

## Advice for those will be studying A Level Biology

Congratulations, you have made a great choice of A Level!

To ensure you are ready to start A Level Biology and to help support your transition from GCSE we advise you to do the following before starting the course in September:

1. Do the 2 printed GCSE Biology Paper 2 papers we have given you– you were only assessed on the paper 1 content in April and the paper 2 content is important to be very familiar with before starting A Level. If you don't review this content and try the 2 paper 2s you are putting yourself at a disadvantage. If you wish to do more paper 2s they are on Sharepoint and Teams, along with all of the mark schemes.
2. CGP publish a 'Headstart to A Level biology'. This is great summer reading and an introduction to A Level topics in the first year. Available in bookshops, CGP direct and Amazon for £4.95, or cheaper for used copies: <https://www.amazon.co.uk/Head-Start-level-Biology-Level-ebook/dp/B00VE2NIOI>
3. Complete the baseline assessment – you will find this on Teams in the transition folder along with the mark scheme to self mark.
4. Learn the key practical terminology that is essential for A Level. You need to be very familiar with the key practical terms for practical work as well as practical style questions (see end of this document for definitions and in context of a practical)
5. Ensure your maths skills are ready for A Level biology. OCR (our exam board) have this great resource with worked examples and questions to try: <https://www.ocr.org.uk/subjects/science/maths-for-biology/index.aspx?id=biology-a-h020-h420-from-2015>
6. Get a white labcoat ready to use in year 12, again can order online.
7. Have a look at the suggestions below to keep your brain thinking biologically – a wide range of suggestions.

- **Book recommendations**

Enjoy this summer with a good read. The books below are popular biologically based science books and great for extending your understanding of Biology

**Nessa Caray 'Junk DNA'**. You may not be aware that only approximately 5% of your genome codes for protein, but what is the rest? It is not just junk DNA. This great book by Nessa Carey will deepen your understanding of DNA, genetics and epigenetics and puts you at an advantage when we do genetics in year 13. If you enjoy this you can also try her other book 'epigenetics revolution' and the latest 'hacking the code of life: how gene editing will rewrite our futures'

**Matt Ridley 'The Red Queen'**. This is a great book about sexual selection and the fascinating role of sex in evolution. Matt Ridley has written quite a few science books, all good reads.

**Bill Bryson 'The Body'**. This was a number 1 bestseller and rightly so. Be amazed by facts about your body, from top to toe that you have probably not thought about. His other book we would also recommend is 'A short History of nearly everything'

**Emily Anthes 'Frankenstein's cat'** This is a great read looking at biotechnology particularly about genetic modification, so find out how those glow in the dark fish were actually created, builds well on your GCSE content

**Dean Burnett 'The idiot brain: a neuroscientist explains what your head is really up to'** An interesting and accessible read on the brain, which we cover in year 13

**Alice Roberts 'The incredible unlikeliness of being: evolution and the making of us'**. This will make you look at human evolution and our relatedness to other species in a new light, she is an excellent author and very readable.

- **Online reading**

### **Big Picture series from Wellcome Trust**

The Wellcome Trust used to publish 3 times a year a magazine on a topical issue aimed at 6<sup>th</sup> form. Great topics covered, such as genetics, the brain, addiction to influenza. All free to download <https://www.stem.org.uk/big-picture/resource-collection>

### **Naked scientists articles**

Varied but topical articles on a wide range of science, divided into the separate sciences so it is easy to search . <http://www.thenakedscientists.com/HTML/articles/>

- **Podcasts, if you prefer to listen**

**The Naked Scientists** – do not be put off by their name! It is not a dodgy website. They are a group of Cambridge scientists with a weekly scientific podcast with interviews, discussions, open questions. Absolutely superb. All past podcasts are available to download and it goes out each week on a Sunday evening. Well worth a look and listen. They also have interesting articles to read and home experiments you can undertake! <http://www.thenakedscientists.com/>

**The Guardian weekly podcast** - A round up of the science in the news each week, great content about 40mins each week. Back podcasts available online to listen again.

<http://www.guardian.co.uk/science/series/science>

**BBC Science podcast** - Weekly podcast, about 20 mins on scientific developments each week.

<http://www.bbc.co.uk/podcasts/series/scia>

- **Films/documentaries if your prefer to watch biology**

**Anything from David Attenborough**, lots from previous series on iplayer (from blue planet, planet earth, life story etc): <https://www.bbc.co.uk/iplayer/group/p03szck8>

**Gorillas in the mist (1988)**: a great conservation film about the work of the conservationist Dian Fossey with mountain Gorillas

**Lorenzo's Oil (1982)**: based on a true story about autoimmune disease and the child's parents trying to research and develop a new cure. With Susan Sarnadon and Nick Nolte

**Something the lord made (2004):** this tells the story of scientists at the early stages of heart surgery. With Alan Rickman

**My sister's keeper (2009):** a real weepy film, but this examines parents having another child to save the life of their older child who needs a bone marrow transplant

**The immortal life of Henrietta Lacks (2017):** the true story of a woman named Henrietta Lacks who has left a huge legacy to the biology world with her stem cells, although these were taken without permission

**Try a Ted talk,** put 'biology' into the search and take your pick, there are over 1000 on a wide range of topics, maximum of 20 minutes. <https://www.ted.com/talks>

**The secret life of the cell,** 58 minute documentary, essential watching for all A Level biologists: <https://www.dailymotion.com/video/xzh0kb>

- **Courses online**

**Futurelearn** have some great courses for biology you could do, all for free.

<https://www.futurelearn.com/courses>

**MOOC** have even more Biology based free courses that you self study at your own pace

<https://www.mooc.org/>

- **Websites**

**Have you discovered Zooniverse?** This is a great example of citizen science where you help scientists with their real data. A favourite is penguin watch where you analyse photographs of penguins to help compile population data! There are currently 49 different projects that are biology based that need help. Take a look:

<https://www.zooniverse.org/projects?discipline=biology&page=1&status=live>

**Learn Genetics from Utah university.** This is one of the best genetics websites that is aimed at your level, lots of interactive activities, areas to explore, all very clear.

<https://learn.genetics.utah.edu/>

**Conservation case studies from London Zoo, ZSL.** The A level course has a module on conservation and biodiversity. Read about ZSLs case studies on conservation from oysters to Salamanders . <https://www.zsl.org/conservation>

**DNA website.** This is a great resource on all thing DNA, from experiments, case studies to the history of DNA. <http://www.dnafb.org/>

## Glossary of terms – these are must learn before September

Term	Definition	Notes
accuracy	a measurement result is considered accurate if it is judged to be close to the true/acceptable value	Accuracy is a property of a single result. Random and systematic errors reduce accuracy.
anomaly (outlier)	value in a set of results that is judged not to be part of the inherent variation	Calculate the mean without the anomaly if you suspect an anomaly due to an error or due to different conditions. If you identify an anomaly during the practical, then consider repeating the measurement. In <b>Maths</b> , you may use the term 'outlier'.
control variable	variables other than the independent and dependent variables which are kept the same	These are quantities or conditions that are kept the same in a practical. Changes in these conditions could affect the validity of your method and results.
dependent variable	variable which is measured whenever there is a change in the independent variable	The dependent variables are recorded as either numerical values with units (quantitative) or in the form of descriptive comments (qualitative).
independent variable	variable which is deliberately changed or selected by the person in the planning of a practical activity	The independent variable is recorded in the first column of a results table. The dependent variable is recorded to the right with processed data in the far-right columns. In a graph, the independent variable is usually plotted on the x-axis with the dependent variable on the y-axis.
line of best fit	a line drawn on a graph that passes as close as possible to the data points. It represents the best estimate of the underlying relationship between the variables.	A line of best fit can be a straight line or a curve.  This differs from <b>GCSE Maths</b> , where a line of best fit is always a straight line.
precision	a quality denoting the closeness of agreement between measured values obtained by repeated measurements	Precision refers to more than one value. Precise results are clustered together. You can only determine if your results are precise by repeating the measurement.  Reducing the effect of random errors improves precision. A systematic error does not affect precision, as it is the same error each time. You may have precise results with a systematic error, but not accurate results.
random error	error in a measurement due to small uncontrollable effects	We can't correct random errors, but we can reduce their effect by making more measurements and calculating the mean. Random errors contribute to uncertainty.
range (of a variable)	the maximum and minimum values of the independent or dependent variables	In <b>Maths</b> the range is the difference between the biggest and smallest value of a variable.
repeatability	precision obtained when measurement results are produced in one laboratory, by a single	A measurement is repeatable when repetition under the same conditions gives similar results.

Term	Definition	Notes
	operator, using the same conditions, over a short timescale	Anomalous results can be identified by repeating the measurement. However, never discard data simply because it does not correspond with expectations.
reproducibility	precision obtained when measurement results are produced by different laboratories and therefore by different operators using different pieces of equipment	A measurement is reproducible when similar results are produced by different groups or different equipment or altered methods. If the results are reproducible then you can be more confident in the quality of the results.
resolution	smallest change in the input quantity being measured by a measuring instrument that gives a perceptible change in the reading of the measuring instrument	For example, the resolution of a ruler is 1 mm and the resolution of a burette is 0.1 cm <sup>3</sup> . It is not correct to describe equipment with a higher resolution as being more precise, as precision is a property of repeated results.
systematic error	error due to the measured value differing from the true value by the same amount each time	Methods or equipment may introduce systematic errors, producing consistent errors in results. Using the same equipment each time avoids introducing more systematic errors. Calibrating equipment where appropriate reduces systematic errors. A <b>zero error</b> is when the measuring device indicates a value when the quantity being measured is zero. Systematic errors contribute to uncertainty.
uncertainty	interval within which the true value can be expected to lie, with a given level of confidence or probability	Uncertainties depend on a range of factors, including systematic and random errors. Analogue apparatus typically has an uncertainty of $\pm$ half the smallest graduation. The uncertainty of the digital apparatus is $\pm$ the resolution of the apparatus.
validity (of an experiment)	suitability of the method used to answer the question being asked	To ensure validity, identify control variables and keep them constant to avoid affecting the dependent variables. In the case of field studies there are naturally changing variables. Ensure the control variables are as similar as possible when repeating.

## Control variable

Hydrogen peroxide volume is kept the same throughout the investigation.

## Validity

To ensure validity, control variables need to be in place and kept constant so that they don't affect the dependent variable.

## Random error

Random error can result from variations in the time between reading the time and recording the result. We can reduce the effect of random error on results by repeating and calculating the mean.

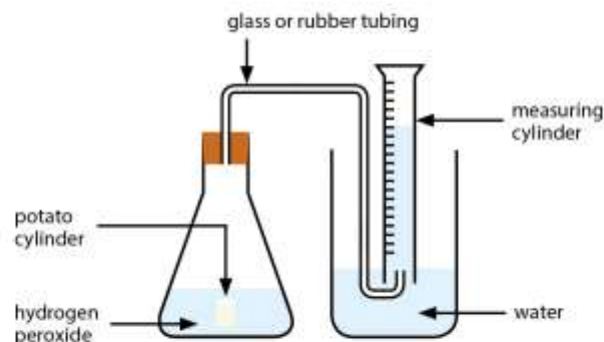
## Accuracy

Repetition alone does not improve accuracy. Accuracy is affected by random and systematic errors.

## Precision

Precision refers to repeated results. Precise results are clustered together. Repeating allows precision to be determined.

## Investigating the effect of catalase on hydrogen peroxide



## Method

1. Add  $20\text{ cm}^3$  of 1.0% hydrogen peroxide to the conical flask.
2. Use a cork borer to cut out a potato cylinder. Carefully trim off the skin and cut to exactly 50 mm in length.
3. Connect the conical flask with a delivery tube to an upside-down measuring cylinder in the tub of water. Record the initial volume of oxygen.
4. Add the potato cylinder to the flask. Time for 3 minutes and then record the volume of oxygen in the measuring cylinder.
5. Repeat 3 times and calculate the mean. Use the same equipment and ensure the same person reads the volume of the oxygen produced.
6. Repeat for different hydrogen peroxide concentrations (1.5%, 2.0%, 2.5%, 3.0%).
7. Compare your results with other groups.

## Systematic error

Not taking readings from the zero mark on the ruler would introduce a systematic error. These are consistent, repeatable errors due to equipment.

## Resolution

Apparatus with higher resolution will give readings with more decimal places. A gas syringe might have a higher resolution than a measuring cylinder.

## Dependent variable

The variable that's being measured.

## Repeatable

Results are repeatable if repeats with the same equipment, method and experimenter give similar results.

## Independent variable

This is changed directly by the person carrying out the investigation.

## Reproducible

Results can be produced by different groups, equipment, or methods. If the results are similar they are reproducible.