

Biology Year 13 introduction

Biologists

Below are some activities for you to complete over the summer holidays as both opportunities to consolidate your knowledge but also to further extend your understanding beyond the specification.

Please ensure that you have all tasks, as physical copies, ready for collection during the first biology lesson in September.

To find out about the GCE specification we deliver at OPGS please use the following link

<https://www.ocr.org.uk/qualifications/as-and-a-level/biology-a-h020-h420-from-2015/>

Task	Purpose	Expected timeframe	Outcome
1. Preparation for September assessment	Material to help you revise disease, biodiversity and classification and evolution. Firstly, go through the student friendly targets sheets from Moodle for these topics green pen with the answer sheets. Focus on the language you are using – is it as GCE standard? Complete the practice questions in this booklet and self-assess with the provided mark scheme.	4-5 hours	To identify areas of weakness in these topics which you can then prioritise for revision in preparation for the September assessment.
2. PAG revision	To revisit some of the PAGs completed in year 12. Complete an 'experiment on a page' sheet (found later in booklet) for each of the following PAGs. You will need to copy/write out for each practical 1.1, 2.1, 3.1, 4.1	2-3 hours	To revisit methodology as these could be assessed in the final paper. Further work will be completed in this area for year 13 DS work.
3. Follow up from beach	Construct a kite diagram of your	1-2 hours <i>Data will be emailed</i>	I gain further understanding of how

ecology fieldwork	collated results. Please collect graph paper before the end of the term. See further information below.		ecologists present their data to understand transitions along a transect
4. Beyond the specification	Go through the suggested reading/podcast lists provided and access at least one. Summarise your learning by completing either; box it, Cornell notes, knowledge organiser or transform activity. These are all further in the booklet	1-2 hours	To encourage wider research in students beyond the specification. This will be especially useful when completing/extending UCAS statements or to give you discussion points for interview.

Task 3

How to Make a Kite Graph Video

<https://www.youtube.com/watch?v=yKtAHhTF50>

How to Draw a Kite Diagram

<https://slidetodoc.com/kite-diagrams-kite-diagrams-are-a-visual-picture/>

Khan Academy Ecological Succession

<https://tinyurl.com/s5aett6v>

Sand Dunes Succession

<https://www.biology-fieldwork.org/a-level/succession/sand-dunes/>

Kite Diagrams

A kite diagram can be used to compare the distribution of different species along a transect.

Watch the video linked above. Draw one kite diagram to show the distribution of different species (plants AND animals) along the transect. You will be emailed the data for this separately.

Guidance:

- You must hand-draw your kite diagram using graph paper, a pencil and a ruler
- You must include a table showing the original data used
- You must include a scale showing how many organisms each box represents. If you have a particularly large number of organisms for one species in your data you may need to draw separate kite diagrams with different scales
- Include clear and descriptive titles and axis labels
- Plan your diagrams carefully to ensure your 'kites' will not overlap
- Write a paragraph summarising what your kite diagram shows in terms of species distribution. Link this to the change in the following abiotic factors as you move along the transect – light intensity, salinity, length of time covered by tide.
- Have this ready to hand in first lesson back in year 13 – collect graph paper if needed.

Task 1.

1. Tuberculosis is an infectious disease that affects humans. It is caused by a pathogen.

Pathogens can also cause diseases in plants.

Which of the following plant diseases is caused by the same **type** of pathogen that causes tuberculosis in humans?

- A black sigatoka in bananas
- B 'mosaic' leaf discolouration in tobacco plants
- C ring rot in tomatoes
- D late blight in potatoes

Your answer ☐

[1]

2. Bats are the only mammals that have wings. Many species of bat hunt flying insects at night. Bats are able to use echolocation (sound waves) in order to help them find their prey in the dark.

- i. Explain why bats and birds, despite not being closely related, have both evolved wings.

[3]

- ii. Suggest why the vast majority of bird species have not evolved the ability to echolocate.

[1]

3. Explain how biological molecules can provide evidence that species have evolved.

You should refer to different types of molecule in your answer.

4. Which of the following options, A to D, lists the three domains of life?

- A. Archaea, Bacteria and Eukaryota
- B. Bacteria, Prokaryota and Eukaryota
- C. Prokaryotae, Protocista and Eukaryota
- D. Protocista, Plantaea and Animalia

Your answer

[1]

5. The Sumatran rhinoceros, *Dicerorhinus sumatrensis*, is a rare member of the family Rhinocerotidae. These rhinoceros are now critically endangered, with only six substantial populations in the wild: four in Sumatra, one in Borneo, and one in the Malay Peninsula.

D. sumatrensis lives in rainforests. Their numbers are difficult to determine but they are estimated to number fewer than 100.

Complete the table below, showing the classification of the Sumatran rhinoceros.

Kingdom
Phylum	Chordata
.....	Mammalia
.....	Perissodactyla
Family	Rhinocerotidae
.....	Dicerorhinus
Species

[2]

6. In 1990, Carl Woese suggested a new top level taxon to the current system of classification of living organisms, which he termed a domain. He used his results from studying RNA to organise organisms into three distinct groups.

Woese carried out a detailed study of RNA molecules in order to draw his conclusions.

Suggest **two** ways in which the scientific community are likely to have validated Woese's research.

[2]

7. Antifreeze proteins are a group of globular proteins that prevent ice crystal formation in living cells. These proteins are found in four different kingdoms and have evolved independently of each other.

Which of the following phrases explains why this convergent evolution has occurred?

- A adaptation to fill a similar niche
- B continuous variation of these species
- C interspecific variation
- D the same gene occurs in these species

Your answer

[1]

8. In his book 'On the Origin of Species', Charles Darwin made the following four observations.

- E Offspring generally appear similar to their parents.
- F No two individuals are identical.
- G Organisms have the ability to produce large numbers of offspring.
- H Populations in nature tend to remain relatively stable.

From these observations he made a number of deductions, listed in the table below.

The deductions are supported by one or more of the observations (E, F, G or H).

In the table, indicate which of the above observations contributed to each deduction.

You may use each letter (E, F, G, or H) once, more than once, or not at all.

Deduction	Supporting observation(s)
Characteristics are passed on to the next generation.	
There is a struggle for existence.	
Individuals with beneficial characteristics are among the few who survive.	

[3]

9. In 1990, Carl Woese suggested a new top level taxon to the current system of classification of living organisms, which he termed a domain. He used his results from studying RNA to organise organisms into three distinct groups.

- i. Name the cell component that appears in organisms of all three domains that Woese suggested.

[1]

- ii. One of the domains he suggested is called Eukarya.

Name the other **two** domains.

1

2

[2]

iii. State **two** defining features of all members of the domain Eukarya.

[2]

10. Young mammals receive antibodies in their mother's milk.

This is an example of which type of immunity?

- A. artificial active immunity
- B. artificial passive immunity
- C. natural active immunity
- D. natural passive immunity

Your answer ☐

[1]

11. Which of the following descriptions is correct?

- A. Vaccination gives long-term protection, immunisation gives short-term protection.
- B. Vaccination involves injection of antigenic material and immunisation is the process of developing immunity.
- C. Vaccination involves injection of antigenic material, immunisation is injection of antibodies.
- D. Vaccination and immunisation have the same meaning.

Your answer ☐

[1]

12(a). The concept of molecules with complementary shapes can be used to explain many processes in living things.

Another molecule that relies on a specific shape to bind to a specific compound is an antibody.

Fig. 23.1 shows the generalised structure of an antibody.

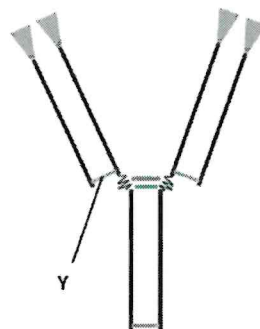


Fig. 23.1

- i. Draw a ring on **Fig. 23.1** to show a part of the molecule that has a shape complementary to the shape of an antigen.

[1]

- ii. The component labelled **Y** on the antibody is a bond.

State what type of bond is found here and give its function.

[2]

(b). Lupus is an autoimmune disease. Lupus occurs when nuclear proteins are exposed and the immune system makes antibodies against these proteins. As a result the proteins clump together. These clumps stick to surfaces such as the blood vessel walls and cause fatigue, joint pain and skin rashes.

- i. What is meant by the term *autoimmune disease*?

[2]

- ii. Suggest why antibodies specific to nuclear proteins are not normally made.

[1]

(c). Scientists often use natural substances to help them develop specific new medicines.

State two possible sources of such natural substances.

[2]

13. The English elm tree, *Ulmus procera*, was once widespread in Britain. The English elm is much less common now because of a disease known as Dutch elm disease.

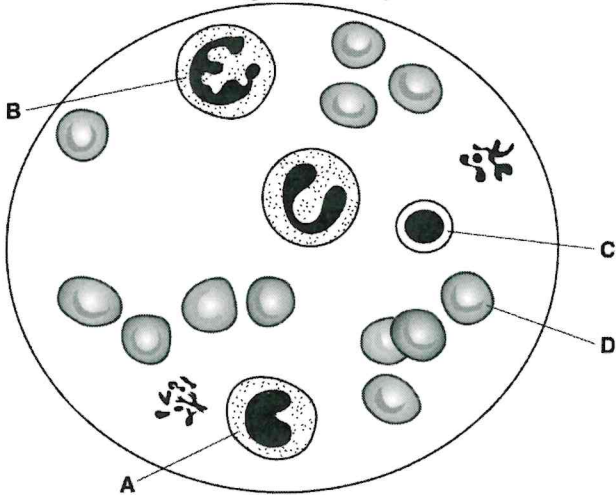
- The disease is caused by a fungus that first arrived in Britain in 1967.
- Beetles living under the bark pick up fungal spores while feeding.
- Within a few years approximately 25 million trees were dead.

Suggest two reasons for the **rapid** spread of the fungus in the elm population.

1

[2]

14. A diagram of a stained blood smear observed under a light microscope is shown below.



Which of the structures labelled A to D in the diagram is a neutrophil?

Your answer

[1]

15. Pathogens cause disease and are transmitted from individual to individual in a variety of ways.

Which of the rows, A to D, in the table below is correct?

	Disease	Type of pathogen	Means of transmission
A	Athlete's foot	Fungus	Direct and indirect contact
B	HIV/AIDs	Virus	Indirect contact
C	Malaria	Bacterium	Vector
D	Tuberculosis	Protoctist	Direct contact

Your answer

[1]

16.

Advances in medical technology include the development of personalised medicines and synthetic biology.

Explain what is meant by personalised medicine **and** synthetic biology.

Personalised medicine

Synthetic biology

[2]

17. The cassowary is a large, flightless bird found in the rainforest in parts of Australia. It feeds mainly on fruit. The seeds of the fruit are deposited on the rainforest floor.

i. The cassowary is known as a *keystone species*. This means it is important for the survival of other species.

Suggest what role the cassowary plays in the survival of other species.

[1]

ii. The cassowary needs to be conserved for ecological reasons.

State **two** other reasons for maintaining biodiversity.

1

2

[2]

18. Two different fields, field G and H, were sampled for three common species of wildflower. The results are shown below.

- iii. Captive breeding programmes with *D. sumatrensis* have been unsuccessful.

Suggest **one** other way in which zoos can contribute to the conservation of the Sumatran rhinoceros.

.....
.....
.....
..... [1]

20. The genetic diversity of a population can be estimated using the following formula:

$$\text{proportion of polymorphic gene loci} = \frac{\text{number of polymorphic gene loci}}{\text{total number of loci}}$$

In 1992 a study estimated the genetic diversity of four isolated populations of lions. They recorded the number of gene variants at a selection of gene loci in each population.

Which of the following populations of lions has the greatest proportion of polymorphic gene loci?

- A Asiatic Lion: 73 polymorphic loci out of 1927.
- B Transvaal Lion: 1110 polymorphic loci out of 2156.
- C Masai Lion: 1030 polymorphic loci out of 2315.
- D West African Lion: 1004 polymorphic loci out of 2008.

Your answer

☐

[1]

21. Tropical rainforests have a very high biodiversity of plant species.

Which of the statements, **A to D**, is an economic benefit of high biodiversity?

- A High plant biodiversity decreases the animal biodiversity in the rainforest.
- B High plant biodiversity increases the organic matter in rainforest soils.
- C High plant biodiversity supports drug discovery and development.
- D High plant biodiversity protects the ecosystem from environmental changes.

Your answer

☐

[1]

22.

Butterfly species in severe decline on farmland include gatekeeper, large skipper, small copper, wall brown, small tortoiseshell and white-letter hairstreak.

Butterfly species in severe decline in woodland include brown argus, common blue, gatekeeper, holly blue, marbled white, meadow brown, peacock, small copper, small heath, small tortoiseshell and wall brown.

State which habitat you would expect to have greater species richness and give **two** reasons for your answer.

----- [2]

23.

A group of students found 50 animals in a soil sample collected from Upper End Meadow and identified them as follows:

- 2 click beetles
- 24 leatherjackets
- 23 meadow ants
- 1 wireworm

What can you conclude about the species evenness shown in the soil sample? Justify your answer.

Conclusion

Justification

[1]

24. The Millennium Seed Bank has over two billion seeds in storage.

Which of the options, **A** to **D**, describes the type of conservation carried out at the Millennium Seed Bank?

- A** in-situ conservation of species biodiversity
- B** in-situ conservation of habitat biodiversity
- C** ex-situ conservation of species biodiversity
- D** ex-situ conservation of habitat biodiversity

Your answer

[


END OF QUESTION PAPER

Mark scheme

Question			Answer/Indicative content	Marks	Guidance
1			C	1	
			Total	1	
2		i	<i>three from</i> similar, niche / lifestyle / AW (1) similar selection pressure (1) <i>idea that</i> wings are advantage for survival in both bats and birds (1) alleles for 'wings' more likely to be passed to next generation (1)	3	ALLOW 'same' ALLOW 'same' ALLOW 'genes'
		ii	<i>idea that</i> echolocation not needed for an animal active during the day where reduced visibility is not an issue (1)	1	
			Total	4	
3			<i>biological molecule</i> nucleic acid / (nuclear) DNA / mtDNA / RNA (1) <i>idea that</i> in samples from two species sequence similarity in any of the above can imply an evolutionary relationship, difference / divergence in sequence implies evolutionary distance (1) <i>biological molecule</i> proteins / polypeptides / cytochrome C / haemoglobin (1) <i>idea that</i> in the same protein from two species, amino acid / primary sequence similarity implies evolutionary relationship, difference / divergence in sequence implies evolutionary distance (1)	4	 ALLOW named proteins commonly used
			Total	4	
4			A	1	Examiner's Comments There is some evident confusion with taxonomy. Despite many candidates choosing the correct option, D was a common suggestion.
			Total	1	

5			<p><i>Column 1</i></p> <p>Class Order</p> <p>Genus ✓</p>	<p><i>Column 2</i></p> <p>Animalia</p> <p><i>sumatrensis</i> ✓</p>	2	<p><i>If additional incorrect answer given, then 0 marks</i></p> <p>One mark per correct column.</p> <p>ACCEPT Animal / phonetic spelling / in lower case</p> <p>'sumatrensis' must be all in lower case DO NOT CREDIT if the 's' is clearly upper case DO NOT CREDIT D. sumatrensis DO NOT CREDIT Sumatran / sumatran</p> <p>Examiner's Comments</p> <p>In the classification table the categories of taxa were correctly stated by the majority but the actual classification groups within the taxa posed more problematical: in particular identifying 'Animalia' as the correct kingdom. Eukaryota was a common error. Although many candidates correctly stated the species as 'sumantrensis', very many were not credited the mark because of using a capital letter.</p>
			Total		2	
6			<p>1 scientific, conferences / meetings ✓</p> <p>peer review / approving the work for publication / publication in (reputable) scientific journal ✓</p> <p>2</p> <p>3 replication of work (by others to see if the same results are obtained) ✓</p> <p>look for more (supporting) evidence (e.g. from other peoples' work / investigating other molecules) ✓</p> <p>4</p>		2 max	<p>2 ACCEPT analysing the procedures and data of the investigation</p> <p>3 ACCEPT (others) repeat the experiments</p> <p>4 Other molecules could include cytochrome C</p> <p>Examiner's Comments</p> <p>This question was relatively well answered with the best responses including two clear validation methods such as replication of work and peer review. Most candidates only referred to one method, usually the replication of work or the additional supporting evidence. A few candidates mistakenly discussed why his work was accepted rather than validated.</p>
			Total		2	

7			A	1 (AO2.5)									
			Total	1									
8			<table><tr><th>Deduction</th><th>Supporting observation(s)</th></tr><tr><td>characteristics are passed on to the next generation</td><td>E (1)</td></tr><tr><td>there is a struggle for existence (1)</td><td>G and H</td></tr><tr><td>individuals with beneficial characteristics are among the few who survive</td><td>F and G and H (1)</td></tr></table>	Deduction	Supporting observation(s)	characteristics are passed on to the next generation	E (1)	there is a struggle for existence (1)	G and H	individuals with beneficial characteristics are among the few who survive	F and G and H (1)	3	
Deduction	Supporting observation(s)												
characteristics are passed on to the next generation	E (1)												
there is a struggle for existence (1)	G and H												
individuals with beneficial characteristics are among the few who survive	F and G and H (1)												
			Total	3									
9		i	ribosome(s) ✓	1	<p><i>If additional incorrect answer given, then 0 marks</i></p> <p>Examiner's Comments</p> <p>Candidates did not appreciate the term 'component' so although many candidates realised it was RNA they didn't realise that the component would be a ribosome or that it was ribosomal RNA. Incorrect responses included nucleus, or a variety of different parts of the cell including cell surface membrane, cytoplasm or DNA.</p>								
		ii	(Eu)bacteria ✓ Archaea(bacteria) ✓	2	<p><i>In either order</i></p> <p>DO NOT ACCEPT bacterium</p> <p>ACCEPT phonetic spelling</p> <p>Examiner's Comments</p> <p>Most candidates were able to identify at least one of the two domains correctly, usually 'Archaea'. The most common incorrect answers were Prokaryotes or Prokarya and Protocists, but also Plantae and Animalia. This indicates that there is some confusion over the Domains classification system.</p>								
		iii	nucleus ✓	2 max	<p>Mark the first two answers but IGNORE multicellular</p> <p>DO NOT ACCEPT microtubule / cytoskeleton / centriole</p>								

			DNA with, histones / (associated) proteins ✓ linear DNA ✓ (named) membrane bound organelles ✓ 80s ribosomes ✓		IGNORE chromosome IGNORE chloroplast ACCEPT large(r) ribosomes Examiner's Comments Most candidates gave one correct answer, usually 'nucleus', and many gave a correct second answer, usually 'membrane bound organelles' or a named organelle. Many candidates stated 'multicellular' which suggested a lack of understanding that many unicellular organisms also belong to this domain. A few candidates did not specify 'linear DNA', or that ribosomes were 'larger' or '80s'.
			Total	5	
10			D	1	
			Total	1	
11			B	1	
			Total	1	
12	a	i	ring drawn around variable region (1)	1	ALLOW 
		ii	disulfide (1) to hold polypeptides / light chain and heavy chain together (1)	2	
	b	i	abnormal immune response (1) against tissues normally in the body (1)	2	
		ii	nuclear proteins normally, hidden in nucleus / not exposed to tissue fluids (1)	1	
	c		plants (1) microorganisms (1)	2	ALLOW named examples, e.g. St John's Wort, frog skin, <i>Penicillium</i> , etc.
			Total	8	
13			mobile vector / insect, moving / flying from tree to tree AW (1) low genetic diversity / lack of resistance (1) fungal spores carried by the wind AW (1)	2	

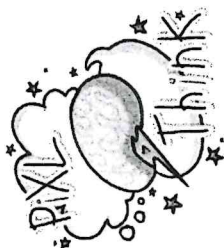
			climate favouring fungal growth / spread of vector (1) overcrowding of trees / small distance between trees (1)		
			Total	2	
14			B	1	Examiner's Comments Some candidates were unable to distinguish between the various white blood cells, although a few did suggest the erythrocyte.
			Total	1	
15			A	1	Examiner's Comments In this question candidates needed to process quite a lot of information about pathogens. While many chose the correct option, the most common error was to think that malaria is caused by a bacterium and therefore choose the incorrect option C. This type of question is one of those that highlight popular misconceptions.
			Total	1	
16			<i>idea that:</i> choice / development, of (more effective), drug / treatment, linked to, genotype / genes / individual ✓ GMOs to produce, drug / useful molecule / enzyme ✓ OR synthesis of new genes / organisms ✓	2	ALLOW named example e.g. GM E. coli making human insulin GM mammals making drugs with milk proteins monoclonal antibodies for targeted drug delivery
			Total	2	
17		i	seed dispersal	1	
		ii	(named) economic reason (named) aesthetic reason	2	
			Total	3	
18			A	1	Examiner's Comments

					Candidates needed to be clear about the definitions of species richness and species evenness in order to answer this question. Option D was a common incorrect suggestion. Some candidates suggested G or H, which were not valid options.
			Total	1	
19		i	<p>loss of, (rainforest) habitat / food source or deforestation ✓</p> <p>hunting / poaching (for horn) ✓</p> <p>climate change ✓</p>	max 2	<p>IGNORE disease</p> <p>ACCEPT loss of (rainforest) ecosystem IGNORE only lives in rainforest</p> <p>Examiner's Comments</p> <p>'Poaching' or 'hunting' and 'deforestation' were the most common correct reasons given for why the species is critically endangered.</p>
		ii	<p>1 hard to find a mate / may be gender imbalance ✓</p> <p>2 (inbreeding leading to) low genetic diversity / small gene pool / genetic bottleneck ✓</p> <p>3 cannot / less likely to, cope with / adapt to, (named) environmental change ✓</p> <p>4 all wiped out by the same disease ✓</p> <p>5 more vulnerable to, predators / poachers ✓</p> <p>6 natural disaster could wipe out, one / some, of the small populations ✓</p>	max 2	<p>1 ACCEPT few individuals of reproductive maturity</p> <p>2 ACCEPT description</p> <p>3 ACCEPT (population) unable to cope with new selection pressures</p> <p>4 DO NOT CREDIT that they are more susceptible to disease in general</p> <p>Examiner's Comments</p> <p>Many candidates stated that less reproduction would occur but did not further develop the idea. A smaller gene pool or less genetic variation was often correctly stated but fewer candidates went on to explain how this would speed up extinction in terms of a lack of ability to adapt to environmental change or all being vulnerable to a particular disease. There was a misconception for some candidates in this question, since they discussed problems for small animals as opposed to small populations.</p>
		iii	<p>education / awareness ✓</p>	max 1	<p>IGNORE ref to cloning</p> <p>In the context of educating the general public e.g. information displayed in the zoo or on website / holding education days for schools</p>

			support for / promote, conservation projects / research ✓		<p>'support' could mean: raise money / provide funds / provide technical support / provide expertise / etc.</p> <p>CREDIT in the context of an example e.g. sending people to monitor populations in the wild e.g. supporting the setting up of nature reserve</p> <p>IGNORE zoo sets up nature reserves</p> <p>Examiner's Comments</p> <p>This question proved to be challenging for most candidates who often failed to note from the information in the question that captive breeding programmes with <i>D. sumatrensis</i> have been unsuccessful. It was very common to read in their responses that the zoos could re-introduce the rhinos into the wild, rather than correctly referring to zoos providing funding or support for conservation projects or raising public awareness.</p>
			Total	5	
20			B ✓	1	<p>Examiner's Comments</p> <p>Most candidates answered this correctly, many with evidence that they had performed the calculation for each population.</p>
			Total	1	
21			C ✓	1	<p>Examiner's Comments</p> <p>This was correctly answered by many candidates.</p>
			Total	1	
22			<p>woodlands have a greater species richness because greater number of butterfly species are in decline (than on farmland) ✓ (so probably) greater number of species were present (originally) ✓ more, niches / types of food available / variety of (food) plants ✓</p> <p>less (or no) pesticide use in woodland / pesticide use in farmland ✓ farmland likely to, be a monoculture / grow limited number of plant species ✓ monoculture results in fewer, niches / variety</p>	2 max	<p>Examiner's Comments</p> <p>This question assessed candidates' understanding of the term species richness. Most stated that woodland had a greater number of species present, showing they understood what richness means. Some made irrelevant comments about species evenness or confused the ideas of species evenness and richness (such as stating that the habitat was more species rich because the population was higher). The mark scheme allowed either woodland or farmland to be selected as having</p>

		<p>of food plants ✓</p> <p>OR</p> <p><i>farmland have a greater species richness because</i></p> <p>lost fewer butterfly species ✓</p> <p>(so) probably larger number of species remain ✓</p> <p>have conservation areas / conserve hedgerows / leave wildlife refuges / leave areas to grow wild ✓</p> <p>(so) more, niches / variety of (food) plants ✓</p> <p><i>general point</i></p> <p>butterflies are an, indicator species / indicator of what is happening (to other species in the habitat) ✓</p>		the higher species richness, but few students gave two good reasons to support their choice.
		Total	2	
23		<p>(species evenness is) low / uneven / not even / poor / not high</p> <p>AND</p> <p>many / large, number OR abundance OR population of, leather jackets / meadow ants / two species / some species, but, not many / only a few / small number of / hardly any / small population of, click beetles / wireworms / two species / other species ✓</p>	1	<p>ALLOW comparatives e.g. a lot more ants than wireworms, ants much more common than click beetles</p> <p>ALLOW dominated by (mostly) leatherjackets and ants / 2 species</p> <p>IGNORE comparative pairs of figures that lack a qualification like 'only' to show which figure is small(er)</p> <p>IGNORE percentage figures unqualified by description</p> <p><u>Examiner's Comments</u></p> <p>Most candidates stated that the sample showed species unevenness and compared the figures to explain why. An answer that only restated figures from the question such as: 'There were 24 leatherjackets and 2 click beetles' did not score. Some evidence of candidate evaluation was required, like: 'There were a large number of leatherjackets but only 2 click beetles'.</p>
		Total	1	

24			C ✓	1	<u>Examiner's Comments</u> Most candidates gave the correct response to this question testing the meaning of in-situ and ex-situ conservation techniques.
			Total	1	



PIXL Revisit: Experiment on a page

Experiment Title:

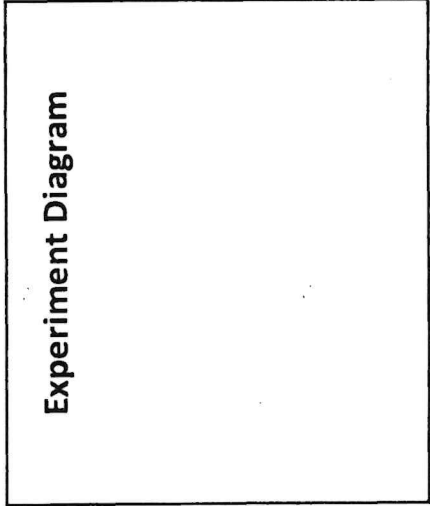
Process / Method

- 1.
- 2.
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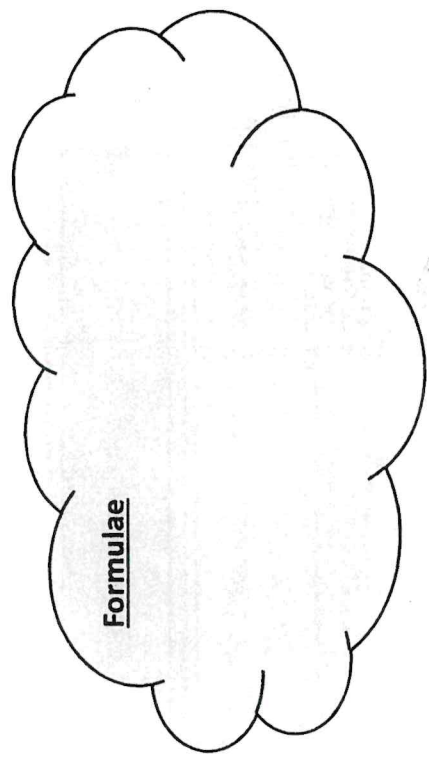
Results

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Label

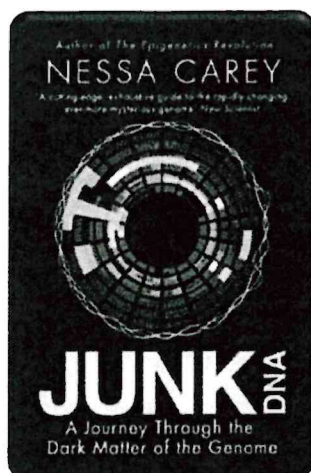


Label



Book Recommendations

Kick back this summer with a good read. The books below are all popular science books and great for extending your understanding of Biology.

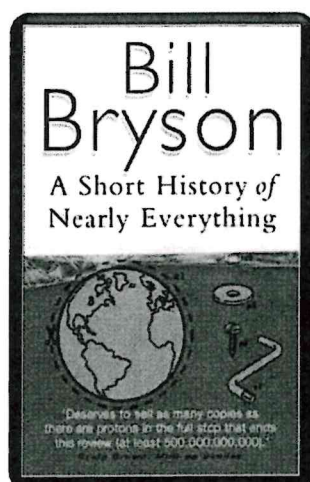
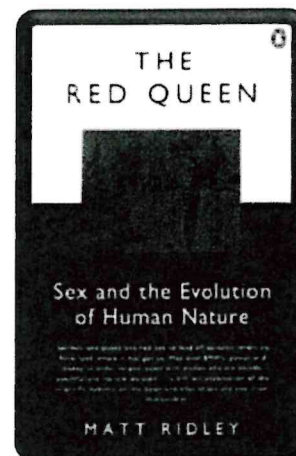


Junk DNA

Our DNA is so much more complex than you probably realize, this book will really deepen your understanding of all the work you will do on genetics. Available at amazon.co.uk

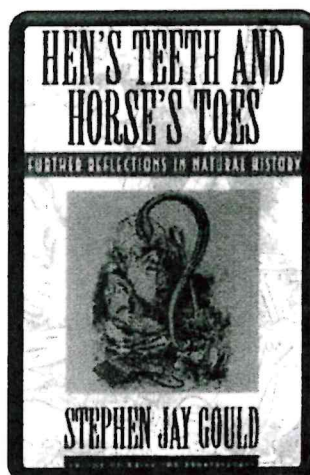
The Red Queen

Its all about sex. Or sexual selection at least. This book will really help your understanding of evolution and particularly the fascinating role of sex in evolution. Available at amazon.co.uk



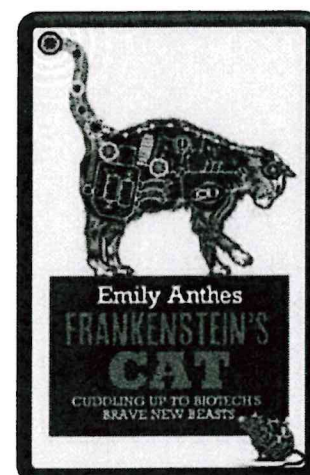
A Short History of Nearly Everything

A whistle-stop tour through many aspects of history from the Big Bang to now. This is a really accessible read that will re-familiarise you with common concepts and introduce you to some of the more colourful characters from the history of science! Available at amazon.co.uk



Studying Geography as well? Hen's Teeth and Horse's Toes

Stephen Jay Gould is a great evolution writer and this book discusses lots of fascinating stories about geology and evolution. Available at amazon.co.uk



An easy read..

Frankenstein's Cat

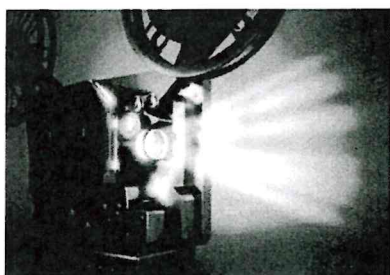
Discover how glow in the dark fish are made and more great biotechnology breakthroughs. Available at amazon.co.uk

III. Summer Reading list

- The Chemistry of Life (Steven Rose)
- Anything by the geneticist Steve Jones (note particularly Language of the Genes, Almost Like a Whale and Y: The Ascent of Man)
- Genome (Matt Ridley)
- The Wisdom of the Genes (Wills)
- Life on the Edge: Quantum
- Biology (Al-Khalili and MacFadden)
- The Selfish Gene and The Extended Phenotype (Dawkins)
- Junk DNA (Carey)
- Life Ascending (Nick Lane)
- The Revenge of Gaia (Lovelock)
- 50 Genetic Ideas You Really Need To Know (Henderson)
- Zoobiquity (Horowitz and Bowers)
- Creation: The Origin of Life (Rutherford)
- The Sixth Extinction (Kolbert)
- Great Myths of the Brain (Jarrett)
- The Gene – an Intimate History (Mukherjee)
- How We Live and Why We Die (Wolpert)
- Honeybee Democracy (Seeley)

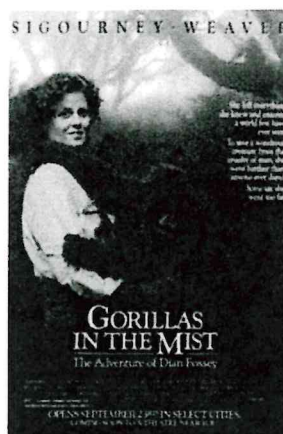
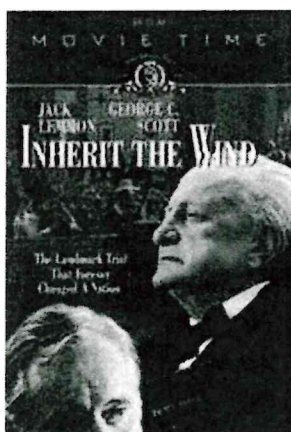
Movie Recommendations

Everyone loves a good story and everyone loves some great science. Here are some of the picks of the best films based on real life scientists and discoveries. You won't find Jurassic Park on this list, we've looked back over the last 50 years to give you our top 5 films you might not have seen before. Great watching for a rainy day.



Inherit The Wind (1960)

Great if you can find it. Based on a real life trial of a teacher accused of the crime of teaching Darwinian evolution in school in America. Does the debate rumble on today?

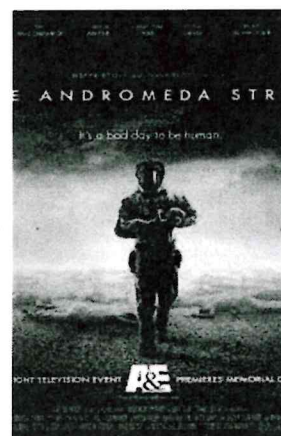


Gorillas in the Mist (1988)

An absolute classic that retells the true story of the life and work of Dian Fossey and her work studying and protecting mountain gorillas from poachers and habitat loss. A tear jerker.

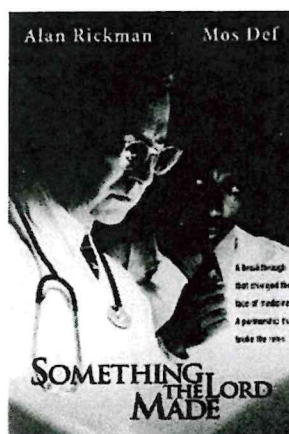
Andromeda Strain (1971)

Science fiction by the great thriller writer Michael Crichton (most famous for writing Jurassic Park). Humans begin dying when an alien microbe arrives on Earth.



Lorenzo's Oil (1992)

Based on a true story. A young child suffers from an autoimmune disease. The parents research and challenge doctors to develop a new cure for his disease.



Something the Lord Made (2004)

Professor Snape (the late great Alan Rickman) in a very different role. The film tells the story of the scientists at the cutting edge of early heart surgery as well as issues surrounding racism at the time.

There are some great TV series and box sets available too, you might want to check out: Blue Planet, Planet Earth I and II, Icarus, Blackfish, The Ascent of Man, Catastrophe, Frozen Planet, Life Story, The Hunt and Monsoon.

Movie Recommendations

If you have 30 minutes to spare, here are some great presentations (and free!) from world leading scientists and researchers on a variety of topics. They provide some interesting answers and ask some thought-provoking questions. Use the link or scan the QR code to view:

A New Superweapon in the Fight Against Cancer

Available at :

http://www.ted.com/talks/paula_hammond_a_new_superweapon_in_the_fight_against_cancer?language=en

Cancer is a very clever, adaptable disease. To defeat it, says medical researcher and educator Paula Hammond, we need a new and powerful mode of attack.



Why Bees are Disappearing

Available at :

http://www.ted.com/talks/marla_spivak_why_bees_are_disappearing?language=en

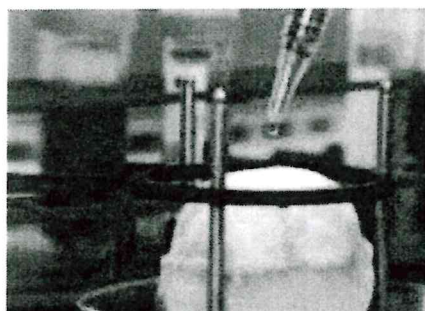
Honeybees have thrived for 50 million years, each colony 40 to 50,000 individuals coordinated in amazing harmony. So why, seven years ago, did colonies start dying en-masse?

What Doctors Don't Know About the Drugs They Prescribe

Available at :

http://www.ted.com/talks/ben_goldacre_what_doctors_don_t_know_about_the_drugs_they_prescribe?language=en

When a new drug gets tested, the results of the trials should be published for the rest of the medical world — except much of the time, negative or inconclusive findings go unreported, leaving doctors and researchers in the dark.



Growing New Organs

Available at :

http://www.ted.com/talks/anthony_atala_growing_organs_engineering_tissue?language=en

Anthony Atalla's state-of-the-art lab grows human organs — from muscles to blood vessels to bladders, and more.

Research Activities

The Big Picture is an excellent publication from the Wellcome Trust. Along with the magazine, the company produces posters, videos and other resources aimed at students studying for GCSEs and A level.

For each of the following topics, you are going to use the resources to produce one page of Cornell style notes.

Use the links or scan the QR code to take you to the resources.

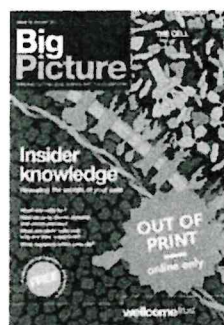
BigPicture



Topic 1: The Cell

Available at: <http://bigpictureeducation.com/cell>

The cell is the building block of life. Each of us starts from a single cell, a zygote, and grows into a complex organism made of trillions of cells. In this issue, we explore what we know – and what we don't yet know – about the cells that are the basis of us all and how they reproduce, grow, move, communicate and die.

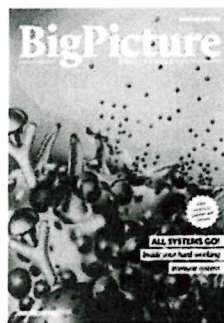


Topic 2: The Immune System

Available at:

<http://bigpictureeducation.com/immune>

The immune system is what keeps us healthy in spite of the many organisms and substances that can do us harm. In this issue, we explore how our bodies are designed to prevent potentially harmful objects from getting inside and what happens when bacteria, viruses, fungi or other foreign organisms or substances breach these barriers.



Topic 3: Exercise, Energy and Movement

Available at:

<http://bigpictureeducation.com/exercise-energy-and-movement>

All living things move. Whether it's a plant growing towards the sun, bacteria swimming away from a toxin or you walking home, anything alive must move to survive. For humans though, movement is more than just survival – we move for fun, to compete and to be healthy. In this issue we look at the biological systems that keep us moving and consider some of the psychological, social and ethical aspects of exercise and sport.

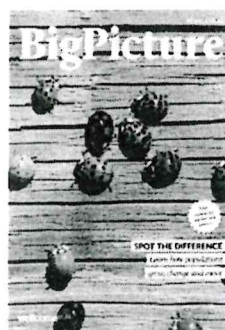


Topic 4: Populations

Available at:

<http://bigpictureeducation.com/populations>

What's the first thing that pops into your mind when you read the word population? Most likely it's the ever-increasing human population on earth. You're a member of that population, which is the term for all the members of a single species living together in the same location. The term population isn't just used to describe humans; it includes other animals, plants and microbes too. In this issue, we learn more about how populations grow, change and move, and why understanding them is so important.



Topic 4: Health and Climate Change

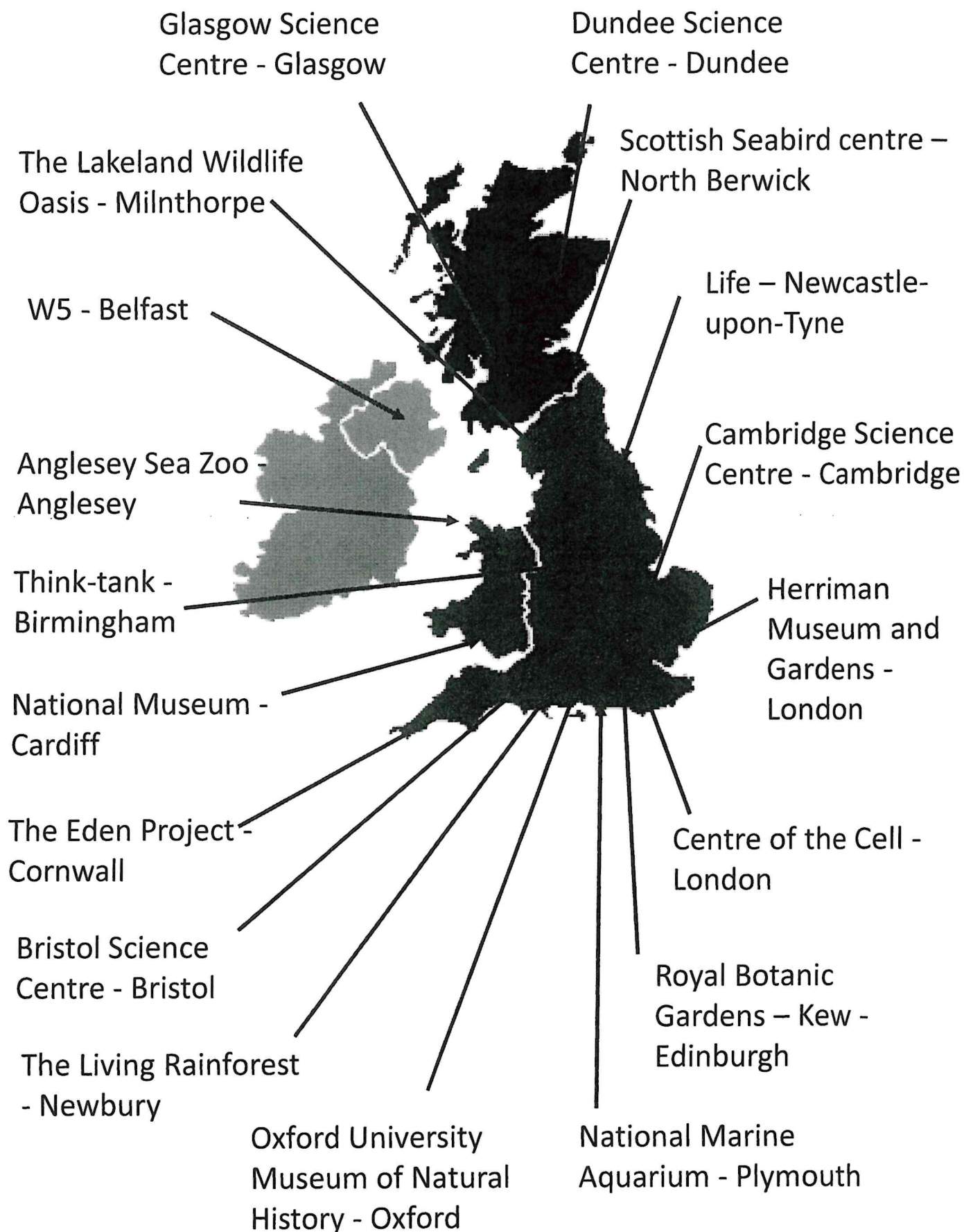
Available at: <http://bigpictureeducation.com/health-and-climate-change>

The Earth's climate is changing. In fact, it has always been changing. What is different now is the speed of change and the main cause of change – human activities. This issue asks: What are the biggest threats to human health? Who will suffer as the climate changes? What can be done to minimise harm? And how do we cope with uncertainty?



Ideas for Day Trips

If you are on holiday in the UK, or on a staycation at home, why not plan a day trip to one of these :



Ideas for Day Trips

If you are on holiday in the UK, or on a staycation at home, why not plan a day trip to one of these :

Remember there are also lots of zoos, wildlife and safari parks across the country, here are some you may not have heard of or considered:

Colchester Zoo, Cotswold Wildlife Park, Banham Zoo (Norfolk), Tropical Birdland (Leicestershire), Yorkshire Wildlife Park, Peak Wildlife Park, International Centre for Birds of Prey (York), Blackpool Zoo, Beale Park (Reading)

There are also hundreds of nature reserves (some of which are free) located all over the country including:

RSPB sites at Lochwinnoch, Saltholme, Fairburn Ings, Old Moor, Conwy, Minsmere, Rainham Marshes, Pulborough Brooks, Radipole Lake, Newport Wetlands.

Wildlife Trust Reserves and others at Rutland Water, Pensthorpe, Insh Marshes, Attenborough Centre, Inversnaid, Skomer, Loch Garten, Donna Nook, Chapmans Well, Woodwalton Fen, London Wetland Centre, Martin Down and Woolston Eyes Reserve.

Many organisations also have opportunities for people to volunteer over the summer months, this might include working in a shop/café/visitor centre, helping with site maintenance or taking part in biological surveys. Not only is this great experience, it looks great on a job or UCAS application.

For opportunities keep an eye out in your local press, on social media, or look at the websites of organisations like the RSPB, Wildlife Trust, National Trust or Wildlife & Wetland Trust.

There are also probably lots of smaller organisations near you who would also appreciate any support you can give!

Science on Social Media

Science communication is essential in the modern world and all the big scientific companies, researchers and institutions have their own social media accounts. Here are some of our top tips to keep up to date with developing news or interesting stories:

Follow on Twitter:

A level Biology – A hub for GCSE and A level biology students
@flagellum_bio

A Level Biology – alevelbiology.co.uk provides resources for AQA, OCR and Edexcel A-Level Biology.
@alevelbiologyuk

David Chalk –daily revision tips for AS and A2 Biology
@teacherchalky1

Understand Biology – news stories relating to A level knowledge and understanding
@a_level_biology

Sci Curious – feed from writer and Bethany Brookshire tweeting about good, bad and weird neuroscience
@scicurious

Carl Zimmer – Science writer Carl blogs about the life sciences
@carlzimmer

Virginia Hughes – science journalist and blogger for National Geographic, keep up to date with neuroscience, genetics and behaviour
@virginiahughes

Maryn McKenna – science journalist who writes about antibiotic resistance
@marynmck

Molecular Biology - latest news, research, books and journals in molecular biology, cell biology, genetics, stem cells, cancer and biotechnology
@molecular



Find on Facebook:

Nature - the profile page for nature.com for news, features, research and events from Nature Publishing Group

Marine Conservation Institute – publishes the latest science to identify important marine ecosystems around the world.

National Geographic - since 1888, National Geographic has travelled the Earth, sharing its amazing stories in pictures and words.

Science News Magazine - Science covers important and emerging research in all fields of science.

BBC Science News - The latest BBC Science and Environment News: breaking news, analysis and debate on science and nature around the world.



Science Websites

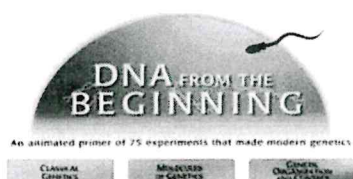
These websites all offer an amazing collection of resources that you should use again and again throughout your course.



Probably the best website on biology....

'Learn Genetics' from Utah University has so much that is pitched at an appropriate level for you and has lots of interactive resources to explore, everything from why some people can taste bitter berries to how we clone mice or make glow in the dark jelly fish.

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



'DNA from the Beginning' is full of interactive animations that tell the story of DNA from its discovery through to advanced year 13 concepts. One to book mark!

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



In the summer you will most likely start to learn about biodiversity and evolution. Many Zoos have great websites, especially London Zoo. Read about some of the case studies on conservation, such as the Giant Pangolin, the only mammal with scales. <https://www.zsl.org/conservation>



At GCSE you learnt how genetic diseases are inherited. In this virtual fly lab you get to breed fruit flies to investigate how different features are passed on.

<http://sciencecourseware.org/vcise/drosophila/>



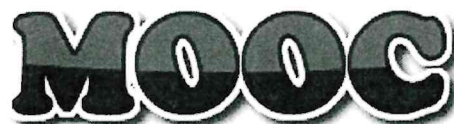
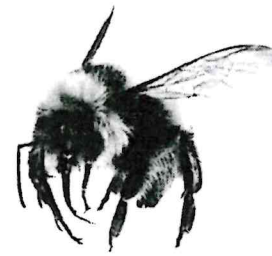
Ok, so not a website, but a video you definitely want to watch. One of the first topics you will learn about is the amazing structure of the cell. This BBC film shows the fascinating workings of a cell... a touch more detailed than the "fried egg" model you might have seen.

http://www.dailymotion.com/video/xzh0kb_the-hidden-life-of-the-cell_shortfilms

If this link expires – google "BBC hidden life of the cell"

Science: Things to do!

Day 4 of the holidays and boredom has set in? There are loads of citizen science projects you can take part in either from the comfort of your bedroom, out and about, or when on holiday. Wikipedia does a comprehensive list of all the current projects taking place. Google 'citizen science project'



Want to stand above the rest when it comes to UCAS? Now is the time to act.

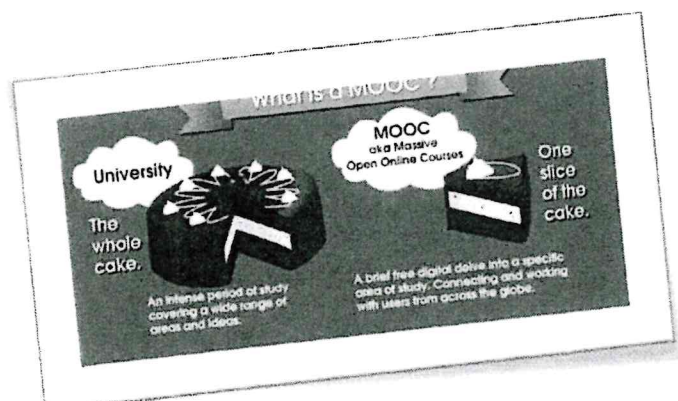
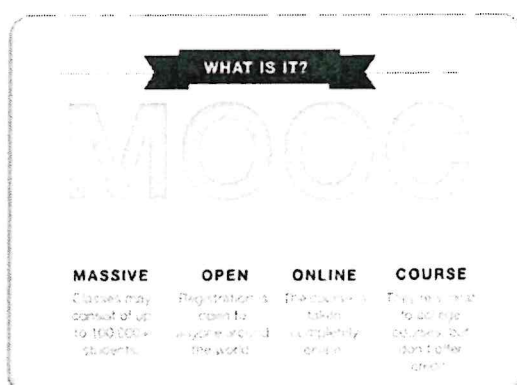
MOOCs are online courses run by nearly all universities. They are short FREE courses that you take part in. They are usually quite specialist, but aimed at the public, not the genius!

There are lots of websites that help you find a course, such as edX and Future learn.

You can take part in any course, but there are usually start and finish dates. They mostly involve taking part in web chats, watching videos and interactives.



Completing a MOOC will look great on your personal statement and they are dead easy to take part in!



IV. Links to TED Talks/Articles/Documentaries/Books/Journals

1. TED talk – How a new species of ancestors is changing our theory of human evolution.

How the discovery of *Homo naledi* is forcing us to rethink where we come from – and what it means to be human.

https://www.ted.com/talks/juliet_brophy_how_a_new_species_of_ancestors_is_changing_our_theory_of_human_evolution?language=en

2. TED talk – How you can help save the bees, one hive at a time.

Learn how ecologists are using citizen scientists to find out where bees are healthy and how this is changing what we know about habitats bees need to thrive.

https://www.ted.com/talks/noah_wilson_rich_how_you_can_help_save_the_bees_one_hive_at_a_time?language=en

3. BBC Sounds – Science betrayed

What happens when science goes bad? From the anthropological hoax of Piltdown man in 1912, to recent cases such as Dr Hwang Woo-suk accused of faking his 'breakthrough' into stem cell research.

<https://www.bbc.co.uk/sounds/play/b00zf4ns>

4. BBC Sounds – Callum Roberts on the urgent need for marine conservation.

As early as the 12th century laws were being put in place to help preserve fishing stocks. Two hundred years ago off the coast of Britain a diverse array of sea fans and sponges covered the sea floor. There were millions of oysters and scallops the size of dinner plates. How can we protect our oceans and still eat fish?

<https://www.bbc.co.uk/sounds/play/b00zf4ns>

5. Article in Nature – Pig brains kept alive outside body for hours after death.

Revival of disembodied organs raises a host of ethical and legal questions about the nature of death and consciousness.

<https://www.nature.com/articles/d41586-019-01216-4>

6. Careers – Royal Society of Biology - Next steps with biology

Wondering where to go next? This site contains a number of different resources showcasing careers available to those studying biology to A-Level.

https://www.rsb.org.uk/images/Becoming_a_Biologist_Degrees_and_Careers_in_Biology.pdf



PiXL Revisit: 'Boxing Up' Activity

Name of Topic: _____

Name: _____

Class: _____

Read the text and then put your thoughts in to different boxes so that you have 'boxed up' the text.

Box 1 – 3 things I did not know

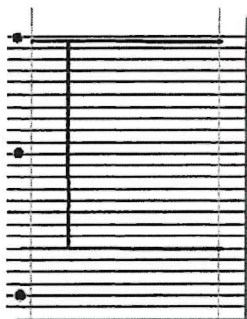
Box 2 – 3 things I understand better now

Box 3 – 3 things I already knew

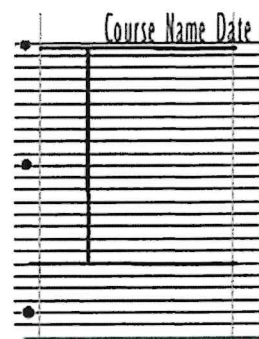
Research Activities

Research, reading and note making are essential skills for A level Biology study. For the following task you are going to produce 'Cornell Notes' to summarise your reading.

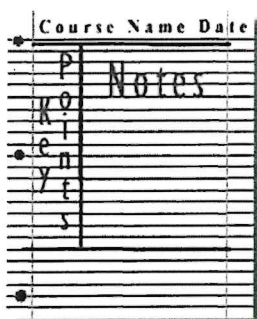
1. Divide your page into three sections like this



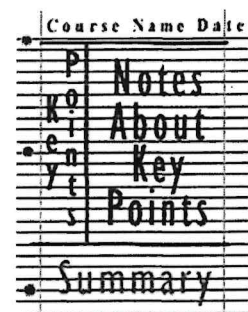
2. Write the name, date and topic at the top of the page



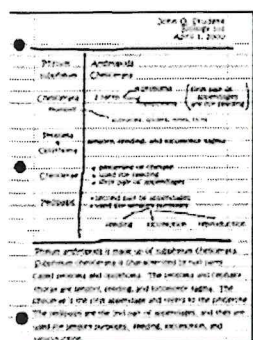
3. Use the large box to make notes. Leave a space between separate ideas. Abbreviate where possible.



4. Review and identify the key points in the left hand box



5. Write a summary of the main ideas in the bottom space



Images taken from <http://coe.jmu.edu/learningtoolbox/cornellnotes.html>

VIII. Cornell Notes Template

Name

Date

Topic

Subject

Main Ideas

Notes

Summary

IX. A Model of the Cornell Notes document

Cornell Notes

Notes from youtube clip *Crawhaute Biology #2*

Name *A. Student*

Date *Today*

Topic *Water*

Subject *Biology*

Main Ideas

- Polar
- Hydrogen bonds
- High cohesion resulting in high surface tension
- Adhesion
- capillary action
- hydrophilic polar molecules
- hydrophobic non-polar molecules
- Universal solvent
- Ice less dense than water
- High S.H.C
- Sweating

Notes H_2O - covalent bonds



polarity

hydrogen bonds between molecules. $\delta^- \cdots \delta^+$

High cohesion resulting in high surface tension → attraction between 2 like things.

→ enables insects etc to walk on water

Adhesion - water likes to stick to other substances e.g. glass

→ attraction between two different substances

capillary action - water molecules adhere to the inside surface of the tube other water molecules are drawn in by cohesion. Surface tension causes water to climb up the tube until gravity prevents further height gain. → *probs.*

polarity ⇒ v. good solvent. hydrophilic substances polarity is stronger than cohesive forces of water. hydrophobic → cannot overcome the cohesive forces of water. → non-polar. *

Sweating → heat excites water molecules, H-bonds break.


Summary water is polar and forms hydrogen bonds.

Water universal solvent; has adhesion + cohesion which enables capillary action. Ice is less dense than water. Surface tension allows insects to walk on water. v. high S.H.C → oceans help maintain climate

⊛ Henry Cavendish - recognized H_2O + composition of water. composition of atmosphere + density of Earth.

Ice density - less than liquid - hydrogen bonds - molecules spaced out evenly.
Heat capacity - v. high - v. good at holding heat → hard to heat/cool ocean evenly? → climate

V. Knowledge Organiser Template



PiXL Revisit: Transform

Unit / Topic:

Key Points

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.

Most
important
+ WHY:

PICTURE/ SOURCE/ INFO/ RESOURCE

A large, empty rectangular box with a black border, intended for a student to draw a picture or provide additional information related to the key points.