A Level Biology Year 11- 12 Transition Workbook

Background Maths and problem-solving skills

This work is designed to help prepare you for A-level Biology. It covers some of the basic skills that will be used throughout the course. Many of these extend and develop ideas you will have come across at GCSE in Science and Maths. You will need to use a combination of **careful reading, research, logic,** and **persistence**. You should expect to find some parts difficult, but if you persevere you will often find you can do them!

YOU MAY USE A CALCULATOR THROUGHOUT

Please complete as much of this booklet as possible, including the self-assessment below, then hand in during the first week of teaching in September.

Confidence: ***A = all parts correct and understood*** ***C = some parts correct and mostly understood*** ***E = few parts correct or poorly understood***	**Self / Teacher Assessment**		
	Mark	**Confidence (A-E)**	**ISSUES / COMMENTS**
1. Expectations – read and remember!	- - -		
2. Unit Prefixes – complete table + questions	……/25		
3. Maths-powers of ten and standard form – complete calculations	……/18		
4. Ratios	……/17		
5. Key terminology	……/11		
6. Photosynthesis and respiration	……/16		
7. Transport across the membrane	……/10		
8. Biodiversity	……/5		
9. Genetics	……../14		
10. Essay- Diffusion	……../25		

FEEDBACK:

Tips on completing this bridging work

- Please write all your answers clearly in **black ink**.
- In calculations show all steps in your working clearly and underline the final answer.
- Where answers or a mark scheme is given mark and correct your work in **green pen**.

1. Expectations

Attendance

1. Attend every lesson
2. Arrive on time
3. Ensure any assignments due are complete and presentable – no excuses

Equipment

4. Bring the following equipment every lesson:
    a. An A4 clip file
    b. pre-punched A4 paper for your notes
    c. plastic wallets for handouts
    d. pen, pencil, ruler (30cm is best), protractor, compasses
    e. Scientific calculator

Private study & Assignments

5. Plan to spend roughly an equal time studying physics outside class as inside.
6. Some of this time will be for assignments ('homework'), the rest for reading around the subject, practicing questions, writing up practicals and improving your notes.
7. Record homework and deadlines clearly.
8. Expect homework at the end of every session – if you are not sure what it is, ask.
9. Make a note of anything you get stuck on or do not understand.
10. Do not always work alone - working with a Biology partner can be very effective (not one person copying another, but arguing and thinking a problem out together)

In Class

11. **Be proactive**: ask for help if there is anything you do not understand, don't let an idea remain vague ask, think and question until it becomes clear – it will!
12. **Interact**: put your hand up & ask questions as much as possible – do not leave it to others.
13. **Be efficient**: do not waste time chatting or being off task – you will drag yourself and others down if you do.
14. **Listen**: pick up on all the tips and advice then put them into practise, do not ignore them.

2. Unit Prefixes

Prefixes are written in front of units to indicate multiplication or division by multiples factors of 1000. So mega means x1,000,000. (One exception is 'centi', as in cm, which means divide by 100)

YOU MUST LEARN THE PREFIXES BY HEART AND BECOME ADEPT AT WORKING WITH THEM.

1. Complete the following table. (You will need to research some of the missing units).

Symbol		Multiplier	Which means…
	terra		
		$\times 10^{9}$	
M			× 1,000,000
k			× 1000
(None)	- - -	- - -	× 1
m			
	micro		/ 1,000,000
n			
		$\times 10^{-12}$	
f			

2. Expand each of these quantities to write out the answer in full (i.e. without the prefixes)

   a. 900 mV =
   b. 12 MJ =
   c. 1.67 mm =
   d. 3.456 kg =
   e. 700 nm =
   f. 0.72 pA =

3. Write each of the following using an appropriate prefix:

   g. 0.005 A =
   h. 30000 s =
   i. 5×10^{5} m =
   j. 1001 m =
   k. 0.006 V =
   l. 2,100,000 N =

4. Convert each of the following to the indicated units:

   a. 34 nm = ... mm
   b. 0.012 s = ... μs
   c. 4.5 MJ = ... kJ

3. MATHS – Powers of 10 and standard form (aka scientific notation)

You need to be able to use your calculator to work in standard form or use power of ten notation to replace unit suffixes.

[Tip: you should use the [x10^x] button on your calculator for entering powers of ten.]

Convert the following numbers into standard form:

1. 32 000
2. 0.0006
3. 104 000
4. 18 200 000
5. 9 230 000
6. 0.000 040 5
7. 0.002 019
8. 30 200

Convert the following numbers from standard form into decimal notation:

9. 3.26×10^4
10. 8.4×10^{-3}
11. 7.29×10^7
12. 1.26×10^2
13. 8×10^{-6}
14. 1.3×10^8
15. 2.3×10^{-4}
16. 5.001×10^6
17. Using the formula Circumference = 2 × 3.14 × radius and given that the mean radius of the Earth is 6 378 000 m, calculate the approximate circumference of the Earth leaving your answer in standard form to two significant figures.

18. There are 86 400 seconds in a day. Calculate the number of seconds in a year leaving your answer in standard form to two significant figures.

4. Why are ratios important

Understanding ratio allows us to easily compare separate quantities. We can then examine patterns, comment on the relationship, or use ratios to help us solve equations.

For example:

- Use 3 parts red paint to 1 part white paint.

- Use 1 teabag to 250 ml of water.

- Use 1 shovel of cement to 2 shovels of sand.

The order of the ratio is very important.

The number of teabags used per ml of water would be **1:250**. Saying that the answer was 250:1 would mean something very different.

Simplify the following ratios (Example 6:4 = 3:2):

1. 120:50
2. 64:24
3. 13:52
4. 100:10 000
5. 24:72
6. 18:90
7. 56:88
8. 36:144

Find x by scaling the ratio.

9. 1:2 = 4:*x*
10. 8:3 = *x*:9
11. 25:10 = *x*:2
12. *x*:160 = 2:8
13. 49:*x* = 2:4
14. 58.5:18 = *x*:4
15. A toy is made from red bricks and yellow bricks.
    Number of red bricks: Number of yellow bricks = 5:2.
    There are 210 more red bricks than yellow bricks.

    How many red bricks are in the toy?
16. There are 100 balls in a bag. The balls are red, blue, green or white. The ratio of blue to red is 5:1. There are twice as many blue as green. $\frac{1}{4}$ of the balls are green.

    How many white balls are in the bag?
17. One day, 460 people visit a zoo. 280 are adults. The ratio of women to men is 4:3. 180 are children. $\frac{3}{5}$ of them are boys. Jane says that altogether there were more females visiting the zoo.

    Show that she is correct.

KS4 Revision & Extension

5. **Key terminology** Look up definitions for each of the following and write down any notes you think are helpful

Accuracy	
Anomalous	
Calibration	
Random Error	
Systematic Error	
Zero Error	
Precision	
Interval	
Range	
Repeatable	
Reproducible	

6. Photosynthesis and respiration

Two of the most important reactions that take place in living things are photosynthesis and respiration. They both involve transfer of energy.

Complete the table below

	Photosynthesis	Respiration
Which organisms carry out this process?		
Where in the organisms dose this process take place?		
Energy store at the beginning of the process		
Energy store at the end of the process		
Reactants needed for the process		
Products of the process		
Overall word equation		
Balanced symbol equation		

Which of the answers for aerobic respiration would be different for anaerobic respiration? Add these answers to the table in a different colour.

7. Transport across membranes

Match the examples to the principle(s) involved. Each statement maybe used more than once. For each, give a brief description of why it is relevant.

Statements

Drinking a sports drink after exercise

Gas exchange in the alveoli

Absorbing nutrients from food into the body

Moving ions into cells

The effect of salt on slugs

Penguins huddling together to keep warm

Potato pieces get heavier when put in pure water

Potato pieces get lighter when put in very salty water

Cacti do not have thin, large leaves

Absorption of ions into a root hair cell

Diffusion

Osmosis

Active transport

Changing surface area or length

8. Biodiversity

1. Define the term biodiversity?
2. Use the internet to find global estimates of current biodiversity. Explain why there is no consensus even with trusted sources.
3. Why does biodiversity need to be maintained on the planet? Create a list of reasons.
4. The grid or polygon method is used to subdivide the surface of the Earth into cells for sampling to take place. Explain why this method ignores the third dimension in many studies.
5. What sampling methods are used to gather data to estimate biodiversity in a pond, rainforest, tropical reef and desert?

9 Genetics

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)

d) What theory did Charles Darwin propose?

……

(1)

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

……

(1)

f) Describe how fossils are formed.

……

……

……

(3)

g) 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)

10 Essay

Writing essays is an important skill when studying Biology. Essays are assessed for relevant biological content, proper biological terminology, logical and coherent explanations.

Write the following essay: **The importance of diffusion in organisms**

In your essay you should include-

- A definition for the term diffusion
- A description of where diffusion occurs in plants, animals, and microorganisms- include examples that you have studied at GCSE only
- An explanation of why diffusion is important in living organisms

Transition Pack for A Level Biology

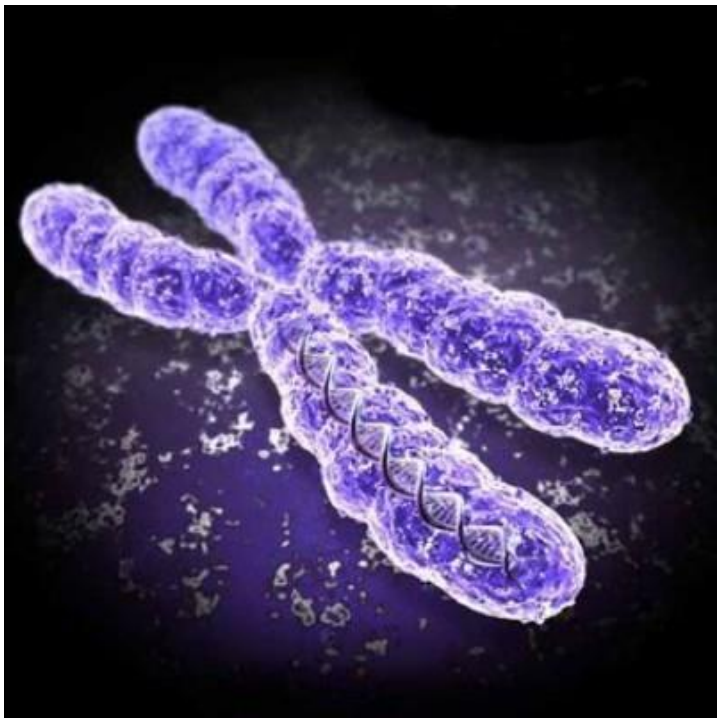
Get ready for A-level!
A guide to help you get ready for A-level Biology, including everything from topic guides to days out and online learning courses.

Commissioned by The PiXL Club Ltd. April 2018

Please note: these resources are non-board specific. Please direct your students to the specifics of where this knowledge and skills most apply.

So you are considering A level Biology?

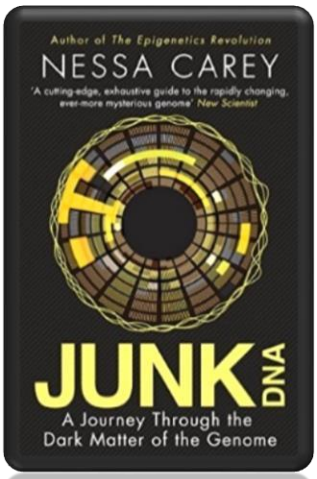
This pack contains a programme of activities and resources to prepare you to start A level Biology in September. It is aimed to be used after you complete your GCSE throughout the remainder of the summer term and over the summer holidays to ensure you are ready to start your course in September.



https://www.distance-education-academy.com/wp-content/uploads/2013/06/biology-a-level-course.jpg

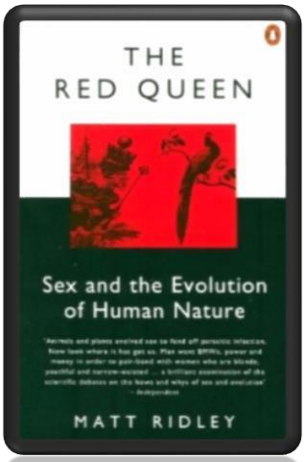
Book Recommendations

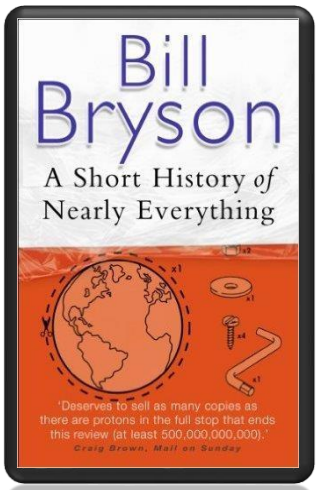
Kick back this summer with a good read. The books below are all popular science books and great for extending your understanding of Biology.



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

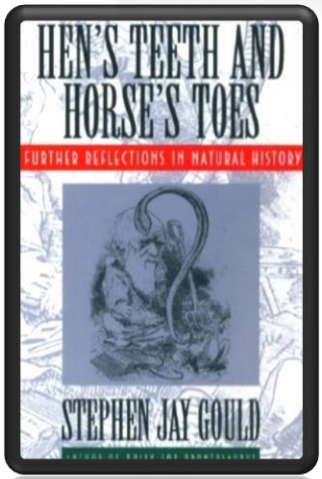
The Red Queen
Its all about sex. Or sexual selection at least. This book will really help your understanding of evolution and particularly the fascinating role of sex in evolution. Available at amazon.co.uk

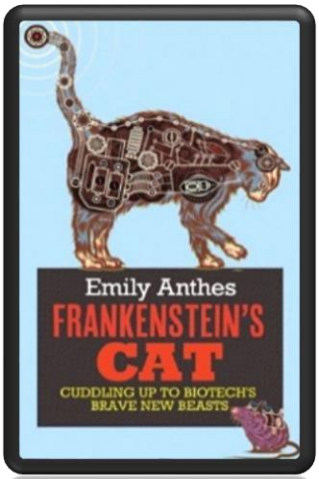




A Short History of Nearly Everything
A whistle-stop tour through many aspects of history from the Big Bang to now. This is a really accessible read that will re-familiarise you with common concepts and introduce you to some of the more colourful characters from the history of science! Available at amazon.co.uk

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

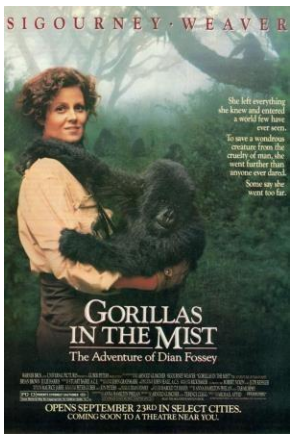




An easy read..
Frankenstein's Cat
Discover how glow in the dark fish are made and more great biotechnology breakthroughs. Available at amazon.co.uk

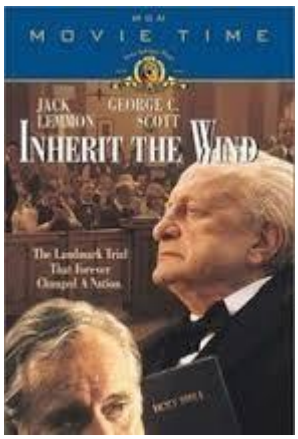
Movie Recommendations

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 wont 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.



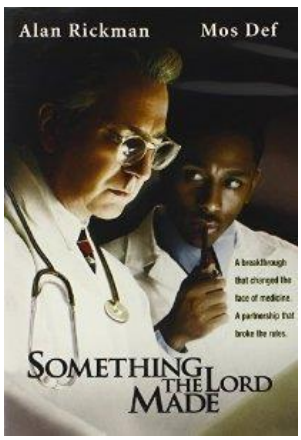
Gorillas in the Mist (1988)
An absolute classic that retells the true story of the life and work of Dian Fossey and her work studying and protecting mountain gorillas from poachers and habitat loss. A tear jerker.

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?



Andromeda Strain (1971)
Science fiction by the great thriller writer Michael Cricthon (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?

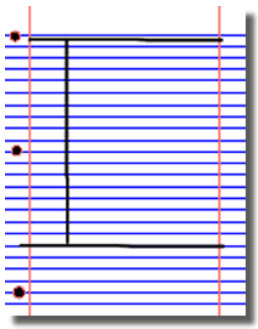
What Doctors Don't Know About the Drugs They Prescribe
Available at :
http://www.ted.com/talks/ben_goldacre_what_doctors_don_t_know_about_the_drugs_they_prescribe?language=en
When a new drug gets tested, the results of the trials should be published for the rest of the medical world — except much of 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.

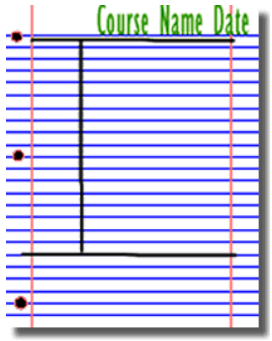
Research Activities

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.

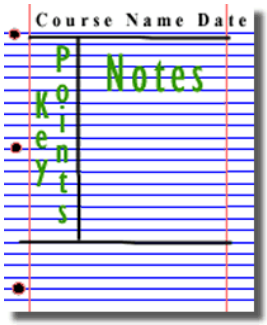
1. Divide your page into three sections like this



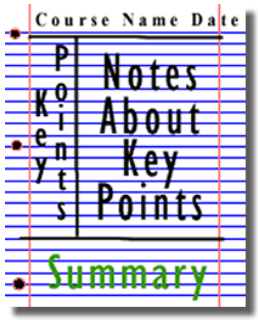
2. Write the name, date and topic at the top of the page



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

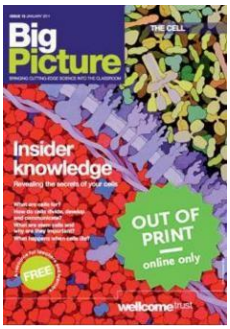
Images taken from http://coe.jmu.edu/learningtoolbox/cornellnotes.html

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?

Pre-Knowledge Topics

A level Biology will use your knowledge from GCSE and build on this to help you understand new and more demanding ideas. Complete the following tasks to make sure your knowledge is up to date and you are ready to start studying:

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 (you could make more Cornell notes if you wish):

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

Task:

Produce a wall display to put up in your classroom in September. You might make a poster or do this using PowerPoint or similar. Your display should use images, keywords and simple explanations to:

- Define gene, chromosome, DNA and base pair
- Describe the structure and function of DNA and RNA
- Explain how DNA is copied in the body
- Outline some of the problems that occur with DNA replication and what the consequences of this might be.

Evolution

Transfer of genetic information from one generation to the next can ensure continuity of species or lead to variation within a species and possible formation of new species. Reproductive isolation can lead to accumulation of different genetic information in populations potentially leading to formation of new species (speciation). Sequencing projects have read the genomes of organisms ranging from microbes and plants, to humans. This allows the sequences of the proteins that derive from the genetic code to be predicted. Gene technologies allow study and alteration of gene function in order to better understand organism function and to design new industrial and medical processes.

Read the information on these websites (you could make more Cornell notes if you wish):

http://www.bbc.co.uk/education/guides/z237hyc/revision/4

http://www.s-cool.co.uk/a-level/biology/evolution

And take a look at these videos:

http://ed.ted.com/lessons/how-to-sequence-the-human-genome-mark-j-kiel

http://ed.ted.com/lessons/the-race-to-sequence-the-human-genome-tien-nguyen

Task:

Produce a one page revision guide for an AS Biology student that recaps the key words and concepts in this topic. Your revision guide should:

- Describe speciation
- Explain what a genome is
- Give examples of how this information has already been used to develop new treatments and technologies.

Biodiversity

The variety of life, both past and present, is extensive but the biochemical basis of life is similar for all living things. Biodiversity refers to the variety and complexity of life and may be considered at different levels. Biodiversity can be measured, for example, within a habitat or at the genetic level. Classification is a means of organising the variety of life based on relationships between organisms and is built around the concept of species. Originally classification systems were based on observable features but more recent approaches draw on a wider range of evidence to clarify relationships between organisms. Adaptations of organisms to their environments can be behavioural, physiological and anatomical. Adaptation and selection are major factors in evolution and make a significant contribution to the diversity of living organisms.

Read the information on these websites (you could make more Cornell notes if you wish):
http://www.s-cool.co.uk/a-level/biology/ecological-concepts
http://www.s-cool.co.uk/a-level/biology/classification

And take a look at these videos:
http://ed.ted.com/lessons/why-is-biodiversity-so-important-kim-preshoff
http://ed.ted.com/lessons/can-wildlife-adapt-to-climate-change-erin-eastwood

Task:
Write a persuasive letter to an MP, organisation or pressure group promoting conservation to maintain biodiversity.
Your letter should:

- Define what is meant by species and classification
- Describe how species are classified
- Explain one way scientists can collect data about a habitat, giving an example
- Explain adaptation and how habitat change may pose a threat to niche species.

Exchange and Transport

Organisms need to exchange substances selectively with their environment and this takes place at exchange surfaces. Factors such as size or metabolic rate affect the requirements of organisms and this gives rise to adaptations such as specialised exchange surfaces and mass transport systems. Substances are exchanged by passive or active transport across exchange surfaces. The structure of the plasma membrane enables control of the passage of substances into and out of cells.

Read the information on these websites (you could make more Cornell notes if you wish):
http://www.s-cool.co.uk/a-level/biology/gas-exchange
http://www.s-cool.co.uk/a-level/biology/nutrition-and-digestion/revise-it/human-digestive-system

And take a look at these videos:
http://ed.ted.com/lessons/insights-into-cell-membranes-via-dish-detergent-ethan-perlstein
http://ed.ted.com/lessons/what-do-the-lungs-do-emma-bryce

Task:
Create a poster or display to go in your classroom in September. Your poster should either: compare exchange surfaces in mammals and fish, or compare exchange surfaces in the lungs and the intestines. You could use a Venn diagram to do this.
Your poster should:

- Describe diffusion, osmosis and active transport
- Explain why oxygen and glucose need to be absorbed and waste products removed
- Compare and contrast your chosen focus.

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 (you could make more Cornell notes if you wish):
http://www.s-cool.co.uk/a-level/biology/cells-and-organelles
http://www.bbc.co.uk/education/guides/zvjycdm/revision

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

Task:

Produce a one page revision guide to share with your class in September summarising one of the following topics: Cells and Cell Ultrastructure, Prokaryotes and Eukaryotes, or Mitosis and Meiosis.

Whichever topic you choose, your revision guide should include:

- Key words and definitions
- Clearly labelled diagrams
- Short explanations of key ideas or processes.

Biological Molecules

Biological molecules are often polymers and are based on a small number of chemical elements. In living organisms carbohydrates, proteins, lipids, inorganic ions and water all have important roles and functions related to their properties. DNA determines the structure of proteins, including enzymes. Enzymes catalyse the reactions that determine structures and functions from cellular to whole-organism level. Enzymes are proteins with a mechanism of action and other properties determined by their tertiary structure. ATP provides the immediate source of energy for biological processes.

Read the information on these websites (you could make more Cornell notes if you wish):
http://www.s-cool.co.uk/a-level/biology/biological-molecules-and-enzymes
http://www.bbc.co.uk/education/guides/zb739j6/revision

And take a look at these videos:
https://www.youtube.com/watch?v=H8WJ2KENlK0
http://ed.ted.com/lessons/activation-energy-kickstarting-chemical-reactions-vance-kite

Task:

Krabbe disease occurs when a person doesn't have a certain enzyme in their body. The disease effects the nervous system. Write a letter to a GP or a sufferer to explain what an enzyme is.

Your poster should:

- Describe the structure of an enzyme
- Explain what enzymes do inside the body

Ecosystems

Ecosystems range in size from the very large to the very small. Biomass transfers through ecosystems and the efficiency of transfer through different trophic levels can be measured. Microorganisms play a key role in recycling chemical elements. Ecosystems are dynamic systems, usually moving from colonisation to climax communities in a process known as succession. The dynamic equilibrium of populations is affected by a range of factors. Humans are part of the ecological balance and their activities affect it both directly and indirectly. Effective management of the conflict between human needs and conservation help to maintain sustainability of resources.

Read the information on these websites (you could make more Cornell notes if you wish):
http://www.bbc.co.uk/education/guides/z7vqtfr/revision
http://www.s-cool.co.uk/a-level/biology/ecological-concepts

And take a look at these videos:
https://www.youtube.com/watch?v=jZKIHe2LDP8
https://www.youtube.com/watch?v=E8dkWQVFAoA

Task:
Produce a newspaper or magazine article about one ecosystem (e.g. the arctic, the Sahara, the rainforest, or something closer to home like your local woodland, nature reserve or shore line).
Your article should include:

- Key words and definitions
- Pictures or diagrams of your chosen ecosystem.
- A description of the changes that have occurred in this ecosystem
- An explanation of the threats and future changes that may further alter this ecosystem.

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 (you could make more Cornell notes if you wish):
http://www.s-cool.co.uk/a-level/biology/homeostasis
http://www.bbc.co.uk/education/topics/z8kxpv4

And take a look at these videos:
https://www.youtube.com/watch?v=x4PPZCLnVkA
https://www.youtube.com/watch?v=x4PPZCLnVkA

Task:
Produce a poster to display in your classroom in September summarising one of the following topics: Temperature Control, Water and the Kidneys, Glucose, or The Liver.
Whichever topic you choose, your poster or display should include:
Key words and definitions
Clearly labelled diagrams
Short explanations of key ideas or processes.

Energy for Biological Processes

In cellular respiration, glycolysis takes place in the cytoplasm and the remaining steps in the mitochondria. ATP synthesis is associated with the electron transfer chain in the membranes of mitochondria and chloroplasts in photosynthesis energy is transferred to ATP in the light- dependent stage and the ATP is utilised during synthesis in the light-independent stage.

Read the information on these websites (you could make more Cornell notes if you wish):
http://www.bbc.co.uk/education/guides/zcxrd2p/revision
http://www.s-cool.co.uk/a-level/biology/respiration

And take a look at these videos:
https://www.youtube.com/watch?v=00jbG_cfGuQ
https://www.youtube.com/watch?v=2f7YwCtHcgk

Task:

Produce an A3 annotated information poster that illustrates the process of cellular respiration and summarises the key points.

Your poster should include:

- Both text and images
- Be visually stimulating
- Key words and definitions
- Clearly labelled diagrams
- Short explanations of key ideas or processes.

Scientific and Investigative Skills

As part of your A level you will complete a practical assessment. This will require you to carry out a series of practical activities as well as planning how to do them, analysing the results and evaluating the methods. This will require you to: use appropriate apparatus to record a range of quantitative measurements (to include mass, time, volume, temperature, length and pH), use appropriate instrumentation to record quantitative measurements, such as a colorimeter or photometer, use laboratory glassware apparatus for a variety of experimental techniques to include serial dilutions, use of light microscope at high power and low power, including use of a graticule, produce scientific drawing from observation with annotations, use qualitative reagents to identify biological molecules, separate biological compounds using thin layer/paper chromatography or electrophoresis, safely and ethically use organisms, use microbiological aseptic techniques, including the use of agar plates and broth, safely use instruments for dissection of an animal organ, or plant organ, use sampling techniques in fieldwork.

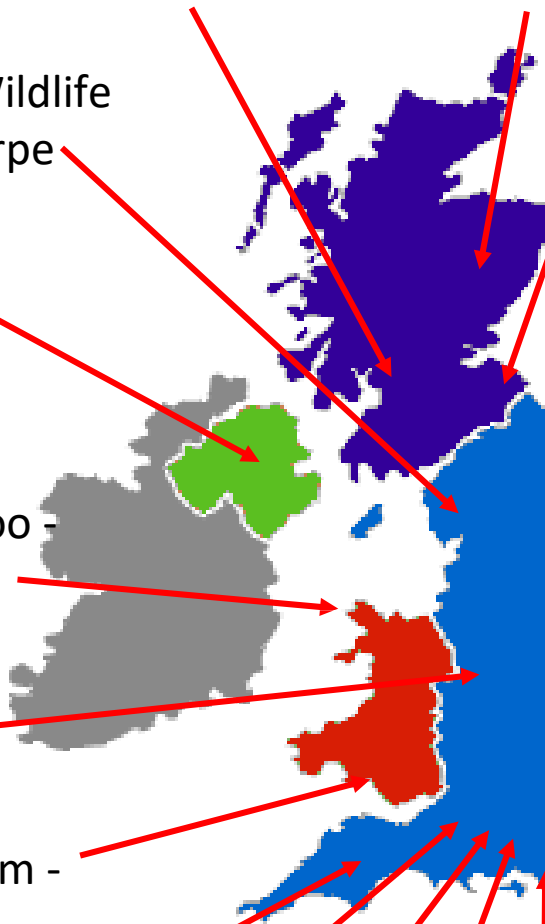
Task:

Produce a glossary for the following key words:

accuracy, anomaly, calibration, causal link, chance, confounding variable, control experiment, control group, control variable, correlation, dependent variable, errors, evidence, fair test, hypothesis, independent, null hypothesis, precision, probability, protocol, random distribution, random error, raw data, reliability, systematic error, true value, validity, zero error,

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 :



Glasgow Science Centre - Glasgow

Dundee Science Centre - Dundee

The Lakeland Wildlife Oasis - Milnthorpe

Scottish Seabird centre – North Berwick

W5 - Belfast

Life – Newcastle-upon-Tyne

Anglesey Sea Zoo - Anglesey

Cambridge Science Centre - Cambridge

Think-tank - Birmingham

Herriman Museum and Gardens - London

National Museum - Cardiff

The Eden Project - Cornwall

Centre of the Cell - London

Bristol Science Centre - Bristol

Royal Botanic Gardens – Kew - Edinburgh

The Living Rainforest - Newbury

Oxford University Museum of Natural History - Oxford

National Marine Aquarium - Plymouth

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.

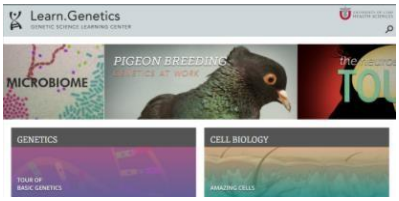
National Geographic - since 1888, National Geographic has travelled the Earth, sharing its amazing stories in pictures and words.

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/

ZSL
LIVING CONSERVATION

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"

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'

Bumblebee Conservation Trust

AgeGuess

OPAL EXPLORE NATURE

big butterfly count
15th July - 7th August

THE SHORE THING GET INVOLVED!

eoceans
www.eoceans.org

WildlifeLog
SPOT IT - SHARE IT - SAVE IT

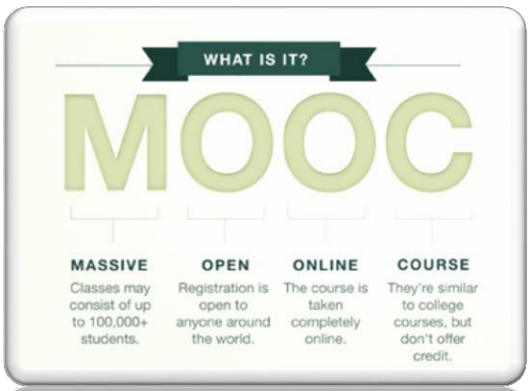
The Big Moss Map

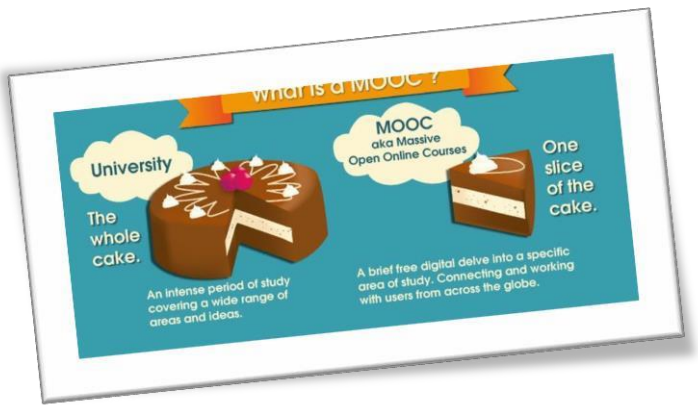
MOOC

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.

canvas NETWORK
edX
coursera
OPEN 2 STUDY
UDACITY udacity.com
FUTURELEARN
KHAN ACADEMY
ed2go

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





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:

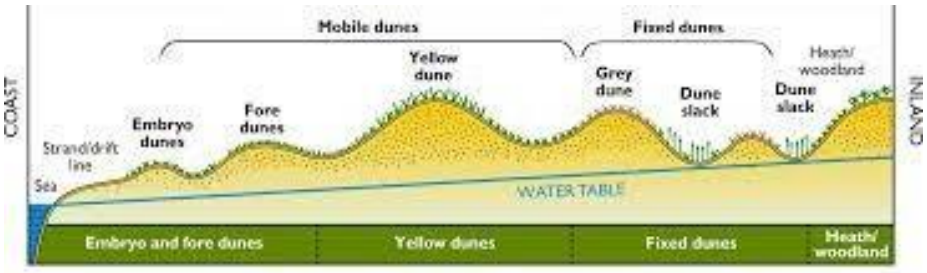


Image taken from http://www.macaulay.ac.uk/soilquality/Dune%20Succession.pdf

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.

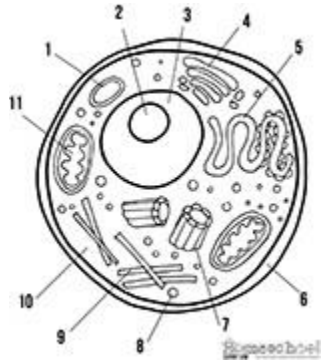


Image taken from http://prestigebux.com/worksheet/label-an-animal-cell-worksheet

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:

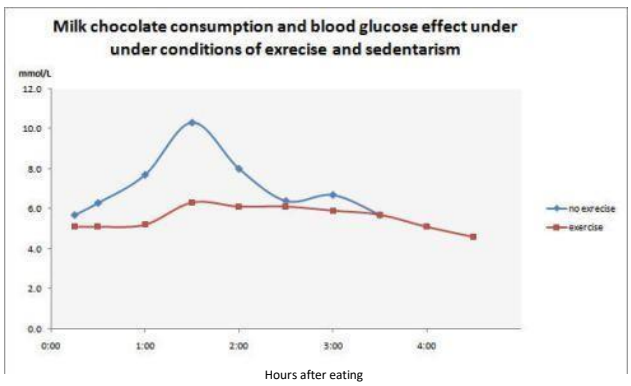


Image taken from https://memoirsofanamnesic.wordpress.com/category/blood-glucose/

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.

……

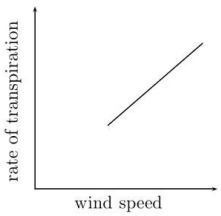
……

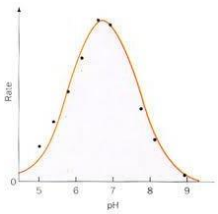
……

……

(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.





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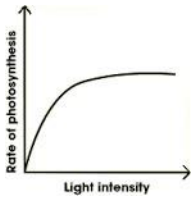

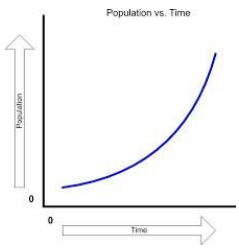

……

……(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

Suggested Mark Scheme:

Question			Answer	Marks
1	a		Adenine-Thymine Cytosine-Guanine	1 1
	b		Protein/enzymes	1
	c		Ribosomes	1
2	a		Evolution (by natural selection)	1
	b		Not enough evidence	1
	c		(Plant/animal dies) and is quickly buried in sediment Not all conditions for decay are present Hard parts of the body are replaced by minerals	1 1 1
	d	i	Organisms that can reproduce to produce viable offspring/offspring that can also reproduce (fertile)	1
		ii	3 from Geographical isolation/named example Mutation of genes Natural Selection/selective advantage Species can no longer interbreed (not produce fertile offspring)	 1 1 1 1
3	a	i	A group of organisms, all of the same species, and all of whom live together in a particular habitat.	1
		ii	The total of all populations living together in a particular habitat.	1
	b		Biotic – one from: Predators, prey, plant, microbes Abiotic – one from: Availability ofwater, temperature, mineral concentration, reference to climate/weather	 1 1
	c		Measure out a transect Using a tape measure Use a quadrat At regular (named) intervals Identify species present Using a key/guide	1 1 1 1 1 1
4	A		2 Nucleolus 5 Smooth Endoplasmic Reticulum 8 Golgi body	1 1 1

Question			Answer	Marks
4	b		Any 3 from the following structure **and** function must be given. Lipid bilayer - has a hydrophobic inside and hydrophilic outside, allowing for selective permeability Proteins - allow for specific substances to come or some molecules to pass through Cholesterol - allows for fluidity of the membrane Glycoproteins - for cell identification they serve as markers	 1 1 1 1
5	a		Pancreas	1
	b		3 from Pancreas detects change Insulin secreted By alpha cells Respiration increased Uptake of glucose increased Liver increases storage of glucose as glycogen	 1 1 1 1 1 1
	c		Any one from: Amount of chocolate, time taken to eat, other food/drink consumed, age, gender, weight, fitness level/metabolic rate, health/pre existing conditions, use of medicines/drugs	1
	d		Any three from Data suggests that blood glucose returns to normal Doesn't show how much exercise has been done Doesn't say age/gender/other named variable May only be true for chocolate/only one type of food investigated	 1 1 1 1
6			Top left: transpiration increases when wind speed increases/there is a positive correlation Top right: rate increases with pH until the optimum is reached, after the optimum, rate decreases Bottom left: Increasing light initially increases the rate of photosynthesis, but after a while remains constant Bottom right: Population increases slowly at first and then increases at a greater rate/increases exponentially	1 1 1 1

4.1.1 Cell structure	Use the terms 'eukaryotic' and 'prokaryotic' to describe types of cells	
	Describe the features of bacterial (prokaryotic) cells	
	Recall the structures found in animal and plant (eukaryotic) cells, including algal cells	
	Use estimations and explain when they should be used to judge the relative size or area of sub-cellular structures	
	Required practical 1: use a light microscope to observe, draw and label a selection of plant and animal cells	
	Describe the functions of the structures in animal and plant (eukaryotic) cells	
	Describe what a specialised cell is, including examples for plants and animals	
	Describe what differentiation is, including differences between animals and plants	
	Define the terms magnification and resolution	
	Compare electron and light microscopes in terms of their magnification and resolution	
	Carry out calculations involving magnification using the formula: magnification = size of image/size of real object - including standard form	
4.1.2 Cell division	Describe how genetic information is stored in the nucleus of a cell (including genes and chromosomes)	
	Describe the processes that happen during the cell cycle, including mitosis (including recognition and description of where mitosis occurs)	
	Describe stem cells, including sources of stem cells in plants and animals and their roles	
	Describe the use of stem cells in the production of plant clones and therapeutic cloning	
	Discuss the potential risks, benefits and issues with using stem cells in medical research/treatments (including diabetes and paralysis)	
4.1.3 Transport in cells	Describe the process of diffusion, including examples	
	Explain how diffusion is affected by different factors	
	Define and explain "surface area to volume ratio", and how this relates to single-celled and multicellular organisms (including calculations)	
	Explain how the effectiveness of an exchange surface can be increased, including examples of adaptations for small intestines, lungs, gills, roots and leaves	
	Describe the process of osmosis (including calculation of water uptake and percentage gain and loss of mass of plant tissue)	
	Required practical 3: investigate the effect of a range of concentrations of salt or sugar solutions on the mass of plant tissue	
	Describe the process of active transport, including examples - gut and roots	
	Explain the differences between diffusion, osmosis and active transport	
4.2.1 Principles of organisation and 4.2.2 Animal tissues, organs and organ systems	Describe the levels of organisation within living organisms	
	Describe the digestive system and how it works as an organ system (from KS3)	
	Describe basic features of enzymes (including rate calculations for chemical reactions)	
	Describe the lock and key theory as a model of enzyme action and explain how the shape a of the active sites makes the enzyme specific	
	Explain the effect of temperature and pH on enzymes	
	Describe the digestive enzymes, including their names, sites of production and actions	
	Describe how the products of digestion are used	
	Describe the features and functions of bile and state where it is produced and released from	
	Required practical 3: use qualitative reagents to test for a range of carbohydrates, lipids and proteins	

	Required practical 4: investigate the effect of pH on the rate of reaction of amylase enzyme	
	Describe the structure of the human heart and lungs (including how lungs are adapted for gaseous exchange)	
	Explain how the heart moves blood around the body (include the role and position of the aorta, vena cava, pulmonary artery and vein and coronary arteries)	
	Explain how the natural resting heart rate is controlled and how irregularities can be corrected	
	Describe the structure and function of arteries, veins and capillaries	
	Use simple compound measures such as rate and carry out rate calculations for blood flow	
	Describe blood and identify its different components, including identifying blood cells from photographs/diagrams	
	Describe the functions of blood components, including adaptations to function	
	Describe what happens in coronary heart disease and what statins are used for	
	Describe and evaluate treatments for coronary heart disease and heart failure (including drugs, mechanical devices or transplant)	
	Recall that heart valves can become faulty and describe the consequences of this	
	Describe how patients can be treated in the case of heart failure	
	Describe health and then explain causes of ill-health and the relationship between health and disease	
	Describe how different types of diseases may interact and translate disease incidence information between graphical and numerical forms	
	Describe what risk factors are and give examples discussing human and financial costs of non-communicable diseases at local, national and global levels	
	Describe what cancer is and explain the difference between benign and malignant tumours	
	Describe the known risk factors for cancer, including genetic and lifestyle risk factors	
4.2.3 Plant tissues, organs and system	Describe plant tissues (epidermal, palisade mesophyll, spongy mesophyll, xylem, phloem and meristem) and describe their functions	
	Explain how the structure of plant tissues are related to their function within the leaf (plant organ), including stomata and guard cells	
	Recall the plant parts that form a plant organ system that transports substances around the plant	
	Explain how root hair cells, xylem and phloem are adapted to their functions	
	Describe the process of transpiration and translocation, including the role of the different plant tissues	
	Explain how the rate of transpiration can be affected by different factors (include naming the factors)	
	Describe the role of stomata and guard cells in the control of gas exchange and water loss	
4.3.1 Communicable diseases	Explain what a pathogen is and how pathogens are spread (including how viruses, bacteria, protists and fungi are spread in animals and plants)	
	Explain how pathogenic bacteria and viruses cause damage in the body	
	Explain how the spread of diseases can be reduced or prevented	
	Describe measles, HIV and tobacco mosaic virus as examples of viral pathogens	
	Describe salmonella food poisoning and gonorrhoea as examples of bacterial pathogens	
	Describe the signs, transmission and treatment of rose black spot infection in plants as an example of fungal pathogens	

	Describe the symptoms, transmission and control of malaria, including knowledge of the mosquito vector as an example of a prototist pathogen	
	Describe defences that stop pathogens entering the human body (including the skin, nose, trachea and windpipe as well as the stomach)	
	Recall the role of the immune system	
	Describe how white blood cells destroy pathogens	
	Describe how vaccination works, including at the population level	
	Explain how antibiotics and painkillers are used to treat diseases, including their limitations	
	Describe how sources for drugs have changed over time and give some examples	
	Describe how new drugs are tested, including pre-clinical testing and clinical trials (including double blind trials and placebos)	
4.4.1 Photosynthesis	Describe what happens in photosynthesis, including using a word equation and recognise the chemical formulas for carbon dioxide, water, oxygen and glucose	
	Explain why photosynthesis is an endothermic reaction	
	Recall the limiting factors of photosynthesis	
	Explain how limiting factors affect the rate of photosynthesis, including graphical interpretation (limited to one factor)	
	HT ONLY: Explain how the limiting factors of photosynthesis interact, including graphical interpretation (two/three factors)	
	HT ONLY: Explain how limiting factors are important to the economics of greenhouses, including data interpretation	
	HT ONLY: Explain and use inverse proportion in the context of photosynthesis	
	Required practical 5: investigate the effect of light intensity on the rate of photosynthesis using an aquatic organism such as pondweed	
	Describe how the glucose produced in photosynthesis is used by plants	
4.4.2 Respiration	Describe what happens in respiration, including using a word equation, and recognise the chemical formulas for carbon dioxide, water, oxygen and glucose	
	Describe aerobic and anaerobic respiration with regard to the need for oxygen, the differing products and the relative amounts of energy transferred	
	Recognise the equations for aerobic respiration, anaerobic respiration in muscles and anaerobic respiration in plants and yeast cells	
	Recall what type of respiration fermentation is and its economic importance	
	Describe what happens to heart rate, breathing rate and breath volume during exercise and why these changes occur	
	Explain what happens when muscles do not have enough oxygen and define the term oxygen dept	
	HT ONLY: Explain what happens to accumulated lactic acid in the body	
	Explain the importance of sugars, amino acids, fatty acids and glycerol in the synthesis and breakdown of carbohydrates, proteins and lipids	
	Explain what metabolism is, including examples	
4.5.1 Homeostasis	Describe what homeostasis is and why it is important, stating specific examples from the human body	
	Describe the common features of all control systems	
4.5.2 The human nervous system	State the function of the nervous system and name its important components	
	Describe how information passes through the nervous system	
	Describe what happens in a reflex action and why reflex actions are important	

	Explain how features of the nervous system are adapted to their function, including a reflex arc (include all types of neurone and the synapse)	
	Required practical 6: plan and carry out an investigation into the effect of a factor on human reaction time	
	Describe how body temperature is monitored and controlled	
4.5.3 Hormonal coordination in humans	Describe the endocrine system, including the location of the pituitary, pancreas, thyroid, aderenal gland, ovary and testis and the role of hormones	
	State that blood glucose concentration is monitored and controlled by the pancreas	
	Describe the body's response when blood glucose concentration is too high	
	Explain what type 1 and type 2 diabetes are and how they are treated	
	HT ONLY: Describe the body's response when blood glucose concentration is too low	
	HT ONLY: Explain how glucagon interacts with insulin to control blood glucose levels in the body	
	Describe how water, ions and urea are lost from the body	
	Describe the consequences of losing or gaining too much water for body cells	
	HT ONLY: Recall that protein digestion leads to excess amino acids inside the body and describe what happens to these	
	Describe how the kidneys produce urine	
	HT ONLY: Describe the effect of ADH on the permeability of the kidney tubules and explain how the water level in the body is controlled by ADH	
	Describe how kidney failure can be treated by organ transplant or dialysis and recall the basic principles of dialysis	
	Describe what happens at puberty in males and females, include knowledge of reproductive hormones	
	Describe the roles of the hormones involved in the menstrual cycle (FSH, LH and oestrogen)	
	HT ONLY: Explain how the different hormones interact to control the menstrual cycle and ovulation	
	Describe how fertility can be controlled by hormonal and non-hormonal methods of contraception (giving specific examples from the specification)	
	HT ONLY: Explain how hormones are used to treat infertility, including the steps in IVF	
	HT ONLY: Evaluate the risks and benefits of fertility treatments	
	HT ONLY: Describe the functions of adrenaline and thyroxine in the body, and recall where they are produced	
	HT ONLY: Explain the roles of thyroxine and adrenaline in the body as negative feedback systems	
4.6.1 Reproduction	Describe features of sexual and asexual reproduction	
	Describe what happens during meiosis and compare to mitosis	
	Describe what happens at fertilisation	
	Describe the structure of DNA and its role in storing genetic information inside the cell	
	Explain the term 'genome' and the importance of the human genome (specific examples from specification only)	
	Describe how characteristics are controlled by one or more genes, including examples	
	Explain important genetic terms: gamete, chromosome, gene, allele, genotype, phenotype, dominant, recessive, homozygous and heterozygous	
	Explain and use Punnet square diagrams, genetic crosses and family trees	
	HT ONLY: Construct Punnet square diagrams to predict the outcomes of a monohybrid cross	
	Describe cystic fibrosis and polydactyly as examples of inherited disorders	

	Evaluate social, economic and ethical issues concerning embryo screening when given appropriate information	
	Describe how the chromosomes are arranged in human body cells, including the function of the sex chromosomes	
	Explain how sex is determined and carry out a genetic cross to show sex inheritance	
4.6.2 Variation and evolution	Describe what variation is and how it can be caused within a population	
	Describe mutations and explain their influence on phenotype and changes in a species	
	Explain the theory of evolution by natural selection	
	Describe how new species can be formed	
	Describe what selective breeding is	
	Explain the process of selective breeding, including examples of desired characteristics and risks associated with selective breeding	
	Describe what genetic engineering is, including examples and how it is carried out	
	Explain some benefits, risks and concerns related to genetic engineering	
	HT ONLY: Explain the process of genetic engineering, to include knowledge of enzymes and vectors	
4.6.3 The development of understanding of genetics and evolution	Describe some sources of evidence for evolution	
	Describe what fossils are, how they are formed and what we can learn from them	
	Explain why there are few traces of the early life forms and the consequences of this in terms of our understanding of how life began	
	Describe some of the causes of extinction	
	Describe how antibiotic-resistant strains of bacteria can arise and spread (including MRSA)	
	Describe how the emergence of antibiotic-resistant bacteria can be reduced and controlled, to include the limitations of antibiotic development	
4.6.4 Classification	Describe how organisms are named and classified in the Linnaean system	
	Explain how scientific advances have led to the proposal of new models of classification, including three-domain system	
	Describe and interpret evolutionary trees	
4.7.1 Adaptations, interdependence and competition	Recall what an ecosystem is	
	Describe which resources animals and plants compete for and why they do this	
	Explain the terms 'interdependence' and 'stable community'	
	Name some abiotic and biotic factors that affect communities	
	Explain how a change in an abiotic or biotic factor might affect a community	
	Describe structural, behavioural and functional adaptations of organisms	
	Describe what an extremophile is	
4.7.2 Organisation of an ecosystem	Represent the feeding relationships within a community using a food chain and describe these relationships	
	Explain how and why ecologists use quadrats and transects	
	Describe and interpret predator-prey cycles	
	Required practical 7: measure the population size of a common species in a habitat. Use sampling to investigate the effect of one factor on distribution	
	Describe the processes involved in the carbon cycle	
	Describe the processes involved in the water cycle	
4.7.3 Biodiversity and the effect of	Describe what biodiversity is, why it is important and how human activities affect it	

human interaction on ecosystems		
	Describe the impact of human population growth and increased living standards on resource use and waste production	
	Explain how pollution can occur and the impacts of pollution	
	Describe how humans reduce the amount of land available for other animals and plants	
	Explain the consequences of peat bog destruction	
	Describe what deforestation is and why it has occurred in tropical areas	
	Explain the consequences of deforestation	
	Describe how the composition of the atmosphere is changing, and the impact of this on global warming	
	Describe some biological consequences of global warming	
	Describe both positive and negative human interactions in an ecosystem and explain their impact on biodiversity	
	Describe programmes that aim to reduce the negative effects of humans on ecosystems and biodiversity	

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PiXL Science

PiXL 6th Gateway

Essential Practical Skills for A Level

Practical skills are essential for A-Level Science!

Practical investigations form a very important part of the course. As well as being assessed in your actual exams you will also have your practical skills assessed in a series of required practical investigations.

This lesson summarises the skills you should have already gained from GCSE and helps you to make a strong start in A-Level.

Recording Data

Missing units - Every column heading must have units.

Inconsistent precision - Each measurement should be made to the same level of precision.

Increased significant figures – A calculation answer cannot have more significant figures than the numbers used in it. Here the average has more s.f. than the repeats.

Incorrect mean – The mean should be calculated ignoring any anomalies.

Time	Distance Travelled (m)				Average Speed (ms^{-1})
	Repeat 1	Repeat 2	Repeat 3	Average	
5	7	5	7	6.33	1.27
10	15	13.2	16	14.73	1.473
15	20	21.6	21	20.87	1.391
20	22	22.1	35	26.37	1.318

Spot the 4 deliberate mistakes in the results table - (HINT - Only 1 mistake is a type of calculation error)

Going deeper… How could the table be improved further? Can you write a set of table rules?

Rules for Results Tables

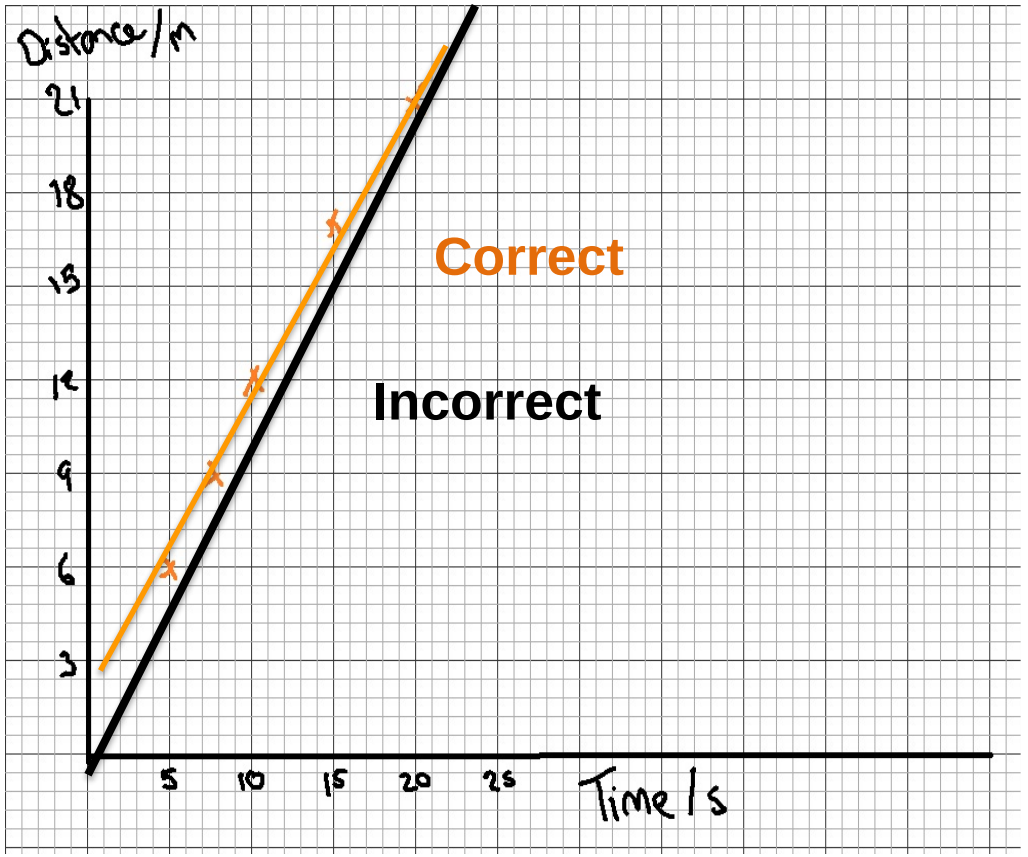
1. Tables should have clear headings with units indicated using a distinguishing mark before the unit, e.g. / or ()
2. It is good practice to draw a table before an experiment commences and then enter data straight into the table.
   a. This may mean that you record results in an non-ascending or descending order which is fine when working in a lab book.
   b. If you were to present the table or to use it to identify patterns, rewriting in ascending or descending order after the experiment would be helpful.
3. The independent variable should be in the left hand column.
4. The body of the table should not contain any units
5. Data within a column should be recorded to the same number of decimal places which is determined by the resolution of the measuring instrument used.
6. Any data which is a calculation from other data in the table should not be recorded to more significant figures.

Adapted from AQA Practical Skills Handbook.

Going deeper - What is the uncertainty in your measurement? This is determined by the resolution of your measuring instrument and could be recorded along with the heading and unit too!

Rules for Graphing

1. Axis should be labelled with a unit which is separated by a distinguishing mark, e.g. / or ()
2. Data points should only be plotted using x or +.
3. The **plotted points** should occupy as much of the graph paper as possible in both the x and y directions.
   a. Use at least half of the graph paper in both the x and y direction
   b. Use a sensible scale - multiples of 1,2,5,10,20,50 etc.
   c. Axis do not have to start at (0,0) but be careful if you need to work out the y-intercept.
4. A line of best fit should be drawn
   a. Use a thin pencil line
   b. Ignore anomalies and don't force it through every plotted point
   c. Have roughly the same number of points on either side
   d. Not all line of best fits go through the origin (0,0) so don't force it!



Types of Error

Random errors

- Unpredictable and vary from measurement to measurement.
- Random errors are always present.
- They cause readings to be spread around the true value.
- Their effects can be reduced by taking multiple repeated measurements and calculating a mean.

Systematic errors

- A systematic error is the same for each measurement made.
- It occurs when there is a problem with the measuring instrument e.g. a zero error; or the observation technique e.g. reading the wrong scale; or a problem with the environment e.g. the experiment was not conducted at standard temperature and pressure.
- The whole experiment should be repeated using a different technique/instrument if a systematic error has occurred.

Sort the following into systematic and random errors:

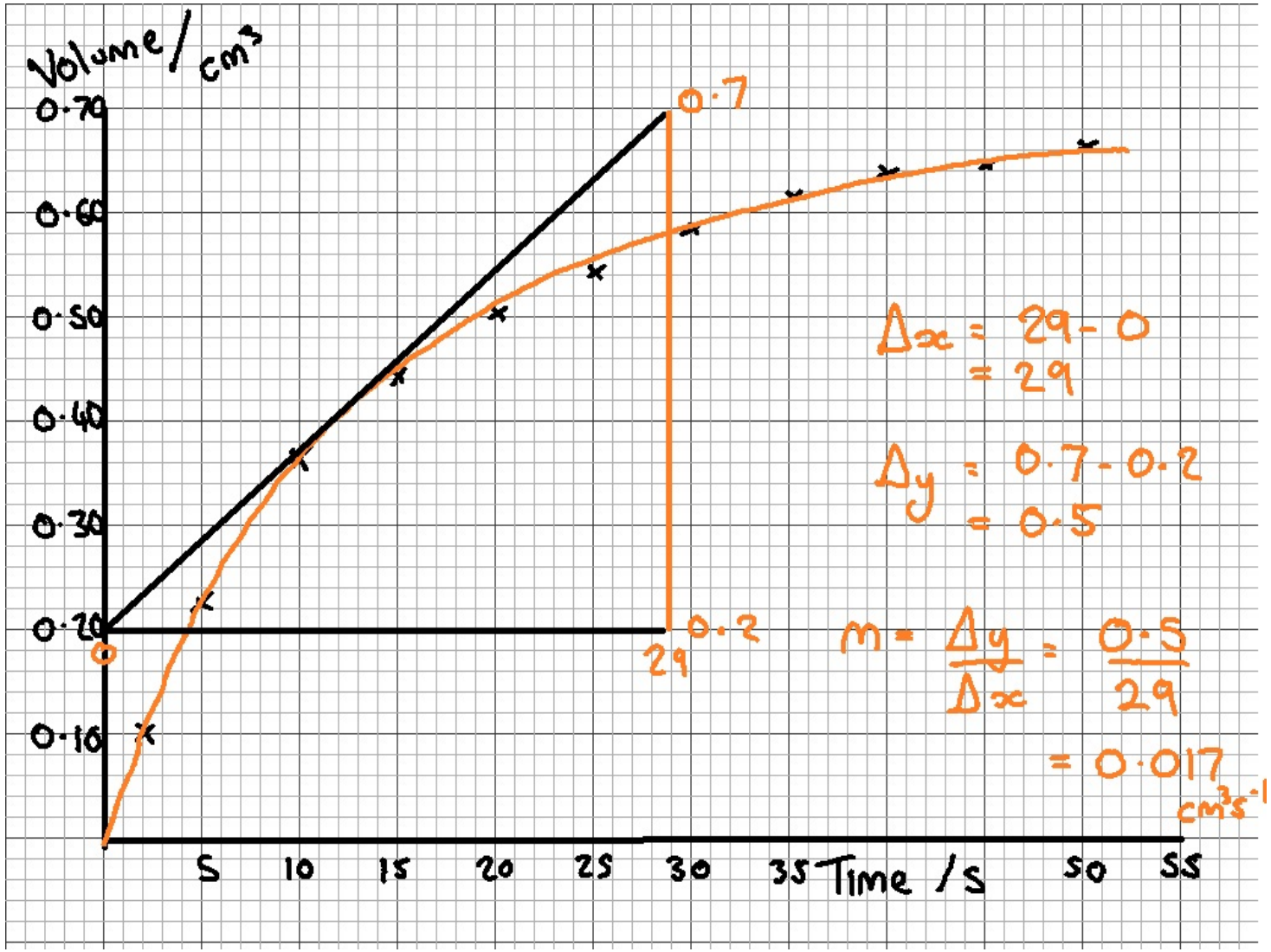
1. Parallax error when measuring the meniscus on water in a measuring cylinder.

2. A faulty analogue ammeter that has a reading of 0.1A when it is not connected in a circuit.

3. Human reaction time error using a stopwatch to time the drop of a tennis ball from the ceiling to the floor.

Going deeper: How would you resolve these errors?

Finding the Gradient



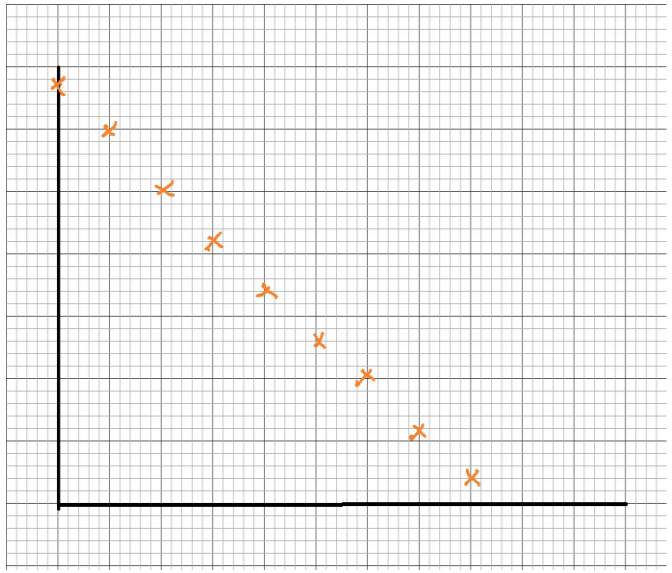
- When finding the gradient ‘m’ of a line always show your working and always draw a triangle!
- The hypotenuse of the triangle should always be at least as big as half of the line of best fit.
- If the line of best fit is a curve, draw a tangent to the curve at the point where the gradient is required.
- The gradient ‘m’ can be calculated by:

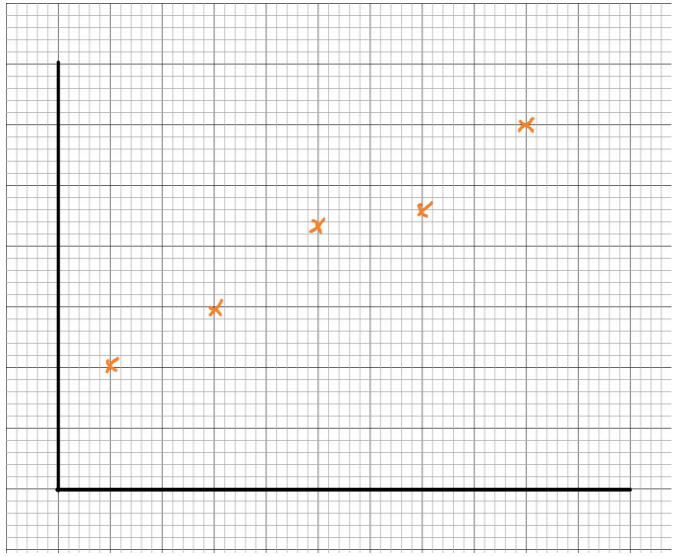
  m = change in y / change in x
  = Δy / Δx

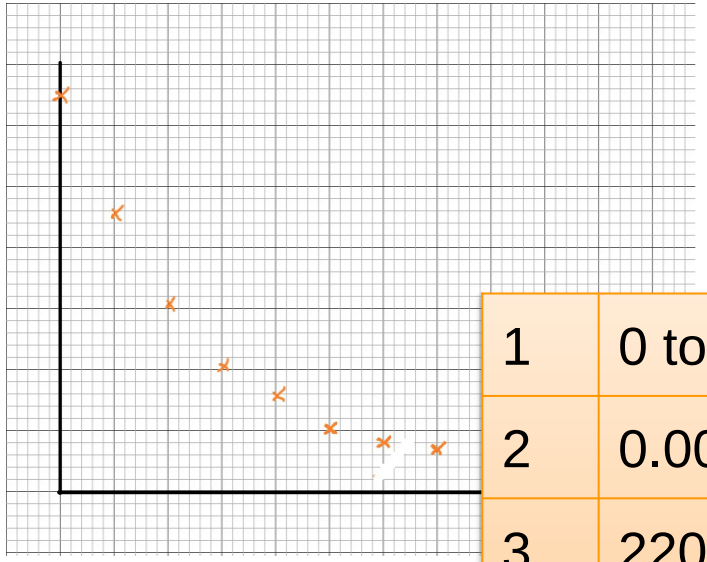
- The unit for the gradient is the unit for the y-values divided by the unit for the x-values.

Graphing Challenge

- Add a random selected range to the x and y axis by rolling a dice. Don't worry about units!
- Create a line of best fit on your graph
- Measure the gradient (use a tangent for the curve). Don't worry about units!







1	0 to 100
2	0.001 to 0.010
3	2200 to 6700
4	0 to - 100
5	0 to - 0.025
6	10000 to 10010

Going Deeper

Sketch the graph with a large random error and suggest how it could be dealt with .

Can you work out the y-intercept from your graph?

Using the Equation of a Line

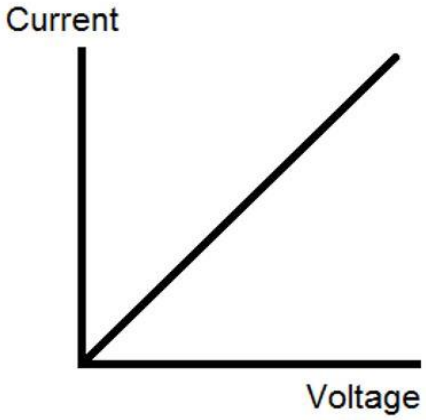
$y = mx+c$

y= y variable

x=x variables

m= gradient

c= y intercept



1. Find a physics equation that matches the variables used in your experiment.
2. Re-arrange it into the form y=mx+c
3. Match up the values to determine what the gradient of your graph and the y-intercept represent

Worked example:

y-axis = current 'I'

x-axis = voltage 'V'

Equation with both : V = IR

Re-arrange to make I subject:

$$I = \frac{1}{R}V$$

Match: $y = mx + c$

y-axis quantity	x-axis quantity	Gradient (m)	y-intercept (c)
Q (charge)	T (time)	I (Current)	0
v^2	s	a	u^2

Summary Quiz

1. Calculate the mean of this set of data: 0.12, 0.14, 0.11

2. Define what is meant by a random error

3. State 4 rules for graphing

4. If a student had plotted a graph of force, applied ‘F’ to a spring on the x-axis and extension ‘e’ of the spring on the y-axis, what would the gradient represent? (F= ke)

Summary Quiz Answers

1. Calculate the average to this set of data: 0.12, 0.14, 0.11

   0.12

2. Define what is meant by a random error.

   An error that is always present and varies from reading to reading causing a spread of results about a true value OWTTE.

3. State 1 of the 4 rules for graphing.

   Axis should be labelled with a unit which is separated by a distinguishing mark, e.g. / or ()

   Data points should only be plotted using x or +.

   The plotted points should occupy as much of the graph paper as possible in both the x and y directions.

   A line of best fit should be drawn

4. If a student had plotted a graph of force, applied ‘F’ to a spring on the x-axis and extension ‘e’ of the spring on the y-axis, what would the gradient represent? (F= ke)

   1/k

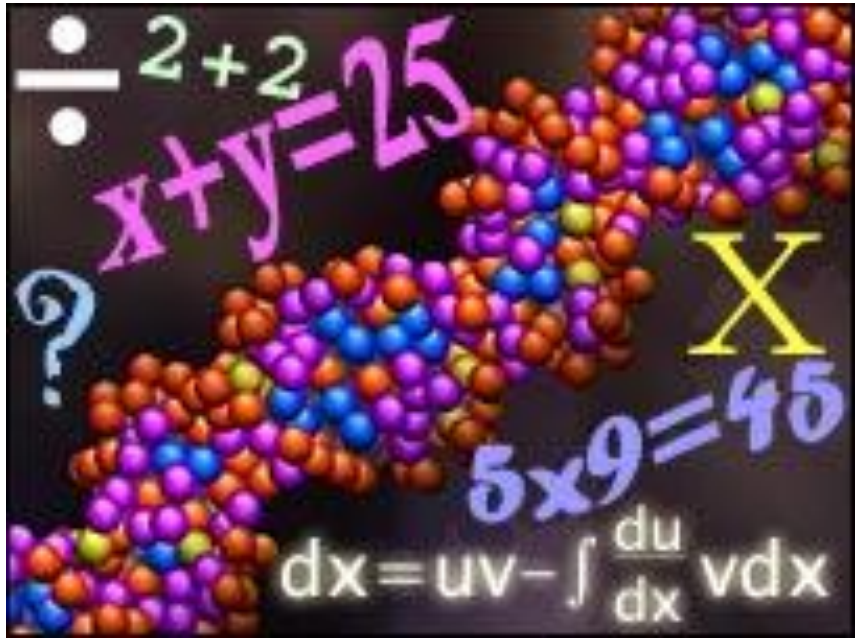
Essential Knowledge for A Level Biology

A Level Biology builds on your GCSE knowledge.

Everyone finds the A Level Biology course difficult, but it is incredibly rewarding so stick at it!

This lesson summarises some of the key concepts from GCSE Biology which will help form the foundation of your study of the advanced material in A-Level.

Essential Maths for Biology



At least **10% of the marks** for assessments in Biology will require the use of mathematical skills. These will be applied in the context of Biology and will be at least the standard of **higher tier GCSE Mathematics**.

You need to be able to demonstrate a range of mathematical skills across the A Level course.

Here we will explore some of the mathematical skills that you will need to use that you might be less familiar with from your GCSE studies.

Essential Standard Form

Standard form is used when numbers are very small, or very large. For example: the nucleus of an atom is 1×10^{-15}m and Earth is 1.49×10^{11}m from the Sun.

These numbers would be too great to write out in full all the time, so standard form helps to communicate this effectively.

Here are some more examples of standard form being used:

Decimal	Standard Form
0.000000286	2.86×10^{-7}
16 500 000 000	1.65×10^{10}
0.00005978	5.948×10^{-5}
89620	8.962×10^{4}
0.29	2.9×10^{-1}

Task: Construct a list of rules for converting numbers to standard form

Essential Statistical Tests

Statistical tests are used in Biology to determine whether or not results have been due to chance, or have been caused by another factor.

There are three tests that you may be required to use or apply:

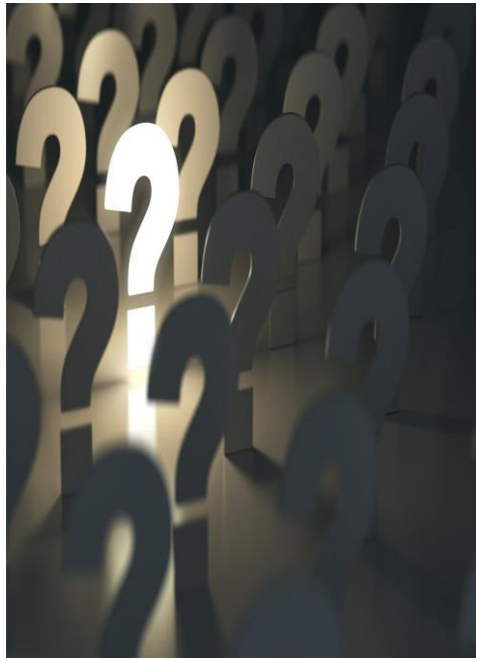
1. **Chi squared**: used with categoric data to see if differences in frequencies are the same as what would be expected, e.g. in a blood sample, is the ratio of red to white blood cells healthy?
2. **Students t-test or t-test**: used to determine whether continuous data has a normal distribution and whether there is any difference between two sets of data, e.g. have boys performed better in their exams than girls?
3. **Correlation coefficient or Spearman Rank**: used to test whether there is a relationship between two variables, e.g. is a persons weight related to their height?

Essential Statistical Tests TASK

Which statistical test would you use for the following experiments/data sets?

1. The number of yellow and white daffodils that come from bulbs where I would expect a ratio of 1:1.
2. Do people who drink energy drinks have a higher blood sugar?
3. Is there a difference in the number of girls in Y9 and Y10?
4. The yield of crop from two different fertilisers.
5. The number of males and females born in a litter of pups.

Essential Statistical Tests



You will need to know some common features of each of these tests:

Hypothesis: the relationship you expect to find or are investigating, e.g. there is a significant difference in the number of lung cancers developed by non-smokers compared to smokers.

Null hypothesis: the opposite of the hypothesis, e.g. there is no significant difference in the number of lung cancers developed by non-smokers compared to smokers.

Degrees of freedom: the number of categories (classes) being tested.

Critical value: the value at which you accept or reject the hypothesis.

Essential Probability

Probability tells us how likely something is or the chances of something occurring.

Probability is used in Biology to judge whether data has been caused by chance, and to make predictions about expected outcomes.

You will use probability in relation to statistical tests as well as in predicting the genetic makeup of populations.

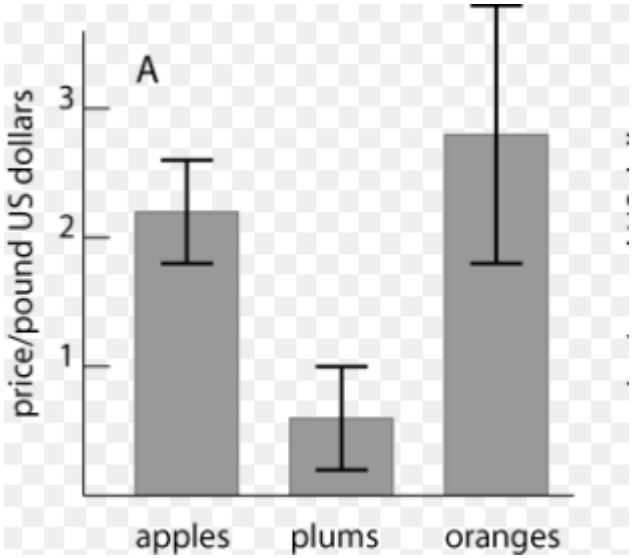
Probabilities can be expressed as a **percentage, decimal or fraction** e.g. 50%, 0.5 or ½.

Essential Standard Deviation

Standard deviation measures the 'spread' of data.

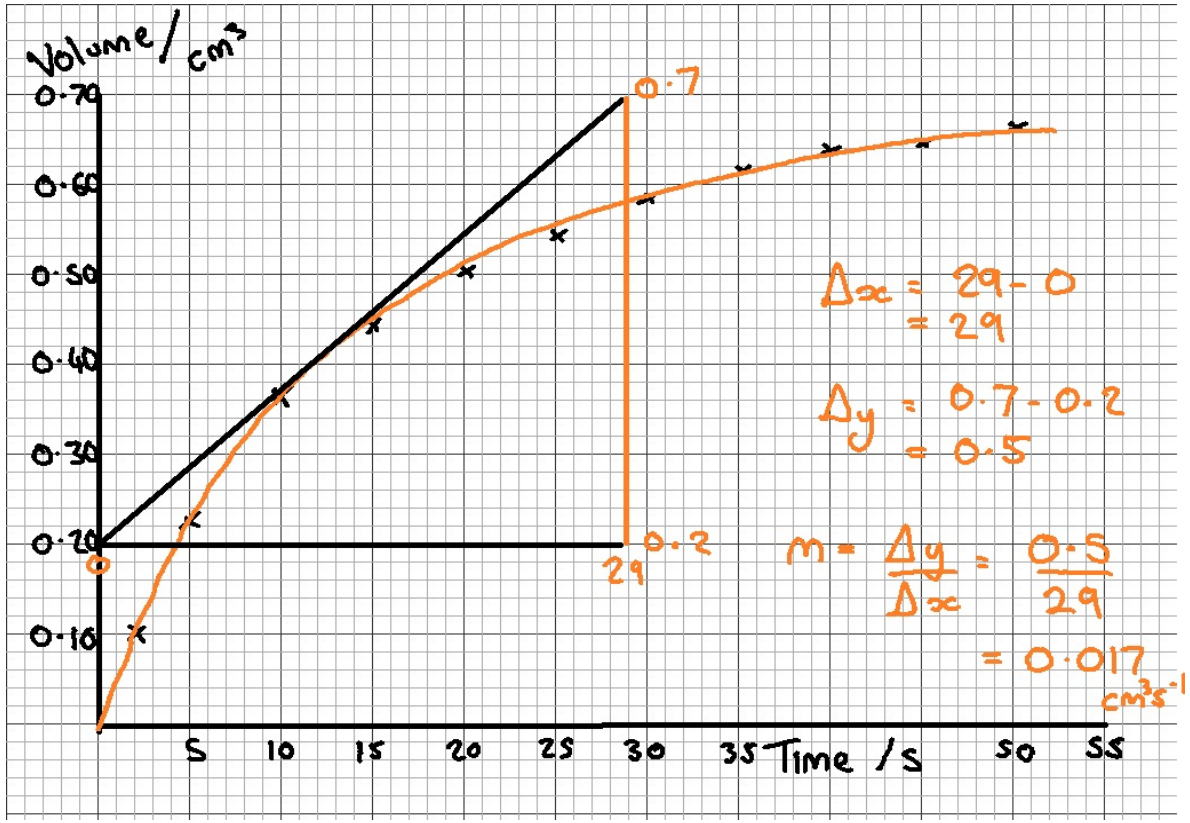
In Biology this can be used to determine whether there is a **significant difference** between groups, e.g. between species of animals, or the efficacy of different drugs on patient symptoms.

You will **not be required to calculate standard deviation** in your exams, but you can be asked to interpret graphs and tables that use it.



The example on the right shows the price of 3 different fruit. The bars show the mean price. The bars show +/- one standard deviation from the mean. This tells us that there is a **significant difference** in the price of plums compared to apples and oranges, but that there is **no significant difference** between the apples and oranges.

Essential Finding the Gradient of a Line



To find the gradient 'm' of a line always show your working and always draw a triangle.
The hypotenuse of the triangle must be at least as big as half of the line of best fit.
If the line of best fit is a curve, draw a tangent to the curve at the point where the gradient is required.
The gradient 'm' can be calculated by:

m = change in y / change in x
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The unit for the gradient is the unit for the y-values divided by the unit for the x-values.