



Transition Pack

For

A-Level Biology

Mandatory Tasks

Task	Page No.	Completed (tick)	Score (if applicable)
Introduction and overview	1		
Research Portfolio (making notes)	2-4		
Research Essay 1	5-7		
Research Essay 2			
Baseline Assessment	8-11		
Optional Task Resources	12-16		

Optional Tasks

What did you read, see or do?

Year 11 Transition Task – A Level Biology

The future of Biology is really very exciting. Already in the 21st Century there have been huge advances that have harnessed new technology to deepen our understanding of the natural world.

One such development was the completion, in 2003, of the Human Genome Project (HGP), which mapped the whole genetic code of human beings, *Homo sapiens*. Within a decade, scientists had managed to convert a DNA structure stored as binary code on a computer, back into DNA in a biological organism. They produced synthetic life.

To understand this achievement, we need to understand many facets of Biology and Biochemistry, all of which will be essential knowledge for you in completing A-Level Biology. This is your opportunity to explore these areas in the context of a real, and truly cutting edge, scientific context. Good luck!

Your task is to produce a piece of extended writing, supported by a research portfolio, to summarise the developments described in the TEDx Caltech lecture entitled “Future Biology”, given by J. Craig Venter in 2011. This lecture focuses on the construction, by J. Craig Venter and his team in 2010, of the very first synthetic bacterial cell.

The lecture can be watched via YouTube at <https://www.youtube.com/watch?v=HdgfzdlgUHw>

You will then explore other biological advances made in the 21st Century before nominating which you think will have the most impact on human life, or the planet, in the future.

You will need to submit each of the following *three pieces* of work in relation to this theme:

- **Research Portfolio**
- **Essay 1 – Title: “Future Biology; unravelling the code.”**
- **Essay 2 – Title: “In your opinion, what has been the most important development in the field of Biology in the 21st Century?”**

Baseline Assessment

You will also need to complete and submit the baseline assessment. In this I would like you to attempt it blind (don't consult your notes as you attempt each question) in one colour of pen and then go back through the questions open-book (using your notes/support materials) and add to/complete answers in a different colour pen.

I am not looking for perfection; just give it an honest go!

Optional Tasks

It's a long summer, and you may struggle to fill the time. You may also be genuinely enthused and interested – which would be amazing! To support this there are links to some TED talks, social media sites/feeds, and some Big Picture resources as well as book recommendations. Take a look at these, or go in a completely different direction that follows your own interests. The choice is yours, but it's good to read around the subject and it helps when it comes to personal statements for the next stage. Yes, we have this in mind all the way through. Enjoy.

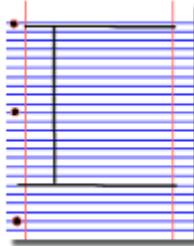
Research portfolio

- This should consist of at least **one page** of research notes **about each of the following** areas of Biology. You have covered most of these in the Biology parts of your GCSE Science course, but you need to try to move slightly beyond your existing knowledge. Some of the resources signposted below will help you with this, but you are welcome to use any other resources that you find useful.
- Your research notes may be handwritten or typed, but they should follow Cornell Notes format.
- Each of these topics relates to something mentioned within the lecture. A thorough understanding of each of these areas will underpin your grasp of the lecture content.
- Topic areas:
 - DNA structure and function, including its importance in protein synthesis
 - Genetic mutations and their effects
 - Prokaryotes and eukaryotes – similarities and differences
 - The process of genetic modification
 - The use of genetic engineering to produce synthetic insulin for managing diabetes
 - Enzymes – structure and function, including the roles of restriction enzymes and ligase enzymes

Resources to support this activity are below:

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.

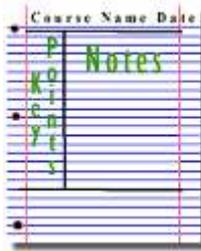
1. Divide your page into three sections like this



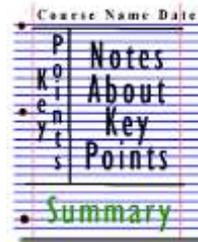
2. Write the name, date and topic at the top of the page



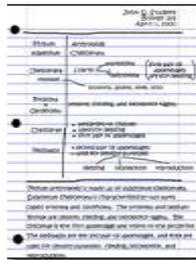
3. Use the large box to make notes. Leave a space between separate ideas. Abbreviate where possible.



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>

I have had to hand-type the urls. If they don't work do some sensible web searches within the sites. The TEDed videos are all on YouTube, just type in the title of the video and take a look.

Pre-Knowledge Topics

DNA and the Genetic Code

In living organisms nucleic acids (DNA and RNA) have important roles and functions related to their properties. The sequence of bases in the DNA molecule determines the structure of proteins, including enzymes.

The double helix and its four bases store the information that is passed from generation to generation. The sequence of the base pairs adenine, thymine, cytosine and guanine tell ribosomes in the cytoplasm how to construct amino acids into polypeptides and produce every characteristic we see. DNA can mutate leading to diseases including cancer and sometimes anomalies in the genetic code are passed from parents to babies in diseases such as cystic fibrosis, or can be developed in unborn foetuses such as Downs Syndrome.

Read the information on these websites:

<http://www.bbc.co.uk/education/guides/z36mmp3/revision>

<http://www.s-cool.co.uk/a-level/biology/dna-and-genetic-code>

And take a look at these videos:

<http://ed.ted.com/lessons/the-twisting-tale-of-dna-judith-hauck>

<http://ed.ted.com/lessons/where-do-genes-come-from-carl-zimmer>

Control Systems

Homeostasis is the maintenance of a constant internal environment. Negative feedback helps maintain an optimal internal state in the context of a dynamic equilibrium. Positive feedback also occurs. Stimuli, both internal and external, are detected leading to responses. The genome is regulated by a number of factors. Coordination may be chemical or electrical in nature

Read the information on these websites:

<http://www.bbc.co.uk/education/topics/z8kxpv4>

<http://www.s-cool.co.uk/a-level/biology/homeostasis>

And take a look at these videos:

<https://www.youtube.com/watch?v=x4PPZCLnVka>

Cells

The cell is a unifying concept in biology, you will come across it many times during your two years of A level study. Prokaryotic and eukaryotic cells can be distinguished on the basis of their structure and ultrastructure. In complex multicellular organisms, cells are organised into tissues, tissues into organs and organs into systems. During the cell cycle genetic information is copied and passed to daughter cells. Daughter cells formed during mitosis have identical copies of genes while cells formed during meiosis are not genetically identical.

Read the information on these websites:

<http://www.bbc.co.uk/education/guides/zvjycdm/revision>

<http://www.s-cool.co.uk/a-level/biology/cells-and-organelles>

And take a look at these videos:

<https://www.youtube.com/watch?v=gcTuQpuJyD8>

<https://www.youtube.com/watch?v=L0k-enzoeOM>

<https://www.youtube.com/watch?v=qCLmR9-YY7o>

Research Essays

Essay 1 – Title: “Future Biology; unravelling the code.”

- Now you have researched the background science, this is your opportunity to summarise the content of the 2011 lecture.
- Suggested essay structure:
 - *Introduction* – Introduce the scientists involved and some of their previous work, including the completion of the Human Genome Project. State the main achievements mentioned in the lecture.
 - *Development* – Describe the steps taken by the scientists, including any problems or setbacks experienced.
 - *Ethical considerations* – Describe any moral or ethical concerns arising from this work. What might the public be concerned about if this technology was to be widely used?
 - *Conclusion* – What impacts might this development have on life in the future? What might be the advantages and disadvantages of such progress?

Essay 2 – Title: “In your opinion, what has been the most important development in the field of Biology in the 21st Century?”

- The development of synthetic life has been widely cited as one of the most important developments in Biology since the millennium. However, there have been many other advances or discoveries that could also have a major impact on life in the future.
- Read around some of the scientific research published since 2000. A useful place to start would be searching a news website, e.g. BBC News, for Biology-related news. You are often able to view articles in date order. From here, you can use the internet to search more widely for information about your chosen development.
- Suggested essay structure:
 - *Introduction* – Introduce the research or development you have chosen and state why you have chosen this as your ‘most important development’.
 - *Development* – Describe key conclusions from this research. Were there any setbacks in this research? What next steps have already been taken following this discovery?
 - *Conclusion* – What impacts might this development/discovery have on life in the future? What might be the advantages and disadvantages of such progress?

Where to look for information

- BBC Bitesize for topic materials at GCSE level
- The internet – type a key term into your search engine, followed by KS4 or KS5 to narrow down the search. Try to choose reliable websites, e.g. those linked to your specifications.
- Youtube channel ‘SnapRevise’ – A-Level Biology OCR [New Spec]
<https://www.youtube.com/watch?v=eaNeyq4iEkw&list=PLkocNWOBsuEGJSrmRCK2JjITeQyDv-EIU>
- Google Scholar – search engine focusing on academic research publications. Input some key search terms, and filter by date or publication as required. This is university level academic research, so it is very

in-depth, however if you focus on the abstract (the first 'summary' paragraph) then you will often find the key ideas presented as a clear series of statements.

- JSTOR – logins available from Mrs Whitson-Jones. This is an online library containing many academic publications. Again, use key terms to search and filter by various parameters. As with Google Scholar, this is university level academic research, so focus on the abstracts.

Referencing

When producing work at A-Level and beyond, it is very important to reference where you found your information. This is to avoid plagiarism. Please use the Harvard referencing system, summarised below.

How to reference – take note of where italics and bold text are used!

A book

Family name/surname, INITIAL(S). Year. *Title*. Edition (if not first edition). Place of publication: Publisher.
E.g. Author, A. N. 2019. *My brilliant book*. Churchdown: Churchdown Publishers.

Print and online journal articles

Family name, INITIAL(S). Year. Title of article. *Journal Title*. **Volume**(issue number), page numbers.
E.g. Author, A. N. 2019. My brilliant journal article. *Journal ABC*. **32**(15), 125-132.

A web page

Family name, INITIAL(S) (or company name). Year. *Title*. [Online]. [Date accessed]. Available from: URL
E.g. Author, A. N. 2019. My brilliant online article. [Online]. [19/9/19]. Available from:
<http://www.onlinearticles.co.uk>

N.B. If one or two authors only, reference both names. E.g. Person A. and Person C. 2019.
If three or more authors, name the first author only followed by *et. al.* E.g. Person A. *et. al.* 2019

Then use chronological referencing...

This is where you number the quotes/references as you write your essay. Then, in the 'References' section (at the end of your essay) you write out the full reference in the order they occur.

This is how it is done...

In the spring, upon emergence from hibernation, females move from their hibernacula to summer roosts where they form maternity colonies, where the pregnant females give birth and raise their young (1). Summer colonies are usually sexually segregated, and generally it is only the females that form groups at all. The males, once they have emerged from hibernation, disperse and form solitary roosts for the duration of the spring and summer, with little or no contact with the maternity colonies. Exceptions do exist (2, 3) and will be briefly discussed later in this report.

Reference list

- (1) Altringham, J.D. 1996. *Bats: Biology and Behaviour*. Oxford: Oxford University Press.
- (2) Senior, P., Butlin, R. K., and Altringham, J.D. (2005) Sex and segregation in temperate bats. *Proceedings of the Royal Society B*, 272.
- (3) Racey, P.A. and Entwistle, A.C. 2000. *Reproductive Biology of Bats*. UK: Academic Press.

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/>



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/>



'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/>



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"

A Level Biology Transition Baseline Assessment

The following 40 minute test is designed to test your recall, analysis and evaluative skills and knowledge. Remember to use your exam technique: look at the command words and the number of marks each question is worth. A suggested mark scheme is provided for you to check your answers.

1. a) What are the four base pairs found in DNA?

.....
(2)

b) What does DNA code for?

.....
(1)

c) Which organelle in a cell carries out this function?

.....
(1)

2. a) What theory did Charles Darwin propose?

.....
(1)

b) Why did many people not believe Darwin at the time?

.....
(1)

c) Describe how fossils are formed.

.....
.....
.....
(3)

d) The fossil record shows us that there have been some species that have formed and some that have become extinct.

i) What is meant by the term 'species'?

.....
(2)

ii) Describe how a new species may arise:

.....
.....
.....(3)

3. Ecologists regularly study habitats to measure the species present and the effect of any changes. One team of ecologists investigated the habitat shown in the picture below:

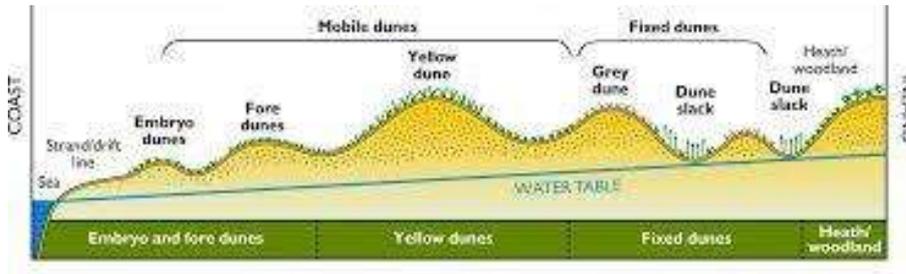


Image taken from <http://www.macaulay.ac.uk/soilquality/Dune%20Succession.pdf>

a) Define the following keywords:

i) Population

.....

ii) Community

.....

(2)

b) Give an example of one biotic factor and one abiotic factor that would be present in this habitat.

Biotic:

Abiotic:

(2)

c) Describe how the ecologists would go about measuring the species present between the coast and the inland.

.....

(6)

4. Every living organism is made of cells.

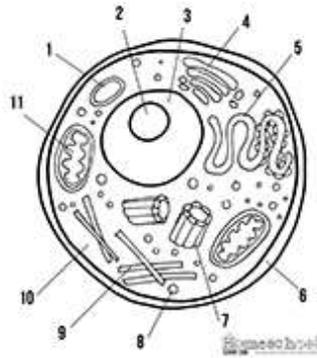


Image taken from <http://prestigebox.com/worksheet/label-an-animal-cell-worksheet>

a) Label the following parts of the animal cell:

- 2
- 5
- 8

(3)

b) Describe how the structure of the cell membrane is related to its function?

.....

(3)

5. A medical research team investigated how quickly the body deals with glucose after a meal. They studied the blood glucose concentration of people who exercised versus those who did not. Here are their results:

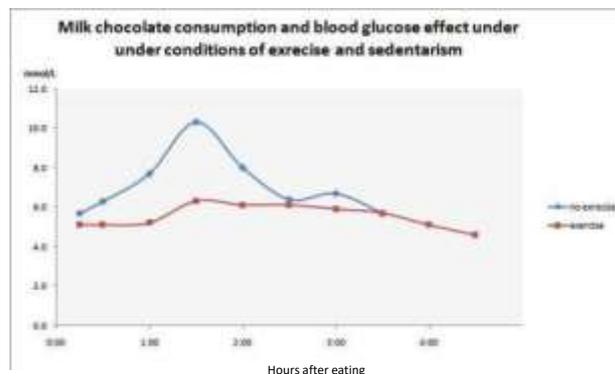


Image taken from <https://memoirsofanamnesic.wordpress.com/category/blood-glucose/>

a) What organ in the body regulates blood glucose concentration?

.....
 (1)

b) Explain the stages that would bring about a return to normal blood glucose concentrations.

.....

.....

.....

.....

(4)

c) Name one variable the researchers will have controlled.

.....

(1)

d) The researchers made the following conclusion:

“Blood glucose returns to normal values for all people after 4 hours”

To what extent do you agree with this conclusion.

.....

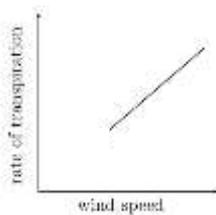
.....

.....

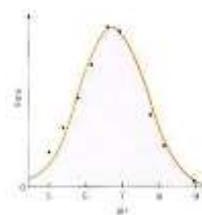
.....

(3)

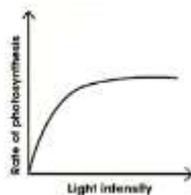
6. Scientists need to be able to interpret data in graphs to decide if there are trends in the results. For each graph below, describe the trend.



.....



.....



.....

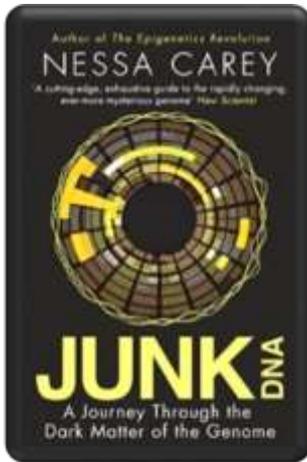


.....(4)

Images taken from: <http://www.everythingmaths.co.za/science/lifesciences/grade-10/05-support-and-transport-systems-in-plants/images/56aff2f9b6c5b041688f745ca928990c.png>
<http://www.bbc.co.uk/staticarchive/afa3f2b16b4d58d077943c96929c9a4020fea83a.gif>
<http://www.rpi.edu/dept/chem-eng/Biotech-Environ/Projects00/temph/enzyme.html>
<http://www.myearthwatchexperience.com/Essential%20Ecology.htm>

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.

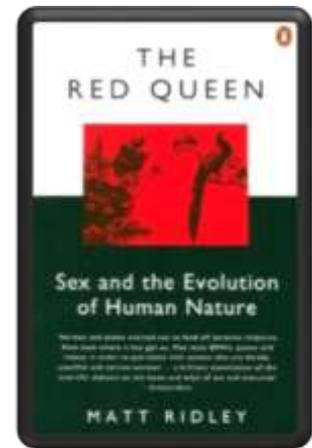


Junk DNA

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

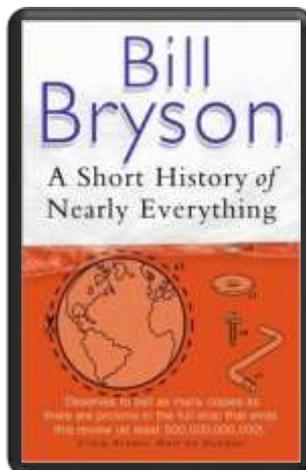
The Red Queen

It's 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

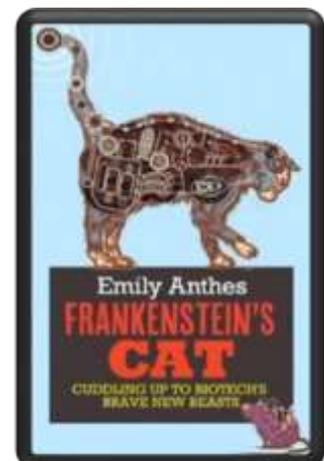
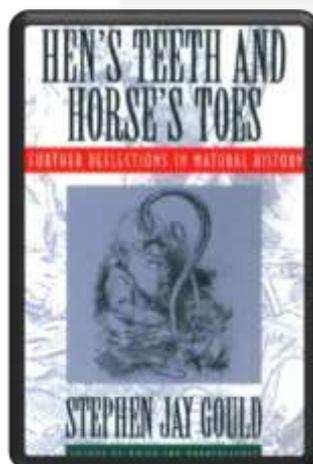
A whistle-stop tour through many aspects of history from the Big Bang to now. This is a really accessible read that will re-familiarise you with common concepts and introduce you to some of the more colourful characters from the history of science! Available at amazon.co.uk



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

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_atalla_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.

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.



Optional Additional Reading

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

Use the url 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?

