

# Science KS4: Blended Learning Booklet

## B3 Moving and changing materials

Name:

Form:


*Aim to complete four lessons each week. Watch the videos and follow the four part lesson plan*

*All video clips are online using the ClassCharts link. Upload all work onto ClassCharts for feedback.*

*The online textbook has all the key information and vocabulary to help you with this unit*

**To log on to the online textbook:**

- <https://connect.collins.co.uk/school/portal.aspx>
- Type in “stewards” and select Stewards Academy
- Login using your date of birth, initial of your surname and your academic year

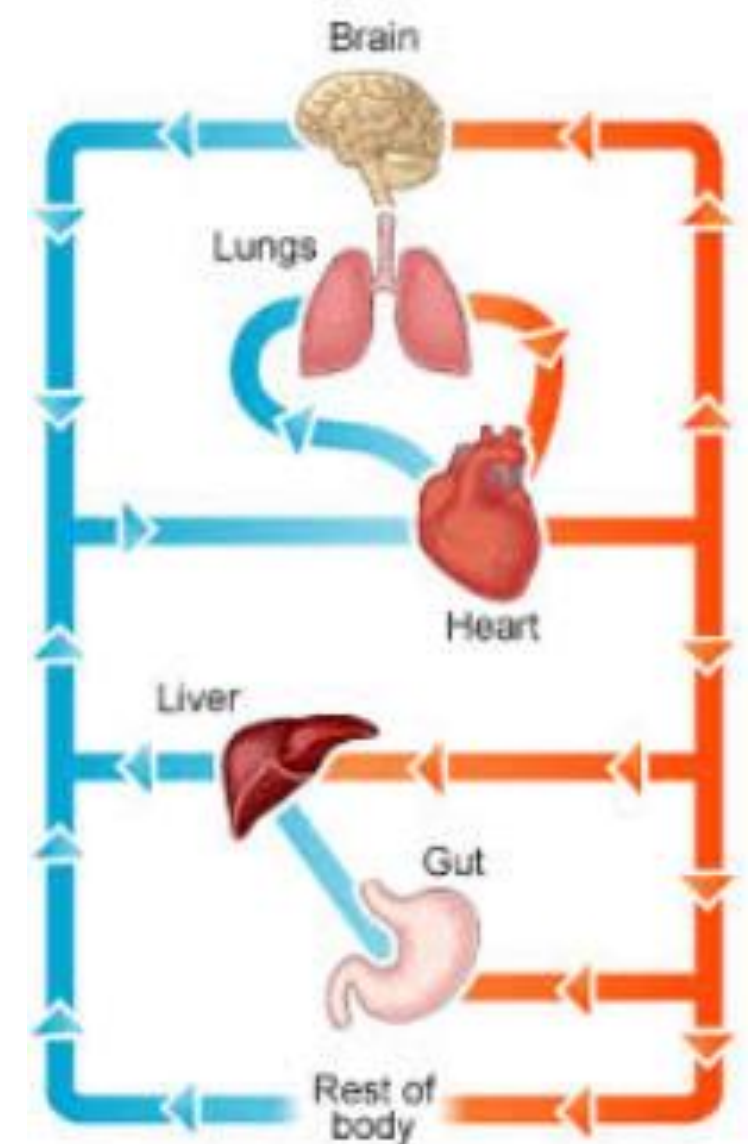
  
**Student**

School name: Stewards Academy - CM18 7NQ(CM18 7NQ) : [Not your school?](#)

Date of birth   First letter of surname

Year group

Login



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SAL

**(T) = Triple scientists only**



# Big Picture – Year 9 Overview Science



End of  
Year  
Exam

Nest  
Year

Particle  
motion in  
gases (T)

Specific  
latent  
heat

Specific  
heat  
capacity

Changing  
state

Density

UNIT  
P3

End of  
Unit  
Test

Volumes and  
concentrations  
(T)

Percentage  
yield (T)

Amounts of  
substance  
(moles)

Apparent  
changes  
in mass

**Matter**



I will be able to explain and apply the law of conservation of mass. I will be able to explain how we measure amounts of substances and how we can use these values to in calculations. I will be able to determine chemical yields (T)

**Chemical  
Quantities**



Osmosis  
and active  
transport

Enzymes  
and  
digestion

Plants and  
minerals

Heart and  
circulatory  
system

Gas  
exchange

End of  
Unit  
Test

UNIT  
C3

Conservation  
of mass

I will be able to calculate the specific heat capacity of water and be able to describe the difference between the specific latent heat of vaporization and the specific latent heat of fusion. I will be able to explain the effect heat energy has on gas particles and how this is related to volume (T).



I will be able to explain the principles behind static electricity (T) and the key concepts in electricity. I will investigate and be able to describe the characteristics of electrical components. I will be able to explain how electricity is used safely in the home

**Electricity**

UNIT  
B3

End of  
Unit  
Test

Electricity in  
the home

Investigating  
resistance

Circuit  
components

Series and  
parallel  
circuits

Static  
electricity  
(T)

UNIT  
P2

End of  
Unit  
Test



I will be able to explain the difference between diffusion and active transport. I will be able to explain why some organisms need organ systems and different organisms move things in different ways. I will be able to explain how enzymes work.



**Chemical Bonds**

I will be able to explain what happens when substances change state and why some substances need a lot of energy for a change of state to occur. I will be able to describe different types of chemical bond and how they give different substances different properties.

Nano  
particles  
(T)

States of  
matter

Bond  
properties

Giant  
covalent  
structures

Chemical  
bond  
formation

Translocation

End of  
Unit  
Test

UNIT  
C2

Chemical  
bond  
formation

**Photosynthesis**



Energy  
transfer  
(T)

Specific  
heat  
capacity

Work  
done &  
Power

Transpiration

I will be able to explain how plants are adapted to survive and get what they need from the environment. I will be able to explain how factors affect photosynthesis. I will be able to describe how water moves through a plant and how other substances diffuse in/out of plant cells

Diffusion

Increasing  
food  
production

Investigating  
photo-  
synthesis

UNIT  
B2

End of  
Unit  
Test

Energy  
Resources

Energy  
transfer  
(T)

Specific  
heat  
capacity

Work  
done &  
Power

**Energy**



I will be learning about the connections between energy and power, and energy and temperature. I will be able to explain how energy is transferred and describe how different energy resources have an impact on the environment

**Atomic  
Structure**

Atoms,  
element  
compounds  
& mixtures

Sub-  
atomic  
structure

The  
periodic  
table

Groups  
1, 9, & 0

Transition  
metals (T)

End of  
Unit  
Test

UNIT  
P1

Energy

I will be able to describe how scientists have developed their understanding cell structure and function. I will be able to explain how a fertilized egg develops into a complex organism. I will be able to explain how organisms get their energy from food. I will be able to explain how microorganisms are grown in the lab and how their growth is affected by disinfectants and antibiotics (T).

**Cell Biology**



UNIT  
B1

UNIT  
C1

End of  
Unit  
Test

Microbes  
and  
antibiotics  
(T)

Respiration

Stem  
cells

Cell division  
and  
differentiation

Structure  
and  
function  
of cells



Year  
9

# ZOOM IN... MY LEARNING JOURNEY:

*Subject: Moving and changing materials*  
*Year: 9 Unit: B3*

## AIMS

Students will learn about the movement of substances in and out of cells. They will investigate osmosis in animal and plant cells as well as active transport. They will then discover why enzymes are so important and investigate the effect of pH on enzyme activity. Students will learn about the role of enzymes in digestion and how the digestive system is adapted to its function. They will then find out more about gas exchange surfaces in plants and animals. Finally, students will learn more about transport in animals and research facts about coronary heart disease

## DEVELOPING COURAGE

- C** How modern medicine has evolved to treat heart disease
- O** Study in detail the movement of substances into and out of cells
- U** Work together to carry out an enzyme practical
- R** Differentiate between osmosis, diffusion and active transport
- A** The similarities and differences in transport between plants and animals
- G** Discussions regarding heart transplant
- E** See how different organ systems work together

## PREVIOUS LEARNING

Pupils will have some knowledge of how molecules move by diffusion. That plants and animals have organ systems to transport substances to where they are needed. That blood is used to transport oxygen around our body and finally that enzymes are important for reactions that occur within our digestive system.

## WHAT WE KNOW/ REMEMBER

- .....
- .....
- .....
- .....
- .....

## UP NEXT

### Health matters (next year)

- Communicable diseases
- Pathogens
- Viral diseases
- Bacterial diseases
- Fungal diseases
- Malaria
- The immune system
- Prescription drugs

## CAREERS

- Cardiologist
- Nutritionist
- Chef
- Gardener



## PERSONAL OBJECTIVES

- .....
- .....
- .....
- .....
- .....
- .....
- .....
- .....
- .....
- .....

## RECOMMENDED READING

1. Journey Through the Digestive System with Max Axiom
2. Super Scientist by Emily Sohn
3. The Circulatory System (Your Body Systems) by Rebecca Pettiford,
4. Your Breathtaking Lungs and Rocking Respiratory System by Paul Mason.

## Connection

Have a look at the topic overview and the B3 zoom in.

Populate what you know and your personal objectives.

## Lesson B3.1 – Explaining water movement

### Activation

#### **LI: Describe how water moves in tissues by osmosis**

1. Make a note of the title and the LI
2. Read pages 88-89
3. <https://www.youtube.com/watch?v=qqe2NhQt8bY>
4. Make a list of the key words – define those you don't know at the end of the lesson
5. Draw and label figure 3.1
6. Draw and label figure 3.3 and 3.4
7. Add the arrows from fig 3.5 to fig 3.1 to show net flow

## Consolidation

Complete and self-assess the relevant past paper question for this topic -  
From the B3 DIP file

## Extension

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

## Demonstration

Attempt questions 1-6.

In 10 mins answer as many questions as you can.

Self-mark the questions you have done making any necessary corrections in blue pen

Challenge yourself to answer as many as you can:

Green questions to GCSE Level 3

Blue questions to GCSE Level 6

Purple questions to GCSE Level 9

# Answers Lesson B3.1 – Explaining water movement

## Connection

N/A

## Demonstration

- 1 Water moves in and out of cells by osmosis: diffusion of water molecules from a dilute solution to a concentrated through a partially permeable membrane
- 2 Boiling potatoes destroys the cell wall and the cells swell as water enters them quickly by osmosis making them softer
- 3 They both occur down a concentration gradient. Dissolved solutes/gases and gases in air diffuse; only water moves by osmosis. Osmosis needs a partially permeable membrane
- 4 Animal cells in a solution less concentrated than in the cell take in water by osmosis, swell and burst. Animal cells in a solution more concentrated than in the cell lose water by osmosis, shrink and shrivel.
- 5 When water enters plant cells by osmosis, it fills the vacuole which pushes against the inelastic cell wall making the cell turgid but preventing it from bursting. If water moves out by osmosis the vacuole shrinks and the cell becomes flaccid, but if too much water leaves the cell it becomes plasmolysed, but it is a reversible process. Plants have a cellulose cell wall, when water enters the cell, it fills the vacuole and makes the cell turgid. Animals don't have a cell wall and their vacuoles are much smaller, so when water enters an animal, the cells swells and may burst (if too much water enters).
- 6 Osmosis is the movement of water from a region of relatively high concentration (of water) to a region of lower water concentration across a partially permeable membrane, thereby attempting to equal out the amount of water on either side of the membrane

## Lesson B3.2 – Investigate the effect of salt and sugar solutions on plant tissue

### Connection

Q1. What is osmosis?

Q2. In osmosis, what direction do the water molecules flow along the concentration gradient?

Q3. What is the risk to animal cells if too much water enters via osmosis?

### Activation

**LI: Carry out an experiment to show how a range of salt solutions affects potato chips**

1. Make a note of the title and the LI
2. Read pages 90-91
3. [https://www.youtube.com/watch?v=oieXYuQm\\_xE](https://www.youtube.com/watch?v=oieXYuQm_xE)
4. Make a list of the key words – define those you don't know at the end of the lesson
5. Carry out the experiment and record results

### Consolidation

Complete and self-assess the relevant past paper question for this topic -  
From the B3 DIP file

### Extension

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

### Demonstration

Attempt questions 1-10.

In 10 mins answer as many questions as you can.

Self-mark the questions you have done making any necessary corrections in blue pen

Challenge yourself to answer as many as you can:

Green questions to GCSE Level 3

Blue questions to GCSE Level 6

Purple questions to GCSE Level 9



**Answers Lesson B3.2 – Investigate the effect of salt and sugar solutions on plant tissue**

**Connection**

**Q1. Osmosis is the diffusion of water through a partially permeable membrane.**

**Q2. From high concentration to low concentration.**

**Q3. They could undergo lysis – swell and burst.**

**Demonstration**

- 1** Concentration inside the cell is higher than the water/concentration outside the cell
- 2** Concentration of salt solution is higher than the concentration inside the cell
- 3** Water will move out of the cell
- 4** Water will flood the cell when it is put in water and will leave the cell when it is put in a salt solution due to the difference in concentrations inside and outside the cell, causing the water to move by osmosis. The stronger the salt solution, the greater the water loss.
- 5** Independent variable – salt concentration.  
Dependent variable – mass of potato cylinders
- 6** So that the excess water was not weighed

**7a**

Change in mass (g)	Percentage change in mass (%)
−1.1	−6.9
−0.9	−4.7
0.8	3.3
1.5	7.2
2.1	8.7
1.4	9.4

- 7b** No.
- 7c** Depends on possible reason for anomaly, best to repeat investigation. If reasons are found for anomaly, can possibly disregard and explain in write up of investigation
- 7d** Because the potato cylinders were not all of the same mass and so it would be difficult to make a meaningful comparison
- 7e** Potato cylinders placed in water and weak salt solutions take up water (and increase in mass). The stronger the salt solution the potatoes are placed the more water they lose.
- 8** The stronger the salt solution, the greater the water loss.
- 9** Proved (upheld, is more correct)
- 10** Water is moving by osmosis from a region of relatively high concentration (the cell) to an area of relatively lesser concentration of water (the stronger salt solutions) across the cell membrane (partially permeable) and so the potato in these stronger solution lost mass



### Connection

Q1. What happens to the potato cells in a low concentration NaCl solution?

Q2. What happens to the potato cells in a high concentration NaCl solution?

Q3. Why was it important to have a hypothesis?



## Lesson B3.3 – Learning about active transport

### Activation

**LI: Explain the importance of active transport and how it is different from osmosis and diffusion**

1. Make a note of the title and the LI
2. Read pages 92-93
3. <https://www.youtube.com/watch?v=eDeCgTRFCbA>
4. Make a list of the key words – define those you don't know at the end of the lesson
5. Copy the table on page 93
6. Draw figure 3.8 and explain what the graph shows



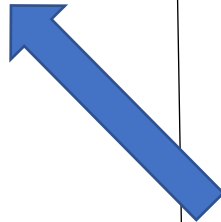
### Consolidation

Complete and self-assess the relevant past paper question for this topic -  
From the B3 DIP file



### Extension

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher



### Demonstration

Attempt questions 1-4.

In 10 mins answer as many questions as you can.

Self-mark the questions you have done making any necessary corrections in blue pen

Challenge yourself to answer as many as you can:

Green questions to GCSE Level 3

Blue questions to GCSE Level 6

Purple questions to GCSE Level 9

# Answers Lesson B3.3 – Learning about active transport

## Connection

**Q1. The solution is more dilute than the potato cell, so water enters the cell via osmosis. This causes the vacuole to fill and the cell to become turgid. The mass increases due to the additional water molecules.**

**Q2. The solution is more concentrated than the potato cell, so water leaves the cell via osmosis. This could cause the cell to become flaccid or plasmolysis. The mass reduces due to the water molecules exiting the cell.**

**Q3. A hypothesis is important in any investigation. It shows that research and planning has gone into the results of the investigation. A hypothesis states what the scientists believe will happen.**

## Demonstration

- 1** Plants absorb minerals by active transport into the root hair cells
- 2** Active transport needs energy and it is against the concentration gradient
- 3** Cells that are adapted for active transport have many mitochondria to supply the energy needed
- 4** It is important that plants select the minerals they need so that they do not suffer from mineral deficiencies and to use the energy they have efficiently
- 5** Molecules to be transported are attached to the transport protein. The transport protein rotates in the cell membrane and then releases the molecule inside the cell. The transport protein rotates back, ready to move another molecule.
- 6** Osmosis and diffusion occur down a concentration gradient and do not need energy but active transport occurs against a concentration gradient and needs energy.  
Diffusion and active transport move dissolved solutes but osmosis moves water.  
Osmosis needs a partially permeable membrane.  
Active transport needs a transport protein

### Connection

Q1. What is the key difference in concentration gradients between active transport and osmosis/diffusion?

Q2. Because of the above, what does active transport require?

Q3. Give an example of active transport in the roots of plants.



## Lesson B3.4 – Investigating the need for transport systems

### Activation

**LI: Explain the importance of and factors affecting exchange surfaces**

1. Make a note of the title and the LI
2. Read pages 94-95
3. <https://www.youtube.com/watch?v=huKUJsqlik2I>
4. Make a list of the key words – define those you don't know at the end of the lesson
5. Copy the equations bullet pointed on page 94



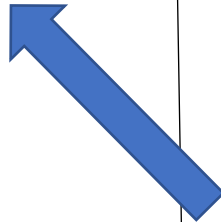
### Consolidation

Complete and self-assess the relevant past paper question for this topic -  
From the B3 DIP file



### Extension

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher



### Demonstration

Attempt questions 1-8.

In 10 mins answer as many questions as you can.

Self-mark the questions you have done making any necessary corrections in blue pen

Challenge yourself to answer as many as you can:

Green questions to GCSE Level 3

Blue questions to GCSE Level 6

Purple questions to GCSE Level 9

**Answers Lesson B3.4 – Investigating the need for transport systems**

**Connection**

- Q1. Active transport works against the concentration gradient – low to high.**
- Q2. Energy from respiration.**
- Q3. Plants absorb nitrate ions through their root hairs from the soil.**

**Demonstration**

- 1** The larger the cell the more chemical activity takes place
- 2** Cells take absorb glucose and oxygen for respiration and produce carbon dioxide and water. Other correct examples include DNA replication, protein synthesis and digestion
- 3** Surface areas: B = 24, C = 54, D = 144; Volumes: B = 16, C = 27, D = 64; SA:V ratios: B =  $24/16 = 1.5$ , C =  $54/27 = 2$ , D =  $144/64 = 2.25$
- 4** Surface areas and volume both increase as the size increases, but surface area increases more than volume
- 5** SA:V decreases as the size increases
- 6** Smaller SA:V make it more difficult to absorb enough of the substances the cell needs to stay alive and to get rid of the waste products made
- 7** Efficient exchange surfaces have a large surface area, thin membranes and a transport system
- 8** In smaller organisms, nutrients, oxygen and waste substances can quickly diffuse in and out. Transport systems are needed in larger organisms so that cells deep inside the organism:
  - get the oxygen and nutrients they need for chemical reactions
  - are able to get rid of the waste products of chemical reactions and any excess heat generated

## Connection

Q1. Why are most cells no more than 1mm in diameter?

Q2. How do larger organisms, with a small surface area to volume ratio, work around it?

Q3. Name 3 useful characteristics of a good exchange surface.



## Lesson B3.5 – Explaining enzymes

### Activation

**LI: Describe what enzymes are and how they work**

1. Make a note of the title and the LI
2. Read pages 96-97
3. <https://www.youtube.com/watch?v=rlH1ym916Fo>
4. Make a list of the key words – define those you don't know at the end of the lesson
5. List 3x bullet points on page 96
6. Draw and label figure 3.11
7. Draw and label figure 3.12



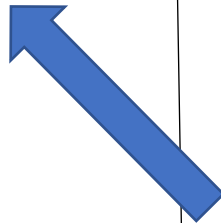
### Consolidation

Complete and self-assess the relevant past paper question for this topic -  
From the B3 DIP file



### Extension

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher



### Demonstration

Attempt questions 1-5.

In 10 mins answer as many questions as you can.

Self-mark the questions you have done making any necessary corrections in blue pen

Challenge yourself to answer as many as you can:

Green questions to GCSE Level 3

Blue questions to GCSE Level 6

Purple questions to GCSE Level 9

# Answers Lesson B3.5 – Explaining enzymes

## Connection

**Q1. If they were bigger it would be difficult for nutrients, oxygen and waste to diffuse in and out.**

**Q2. They use organ systems specialised in exchanging materials.**

**Q3. – A large surface area.**  
**- A thin membrane.**  
**- A method of transporting substances to and from the exchange site.**

## Demonstration

- 1** An enzyme is a chemical that speeds up a reaction without being used up itself
- 2** Enzymes catalyse/speed up the chemical reactions in cells e.g. respiration, protein synthesis and photosynthesis.  
Accept:
  - break down large molecules into smaller ones
  - build large molecules from smaller ones
  - change one molecule into another molecule
- 3** 40°C is the optimum temperature for many enzymes to work at so they can breakdown proteins in stains. At 60°C the enzymes are denatured/ the active site changes shape and cannot catalyse reactions. Do not accept: the enzymes are killed
- 4** Each enzyme has a differently shaped active site that only one particular substrate can fit into, so each enzyme catalyses just one type of reaction.
- 5** Enzymes hold reactants in place so that there is an increase in collision rate in a given time which increases the rate of reaction. Once the reactants start to run out, the amount of product made starts to level off as collisions start to decrease again.

## Lesson B3.6 – Investigating the effect of pH on the rate of reaction of amylase

### Connection

Q1. What is an enzyme?

Q2. What is the active site of an enzyme?

Q3. Name 2 factors that effect the rate of enzyme controlled reactions.

### Activation

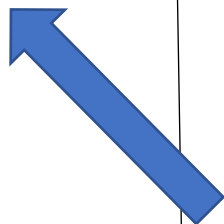
**LI: Accurately and safely complete the practical. Record and interpret your data.**

1. Make a note of the title and the LI
2. Read pages 98-99
3. <https://www.youtube.com/watch?v=8Yqbu56lmXk>
4. Make a list of the key words – define those you don't know at the end of the lesson
5. Copy the table in the pink/purple section.



### Consolidation

Complete and self-assess the relevant past paper question for this topic -  
From the B3 DIP file



### Extension

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

### Demonstration

Attempt questions 1-13.

In 10 mins answer as many questions as you can.

Self-mark the questions you have done making any necessary corrections in blue pen

Challenge yourself to answer as many as you can:

Green questions to GCSE Level 3

Blue questions to GCSE Level 6

Purple questions to GCSE Level 9



**Answers Lesson B3.6 – The effect of pH on the rate of amylase**

**Connection**

**Q1. An enzyme is a biological catalyst. They are used to help speed up reactions.**

**Q2. The active site is the part of the enzyme that attaches to the substrate (reactant). It is a specific shape to fit the substrate.**

**Q3. – pH  
- Temperature**

**Demonstration**

- 1a** 10cm<sup>3</sup> measuring cylinder or a calibrated dropping pipette
- 1b** Glass rod or dropping pipette
- 2** Drops should be done at a consistent rate, each drop equates to about 10 seconds of reaction time
- 3** Care over use of chemicals – iodine (stains irritant); powered amylase is harmful (for making the solution); buffers – maybe an irritant; use of safety goggles; care with heated water
- 4** Original orange colour of iodine
- 5** To catch the point at which all the starch has been ‘digested’/converted ie the end point of the reaction
- 6** To ensure that the concentration he was using were sufficient to see the reaction – it wasn’t going too fast or too slow
- 7** Every 10 seconds (5 is Ok, but errors may occur as this is quite quick to do, 20 seconds isn’t often enough)
- 8** Line graph
- 9a** To make his results more valid
- 9b** pH 9, test 2, 90 s, much lower than tests 1 and 3
- 9c** Think about why it might be anomalous, if due to his poor/inaccurate technique, he could consider ignoring it
- 10** pH5 156.7   pH6 73.3   pH7 43.3   pH8 73.3   pH9 120 (or 135 if Test 2 disregarded)
- 11** Line graph (continuous process), independent variable (pH) on x axis, time on y axis. Axes labelled, including units. Sensible scale used on both axes. Points plotted accurately. Points joined together
- 12** Rate of reaction is 1/time
- 13** Reaction is fastest at pH 7 and slows when the pH is either more or less than this. This is the pH found in the body

### Connection

Q1. What is the function of amylase in our digestive system?

Q2. Why does the experiment take place in a water bath?

Q3. If you find an anomalous result in your data what is generally the best solution?



## Lesson B3.7 – Learning about the digestive system

### Activation

**LI: Identify and locate the organs in the digestive system and describe their functions.**

1. Make a note of the title and the LI
2. Read pages 100-101
3. <https://www.youtube.com/watch?v=4ui4oSHHnzA>
4. Make a list of the key words – define those you don't know at the end of the lesson
5. Draw and label fig 3.16



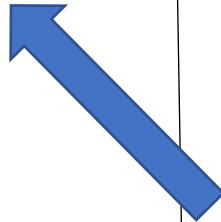
### Consolidation

Complete and self-assess the relevant past paper question for this topic -  
From the B3 DIP file



### Extension

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher



### Demonstration

Attempt questions 1-6.

In 10 mins answer as many questions as you can.

Self-mark the questions you have done making any necessary corrections in blue pen

Challenge yourself to answer as many as you can:

Green questions to GCSE Level 3

Blue questions to GCSE Level 6

Purple questions to GCSE Level 9

# Answers Lesson B3.7 – Learning about the digestive system

## Connection

- Q1. It controls the break down of starch.**
- Q2. To mimic body temperature – the temperature the enzyme is built to work at.**
- Q3. If you think a result is anomalous you should discount it and state why.**

## Demonstration

- 1** Digestion changes insoluble nutrients into soluble products that can be absorbed and transported to all cells
- 2** Absorption is when the soluble products of digestion pass through the intestine wall
- 3** Emulsification is when fats are broken up into smaller pieces of fat resulting in a larger surface area for digestion to occur. Digestion is when the fats are broken down into fatty acids and glycerol
- 4** They are still too large to pass through the capillaries
- 5** Digestion breaks down large insoluble molecules to small soluble molecules. These can then be absorbed into the bloodstream and transported to every cell in the body where they are used for cellular metabolism
- 6** The small intestine is an effective exchange surface because it:
  - is very long to allow time for absorption
  - the villi and microvilli increase the surface area for absorption
  - it has a thin, permeable membrane for easy diffusion
  - it has many blood capillaries to transport products of digestion and maintain the concentration gradient

### Connection

Q1. What is the purpose of the digestive system?

Q2. What is the role of the pancreas in the digestive system?

Q3. What are the 3 main products of the digestive system?

## Lesson B3.8 – Explaining digestion

### Activation

**LI: Describe physical and chemical digestion.**

1. Make a note of the title and the LI
2. Read pages 102-103
3. <https://www.youtube.com/watch?v=kFx9a3TSvXg>
4. Make a list of the key words – define those you don't know at the end of the lesson
5. Draw and label fig. 3.20

### Consolidation

Complete and self-assess the relevant past paper question for this topic -  
From the B3 DIP file

### Extension

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

### Demonstration

Attempt questions 1-6.

In 10 mins answer as many questions as you can.

Self-mark the questions you have done making any necessary corrections in blue pen

Challenge yourself to answer as many as you can:

Green questions to GCSE Level 3

Blue questions to GCSE Level 6

Purple questions to GCSE Level 9

# Answers Lesson B3.8 – Explaining digestion

## Connection

- Q1. To digest and absorb food and nutrients.**
- Q2. Produce enzymes that digest food in the small intestine.**
- Q3. Glucose, amino acids and fatty acids.**

## Demonstration

- 1** Physical digestion breaks the food down into smaller pieces to allow it to be swallowed and increases the surface area to speed up chemical digestion
- 2** Chemical digestion uses enzymes and breaks the food down into different products
- 3** Proteases are produced in the stomach, pancreas, small intestine. They catalyse the breakdown of proteins into amino acids
- 4** If digestive enzymes worked inside cells they would break down the cell which is made of protein etc.
- 5** The optimum pH of pepsin is about pH 2.5-3.0/acidic but the optimum pH of trypsin is about pH7-8/which is very slightly alkaline  
The range that pepsin works at is pH0-about 5.5  
The range that trypsin works at is pH4-about 11.5
- 6** As the temperature increases, the rate of enzyme action increases because enzymes have more (kinetic) energy/collide more (frequently)/reaches a maximum activity rate at about 38°C (its optimum temperature) decreases rapidly because enzymes denature above 40°C

### Connection

Q1. Give an example of physical digestion.

Q2. Give an example of chemical digestion.

Q3. What are fats converted into during digestion?

## Lesson B3.9 – Use qualitative reagents to test for a range of carbohydrates, lipids and proteins

### Activation

**LI: Accurately and safely complete the practical. Record and interpret your data.**

1. Make a note of the title and the LI
2. Read pages 104-105
3. <https://www.youtube.com/watch?v=akMLGbNA0gE>
4. Make a list of the key words – define those you don't know at the end of the lesson

### Consolidation

Complete and self-assess the relevant past paper question for this topic -  
From the B3 DIP file

### Extension

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

### Demonstration

Attempt questions 1-8.

In 10 mins answer as many questions as you can.

Self-mark the questions you have done making any necessary corrections in blue pen

Challenge yourself to answer as many as you can:

Green questions to GCSE Level 3

Blue questions to GCSE Level 6

Purple questions to GCSE Level 9

**Answers Lesson B3.9 – Use qualitative reagents to test for nutrients**

**Connection**

- Q1. Teeth chewing, muscles in the stomach squeezing.**
- Q2. Enzymes in the small intestine.**
- Q3. Glycerol and fatty acids**

**Demonstration**

- 1a** Pestle and mortar
- 1b** Dropping pipette or glass rod
- 1c** Measuring cylinder or a calibrated dropping pipette
- 2** To ensure maximum surface area is exposed to the test solutions/ molecules released from cells
- 3** Transfer the filtrate of ground food and distilled water to test tube. Add the same amount of sodium hydroxide (NaOH) to the filtrate, mix carefully. Add a few drops of 1% copper sulfate, CuSO<sub>4</sub>, do not shake the mixture. The solution turns purple if protein is present (from blue).
- 4** Care with grinding food; safety goggles for Biuret's NaOH and CuSO<sub>4</sub>; heat with a water bath (not a Bunsen); do not eat food in laboratory; check for allergies
- 5** To make her results more valid
- 6** To check that the procedure does not have an effect/ to make a fair test
- 7** Table with RHC headed: food type, rows to be labelled with the 3 food types (A< B & C) and the control and each one tested twice A1, A2, B1, B2, C1, C2, control 1, control 2. Text in book says to include units – but we are recording colour changes, so no units required. Other column headings: starch, protein and fat. Ravi can tick the appropriate box if the food group in question is detected, or he can write the final colour. Allow table to be other way round
- 8a** Food A had no protein – solution remained blue (purple indicates presence of protein)
- 8b** Foods A and C had Glucose – solution turned red
- 8c** Food A had lipids – red layer at top of tube



### Connection

Q1. What is Benedict's test used for?

Q2. What is Sudan III stain used for?

Q3. What is the Biuret test used for?

## Lesson B3.10 – Looking at more exchange surfaces

### Activation

**LI: Identify the structures responsible for gas exchange in different organisms and adaptations of different gas exchange surfaces.**

1. Make a note of the title and the LI
2. Read pages 106-107
3. <https://www.youtube.com/watch?v=dVNr8lwaGqQ>
4. Make a list of the key words – define those you don't know at the end of the lesson
5. Draw and label fig. 3.25



### Consolidation

Complete and self-assess the relevant past paper question for this topic -  
From the B3 DIP file



### Extension

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

### Demonstration

Attempt questions 1-5.

In 10 mins answer as many questions as you can.

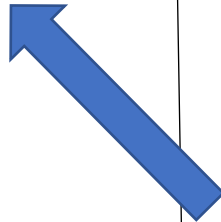
Self-mark the questions you have done making any necessary corrections in blue pen

Challenge yourself to answer as many as you can:

Green questions to GCSE Level 3

Blue questions to GCSE Level 6

Purple questions to GCSE Level 9



**Answers Lesson B3.10 – Looking at more exchange surfaces**

**Connection**

**Q1. Testing for sugars.**

**Q2. Testing for lipids.**

**Q3. Testing for protein.**

**Demonstration**

**1** Fish use gills, insects use trachea and amphibians use skin and lungs for gas exchange

**2** Tadpoles have external gills and use their skin for gas exchange but fish only use internal gills

**3** Skin: has thin membrane for diffusion, is moist for dissolving gases and organisms usually a large SA:V

Tracheae: have spiracles that can close to prevent evaporation to keep exchange surfaces

moist, tracheae have many branches to increase surface area, insects pump air in and out

of tracheae, tracheae are stiffened to prevent collapse, there is only a short diffusion distance

Gills: have feathery projections to increase the surface area, very thin walls for diffusion and water is pumped over the gills

Lungs: the alveoli have thin membranes, millions of alveoli to provide large surface area,

moist for dissolving gases, constant ventilation to maintain the concentration gradient

**4** When they are being more active and need more oxygen more quickly or if their skin becomes dry and the oxygen cannot dissolve to be absorbed through the skin.

**5** When you breathe out, the concentration of oxygen left in the lungs and the air pressure is

low compared to outside, so oxygen (in the air) is drawn into the lungs

## Lesson B3.11 – Learning about plants and minerals

### Connection

Q1. What do fish use for gas exchange?

Q2. Do insects have a transport system? Explain.

Q3. Name 3 properties of a good respiratory exchange system.

### Activation

**LI: Describe how mineral ions from the soil help plants to grow.**

1. Make a note of the title and the LI
2. Read pages 108-109
3. [https://www.youtube.com/watch?v=w\\_x-WDdQdxI](https://www.youtube.com/watch?v=w_x-WDdQdxI)
4. Make a list of the key words – define those you don't know at the end of the lesson
5. Draw and label fig 3.26

### Consolidation

Complete and self-assess the relevant past paper question for this topic -  
From the B3 DIP file

### Extension

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

### Demonstration

Attempt questions 1-6.

In 10 mins answer as many questions as you can.

Self-mark the questions you have done making any necessary corrections in blue pen

Challenge yourself to answer as many as you can:

Green questions to GCSE Level 3

Blue questions to GCSE Level 6

Purple questions to GCSE Level 9

# Answers Lesson B3.11 – Learning more about plants and minerals

## Connection

**Q1. They have very thin gills with protective muscular flaps.**

**Q2. No, gases are taken directly to the respiring tissues in their body.**

**Insects have tiny holes called spiracles along their side which open to small tubes called tracheae. The end of each trachea contains a small amount of water and connects to the body cells. Gases diffuse into the cells through the water.**

**Q3. –Large surface area.**

- A thin, permeable membrane.**
- a moist exchange surface.**

## Demonstration

**1** Root hairs help to anchor the plant and absorb water and minerals from the soil

**2** Water is absorbed through the root hair cells carrying mineral ions with it

**3** Root hair cell adaptations for osmosis are:

- they have a large surface area for absorption of water
- have no cuticle, just a thin membrane to allow absorption
- have a thin wall to reduce the distance for osmosis
- have a large permanent vacuole to absorb as much water as possible
- are close to the xylem so that materials can be moved around the plant

**4** Plants need minerals to make proteins and other chemicals needed for the plant to grow

**5** Enzymes catalyse the chemical reactions in plants cells e.g. respiration to supply the energy needed for active transport

**6** Fertiliser is dissolved in the soil water and absorbed into the root hair cells by active uptake. The mineral ions then move by transpiration through the xylem up through the plant. This happens more quickly on windy days because the water evaporates more quickly off the leaves increasing the rate of transpiration.

## Lesson B3.12 – Investigating how plants use minerals

### Connection

Q1. What is the role of root hair cells?

Q2. How can fertilizers help plants to grow?

Q3. Name 3 ways root hair cells are specialised to be an efficient exchange surface.

### Activation

**LI: Describe why plants need different mineral ions and explain the effects of mineral deficiencies on plant growth.**

1. Make a note of the title and the LI
2. Read pages 110-111
3. [https://www.youtube.com/watch?v=w\\_x-WDdQdxI](https://www.youtube.com/watch?v=w_x-WDdQdxI)
4. Make a list of the key words – define those you don't know at the end of the lesson
5. Draw and label fig. 3.30

### Consolidation

Complete and self-assess the relevant past paper question for this topic -  
From the B3 DIP file

### Extension

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

### Demonstration

Attempt questions 1-6.

In 10 mins answer as many questions as you can.

Self-mark the questions you have done making any necessary corrections in blue pen

Challenge yourself to answer as many as you can:

Green questions to GCSE Level 3

Blue questions to GCSE Level 6

Purple questions to GCSE Level 9

**Answers Lesson B3.12 – Investigating how plants use minerals**

**Connection**

**Q1. They absorb nutrients from the soil and anchor the plant.**

**Q2. Fertilizers contain minerals such as nitrates, phosphates, potassium and magnesium.**

**These are absorbed through the root hair cells and utilized by the plants.**

**Q3. – Large surface area.**

- No cuticle, just a thin membrane.**
- Thin cell wall.**
- Large permanent vacuole.**
- close to the xylum.**

**Demonstration**

- 1** Fertilisers replace the essential mineral nutrients that plants have used up from the soil
- 2** Gardeners add fertiliser to water before watering their plants so that the fertiliser dissolves and the mineral ions can be quickly absorbed
- 3** Plants with different mineral deficiencies show specific symptoms. Accept a named example, e.g. plants with nitrate deficiencies have yellow leaves and poor growth
- 4** Magnesium deficiency symptoms are yellow leaves; plants with phosphate deficiency have discoloured leaves and poor buds and flowers
- 5** Organic and inorganic fertilisers both contain essential plant nutrients. Organic fertilisers come from animal or plant matter; take time to break down in the soil and slowly release the minerals; can reduce soil erosion and improve water retention in the soil. Inorganic fertilisers are man-made; come from concentrated sources of mineral; are used in small amounts and can be absorbed immediately; do not smell, are easy to apply and store.
- 6** Advantages: Increase in crop yields; crops receive all minerals they need so more likely to be healthy; farmer makes more money due to higher yield.  
Disadvantages: High cost of buying and applying fertiliser; may pollute nearby water and cause eutrophication

### Connection

Q1. Why is it important to use fertilizers if growing crops on a patch of land for many years?

Q2. Describe the physical appearance of a nitrate deficiency in a plant.

Q3. Give an example of an organic fertilizer.



## Lesson B3.13 – Learning about the circulatory system

### Activation

**LI: Identify the parts of the circulatory system and describe their functions.**

1. Make a note of the title and the LI
2. Read pages 112-113
3. <https://www.youtube.com/watch?v=bpYaKM2hVFY>
4. Make a list of the key words – define those you don't know at the end of the lesson
5. Draw and label figure 3.31
6. Draw and label figure 3.32



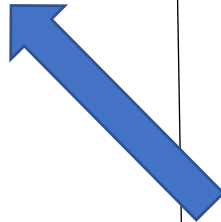
### Consolidation

Complete and self-assess the relevant past paper question for this topic -  
From the B3 DIP file



### Extension

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher



### Demonstration

Attempt questions 1-5.

In 10 mins answer as many questions as you can.

Self-mark the questions you have done making any necessary corrections in blue pen

Challenge yourself to answer as many as you can:

Green questions to GCSE Level 3

Blue questions to GCSE Level 6

Purple questions to GCSE Level 9



**Answers Lesson B3.13 – Learning about the circulatory system**

**Connection**

- Q1. Without them, the crops will eventually use up all the nutrients in the soil and stop growing.**
- Q2. Poor growth, yellow leaves.**
- Q3. Manure, plant or animal matter.**

**Demonstration**

- 1** A double circulation is where the blood goes from the heart to the lungs, back to the heart, to the body and back to the heart again.
- 2** Closed circulation systems need a heart to pump the blood under high pressure around the system
- 3** Blood from the heart travels under high pressure in arteries with thick walls to the body. At body tissues the blood travels in capillaries. The pressure gradually falls as blood flows through the capillaries to the veins. Veins carry blood under low pressure back to the heart.
- 4** Arteries: thick elastic walls to withstand pressure; small lumen increases blood flow speed  
Veins: have valves along their length to prevent the backflow of blood; large lumen gives least flow resistance  
Capillaries: capillary networks have a large surface area for diffusion; walls are one cell thick and permeable to allow substances to diffuse in and out easily
- 5** Double circulation is an advantage to active animals because:
- blood pressure is higher
  - there is a higher blood flow to body tissues
  - oxygenated blood is separate from deoxygenated blood.

### Connection

Q1. Describe the structure of a double circulation system, like in humans.

Q2. Briefly describe the differences between arteries, veins and capillaries.

## Lesson B3.14 – Exploring the heart

### Activation

**LI: Describe the structure and function of the heart.**

1. Make a note of the title and the LI
2. Read pages 114-115
3. <https://www.youtube.com/watch?v=zU90AkcTjEs>
4. Make a list of the key words – define those you don't know at the end of the lesson
5. Draw and label figure 3.36

### Consolidation

Complete and self-assess the relevant past paper question for this topic -  
From the B3 DIP file

### Extension

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

### Demonstration

Attempt questions 1-6.

In 10 mins answer as many questions as you can.

Self-mark the questions you have done making any necessary corrections in blue pen

Challenge yourself to answer as many as you can:

Green questions to GCSE Level 3

Blue questions to GCSE Level 6

Purple questions to GCSE Level 9

# Answers Lesson B3.14 – Exploring the heart

## Connection

**Q1. Blood flows in 2 circuits around the body:**

- From the heart to the lungs.
- From the heart to the rest of the body.

**Q2. Arteries – Thick elastic wall, small lumen, carry blood from the heart, high pressure, no valves.**

**Veins – Thin wall, large lumen, carry blood to the heart, low pressure, have valves.**

**Capillaries – wall is 1 cell thick, carry blood from arteries to veins, pressure falls and pulse disappears, no valves.**

## Demonstration

- 1 The function of the heart is to pump blood around the body
- 2 Blood from the lungs enters the heart at the left atrium. It passes into the left ventricle and  
is pumped out to the body. Blood from the body enters the heart at the right atrium passes  
into the left ventricle and is pumped to the lungs
- 3 Atria pump blood to the ventricles in the heart  
Ventricles pump blood to the rest of the body
- 4 Blood enters the heart at the atria. The ventricles relax whilst the atria contract and push blood into the ventricles. The valve between the atria and ventricles closes and the atria relax whilst the ventricles contract to push blood out of the heart towards the body.
- 5 The left atrium receives oxygenated blood from the lungs and contract to push it through the open valve into the left ventricle. At the same time, the right atrium receives deoxygenated blood from the rest of the body and contract to push it through the open valve into the right ventricle. The valves between the atria and ventricles then close. The left ventricle contracts to send oxygenated blood through the open valve to the rest of  
the body. At the same time, the right ventricle contracts to send the deoxygenated blood through the open valve to the lungs. These valves then close
- 6 A blocked coronary artery would prevent oxygen and glucose reaching some of the heart so the muscle cells would not be able to respire and produce energy to contract. If the muscle stopped contracting, then the heart might not be able to pump the blood effectively  
around the body.

### Connection

Q1. What do we call the muscle that makes up the heart?

Q2. What do we call the 4 chambers of the heart?

Q3. What does a pacemaker do?

## Lesson B3.15 – Studying blood

### Activation

**LI: Identify the parts of the blood and their functions.**

1. Make a note of the title and the LI
2. Read pages 116-117
3. <https://www.youtube.com/watch?v=81w0BXg7QJA>
4. Make a list of the key words – define those you don't know at the end of the lesson
5. Draw and label figure 3.40

### Consolidation

Complete and self-assess the relevant past paper question for this topic -  
From the B3 DIP file

### Extension

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

### Demonstration

Attempt questions 1-7.

In 10 mins answer as many questions as you can.

Self-mark the questions you have done making any necessary corrections in blue pen

Challenge yourself to answer as many as you can:

Green questions to GCSE Level 3

Blue questions to GCSE Level 6

Purple questions to GCSE Level 9

# Answers Lesson B3.15 – Studying blood

## Connection

- Q1. Cardiac muscle.**
- Q2. Left/right atrium, left/right ventricle.**
- Q3. Device that helps control the pulse rate of the heart if unable to do so naturally.**

## Demonstration

- 1** Red blood cells - bi-concave disc shaped  
White blood cells -  
Platelets – finger like projections
- 2a** Red blood cells transport oxygen from the lungs to body cells
- 2b** White blood cells help to protect the body against infection.
- 3** Plasma transports substances around the body e.g. carbon dioxide
- 4** The adaptations of red blood cells are:
  - they are tiny so they can pass through narrow capillaries
  - they have a large surface area to increase diffusion of oxygen into and out of the cell.
  - contain haemoglobin to bind to oxygen to transport it
  - have no nucleus, increasing the space for haemoglobin
- 5** Haemoglobin binds with oxygen to form bright red oxyhaemoglobin when there is a high concentration of oxygen. The bonds between the haemoglobin and oxygen are weak, and oxyhaemoglobin dissociates to haemoglobin and oxygen in low oxygen concentrations.  
 $\text{oxygen} + \text{haemoglobin} \rightleftharpoons \text{oxyhaemoglobin}$
- 6** The biconcave disc shape of red blood cells gives them a large surface area to volume ratio to increase the rate of diffusion of oxygen into and out of the cell
- 7** Haemoglobin binds to oxygen and transports it around the body. A person with sickle cell anaemia has abnormal haemoglobin therefore they can't transport oxygen around the body with the same efficiency as normal red blood cells. As a result they tend to feel tired and easily get breathless when exercising.

## Connection

Q1. What is blood?

Q2. What is the advantage of red blood cells having a biconcave shape?

Q3. How does the blood carry oxygen?

## Lesson B3.16 – Investigating gas exchange

### Activation

**LI: Identify the parts of the human gas exchange system and know their functions.**

1. Make a note of the title and the LI
2. Read pages 118-119
3. <https://www.youtube.com/watch?v=aPUPfzsqDgs>
4. Make a list of the key words – define those you don't know at the end of the lesson
5. Draw and label figure 3.41

### Consolidation

Complete and self-assess the relevant past paper question for this topic -  
From the B3 DIP file

### Extension

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

### Demonstration

Attempt questions 1-6.

In 10 mins answer as many questions as you can.

Self-mark the questions you have done making any necessary corrections in blue pen

Challenge yourself to answer as many as you can:

Green questions to GCSE Level 3

Blue questions to GCSE Level 6

Purple questions to GCSE Level 9

# Answers Lesson B3.16 – Investigating gas exchange

## Connection

- Q1. Blood is a tissue made up of a mixture of cells, solutes and a liquid.**
- Q2. It gives them a larger surface area for the diffusion on oxygen.**
- Q3. Oxygen bonds to the haemoglobin in RBC's at high concentration, such as in the lungs. This forms oxyhaemoglobin. These bonds are weak and oxyhaemoglobin dissociates to oxygen and haemoglobin at low oxygen concentrations, such as in respiring tissue.**

## Demonstration

- 1** Air is filtered, warmed and moistened in the mouth and nasal passages, passes into the trachea, through one of the bronchi into the lungs. In the lungs, air passes the bronchioles to the alveoli.
- 2** Gas exchange is the absorption of oxygen and the release of carbon dioxide across a gas exchange/specialised surface e.g. the alveoli.
- 3** Air entering the alveoli has a greater oxygen concentration than the deoxygenated blood flowing through the lungs. This steep concentration gradient allows the oxygen to diffuse into the blood. Deoxygenated blood contains a greater concentration of carbon dioxide, so it diffuses out of the blood and into the alveoli to be breathed out.
- 4** Breathing is taking oxygen into the lungs and expelling carbon dioxide out of the lungs  
Respiration the chemical reaction between glucose and oxygen to release energy. Carbon dioxide and water are waste products.
- 5** Alveoli are efficient exchange surfaces because they:
- are spherical with a large surface area to volume ratio, resulting in efficient diffusion of gases
  - have very thin walls so the diffusion distance is very short.
  - are surrounded by blood capillaries to ensure a good blood supply. Oxygen is constantly moved into the blood and carbon dioxide is constantly taken to the lungs to be removed. This means that gas exchange happens at the steepest concentration gradients possible.
  - have moist surfaces so gases dissolve to allow efficient diffusion
- 6** Blood is pumped with continuous fresh supplies of oxygen from the lungs to all body cells. Capillaries around the alveoli are efficient transfer surfaces, There is a steep concentration gradient and oxygen from the lungs is quickly diffused into the bloodstream and carried to cells deep in the body. Again, capillaries around the cells are efficient transfer surfaces and oxygen quickly and continuously diffuses down the concentration gradient into the body cells and carbon dioxide diffuses into the blood to be carried back to the lungs. At the lungs the capillaries allow the rapid diffusion of carbon dioxide down the concentration gradient into the lungs to be breathed out.



### Connection

Q1. What is the role of the intercostal muscles?

Q2. What is the role of the diaphragm?

Q3. Complete the sentence: human gas exchange is taking in \_\_\_\_\_ and releasing \_\_\_\_\_.



## Lesson B3.17 – Learning about coronary heart disease

### Activation

**LI: Identify the cause and symptoms of coronary heart disease. Describe possible treatments.**

1. Make a note of the title and the LI
2. Read pages 120-121
3. <https://www.youtube.com/watch?v=UN5BIPfMUkg>
4. Make a list of the key words – define those you don't know at the end of the lesson
5. Draw and label figure 3.43
6. Draw and label figure 3.44



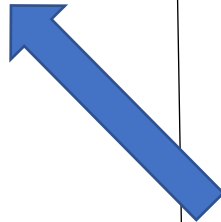
### Consolidation

Complete and self-assess the relevant past paper question for this topic -  
From the B3 DIP file



### Extension

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher



### Demonstration

Attempt questions 1-6.

In 10 mins answer as many questions as you can.

Self-mark the questions you have done making any necessary corrections in blue pen

Challenge yourself to answer as many as you can:

Green questions to GCSE Level 3

Blue questions to GCSE Level 6

Purple questions to GCSE Level 9

# Answers Lesson B3.17 – Learning about coronary heart

## Connection

- Q1. They help to ventilate the lungs.**
- Q2. The diaphragm contracts, also to help ventilate the lungs.**
- Q3. Taking in oxygen, releasing carbon dioxide.**

## Demonstration

- 1** The symptoms of coronary heart disease are a build-up of fatty material inside the coronary artery, Reducing blood flow so less glucose and oxygen reach the heart cells for respiration. Less energy is available for the heart to contract. If cells are starved of nutrients, they can die and a heart attack may happen.
- 2** It is caused by gender, age, diet and genetic factors
- 3** It is treated by the insertion of stents to open up blocked arteries or bypass surgery
- 4** Artificial valves are mechanical valves that are used to replace damaged valves and they control the blood flow through the heart
- 5** Statins: drugs work by lowering cholesterol levels but can cause unwanted side-effects, such as damage to the liver. Artificial valves: no rejection problems and no blood supply needed but can damage red blood cells and need to take anticlotting drugs. Good option especially if there is no damage to RBCs  
Artificial pacemakers: no surgery is needed but the immune system can reject them and they may need replacing. Good option as, even though they may need replacing, it is not major surgery like the heart transplant  
Heart transplant: does give a better quality of life but it is major surgery, anti-rejection drugs need to be taken (greater infection risk) and there is a shortage of donors. Probably a final option for most people as major surgery carries great risks and finding a suitable donor is hard due to the shortage of suitable organs
- 6** Statins are being increasingly prescribed to reduce levels of cholesterol produced by the liver to prevent coronary arteries from becoming blocked

## B3 - Revision

### Connection

Q1. What leads to the development of coronary heart disease?

Q2. What is a stent?

Q3. list the advantages and disadvantages of stents.

### Activation

#### LI: Create a topic summary sheet

1. Fold an A3 sheet so it is divided into 8 sections
2. Look back over you lesson and group them into 8 main headings
3. Summarise the key points into each section, use keywords and diagrams and symbols rather than sentences



### Consolidation

Look though the relevant past paper questions for this topic - From the B4 DIP file – see if you can complete any additional questions

### Extension

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

### Demonstration

Test yourself by working with the person sitting next to you by talking though each box on your summary sheet and seeing how many key facts you can remember



## **Answers Lesson B3 – Revision**

### **Connection**

**Q1. Fatty deposits called plaques in the blood vessels. These lead to a narrowing of the vessel. They can be caused by poor diet.**

**Q2. It's a device used to treat narrow coronary arteries.**

**Q3. Advantage – little risk**

**Disadvantage – fatty deposits can rebuild.**

### B3: Heart Disease DART Activity

A new study has found that an unhealthy lifestyle increases a person's risk of heart disease significantly more than a person's genetic make-up. The research showed that physical inactivity, smoking, hypertension, diabetes, and high cholesterol all played more of a role in young patients with heart disease than genetics.

The findings, which were presented Monday at a meeting of the European Society of Cardiology in Paris, suggest that adopting healthy lifestyle habits should be a top priority for preventing heart disease, even among individuals with a family history of the condition. Lifestyle factors include diet, exercise, water intake and salt intake.

Study author Joao Sousa of Funchal Hospital, Portugal, says that although genetics is an important contributor to premature heart disease, it should not be used as an excuse to assume its development is inevitable. "In our clinical practice, we often hear young patients with premature heart disease 'seek shelter' and explanations in their genetics/family history. However, when we look at the data in our study, these young patients were frequently smokers, physically inactive, with high cholesterol levels and high blood pressure — all of which can be changed."

For the study, the researchers recruited 1,075 (aged an average of 45 years), of whom 555 had premature coronary artery disease (CAD). Specific conditions included stable angina, unstable angina and heart attack. The researchers performed genomic sequencing and assessed five modifiable risk factors associated with heart disease, which were physical inactivity, smoking, hypertension, diabetes and high cholesterol. They then compared the results with those from 520 healthy controls aged an average of 44 years. Both patients and controls were enrolled from the Genes in Madeira and Coronary Disease (GENEMACOR) database.

Almost three-quarters (73%) of the premature CAD patients had at least three of the risk factors, compared with only 31% of the control group. In both groups, the odds of developing CAD significantly increased with each additional risk factor. For those with only one risk factor, the likelihood of CAD was three times higher, compared with seven times higher with two risk factors and a startling 24 times higher with three risk factors. All study participants underwent genomic sequencing and the team created a genetic risk score that covered 33 variants thought to be contributors to CAD risk. The average risk score was significantly higher among patients than among controls and was also an independent predictor of premature CAD. However, the more modifiable risk factors the patients had, the less genetics contributed to CAD risk. He concluded that the findings provide strong evidence that people with a family history of premature CAD should adopt healthy lifestyle habits, since unhealthy habits may be a more significant contributor to the risk for heart disease than their genetics. "The findings demonstrate that genetics contribute to CAD. However, in patients with two or more modifiable cardiovascular risk factors, genetics play a less decisive role in the development of CAD... That means quit smoking, exercise regularly, eat a healthy diet, and get blood pressure and cholesterol levels checked."

#### Habits to adopt for a healthy lifestyle

##### 1. Follow a healthy diet

Diets that are high in saturated fats, trans fat and cholesterol have been associated with an increased risk for heart disease and associated conditions such as atherosclerosis. High salt intake can also increase blood pressure. Following a diet low in fat, but rich in nutrients such as vitamins minerals and fiber helps to reduce these risks. Recommended foods include vegetables, fruits, whole grains, fish, poultry, legumes, nuts and non-tropical vegetable oils.

##### 2. Get physically active

Physical activity can lower the risk of heart disease by helping to lower blood pressure, cholesterol, and weight. Being physically active every day is recommended, although any amount of physical activity is better than none. Research has shown that people who only achieve a moderate level of fitness are still at a significantly reduced risk for premature death than those with a low fitness level.

##### 3. Reduce alcohol intake

A high alcohol intake can increase heart disease risk by raising blood pressure and triglycerides. Women are advised to drink no more than one alcoholic beverage per day, while men are advised to drink no more than two.

#### 4. Stop smoking

Tobacco smoking can damage the heart and vasculature, which increases the risk of heart disease and heart attack. It also increases blood pressure and lowers the amount of oxygen that the body can carry. Although giving up smoking is difficult, it is not as difficult as trying to recover from a heart attack or stroke.

#### 5. Reduce cholesterol levels

Cholesterol accumulation in the arteries can trigger a heart attack or stroke. If physical activity and a healthy diet do not bring the cholesterol level down, medication can be prescribed.

#### 6. Maintain a healthy weight

Obesity increases the risk for high cholesterol, hypertension and insulin resistance, which is a precursor for type 2 diabetes. Following a nutritious diet, controlling calorie intake and being physically active are the only ways to maintain a healthy weight.

#### 7. Reduce stress

Some research has shown an association between stress and coronary heart disease. Stress may cause people to start smoking, smoke more than usual or overeat. Some studies have even shown that stress is a predictor of middle-aged blood pressure risk among young adults.

*Article from medical life sciences news. Sally Robertson, B.Sc. Sep 3 2019*

### DART B3 – Heart disease

#### 1.

- Name 3 factors that can contribute to an unhealthy lifestyle.
- Is an individual's lifestyle the only factor in them potentially developing heart disease?
- Look at the results of the study carried out in the article. By how much did the presence of just one risk factor increase the test subject's chances of developing CAD?

#### 2.

- Define the term lifestyle.
- Why might an individual who suffers from premature heart disease choose to blame their genetics for the condition?
- Why did the study require a control group of healthy individuals?

#### 3.

- Discuss one of the habits an individual could pick up to improve their lifestyle. What would this involve and how would it help them?
- Case study: You meet an individual who is 45 years old. They smoke, don't exercise and have a poor diet but haven't been diagnosed with any form of heart disease. Their parents have a similar lifestyle and have never had heart disease so they don't believe it will affect them. Do you think they are correct? What advice might you give them?
- After reading the above article how do you feel about your own lifestyle? What do you think you could be doing to reduce your risk of developing heart disease in later life?

## Answers

1.

- a. Any 3 from diet, level of activity/exercise, water intake, salt intake, smoking, alcohol intake, stress levels.
- b. No, genetics are also a factor.
- c. 3 times.

2.

- a. The way in which a person lives (not related to their genetics).
- b. It's easier than accepting that they might need to change their lifestyle.
- c. To establish a baseline that the experimental group could be compared to. The control group were made up of healthy individuals that the group with CAD could be compared to.

3.

- a. Any of points 1-7 from the text with explanation.
- b. They aren't correct. The study states that, while genetic factors do have an effect, lifestyle factors are much more significant. They would be advised to stop smoking, exercise more and improve their diet.
- c. Personal responses will vary. Any of points 1-7, in the text, could be used as ways to improve their lifestyle and reduce their risk of developing heart disease.



## B3 Moving and changing materials (AQA)

Attainment	
Band :	Knowledge and Understanding
Yellow Plus/ Yellow	<p>Predict water movement during osmosis.</p> <p>Explain the words flaccid, <del>plasmolysed</del> and turgid.</p> <p>Explain how pH and temperature affect enzyme activity.</p> <p>Use collision theory to explain enzyme action.</p> <p>Explain the features of exchange surfaces.</p> <p>Explain how the circulatory system is adapted to its function.</p> <p>Explain how the small intestine is adapted for efficient food absorption.</p>
Blue	<p>Explain osmosis as the movement of water through a partially permeable membrane.</p> <p>Describe how pH and temperature affect enzymes.</p> <p>Describe the lock-and-key theory.</p> <p>Describe the features of a range of exchange surfaces in plants and animals.</p> <p>Describe how the circulatory system transports substances.</p> <p>Describe the adaptations of the intestine as an exchange surface.</p>
Green	<p>Recall that osmosis describes water movement in and out of cells.</p> <p>Know that enzymes catalyse reactions in cells.</p> <p>Understand that substrate molecules fit into active sites of enzymes.</p> <p>Describe the effect of <del>SA/V</del> on the diffusion of substances.</p> <p>Describe the functions of different parts of the circulatory system.</p> <p>Know that digested food is transported from the small intestine to body cells.</p>
White	<p>Some elements of the above have been achieved</p>

