet, exercise, and by injecting insulin.				

B3.3.1 Removal of Waste and Water Control

Waste products that have to be removed from the body include:

Carbon dioxide, produced by respiration and removed via the lungs when we breathe out

Urea, produced in the liver by the breakdown of amino acids and removed by the kidneys in the

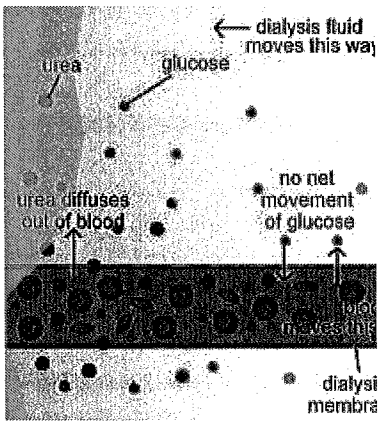
Urine, which is temporarily stored in the bladder

If the water or ion content of the body is wrong, too much water may move into or out of the cells and damage them.
Water and ions enter the body when we eat and drink.

A healthy kidney produces urine by:

- First filtering the blood
- Reabsorbing all the sugar
- Reabsorbing the dissolved ions needed by the body
- Reabsorbing as much water as the body needs
- Releasing urea, excess ions and water as urine.

People who suffer from kidney failure may be treated either by using a kidney dialysis machine or by having a healthy kidney transplanted.



Treatment by dialysis restores the concentrations of dissolved substances in the blood to normal levels and has to be carried out at regular intervals.

In a dialysis machine a person's blood flows between partially permeable membranes.

The dialysis fluid contains the same concentration of useful substances as the blood.
This ensures that glucose and useful mineral ions are not lost.
Urea passes out from the blood into the dialysis fluid.

In kidney transplants a diseased kidney is replaced with a healthy one from a donor. However, the donor kidney may be rejected by the immune system unless precautions are taken.

Antigens are proteins on the surface of cells. The recipient's antibodies may attack the antigens on the donor organ as they do not recognise them as part of the recipient's body.

To prevent rejection of the transplanted kidney:

- A donor kidney with a 'tissue-type' similar to that of the recipient is used

- The recipient is treated with drugs that suppress the immune system.

B3.3.2 Temperature Control

Sweating helps to cool the body. More water is lost when it is hot, and more water has to be taken as drink or in food to balance this loss.

Body temperature is monitored and controlled by the thermoregulatory centre in the brain. This centre has receptors sensitive to the temperature of the blood flowing through the brain.

Also temperature receptors in the skin send impulses to the thermoregulatory centre, giving information about skin temperature.

If the core body temperature is too high:

- Blood vessels supplying the skin capillaries dilate so that more blood flows through the capillaries and more heat is lost

- Sweat glands release more sweat which cools the body as it evaporates.

If the core body temperature is too low:

- Blood vessels supplying the skin capillaries constrict to reduce the flow of blood through the capillaries

- Muscles may 'shiver' – their contraction needs respiration, which releases some energy to warm the body.

B.3.3.3 Sugar Control

The blood glucose concentration of the body is monitored and controlled by the pancreas.

The pancreas produces the hormone insulin, which allows the glucose to move from the blood into the cells.

A second hormone, glucagon, is produced in the pancreas when blood glucose levels fall.

This causes glycogen to be converted into glucose and be released into the blood.

Type 1 diabetes is a disease in which a person's blood glucose concentration may rise to a high level because the pancreas does not produce enough of the hormone insulin.

Type 1 diabetes may be controlled by careful attention to diet, exercise, and by injecting insulin.

B.3.4 Humans and their Environment

Humans often upset the balance of different populations in natural ecosystems, or change the environment so that some species find it difficult to survive.

With so many people in the world, there is a serious danger of causing permanent damage not just to the local environments but also to the global environment unless our overall effect is managed carefully.

Humans rely on ecosystems for food, water and shelter.

Candidates should use their skills, knowledge and understanding to:

- Analyse and interpret scientific data concerning environmental issues

- Evaluate methods used to collect environmental data and consider their validity and reliability as evidence for environmental change

- Evaluate the methods being used to feed and provide water to an increasing human population, both in terms of short term and long term effects

B3 REVISION – CHAPTER 3 – KEEPING INTERNAL CONDITIONS CONSTANT

Ions and water loss:

Explain the function of the kidneys:

Explain how the kidneys work:

Explain what dialysis is and why it is needed:

Explain kidney transplants and the risk of rejection:

Thermoregulation:

Describe how the body reacts when it is cold:

Describe how the body reacts when it is hot:

Draw the thermoregulation feedback loop:

Blood glucose:

Describe how insulin controls blood sugar levels in the body:

Draw the feedback loop of blood glucose control:

Explain what diabetes is and the different types people can have:

State the internal conditions that the body needs to maintain:

KEY WORDS:

Liver
Bladder
Selective reabsorption
Urobilins
Dialysis
Kidney transplant
Dialysis machine
Recipient
Immune response
Immunosuppressant drugs
Xenotransplantation
Core body
temperature
Thermoregulatory centre
Hypothermia
Insulin
Type 1 diabetes
Glucagon

ASSESSMENT:

Topic: B3 4 How humans can affect the planet Name:

Date	Specification Content	☺	😐	☹	Comments
B3.4 Humans and their environment					
	Humans often upset the balance of different populations in natural ecosystems, or change the environment so that some species find it difficult to survive. With so many people in the world, there is a serious danger of causing permanent damage not just to the local environments but also to the global environment unless our overall effect is managed carefully. Humans rely on ecosystems for food, water and shelter. **You should use your skills, knowledge and understanding to:** • Analyse and interpret scientific data concerning environmental issues. • Evaluate methods used to collect environmental data and consider their validity and reliability as evidence for environmental change. • Evaluate the methods being used to feed and provide water to an increasing human population, both in terms of short term and long term effects. • Evaluate the use of biogas generators. You should have considered a number of biogas generator designs ranging from third-world generators supplying a single family to commercial generators. You should understand how the output from a biogas generator might be affected by climatic conditions. • Evaluate the positive and negative effects of managing food production and distribution, and be able to recognise that practical solutions for human needs may require compromise between competing priorities. You should consider: o The differences in efficiency between producing food from animals and plants. o The pros and cons of factory farming of animals. o The implications of 'food miles'.				
B3.4.1 Waste from human activity					
	a) Rapid growth in the human population and an increase in the standard of living means that increasingly more waste is produced. Unless waste is properly handled, more pollution will be caused.				

Topic: B3 4 How humans can affect the planet **Name:**

Date	Specification Content	☺	😐	☹	Comments
	b) Waste may pollute: • Water, with sewage, fertiliser or toxic chemicals. • Air, with smoke and gases such as sulfur dioxide, which contributes to acid rain. • Land, with toxic chemicals such as pesticides and herbicides, which may be washed from the land into waterways.				
	c) Humans reduce the amount of land available for other animals and plants by building, quarrying, farming and dumping waste.				
B3.4.2 Deforestation and the destruction of areas of peat					
	a) Large-scale deforestation in tropical areas, for timber and to provide land for agriculture, has: • Increased the release of carbon dioxide into the atmosphere (because of burning and the activities of microorganisms). • Reduced the rate at which carbon dioxide is removed from the atmosphere and 'locked up' for many years as wood.				
	b) Deforestation leads to reduction in biodiversity.				
	c) Deforestation has occurred so that: • Crops can be grown from which biofuels, based on ethanol, can be produced • There can be increases in cattle and in rice fields to provide more food. These organisms produce methane and this has led to increases in methane in the atmosphere.				
	d) The destruction of peat bogs and other areas of peat releases carbon dioxide into the atmosphere. You should understand why 'peat free' composts are of increasing importance.				

Topic: B3 4 How humans can affect the planet **Name:**

Date	Specification Content	☺	😐	☹	Comments
B3.4.3 Biofuels					
	a) Levels of carbon dioxide and methane in the atmosphere are increasing and contribute to 'global warming'. An increase in the Earth's temperature of only a few degrees Celsius: • May cause big changes in the Earth's climate. • May cause a rise in sea level. • May reduce biodiversity. • May cause changes in migration patterns, e.g. in birds. • May result in changes in the distribution of species.				
	b) Carbon dioxide can be sequestered in oceans, lakes and ponds and this is an important factor in removing carbon dioxide from the atmosphere.				
	c) Biofuels can be made from natural products by fermentation. Biogas, mainly methane, can be produced by anaerobic fermentation of a wide range of plant products or waste material containing carbohydrates.				
B3.4.4 Food production					
	a) At each stage in a food chain, less material and less energy are contained in the biomass of the organisms. This means that the efficiency of food production can be improved by reducing the number of stages in food chains.				
	b) The efficiency of food production can also be improved by restricting energy loss from food animals by limiting their movement and by controlling the temperature of their surroundings.				
	c) Fish stocks in the oceans are declining. It is important to maintain fish stocks at a level where breeding continues or certain species may disappear altogether in some areas. Net size and fishing quotas play an important role in conservation of fish stocks. This is an example of sustainable food production.				
	d) The fungus *Fusarium* is useful for producing mycoprotein, a protein-rich food suitable for vegetarians. The fungus is grown on glucose syrup, in aerobic conditions, and the biomass is harvested and purified.				

- Evaluate the use of biogas generators

- Evaluate the positive and negative effects of managing food production and distribution, and be able to recognise that practical solutions for human needs may require compromise between competing priorities.

B3.4.1 Waste from Human Activity

Rapid growth in the human population and an increase in the standard of living means that increasingly more waste is produced.

Unless waste is properly handled, more pollution will be caused.

Waste may pollute:

- Water, with sewage, fertiliser or toxic chemicals

- Air, with smoke and gases such as sulfur dioxide, which contributes to acid rain

- Land, with toxic chemicals such as pesticides and herbicides, which may be washed from the land into waterways.

Humans reduce the amount of land available for other animals and plants by building, quarrying, farming and dumping waste.

B3.4.2 Deforestation and the Destruction of Areas of Peat

Large-scale deforestation in tropical areas, for timber and to provide land for agriculture, has:

- Increased the release of carbon dioxide into the atmosphere (because of burning and the activities of microorganisms)

- Reduced the rate at which carbon dioxide is removed from the atmosphere and 'locked up' for many years as wood.

Deforestation leads to reduction in biodiversity.

Deforestation has occurred so that:

- Crops can be grown from which biofuels, based on ethanol, can be produced

- There can be increases in cattle and in rice fields to provide more food. These organisms produce methane and this has led to increases in methane in the atmosphere.

The destruction of peat bogs and other areas of peat releases carbon dioxide into the atmosphere.

B3.4.3 Biofuels

Levels of carbon dioxide and methane in the atmosphere are increasing and contribute to 'global warming'. An increase in the Earth's temperature of only a few degrees Celsius:

- May cause big changes in the Earth's climate
- May cause a rise in sea level
- May reduce biodiversity
- May cause changes in migration patterns, eg in birds
- May result in changes in the distribution of species.

Carbon dioxide can be sequestered in oceans, lakes and ponds and this is an important factor in removing carbon dioxide from the atmosphere.

Biofuels can be made from natural products by fermentation. Biogas, mainly methane, can be produced by anaerobic fermentation of a wide range of plant products or waste material containing carbohydrates.

B3.4.5 Food Production

At each stage in a food chain, less material and less energy are contained in the biomass of the organisms.

This means that the efficiency of food production can be improved by reducing the number of stages in food chains.

The efficiency of food production can also be improved by restricting energy loss from food animals by limiting their movement and by controlling the temperature of their surroundings.

Fish stocks in the oceans are declining. It is important to maintain fish stocks at a level where breeding continues or certain species may disappear altogether in some areas.
Net size and fishing quotas play an important role in conservation of fish stocks.

The fungus Fusarium is useful for producing mycoprotein, a protein-rich food suitable for vegetarians.

The fungus is grown on glucose syrup, in aerobic conditions, and the biomass is harvested and purified.

B3 REVISION - CHAPTER 4 - HOW HUMANS CAN AFFECT THE ENVIRONMENT

Describe human population growth:

Describe how acid rain is formed and the effects it has:

Explain what deforestation is and the effects is has on biodiversity:

Describe some of the ways humans pollute the land:

Describe how increasing agricultural production effects the carbon dioxide levels in the atmosphere:

Explain what causes global warming and its effect:

Describe some of the ways humans pollute the water:

Describe how food production can be made sustainable:

What are biofuels:

What are the advantages and disadvantages of using them:

KEY WORDS:

Non-renewable	Biodiversity	Distillation
Industrial waste	Global warming	Carbon neutral
Sewage	Greenhouse gases	Exothermic
Ecology	Greenhouse effect	Sustainable food production
Eutrophication	Biofuels	Mycoprotein
Acid Rain	Biogas	Fermenters
Deforestation		

ASSESSMENT:

Q1. In fish and chip shops, potatoes are cut into chips several hours before the chips are cooked.

The amount of water in the chips must be kept constant during this time.

To keep the water in the chips constant, the chips are kept in salt solution.

A student investigated the effect of different concentrations of salt solution on the mass of five chips.

- He weighed each one of the five chips.
- He placed each chip into a different concentration of salt solution.
- After one hour he removed the chips from the salt solutions and then reweighed the chips.

	Concentration of salt solution				
	0 M	**0.5 M**	**1 M**	**2 M**	**3 M**
Mass of chip at start, in grams	2.6	2.8	2.8	2.5	2.6
Mass of chip after one hour, in grams	2.7	2.8	2.7	2.3	2.1

(a) (i) In which concentration of salt solution did the chip gain mass? .....

(1)

(ii) Explain why the chip gained mass in this solution.

.....

.....

.....

.....

.....

(2)

(b) In which concentration of salt solution should the chips be kept in the shop?

Give the reason for your answer.

.....

.....

.....

.....

.....

(2)
(Total 5 marks)

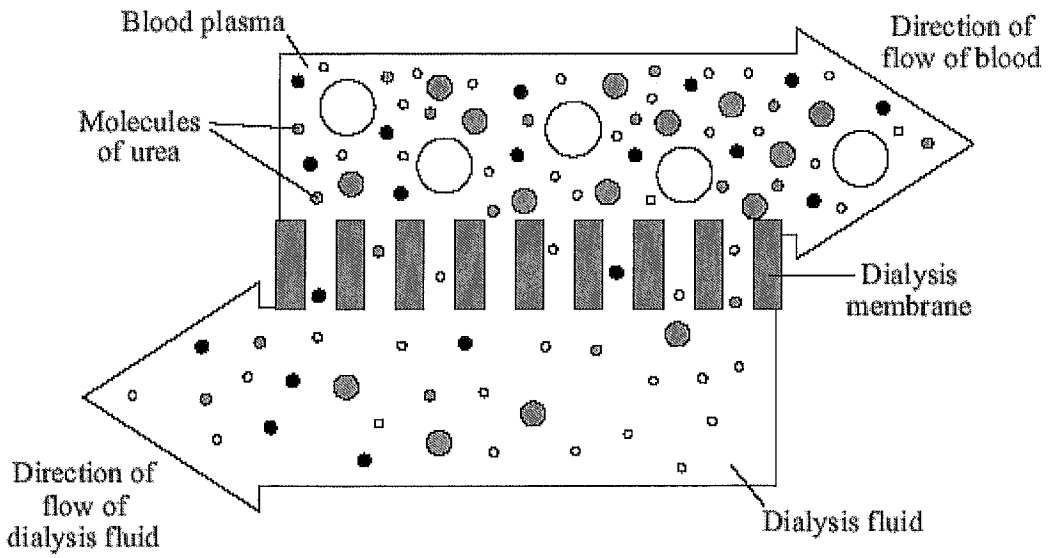
Q2. (a) Which **two** of the following substances are found in the urine of a healthy person?

Tick (✓) **two** boxes.

Glucose	☐
Mineral ions	☐
Proteins	☐
Water	☐

(2)

(b) A person with kidney disease can be treated by dialysis.
The diagram shows how dialysis works.
The circles represent molecules of different substances.



Draw a ring around the correct word or phrase to complete each sentence.

(i) During dialysis, urea moves out of the

blood cells
blood plasma
dialysis fluid

.

(1)

(ii) During dialysis, urea moves into the

blood cells
blood plasma
dialysis fluid

.

(1)

(iii) Urea moves by the process of

diffusion
digestion
transpiration

.

(1)

(iv) To allow the movement of urea, the dialysis membrane is

impermeable
partially permeable
thick

.

(1)

(v) The urea can pass through the membrane because

the urea molecules are

large
round
small

.

(1)

(c) For most patients a kidney transplant is better than continued dialysis treatment.

Tick (✓) **one** box to complete the sentence.

One major problem with a kidney transplant is that

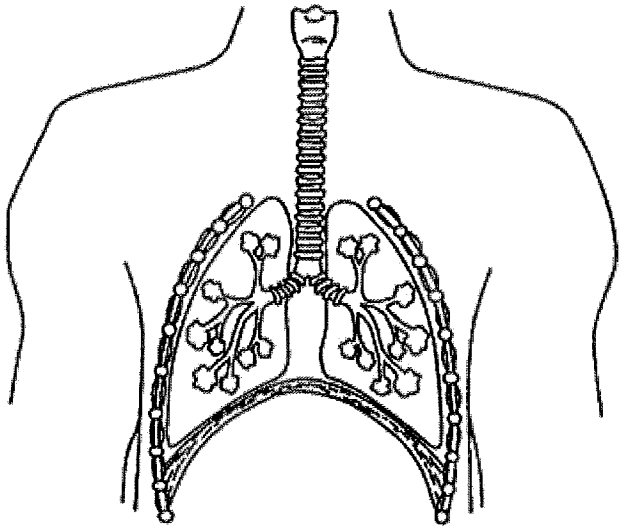
drug treatment is needed to suppress the immune system. ☐

hospital visits are needed three times a week. ☐

yearly costs are higher than for dialysis. ☐

(1)
(Total 8 marks)

Q3. The diagram shows the human breathing system.



(a) Place on the diagram:

(i) a letter **X** where oxygen enters the blood;

(1)

(ii) an arrow showing the direction the diaphragm moves when we breathe in.

(1)

(b) List the following structures in the order the air passes through them when we breathe in.

alveoli **bronchi** **bronchioles** **trachea**

1 .....

2 .....

3 .....

4 .....

(1)

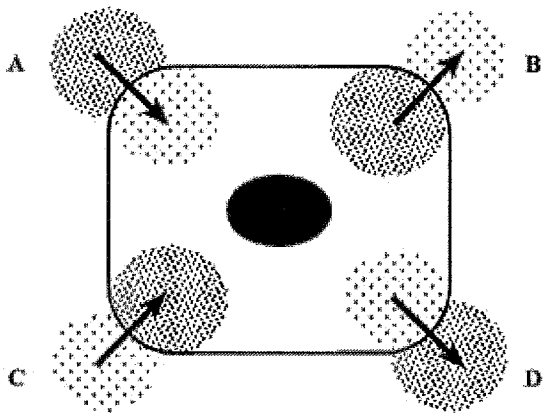
(c) By what process does oxygen enter the blood? Draw a ring around your answer.

diffusion **digestion** **osmosis** **respiration**

(1)

(Total 4 marks)

Q4. (a) The diagram shows four ways in which molecules may move into and out of a cell. The dots show the concentration of molecules.



The cell is respiring aerobically.
Which arrow, **A**, **B**, **C** or **D**, represents:

(i) movement of oxygen molecules; .....

(ii) movement of carbon dioxide molecules? .....

(2)

(b) Name the process by which these gases move into and out of the cell.

.....

(1)

(c) Which arrow, **A**, **B**, **C** or **D**, represents the active uptake of sugar molecules by the cell?

.....

Explain the reason for your answer.

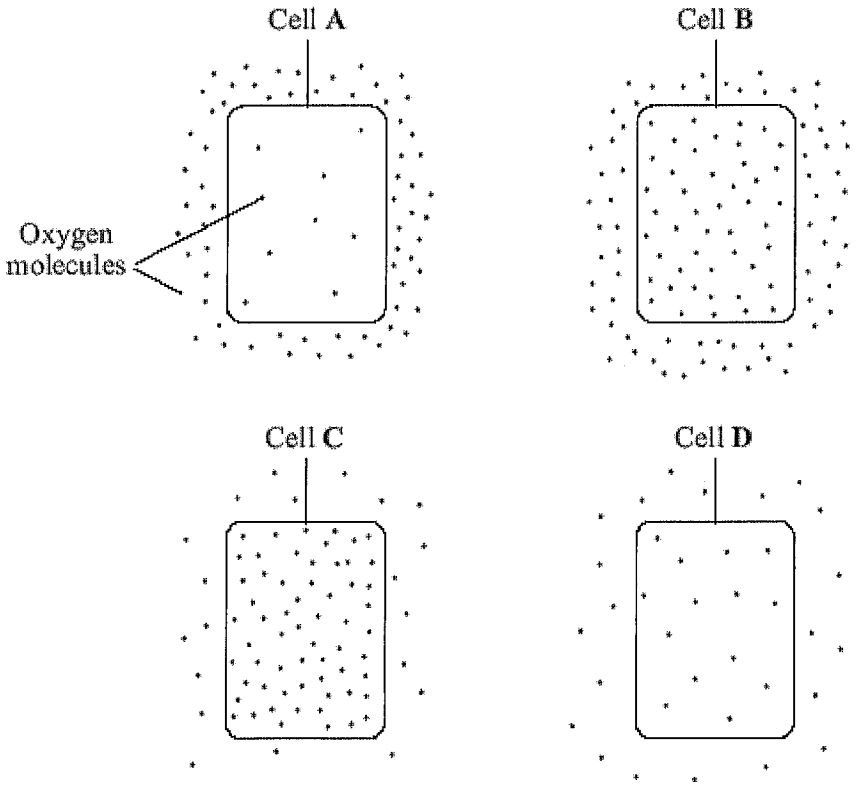
.....

.....

.....

(2)
(Total 5 marks)

Q5. (a) The diagrams show cells containing and surrounded by oxygen molecules. Oxygen can move into cells or out of cells.



Into which cell, **A**, **B**, **C** or **D**, will oxygen move the fastest?

Write your answer, **A**, **B**, **C** or **D**, in the box. ☐

(1)

(b) Draw a ring around the correct word to complete each sentence.

(i) Oxygen is taken into cells by the process of

diffusion
osmosis
respiration

.

(1)

(ii) Cells need oxygen for [breathing / photosynthesis / respiration] .

(1)

(iii) The parts of cells that use up the most oxygen are the [membranes / mitochondria / nuclei] .

(1)

(iv) Some cells produce oxygen in the process of [diffusion / photosynthesis / respiration] .

(1)
(Total 5 marks)

Q6. (a) Explain, as fully as you can, why respiration has to take place more rapidly during exercise.

.....

.....

.....

(2)

(b) During exercise the process of respiration produces excess heat. Explain how the body prevents this heat from causing a rise in the core (deep) body temperature.

.....

.....

.....

.....

.....

.....

.....

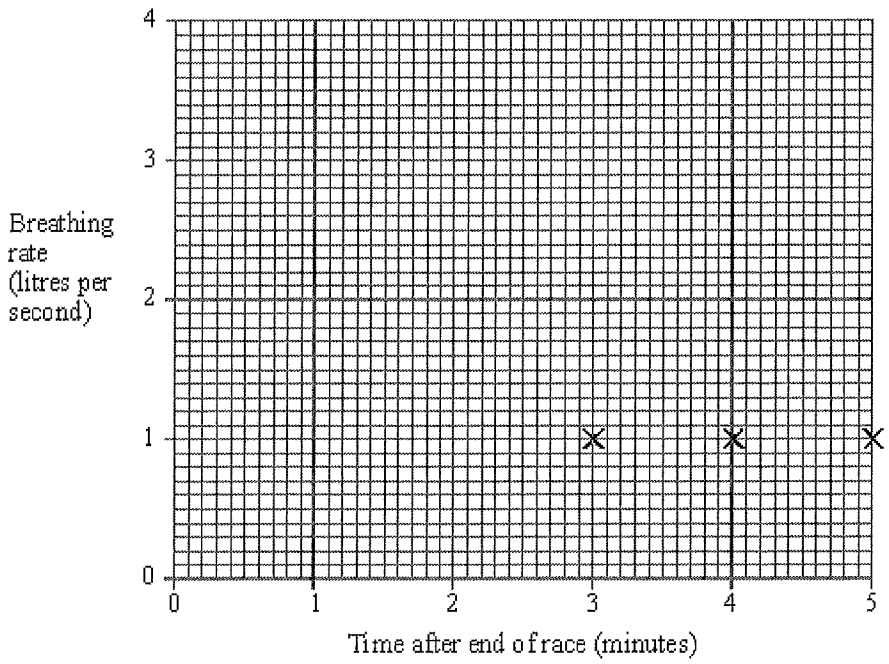
.....

(4)
(Total 6 marks)

Q7. (a) (i) The table shows an athlete's breathing rate after the end of a race.

The results can be put onto a graph.
Three of the points are already plotted.
Plot the other points shown in the table.
Then draw the graph.

Time after end of race (minutes)	Breathing rate (litres per second)
0	4
1	2
2	1
3	1
4	1
5	1



(4)

(ii) What is the athlete's breathing rate ½ (half) a minute after the end of the race?

.....

(2)

(b) One of the reasons for breathing is to get rid of carbon dioxide from your body.
Choose words from the list to complete the sentences below about how your body does this.

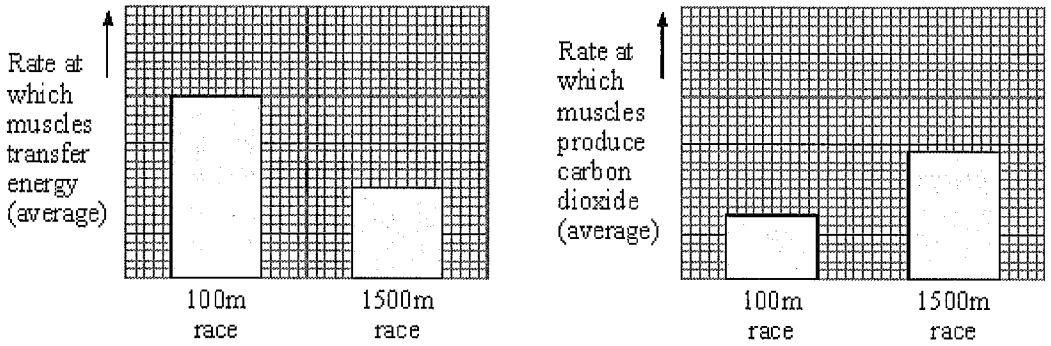
blood **heart** **kidneys** **lungs** **urine**

Carbon dioxide gets out of your body from your .....

The carbon dioxide is carried to this part of your body by your .....

(2)

(c) The bar charts show what happens in an athlete's muscles when running in two races of different distances.



(i) Compare what happens in the athlete's muscles when running in the two races.

.....

.....

.....

.....

(3)

(ii) Use the information in the box to explain your answer to (i).

aerobic respiration	glucose + oxygen ------>	carbon dioxide + water
anaerobic respiration	glucose ------>	lactic acid

.....

.....

(2)
(Total 13 marks)

Q8. (a) (i) Name the red pigment found in red blood cells.

.....

(1)

(ii) Describe, in detail, the function of this red pigment.

.....

.....

.....

.....

(2)

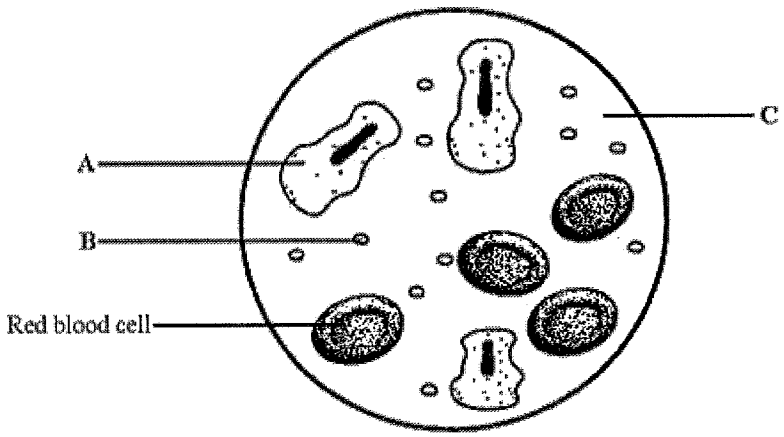
(b) Describe **one** other way in which the structure of a red blood cell is different from the structure of a white blood cell.

.....

.....

(1)
(Total 4 marks)

Q9. The diagram shows four parts of blood.



(a) Complete the table to give the name and function of the parts labelled **A**, **B** and **C**.

Letter	Name	Function
A	.....	.....
B	.....	.....
C	.....	.....

(6)

(b) Red blood cells contain haemoglobin. Explain how this enables red blood cells to pick up oxygen from the alveoli and release it to cells in other parts of the body.

.....

.....

.....

.....

.....

.....

.....

(4)
(Total 10 marks)

Q10. There are many ways in which we can help the environment.

List A gives four methods of helping the environment.

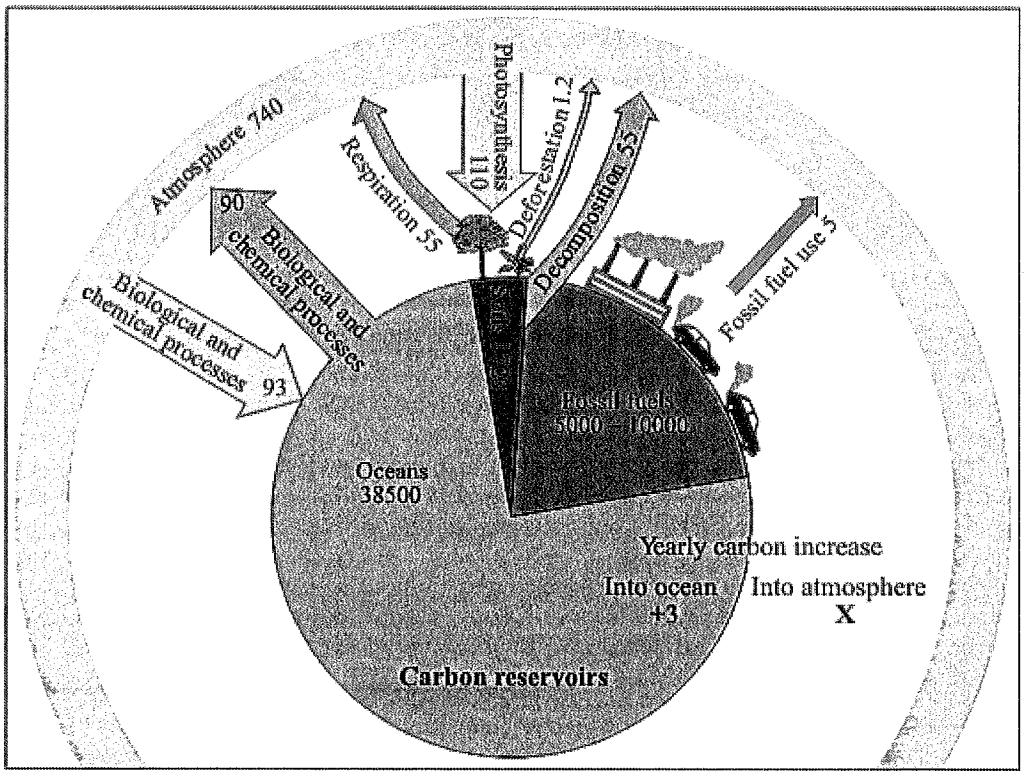
List B gives the impact of the methods on the environment.

Draw **one** line from each method in **List A** to the impact on the environment in **List B**.

List A **Method**	**List B** **Impact on the environment**
	fewer forests are cut down
increasing the amount of metal recycled	
	less methane is added to the atmosphere
using fewer pesticides	
	less pollution of rivers flowing through farmland
reducing the number of cattle raised for food	
	fewer quarries are dug to provide raw materials
increasing the amount of paper recycled	
	no energy is wasted

(Total 4 marks)

Q11. The diagram shows the mass of carbon exchanged between carbon reservoirs and the atmosphere. The pie chart in the diagram shows the mass of carbon in three reservoirs: oceans, soils and fossil fuels. The figures are in billions of tonnes of carbon per year.



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(a) Calculate **X** (the yearly carbon increase into the atmosphere).

Show all your working.

.....

.....

.....

.....

X = ... billion tonnes of carbon

(2)

(b) Give **one** reason why deforestation increases the carbon dioxide concentration of the atmosphere.

.....

.....

(1)

(Total 3 marks)

Q12. In tropical areas of the world, forests are being cut down at the rate of 150 hectares every minute of every day.

(a) Give **two** reasons why forests in tropical areas are being cut down at a high rate.

1 .....

.....

2 .....

.....

(2)

(b) Explain how this deforestation is affecting the composition of the atmosphere.

.....

.....

.....

.....

.....

.....

(5)

(Total 7 marks)

M1. (a) (i) 0 M

1

(ii) water entered cells by osmosis

1

because the concentration of water outside cells was higher than inside the cells

1

(b) 0.5 M

1

because the chip did not change mass in this solution

1

[5]

M2. (a) mineral ions

1

water

*each extra box ticked cancels **1** mark*

1

(b) (i) blood plasma

1

(ii) dialysis fluid

1

(iii) diffusion

1

(iv) partially permeable

1

(v) small

1

(c) drug treatment is needed to suppress the immune system

1

[8]

M3. (a) correctly labelled on diagram

(i) 'X' on an alveolus

centre of X on the alveolus wall or inside the alveolus

***not** if the centre is outside*

1

(ii) arrow pointing downwards

accept anywhere but must point down

1

(b) in sequence

1 trachea

2 bronchi

3 bronchioles

4 alveoli

1

(c) diffusion

accept positive indicator

1

[4]

M4. (a) (i) A

(ii) B

for 1 mark each

2

(b) diffusion

(reject osmosis)
for one mark

1

(c) C
because uptake against a concentration / diffusion gradient
(*reject* osmosis)
(if C not given, then idea of <u>movement</u> essential)

for 1 mark each

2

[5]

M5. (a) A

1

(b) (i) diffusion

1

(ii) respiration

1

(iii) mitochondria

1

(iv) photosynthesis

1

[5]

M6. (a) more energy needed,
for increased muscular activity
for 1 mark each

2

(b) increased sweat production,
evaporation of sweat cools body,
vasodilation OWTTE,
more heat loss (by radiation)
for 1 mark each

4

[6]

M7. (a) (i) points correctly plotted
all correct gains 2 marks
2 correct gains 1 mark

each part of line correctly drawn (i.e. curve + straight line)
for 1 mark each part of line

4

(ii) 3 (or according to plotted graph)
litres per second
for 1 mark each

2

(b) lungs
blood
for 1 mark each

2

(c) (i) *ideas that*

- energy transferred <u>faster</u> in 100m race
- carbon dioxide produced faster during 1500m race / more
- carbon dioxide produced

for 1 mark each

3

correct reference to twice / half as fast in either / both cases

for a further mark

1

(ii)

- respiration during 100m race (mainly) anaerobic
- respiration during 1500m race (mainly) aerobic
- aerobic respiration produced carbon dioxide
- anaerobic respiration produced / lactic acid

for 1 mark each

1

[13]

M8. (a) (i) haemoglobin / oxyhaemoglobin

must be phonetic

1

(ii) carries oxygen **or** forms oxyhaemoglobin

Ignore references to CO_2 / iron

cancel if extras like food / glucose

1

from lungs to tissues

1

(b) no nucleus **or** biconcave disc (described)

ignore references to size

ignore vague references to being 'round' / 'donut' shaped etc.

1

[4]

M9. (a) **A** white blood cell/leucocytes / phagocytes / lymphocytes

SEPARATE MARKING POINTS

1

make/contain antibodies/antitoxins
or
destroy/engulf/kill bacteria

*do **not** accept fight infection*
*do **not** accept fight disease*

1

B platelets

1

help clot the blood

*do **not** accept stick together*
*do **not** accept from scabs*

1

C plasma

1

carries/transports all the cells/digested food/waste products/hormones/carbon dioxide/platelets/dissolved minerals/antibodies/antitoxins/water

allows blood to flow

1

(b) any four from:

(oxygen) diffuses

1

has affinity for/combines with oxygen / forms oxy-haemoglobin

*do **not** accept absorbed*

1

in areas of high oxygen concentration

n.b. 'pick up oxygen' is stem of question

1

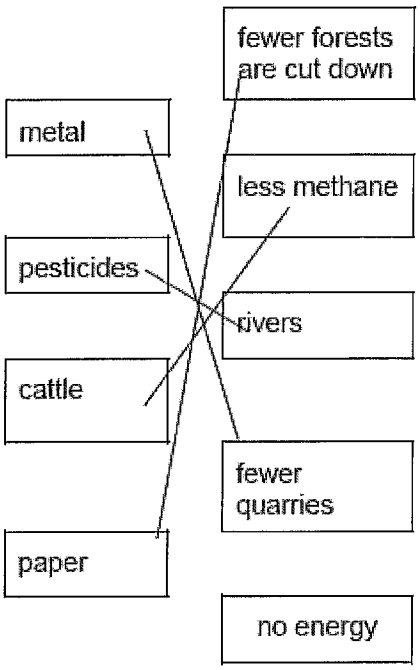
in conditions of low oxygen concentration it breaks down and releases the oxygen

low oxygen concentration can be implied e.g. active muscles

1

[10]

M10.



*all four correct = **4** marks*
*three correct = **3** marks*
*two correct = **2** marks*
*one correct = **1** mark*
extra line from a statement cancels the mark

[4]

M11. (a) 3.2

*award **both** marks for correct answer irrespective of working*
if answer incorrect
(55 + 55 + 1.2 +5) – (110 + 3)
or
116.2 – 113
or
*(55 + 55 + 1.2 + 5 + 90) – (110 + 93) gains **1** mark*

2

(b) any **one** from:

- less carbon dioxide taken in by trees
  ignore carbon dioxide released by trees ***or*** *trees store carbon dioxide*
- less photosynthesis
- burning trees releases carbon dioxide
- decay releases carbon dioxide

1

[3]

M12. (a) e.g.
timber
agriculture
roads / urban development / buildings
any two for 1 mark each

2

(b) *ideas that (accept reverse arguments)*
increased carbon dioxide content since less during photosynthesis
and locked-up as wood burning increases carbon dioxide content
increased activity of microbes increases carbon dioxide content
oxygen content reduced water vapour content reduced
any five for 1 mark each

5

[7]