



**Subject: Biology Pre-A-level**  
Knowledge and Enrichment Ideas

Biology at A-level is far more demanding than it was at GCSE. It will require you to learn a large amount of factual information so that you are able to apply knowledge to unfamiliar scenarios without having to search your memory for appropriate terminology. There is also a large mathematical component.

**Knowledge**

Log on to kerboodle and look through the A-level text book online: A/S year 1.

Topic 1: Section 1 and section 2 for each teacher respectively.

Have a go at these A-level questions: send to Ms Coles for review.

[https://highstedkentschuk-my.sharepoint.com/:f:/g/person/coles\\_j\\_highsted\\_kent\\_sch\\_uk/ErB3uqIHJ2NLr0fPaam9o5YBG7uZfkTuIUbqMZsk3ONNqQ?e=xGHPf](https://highstedkentschuk-my.sharepoint.com/:f:/g/person/coles_j_highsted_kent_sch_uk/ErB3uqIHJ2NLr0fPaam9o5YBG7uZfkTuIUbqMZsk3ONNqQ?e=xGHPf)

Read through this pdf: [https://drive.google.com/open?id=0Bxi9XT52keC\\_SS15bThNR09FWDQ](https://drive.google.com/open?id=0Bxi9XT52keC_SS15bThNR09FWDQ)

It is a revision resource that supports 25% of your course.

**Knowledge**

Read the strategies of 'How to learn'. This is a document that describes the most recent ideas on how brains can best be made to remember factual information. It is what science tells us, work! So, listen and try them.

<https://drive.google.com/file/d/19lqys0iBaVJY5gMI31mOqiVoDyeogGBx/view?usp=sharing>

**Biology A-level suggested reading list**

**Evolution and DNA:**

The Blind Watchmaker; The Selfish Gene; The Ancestors Tale: Richard Dawkins.

GENOME: Matt Ridley.

DNA: the secret of life: James Watson

A Brief History of Everyone Who Ever Lived: the Human Story Retold Through Our Genes: Adam Rutherford.

**General:**

Why We Sleep: Unlocking the Power of Sleep and Dreams: Matthew Walker.

Sapiens: A Brief History of Humankind: Yuval Noah Harari.

Introducing Epigenetics: A Graphic Guide: Cath Ennis.

Unnatural Causes: Dr Richard Shepard warning: upsetting content.

This is Going to Hurt: Adam Kay (warning: explicit language).

Listening to the Animals: Becoming the Supervet: Noel Fitzpatrick.

Brief Answers to the Big Questions: Stephen Hawking.

Do No Harm: Stories of Life, Death and Brain Surgery: Henry Marsh.

Adventures of a Young Naturalist: The Zoo Quest Expeditions: Sir David Attenborough.



## Knowledge

### You could also

Take free online biology courses in genetics, biotechnology, biochemistry, neurobiology and other disciplines. Courses include *Fundamentals of Neuroscience* from Harvard University, *Molecular Biology* from MIT and an *Introduction to Bioethics* from Georgetown.

<https://www.edx.org/course/subject/biology-life-sciences>

These will be excellent to do to prepare....and free!!!

## Knowledge/Enrichment

Perhaps the best single thing you can do to help you prepare for A-level is to keep up to date with events and current affairs as they pertain to your subject. The simplest way to do this is to ensure that you regularly read quality journalism and search within this for articles related to your academic interests. Some suggestions include:

- Broadsheet newspapers: The Guardian, The Times, The Daily Telegraph
- BBC News online: [www.bbc.co.uk/](http://www.bbc.co.uk/)
- The Economist: [www.economist.com/](http://www.economist.com/)
- Reuters: <https://uk.reuters.com/> (change edition for international news)
- The New Statesman magazine: [www.newstatesman.com/](http://www.newstatesman.com/)
- New Scientist magazine, news section: <https://www.newscientist.com/section/news/>

Another excellent way to stay up to date with recent developments in your field of interest is **podcasts**. There is a wealth of academic podcasts available online, covering virtually every subject or topic you can think of.

This links you to a page of with podcast links:

<https://thebiologist.rsb.org.uk/biologist-features/158-biologist/features/1803-12-of-the-best-podcasts-for-biologists>

The beauty of these is that they are usually free to download and are completely low-hassle for you. Listen to them at your convenience: or whenever and wherever you please: some I found.....yes I have checked these!

- Cambridge YouTube: you will need to search within this for biology related tips.....
- Cambridge online lectures at the University Streaming Media Service: <https://www.sms.cam.ac.uk/> all pages. This is their covid-19 research update page <https://www.sms.cam.ac.uk/media/3203754>
- Cambridge resources at TES: bio resources they have uploaded

<https://www.tes.com/resources/search/?authorId=3585719&subjects=GB%7C0%7CScience%7C&subjects=GB%7C1%7CScience%7CBiology%7C>

- Oxford University podcasts: <https://podcasts.ox.ac.uk/units/department-earth-sciences>

## Enrichment

**Go to a Zoo and Aquarium.....** all of these have virtual facilities....

- **The Cincinnati Zoo:** Check in around 3 pm, because that's the time the Zoo holds a daily Home Safari on its Facebook live feed: <https://www.facebook.com/cincinnati-zoo/>
- **Atlanta Zoo:** The Georgia zoo keeps a 'Panda cam' <https://zooatlanta.org/panda-cam/> livestream on its website.
- **Georgia Aquarium:** Sea-dwellers like African penguins and Beluga Whales are the stars of this aquarium's live cam: <https://www.georgiaaquarium.org/webcam/beluga-whale-webcam/>



- **Houston Zoo:** There are plenty of different animals you can check in on with this zoo's live cam: <https://www.houstonzoo.org/explore/webcams/> but we highly recommend watching the playful elephants.
- **The Shedd Aquarium:** This Chicago aquarium shares some pretty adorable behind-the-scenes footage of their residents on Facebook: <https://www.facebook.com/sheddaquarium/>
- **San Diego Zoo:** With what may be the most live cam options: <https://kids.sandiegozoo.org/videos>, this zoo lets you switch between koalas, polar bears, and tigers in one sitting.
- **Monterey Bay Aquarium:** It can be Shark Week every week thanks to live online footage of Monterey Bay's Habitat exhibit: <https://www.montereybayaquarium.org/animals/live-cams>
- **National Aquarium:** Walk through tropical waters to the icy tundra in this floor by floor tour: <https://aqua.org/media/virtualtours/baltimore/index.html> of the famous, Baltimore-based aquarium.

### EXTEND YOURSELF!!!

#### Find a reading list from a university for Biological sciences degree:

See if you can find books second hand online! Most students buy and then sell.....

#### Some ideas for preparatory reading, before A Levels commence.

##### This is from Cambridge:

- Ashcroft, F. (2012) *The Spark of Life: Electricity in the Human Body*. London: Penguin Books.
- Greenfield, S. (1997) *The Human Brain: A Guided Tour*. London: Phoenix.
- King, J. (2011) *Reaching For The Sun: How Plants Work, 2nd ed.* Cambridge: Cambridge University Press.
- Lavers, C. (2000) *Why Elephants have Big Ears*. London: Victor Gollancz.
- Widmaier, E.P. (1998) *Why Geese don't get Obese (and we do)*. New York: W.H. Freeman and Co.

##### This link is from Waterstones as an example of great books:

<https://www.waterstones.com/books/search/term/new+scientist>



**Subject: Biology Pre-A-level**  
Practical work

## The Response of Seedlings to Light

### Investigations

1. Make a list of all possible stimuli that the seedlings could be responding to when they bend towards a window.
2. Why are coloured filters useful when you investigate this response?
3. Think carefully about your choice of filters in steps your investigation, which ones should you not use? Why? What combinations of filters will you use?
4. What are all the variables are there in your investigation (IV, DV and controls), and how will you control them?
5. Predict what results you think you will get and say why you think you will get these results.
6. How will you analyse your results to decide whether or not what you record is a response to the variables which you have controlled or, is likely to be due just to chance?
7. What changes could you make to the design of the tropism chamber to make it more valid an experiment?

### Technical aspects and notes

Seedlings growing on a windowsill will often bend towards the window. This bending is called a tropism. What are the seedlings responding to? The simple technique described on this worksheet and the link will help you to investigate this tropic response.

### Apparatus

- Toilet roll/yoghurt pots similar
- Coloured plastic/tissue paper filters, e.g. red, green and blue
- Scotch tape/cellotape
- Scissors
- Compost/cotton wool
- Water
- A lamp
- Any small seedlings, e.g. rapid-cycling *Brassica rapa* (fast plants), *Sinapis alba* (white mustard), *Raphanus sativus* (radish). The seedlings should have straight hypocotyls.



### Technical Notes and safety

The only safety issue arises when making the hole in the side of the toilet roll/yoghurt pot and it may be advisable for a parent to do this in advance. The hole should be about 5 mm in diameter and can be made with a one-hole punch or pair of pointed scissors.

White mustard can be used, as the seeds are relatively large and can be seen and manipulated more easily than cress seeds. Mustard seeds also germinate more readily than cress and radish.

The matting/wool/compost must just be damp but care must be taken to ensure that there is not an excess of water in the pots. The matting can be replaced by a thin layer of compost but then the plants are not so easily removed if measurements are required. By placing the cans in a white lined box lid, the light tends to be reflected in all directions whereas plants are grown in a window the light comes in one direction. The use of a light-bank ensures sufficient heat and light to gain results after 4 or 5 days. If the plants are just left in a warm room that is lit only during the day it may need 6 or 7 days to get results.

Now follow this link to set up your practical.

<https://www.saps.org.uk/attachments/article/185/SAPS%20Sheet%208%20-%20Worksheet%20-%20The%20response%20of%20seedlings%20to%20light.pdf>

Complete a write up of your process as you would a required practical.

**A Level Bridging questions  
2020**

Please return to Miss Coles

Time:	<b>32 minutes</b>
Marks:	<b>25 marks</b>
Comments:	Attempt and return to Ms Coles

**Q1.**

Below is a diagram of an animal cell.

(a) Name the organelles labelled:

**B** \_\_\_\_\_

**C** \_\_\_\_\_

(2)

(b) Name **two** structures present in plant cells that are **not** present in animal cells.

1. \_\_\_\_\_

2. \_\_\_\_\_

(1)

A biologist prepared a sample of organelles labelled **C** from liver. He used the following method.

1. Added to the liver tissues an ice-cold, buffered solution with the same water potential as the liver tissue.
2. Mixed the liver and solution in a blender.
3. Filtered the mixture from the blender.
4. Spun the filtered liquid in a centrifuge at a low speed. A pellet appeared in the bottom of the centrifuge tube.
5. Poured off the liquid above the pellet into a second centrifuge tube and spun this at a higher speed to obtain the sample of organelles labelled **C**.

- (c) Explain why the solution the biologist used was ice-cold, buffered and the same water potential as the liver tissue (step 1).

Ice-cold \_\_\_\_\_

\_\_\_\_\_

Buffered \_\_\_\_\_

\_\_\_\_\_

Same water potential \_\_\_\_\_

\_\_\_\_\_

(3)

- (d) Explain why the biologist used a blender and then filtered the mixture (steps 2 and 3).

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

(2)

- (e) Name the organelle that made up most of the first pellet after centrifuging at a low speed (step 4).

\_\_\_\_\_

(1)

- (f) The second centrifuge tube was spun at a higher speed to obtain the sample of organelles labelled **C** in the diagram (step 5).

Suggest why.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

(1)

(Total 10 marks)

## Q2.

- (a) Describe how you could make a temporary mount of a piece of plant tissue to observe the position of starch grains in the cells when using an optical (light) microscope.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

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(4)

The figure below shows a microscopic image of a plant cell.

© Science Photo Library

- (b) Give the name and function of the structures labelled **W** and **Z**.

Name of **W** \_\_\_\_\_

Function of **W** \_\_\_\_\_

Name of **Z** \_\_\_\_\_

Function of **Z** \_\_\_\_\_

(2)

- (c) A transmission electron microscope was used to produce the image in the figure above.  
Explain why.

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(2)

(Total 8 marks)

### Q3.

The diagram shows part of a prokaryotic cell.

- (a) Name the structures labelled **W** to **Z** in the diagram.

**W** \_\_\_\_\_

**X** \_\_\_\_\_

**Y** \_\_\_\_\_

**Z** \_\_\_\_\_

(2)

(b) Name the main biological molecule in:

**W** \_\_\_\_\_

**X** \_\_\_\_\_

(2)

(c) Name the process by which prokaryotic cells divide.

\_\_\_\_\_

(1)

(d) Some prokaryotic cells can divide every 30 minutes. A liquid culture contained a starting population of  $1.35 \times 10^4$  cells.

Assuming each cell divides every 30 minutes, calculate how many cells there will be after 3 hours. Assume no cells die during this time.

Answer = \_\_\_\_\_

(2)

(Total 7 marks)

## Mark schemes

### Q1.

(a) **B** Golgi (body / apparatus);

**C** Mitochondria / mitochondrion;

2

(b) 1. Chloroplasts / plastids

2. Cell wall

3. Cell vacuole

4. Starch grains / amyloplasts;

*Any 2 for 1 mark*

1 max

(c) 1. Ice-cold – Slows / stops enzyme activity to prevent digestion of organelles / mitochondria;

2. Buffered – Maintains pH so that enzymes / proteins are not denatured;

*Reject reference to cells*

3. Same water potential – Prevents osmosis so no lysis / shrinkage of organelles / mitochondria / **C**;

*Ignore damage*  
*For each mark must link reason to relevant property*

- (d) 1. Break open cells / homogenise / produce homogenate; 3  
2. Remove unbroken cells / larger debris; 2
- (e) Nucleus / nuclei; 1
- (f) Mitochondria / organelle **C** less dense than nucleus / organelle in first pellet; 1  
*Accept 'lighter' for less dense* 1
- [10]

## Q2.

- (a) 1. Add drop of water to (glass) slide;  
2. Obtain thin section (of plant tissue) and place on slide / float on drop of water;  
3. Stain with / add iodine in potassium iodide.  
3. *Allow any appropriate method that avoids trapping air bubbles*  
4. Lower cover slip using mounted needle. 4
- (b) 1. **W** – chloroplast, photosynthesis;  
2. **Z** – nucleus, contains DNA / chromosomes / holds genetic information of cell. 2
- (c) 1. High resolution;  
2. Can see internal structure of organelles. 2
- (d) Length of bar in mm × 1000. 1
- [9]

## Q3.

- (a) W – (cell surface) membrane  
X – cell wall  
Y – capsule  
Z – flagellum  
*Four correct = 2 marks.*  
*Three or two correct = 1 mark.*  
*Y - Ignore references to slime/mucus*  
*Y - Reject capsid*  
*Z - accept flagella* 2
- (b) W - Phospholipids;  
X - Murein / glycoprotein;  
*X - Accept peptidoglycans.*  
*Accept phonetic spellings*

2

(c) Binary fission;

*Reject binary fusion*

1

(d)  $8.64 \times 10^5$ ;;

*Accept 864 000 however expressed, e.g.  $864 \times 10^3$*

*Allow one mark for*

$$2^6 = 64$$

**OR**

$$64 / 26 \times (1.35 \times 10^4)$$

2

[7]

**PLEASE RETURN TO MISS COLES**