Hello. I’m Dr Alex Lathbridge and this is Bitesize Biology.

This series is all about exam techniques; tips, tricks and advice that you need to help you ace your exams.

In this episode, we’re going to talk about data analysis questions, basically what you need to do when you’re confronted with tables and graphs.

We’ll also going to take a look at application questions, where you get to apply your biology knowledge in new situations.

I know data analysis can be a little bit tricky. When you think biology, you think plants and animals, not equations and graphs. But trust me, this stuff is fundamental to biology and it's not as difficult as you might think.

We're going to make sure that by the end, you know what you need to know about data and knowledge. Let’s remind ourselves about the different types of variables that crop up in experiments. Variables are used in experiments to test a hypothesis. You normally change one variable and measure how it affects another.

An Independent variable is the variable you change in your investigation: temperature, height or time.

A Dependent variable is the variable you measure in response to changing the independent one, eg: rate of reaction, mass, volume of oxygen released.

Control variables are kept constant throughout an experiment, such as the volume of reactants used, or the concentration of a reactant.

So, if you want to see how long it takes for water to boil on your stove, the setting on your stove (the temperature) is the independent variable, how fast the water the boils is the dependent variable and the control, the thing that you keep the same, is the size of the pot.

After variables are measured in an investigation, the data is normally put into a table to record the results. You might be asked to create a table using a dataset in your exam.

Here are some top tips for creating a table:

Remember, when you’re organising your data into a table you use a ruler and a pencil, don’t be like me and try to freehand it with a pen.

Generally, the independent variable gets written down in the left-hand side column.

The table needs to have headings, with the correct units eg: reaction time in seconds.

The table should include a column for a mean calculation (that's the average).

Any numbers written in the table need to have the same number of decimal places that matches the equipment used.

But sometimes a table is not enough. Line graphs return time and time again in biology exam papers. Here's what you need to remember about line graphs:

Line graphs can show correlations (or relationships) between two variables.

A positive correlation means as one variable increases, the other also increases.

A negative correlation means as one variable increases, the other decreases.

No correlation means there's no relationship between the two variables.

Remember that line graphs can show correlations, relationships, but they cannot demonstrate causation or coincidence.

Causation means that one factor causes a particular outcome. This is different to a correlation. Just because a correlation is shown on one graph, it doesn't mean that the variable definitely causes a specific outcome.

A line graph that has a directly proportional relationship, shows one variable increasing in proportion to the other.

A straight line of best fit would indicate a constant rate of reaction, while a curve indicates a change in the rate (or speed) of a reaction over time.

If a straight line or curve flattens into a horizontal line, that indicates no further change in the rate of the reaction from a certain level.

You might get asked to draw a line graph from a set of results in your exam.

Remember, the X axis is the horizontal line, the Y axis is the vertical line.

The independent variable (what's being changed) is shown on the X axis, and the dependent variable (what's being measured) is shown on the Y axis.

Each of the axes must be accurately labelled with the right units and your graph needs a title explaining what it is showing.

The graph should be drawn so that its scale fits the whole space on your exam paper, don't try to cram it into a small corner, use the entire space, and this will make it easier for you to complete.

Use the correct, appropriate numbers on the scale, for instance 0 – 16, so that the numbers are nicely spread out.

The intervals on the axes should go up in multiples of 1, 2, 5, or 10, as they are easier to plot and read, rather than going up in something like 3 or 9 or 7 or 13.

Plot the data points using a sharp pencil using a little cross. If your pencil is not sharp, those Xs will be too thick.

Then when everything else is done, use a ruler to draw a line of best fit, or draw a curve if that is more appropriate.

Ignore any anomalous results and remember, never, ever draw dot-to-dot lines where you join the dots, you're not in primary school.

You might be asked to measure the rate shown on a line graph, so how much something is changing over a period of time, eg: the rate of a reaction over minutes or hours.

You do this by finding the gradient of a line graph, basically how steep the line is.

To do this you will need to make a large triangle on the graph linked up to the line of best fit.

You then measure the vertical and horizontal parts of the triangle using your scales.

To calculate the gradient, you divide the change in the vertical amount by the change in the horizontal amount.

You might get shown a line graph and be asked some questions on it, and once again, we're talking about those describe and explain questions.

It might be something like: describe the pattern shown in this graph.

Just say what you see, describe what you can see on the graph.

If there are numbers on the scales of the graph, quote these numbers to back up your answer.

Make sure you describe everything happening in the graph, not just the part where something increases or decreases.

If the line levels out and goes flat, so it stops increasing, be sure to mention this as well. Don't ignore flat lines.

You might get a question that says: explain what is happening in the graph.

Explain why the pattern or trend shown on the graph is happening.

Here you're going to need to use your scientific knowledge to explain what is happening.

Like other “explain” questions, you need to use words like “because” or “therefore” to demonstrate why the results shown in the graph occurred.

That was a lot about graphs, because they are really important to help biologists work out what’s going on. I know it’s much easier to get your head around graphs when you can actually see them.

Check out the Bitesize website, have a look at the graphs on there and listen to this again, and it will all start to make sense.

There will be questions in your exam where you will need to apply your own knowledge, these are called application questions.

Application questions are asking you to take the biology knowledge you already have and answer questions about things you’re not familiar with.

You might get a question that says something like:

The Polyp Stage of a Jellyfish’s lifecycle reproduces asexually to make clones. Suggest how this happens.

And you might think: what is this on about? We have never, ever talked about jellyfish. If there’s something you don’t think has come up in your lessons, this might be an application question.

The key is to not panic. It's ok if there are things you don’t recognise, because there will be a few that you do. The examiner wants to see if you can take what you’ve learned and apply it to a new situation.

What you can do is look for the words that are familiar, highlight or underline the key biology words you do know. This will help you to think about where the question fits in the topics that you’ve learnt. Then you can base your answer around the key words that you’ve identified.

In this case, where the question is, “The Polyp stage of a jellyfish’s lifecycle reproduces asexually to make clones,” they want you to talk about asexual reproduction and meiosis.

I’m Dr Alex Lathbridge and this is Bitesize Biology. check out the rest of the Bitesize podcasts by searching Bitesize on BBC Sounds