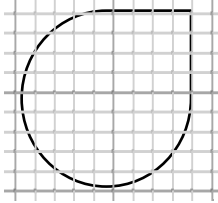


## AS Level Biology – Key knowledge and maths skills

By working through these sheets you will be able to gauge your current knowledge and understanding of some aspects of How Science Works and key topics in Biology

### 1. Measuring and using a microscope.



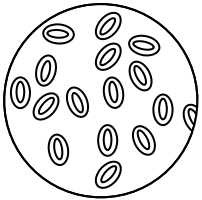
The diagram below shows a tracing of the outline of a leaf on graph paper. A small square has a side length of 2mm.

- Estimate the area of this leaf. Leaf area = \_\_\_\_\_ mm<sup>2</sup>
- Convert the area of the leaf into m<sup>2</sup> and write your answer in standard form.

Leaf area = \_\_\_\_\_ m<sup>2</sup>

- Describe how you could modify this technique to give the area of the leaf with increased accuracy.

A piece of the lower epidermis of the leaf was examined with an optical (light) microscope at a magnification of 400. The diagram shows a field of view, as seen from looking down the microscope and many stomata.



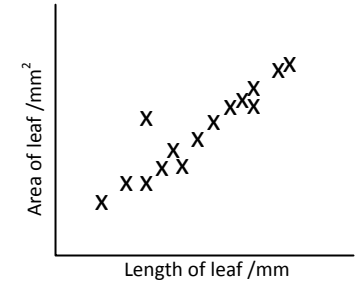
- Given that the field of view has a diameter of 0.4mm. Calculate the number of stomata per mm<sup>2</sup> of leaf.

Number of stomata = \_\_\_\_\_ per mm<sup>2</sup> of leaf

- Describe how would you count the number of stomata in a field of view accurately?

- How could the reliability of the estimate of the number of stomata per leaf be improved?

- 15 leaves from the same plant were taken and their maximum length and area were measured. This data was then plotted as a scatter graph.



- Describe how leaves could be selected to avoid human bias.
- Evaluate the statement "There is a positive correlation between leaf length and leaf area." In 'evaluate' questions you should give reasons why you agree and disagree with the statement.

- Use the data collected to describe how the shape of a leaf changes as it grows.

### 2. Investigations

An investigation was conducted to find out if caffeine increases heart rate. Five test subjects were given a single caffeine tablet with 200ml of water. Their heart rate was measured at rest before and ten minutes after taking the caffeine pill. The results are shown below.

Test subject	Heart rate			Percentage increase
	Before	After	Increase	
1	65	75	10	15.4
2	78	79	1	1.3
3	60	62	2	3.3
4	60	79	19	31.7
5	67	70	3	4.5
Mean				11.2

- Suggest suitable units to measure heart rate.
- Explain why it was necessary to calculate the percentage increase instead of drawing conclusions from the raw increase.

c) Use the information given in question 2 to complete this table will detail.

Independent variable	
Dependent variable	
Resolution of the data	

d) The group of test subjects are matched to allow for a fair comparison. One example would be to use the same age of test subject. Give two other ways in which you would match the group.

e) The use of a control group would have made the test more valid. Describe what a control group would look like and how its inclusion the investigation would increase validity.

f) Give **two** further examples of factors that would have to be controlled if valid data was to be obtained.

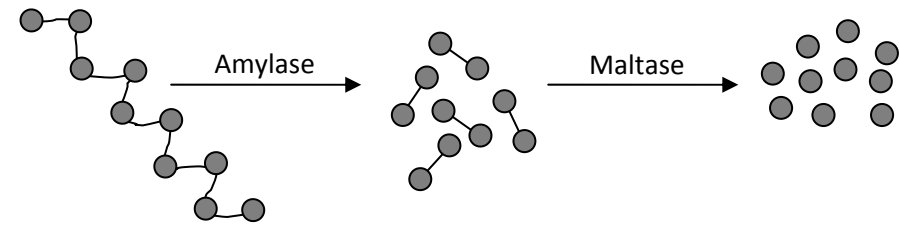
### 3. Digestion of carbohydrates

100g of the carbohydrate starch) was mixed with amylase solution. The mass of sugar present was measured at different time intervals. The data collected is shown below.

Time in amylase solution / seconds	Mass of sugar present / g
0	0
30	1.6
60	3.4
100	6.8
200	20.4

a) Describe how you could use the data to find the likely mass of sugar present after 2 minutes.

b) The diagram shows the digestion of **starch** by two types of carbohydrase enzyme.



i) Label the molecules to show what type of carbohydrate they are. Use the words: Disaccharide, Monosaccharide and Polysaccharide.

ii) Complete the table with examples of different carbohydrates (two have been done for you).

The Carbohydrates		
Polysaccharides	The Sugars	
	Disaccharides	Monosaccharides
1. Stored in plants: <b>Starch</b>	4. Digested starch results in: <b>Maltose</b>	7. Sugar made in photosynthesis:
2. Stored in the liver of animals:	5. Common sugar:	8. Sugar found in fruit:
3. Forms plant cell walls:	6. Sugar found in milk:	9. Sugar found in DNA

iii) Explain why the carbohydrase enzymes are shown above the arrows in the diagram.

iv) The only enzyme present in the mouth is amylase (salivary amylase). Explain why this enzyme cannot digest starch into a monosaccharide. Use your knowledge of how enzymes work.

How to do well in Biology! Some of our students speak!

Lewis:

- The jump from GCSE to A level is huge!
- Revise your week each week! You need it!

Sarah

- The most important thing is organisation!
- Make sure from the first lesson that you file everything.
- You will need it all organised when you start to revise.
- Make a revision timetable and stick to it.
- Revision isn't fun but you can't leave it until last minute!
- You cannot blog A levels!!

Tyler

- My advice to a new sixth former would be to produce revision cards for each topic as you learn it!
- This saves time nearer the exams and you have ready made revision tools.
- Save plenty of time for doing past papers.

# AQA AS and A-level Biology

- Exams from: 2016 (AS), 2017 (A-level)
- Specification code: 7401; 7402
- Link to AQA web site, specification and specimen exam papers.
  - <http://www.aqa.org.uk/subjects/science/as-and-a-level/biology-7401-7402>



## What independent learning looks like in **Biology**...

- ✓ **Make sense of your lessons.** Use your text book (or revision guide) and your class notes / hand-outs to produce summary notes on the topic. These could be annotated diagrams, flow charts, mindmaps or revision bullet points.



- ✓ **Make use of past papers, mark schemes and examiners reports.** [Doddlelearn.co.uk](http://Doddlelearn.co.uk) also has resources that you can browse and work through.



- ✓ **AQA information.** <http://www.aqa.org.uk/subjects/science/as-and-a-level/biology-7401-7402>



- ✓ **Read Biological Sciences Review.** You can browse this magazine by following this link. .
- ✓ <http://www.bsr.manchester.ac.uk/>
- ✓ Get into the habit of doing this on a regular basis.



- ✓ **Use YouTube to explain** any areas you are struggling with. There are lots of narrated animations of complex biological processes. Consider using [khanacademy.org](http://khanacademy.org) to consolidate your understanding.

- ✓ Keep an eye out for **relevant television programmes and documentaries.** News coverage of stories with a biological slant can be very useful and aid your overall understanding of Biology and the wider world.



## Previous Knowledge

Students starting A-level Biology will have a variety of GCSE qualifications e.g. different exam boards and different journeys through those exams e.g. 'Triple Science' or 'Core and Additional Science' (sometimes called Dual Award).

You may wish to read ahead on topics that you did not do as part of your Biology course at GCSE. All these topics are taught at AS and A-level; understanding these before you start will help you make rapid progress.

Area of Biology	Topic	Essential knowledge	Desired knowledge
<b>Cells, tissues, organs and organ systems</b>	Structure of a typical animals cell	✓	
	Structure of a typical plant cell	✓	
	Anatomy of the human digestive system	✓	
	Structure and function of a broad leaf	✓	
	How roots absorb water and mineral ions		✓
	Structure of the lungs		✓
	Structure and basic function of the mammalian heart		✓
<b>Biological molecules</b>	Amino acids and proteins	✓	
	Carbohydrates (sugars and starch)	✓	
	Fats		✓
<b>Chemical reactions</b>	Diffusion	✓	
	Osmosis		✓
	Enzymes – conditions in which they work at their optimum	✓	
	Role of enzymes in digestion		✓
	Photosynthesis	✓	
	Respiration	✓	
<b>DNA / genetics</b>	Structure of DNA and how it codes for a protein		✓
	Difference between genes and alleles		✓
	Mitosis and meiosis		✓
	Cloning and genetic modification		✓
	Genetic crosses and heredity		✓
<b>Evolution</b>	Natural selection	✓	
<b>Processes in the human body</b>	Control of body temperature		✓
	Control of blood sugar		✓
	Nervous system inc. reflex arcs		✓
	Immune system inc. white blood cells and antibodies	✓	
	Menstrual cycle		✓
<b>Environment</b>	Human cause of Global Warming		✓
	Sampling techniques e.g. use of quadrats / transects		✓
<b>Maths skills</b>	Percentages / ratios / fractions	✓	
	Graphs (bar charts, histograms, line graphs, scatter graphs)	✓	
	Presenting scientific data in tables	✓	
	Averages (mean, medians, modes)	✓	
	Rearranging equations	✓	
<b>Skills</b>	Using a microscope		✓
	Using pipettes / measuring cylinders		✓

## Useful Biology Websites:

URL	Content
<a href="http://www.bbc.co.uk/schools/gcsebitesize/science/aqa/">http://www.bbc.co.uk/schools/gcsebitesize/science/aqa/</a>	At CRGS we study AQA AS and A level Biology. If your GCSE is a different exam board or you did not study Separate Sciences, then looking at this content may be useful
<a href="http://www.mrothery.co.uk/">http://www.mrothery.co.uk/</a>	Made by the chief examiner when he was a lowly Biology teacher; these notes are concise and useful to look at the type and level of content at A-level
<a href="http://www.heckgrammar.co.uk/online/students/curriculum/departments/science/biology/sixth-form/">http://www.heckgrammar.co.uk/online/students/curriculum/departments/science/biology/sixth-form/</a>	Teachers at this school have made some fantastic notes (textbook quality) that are free to access. These are well worth downloading and keeping on a computer to refer to later or to read up on a topic before you start.
Youtube.com <a href="http://www.youtube.com/watch?v=1Z9pqST72is">http://www.youtube.com/watch?v=1Z9pqST72is</a>	Search for 'Bozeman Science' or 'crash course biology' there are animations / presentations on core Biology topics.
<a href="http://www.bbc.co.uk/news/">http://www.bbc.co.uk/news/</a>	Search for Biology stories e.g. stem cells / new drugs etc. Wider reading will help when it comes to applying to University / seeing the bigger picture and also with General Studies. The last Biology exam in Y13 contains an essay that requires evidence of wider reading to access the highest marks.