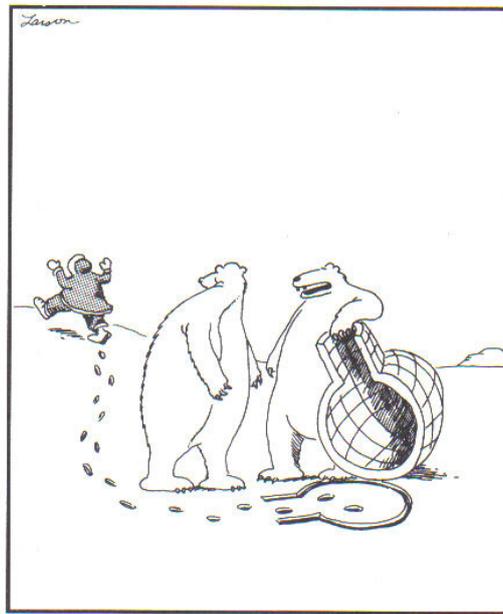




B E R K H A M S T E D
S C H O O L



“I lift, you grab. ... Was that concept just a little too complex, Carl?”

Bridging the Gap
BIOLOGY
2022

Welcome to the Berkhamsted School Biology Department. You have chosen to do an A-level subject that is both rewarding and interesting. It is an academically challenging subject which will require you to make a substantial leap in your understanding and skills learnt and applied at KS4. This may seem daunting but putting in the required level of effort in right from day one will mean success.

The pathway to success begins now. This pack is designed to get you up and running before the start of the academic year. There is a lot of information in this booklet and also some summer activities to do.

The following work set needs to be completed and submitted via email to hgreen@berkhamsted.com before the term starts. Your teachers wish to have access to this work before your first lesson.

You will submit a minimum of 2 documents:

- Must submit a Reading log
- Then at least one of the following:
 - 1) Magnification and Microscopy
 - 2) Maggots and Murder
 - 3) New Heart Cells

Ensure that this work is sent as separate documents and each page is clearly labelled with your name at the top of each page.

Each document must have your name in the saved title.

Due date: Thursday 1st September 2022

Email back to: hgreen@berkhamsted.com

1. Summer Reading Log

This is part of How Science Works. Scientists read and think and talk about ideas - hypotheses - evidence. They try things out - test their ideas - listen to each other.

There are hundreds of good, popular science books around and background reading will definitely support you through the course. We want you to read a variety of books/journals/articles – whatever interests you! You don't have to read a whole book – start a chapter or two, make a note of your thoughts and you can come back to it later if you enjoy it!

As you read throughout the summer, complete the reading log on pages 5 - 6 making a brief note of what you found interesting and why. **You don't have to fill the entire log.** Reading suggestions are included below.

Reading suggestions

If you are looking for journals, then here are three suggestions of how you can access some:

- **Biological Sciences Review Magazine:**

<https://my.dynamic-learning.co.uk/Default.aspx?cid=20918>

Username: MagazineArchive9781471862410

And the password is: student

- **New Scientist:**

NEW SCIENTIST

Username: library@newscientist.com

Password: castle

<https://www.newscientist.com/>

- **JSTOR**

JSTOR

Username: berkhamsted

Password: researcher

<http://www.jstor.org/>

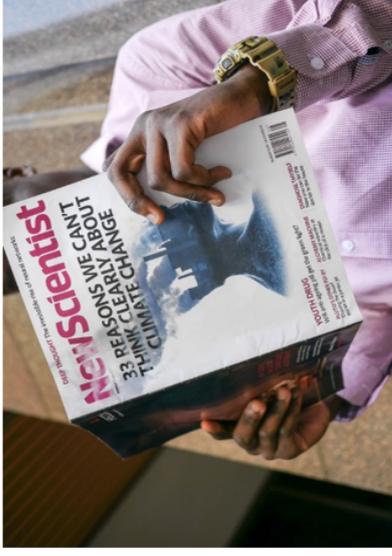
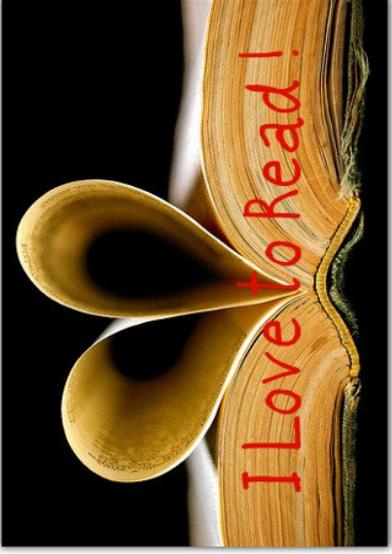
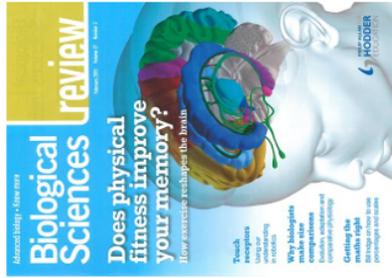
If you're interested in a longer read, or want to just delve into a few chapters (or even just one chapter!), there are lots of excellent books that the Biology staff have recommended:

1. **Dawkins, Richard** *The greatest Show on Earth – the evidence for evolution*
2. **Shubin, Neil** *Your inner Fish: the discovery of our 375 million year old ancestor*
3. **Gould, Stephen Jay** *The richness of life*
4. **Forbes, Peter** *The gecko's foot: how scientists are taking a leaf from nature's book*
5. **Jones, Steve** *Y: the descent of men*
6. **Watson, James D** *Darwin: the indelible stamp*
7. **Hobhouse, Henry** *Seeds of change: six plants that transformed Mankind*
8. **Ridley, Matt** *Nature via nurture: genes, experience and what makes us human*
9. **Sykes, Brian** *The seven daughters of eve*
10. **Reiss, Michael J** *Improving nature?*
11. **Postgate, J R** *Microbes and man*
12. **Carson, R** *Silent spring*
13. **Fortey, R A** *Life: an unauthorised biography.*
14. **Sigman, M** *The Secret life of the Mind*
15. **Mukherjee, S** *The Gene – an intimate history.*
16. **Yong, E** *I Contain Multitudes.*
17. **Godfrey-Smith, P** *Other Minds.*
18. **Enders, G** *Gut.*
19. **Lane, N** *The vital question*
20. **Lane, N** *Life Ascending*
21. **Parrington, J** *The Deeper Genome*
22. **Carey, N** *Junk DNA*
23. **Shapiro, B** *How to clone a mammoth*
24. **Criado Perez, C** *Invisible Women*

Please submit by Thursday 1st September (see the empty reading log on the next page – you can use this as a template for your reading log).

Email it to: hgreen@berkhamsted.com

Year 12 Biology Summer Reading Log



Wider reading, beyond your specification, supported by active reflection on what you have read, is a key skill at A-level.

This will prepare you also for your Extended Project Qualification and, moreover, support your future UCAS Personal Statement.

Date	Name of the book, magazine, journal you have read	What was the name of the article you read?	What did you find interesting? Explain why?

Research and Bibliographies

Searching the Internet

On this page you will find hints and tips for searching for information online and in books etc.

Searching - the advanced method:

Lots of search engines - and search facilities on websites - have advanced search options. Using these can help to focus your search even further.

For example, in Google Scholar you can:

- enter an exact phrase
- exclude particular words that you know will hinder your search
- search by author
- search by article publication date (very useful if you are looking for only recently published material)
- search within subject areas

The image shows the Google Scholar Advanced Search page. At the top, it says "Google Scholar BETA" and "Advanced Scholar Search". There are links for "Advanced Search Tips" and "About Google Scholar". The main search area has a "Find articles" section with radio buttons for "with all of the words", "with the exact phrase", "with at least one of the words", "without the words", and "where my words occur". A dropdown menu is set to "anywhere in the article". There are input fields for the search terms and a "Search Scholar" button. Below this are sections for "Author" (Return articles written by), "Publication" (Return articles published in), and "Date" (Return articles published between). The "Subject Areas" section has a radio button for "Return articles in all subject areas" (which is selected) and another for "Return only articles in the following subject areas". Below this are several checkboxes for subject areas: "Biology, Life Sciences, and Environmental Science", "Business, Administration, Finance, and Economics", "Chemistry and Materials Science", "Engineering, Computer Science, and Mathematics", "Medicine, Pharmacology, and Veterinary Science", "Physics, Astronomy, and Planetary Science", and "Social Sciences, Arts, and Humanities".

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Searching in books etc.:

When using books, journals and magazines etc. use the **contents page** - which breaks the publication down into chapters and sections - and the **index** to focus your search. This will save time and help to avoid gathering too much non-essential information. **Glossaries** (useful words and phrases explained), **timelines**, **footnotes** and **bibliographies** can also be useful places to gather information from in a books, journal or magazine.

What is a bibliography?

A bibliography is a list of all the sources you have referred to throughout your research, i.e. your [references](#). It usually placed at the end of your essay/presentation.

Why should you include a bibliography at the end of your essay?

It makes clear which sources you have used, how you have used them, and enables your readers/audience to consult the same sources should they wish to.

How do you create a bibliography online?

There are numerous tools available to help you keep track of your sources and to create a complete bibliography at the end of your research.

What else you should know.

It is important that your bibliography is consistent, and all your references should be presented in the same way. It should be presented in alphabetical order, usually by author surname.

We suggest you use EasyBib to create your bibliographies. It is free, and very simple to use.

There are many different methods you can use to reference your sources. The Biology Department would prefer that you use the **HARVARD** system for referencing.

Whichever system you use; it is important that you are **consistent**. Select **one system** and stick to it throughout your essay/dissertation.

BOOKS

AUTHOR SURNAME, Author initial(s). (Year). *Title*. Place of Publication: Publisher.

e.g. BLUMENTHAL, H. (2006). *In Search of Perfection*. London: Bloomsbury Publishing PLC.

WEBSITES

PUBLISHER (Year) Title. Website

e.g. WIKIPEDIA (2008) Molecular gastronomy. <http://www.Wikipedia.org>

JOURNAL ARTICLES

AUTHOR SURNAME, Author initial(s). Article Title. *Journal Title*, Vol. (No.), pages.

e.g. THIS, H. Food for tomorrow? How the scientific discipline of molecular gastronomy could change the way we eat? *EMBO reports*, 7 (11), 1062-1066

Option 1, Research on Magnification and Microscopy

Of all the techniques used in biology, microscopy is probably the most important. To see any detail of cells and organelles, you need to magnify the real object using a microscope. There are different types of microscopes that you will discover early on in the A level course – light microscopy, scanning and transmission microscopy (SEM and TEM respectively).

You might want to find out the differences between these and the advantages and disadvantages of using the different types.

Here is an SEM image of an organism called *Demodex folliculorum*. It is magnified 400X



- *Can you find out where this organism lives?*
- *What it feeds on?*
- *What type of organism it is?*
- *What is its real size?*
- *How has this image been made?*

Task: Summarise your findings above on a word document with the image pasted in it and email it to: hgreen@berkhamsted.com (Don't forget to list your sources.)

To calculate magnification or work out real sizes of objects from images, you will need to be comfortable using different units of measurement.

Metre	m	=	1 m
Millimetre	mm	=	10^{-3} m
Micrometre	μm	=	10^{-6} m
Nanometre	nm	=	10^{-9} m

Practise converting from one unit to another:

1. 10mm = ? m
2. 12.25mm = ? μm
3. 1mm = ? nm
4. 14 μm = ? mm

Option 2, Maggots and murder



When an animal such as a rabbit is knocked down and killed by a car, flies soon find its body. They lay their eggs on it. The eggs hatch into maggots which burrow into the body. The maggots grow rapidly and then moult to form pupae. A new generation of flies emerges from these pupae.

To a fly, a dead human is no different from any other dead mammal. Flies are just as likely to

lay eggs on the body of a murder victim abandoned in a lay-by as on a dead rabbit. Forensic scientists make use of this to estimate the time of death. They must take into consideration, however, that the time taken for a fly to complete its lifecycle varies with temperature. The lifecycle is completed much faster in hot summer conditions than it is in cooler spring and autumn weather. Look at Table 1. This shows the time taken for eggs to hatch at different temperatures.

Table 1. The effect of temperature on the time taken for fly eggs to hatch

Temperature / °C	Time taken for eggs to hatch / h
5	230
10	90
11	70
13	50
17	30
19	25

1. Plot the data in the table as a suitable graph (using the grid below). Join the points with a best-fitting smooth curve.

There is a problem, however, in estimating the time of death in the way you have just done. How do we know the local temperature at the time the body was lying undiscovered? It is this temperature which determines how long the fly eggs take to hatch. What forensic scientists do is to measure the temperature at the place where the body is found and plot this against the temperature at the nearest meteorological station at which records are kept. Figure 2 shows some figures obtained from an actual investigation involving the body described in question 3.

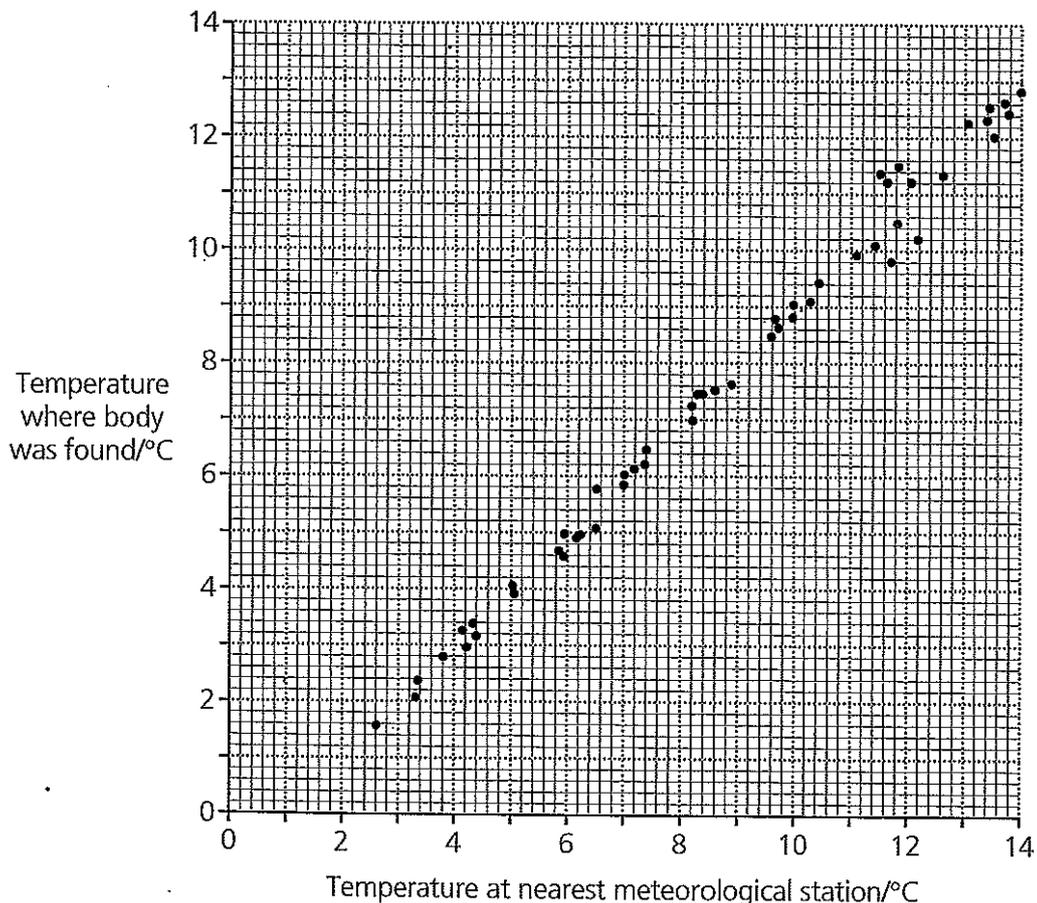


Figure 2. Graph showing local temperature at the place where a body was found and the corresponding temperature at the nearest meteorological station

4. Describe the relationship between the local temperature at the place where the body was found and the temperature at the nearest meteorological station.
5.
 - a. How could a forensic scientist use the graph you have drawn and the graph in Figure 2 to provide an estimate of the time when the body was dumped in the bush?
 - b. Explain **one** way in which using the time taken for fly eggs to hatch might give an unreliable estimate of the time at which the body was dumped.

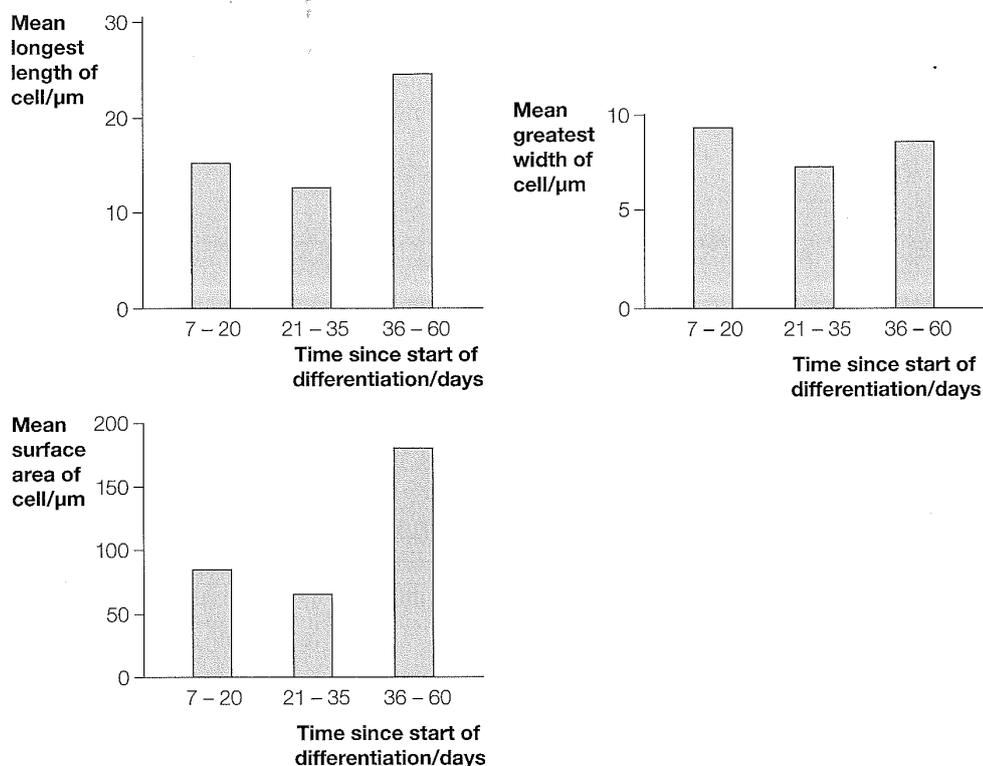
Please submit your work by email to
hgreen@berkhamsted.com

Option 3, New Heart Cells

Stem cells are undifferentiated cells. They are able to divide by mitosis to form new stem cells. They are also able to differentiate into different types of body cell.

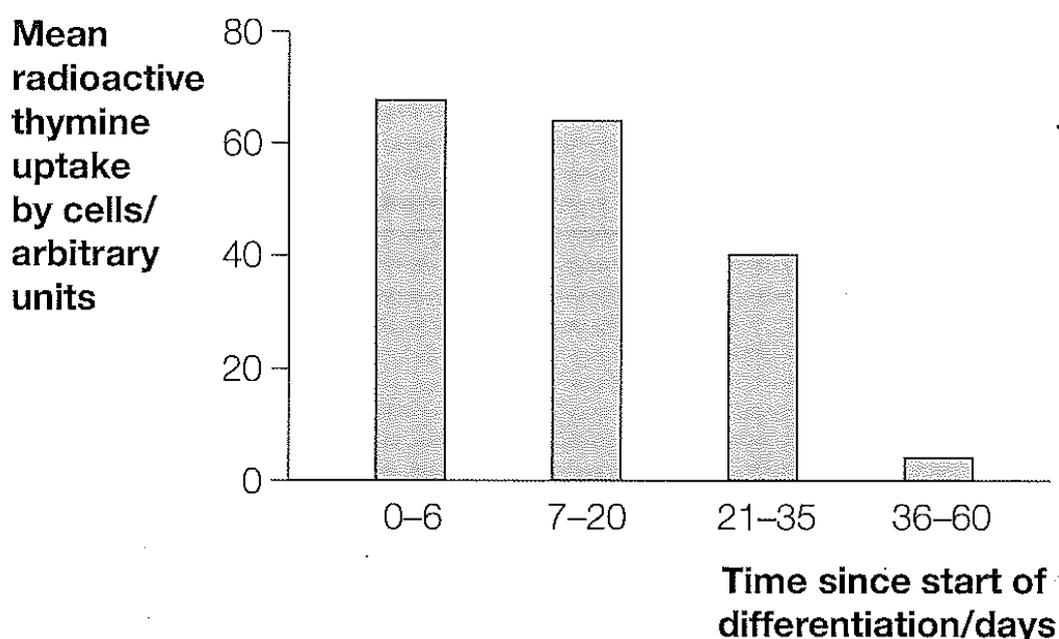
Scientists obtained stem cells from embryos and grew them in a cell culture. The stem cells were stimulated to differentiate into heart-muscle cells. The scientists measured the length, width and surface area of samples of cells at intervals during this process of differentiation.

The charts show their results, as they were presented in a scientific paper.



1. Suggest why the scientists measured the longest length and the greatest width of each cell. (2)
2. Was a bar chart the best way to present their data? Give reasons for your answer. (2)
3. (a) Calculate the length-to-width ratios for the three samples of cells and present them in a table. (2)

- (b) What do the ratios show about changes in shape of the stem cells as they differentiated? (2)
4. What do the results for mean surface area suggest about the growth of the cells during differentiation? (2)
5. In a different investigation, the scientists measured the uptake of radioactive thymine by stem cells in a culture at different time intervals as they differentiated into heart-muscle cells. Thymine is part of one of the nucleotides used in the synthesis of DNA. The cells began to contract during the 7–20 day period. The chart shows their results, as they were presented in a scientific paper.



- (a) Describe the results. (3)
- (b) Suggest an explanation for the results. (4)
6. Some clinics are offering injections of stem cells to treat people who have suffered a heart attack. The stem cells are taken from the patient's own bone marrow.
- (a) Suggest how injection of these stem cells might benefit the patient. (2)
- (b) Suggest why the patient's own stem cells are used. (1)

**Please submit your work by email to:
hgreen@berkhamsted.com**