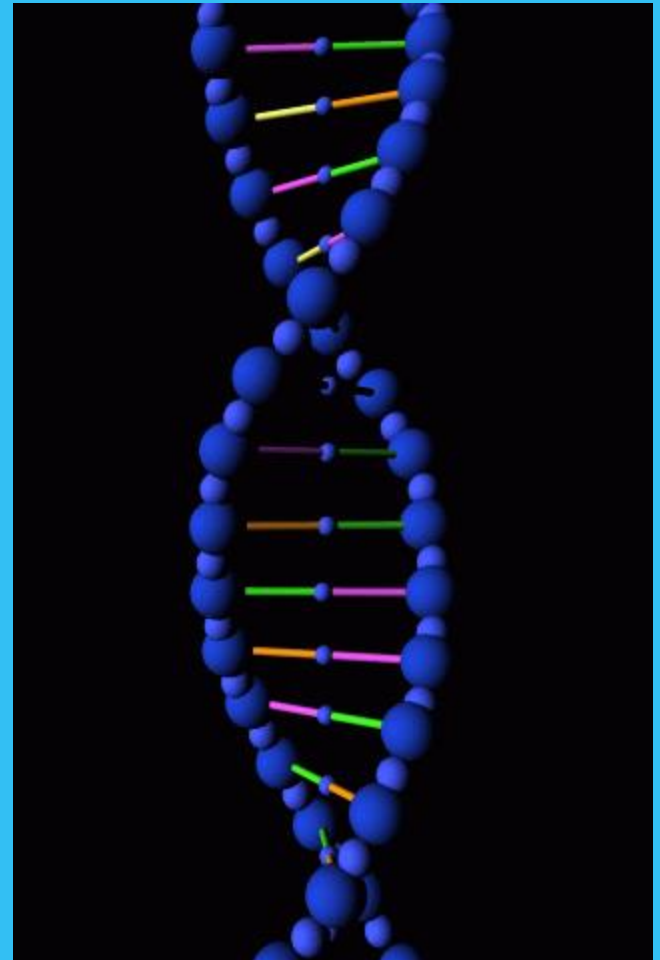


**Welcome to A-level Biology**

**Head of Biology: Karen Wilson**



# Why study Biology?

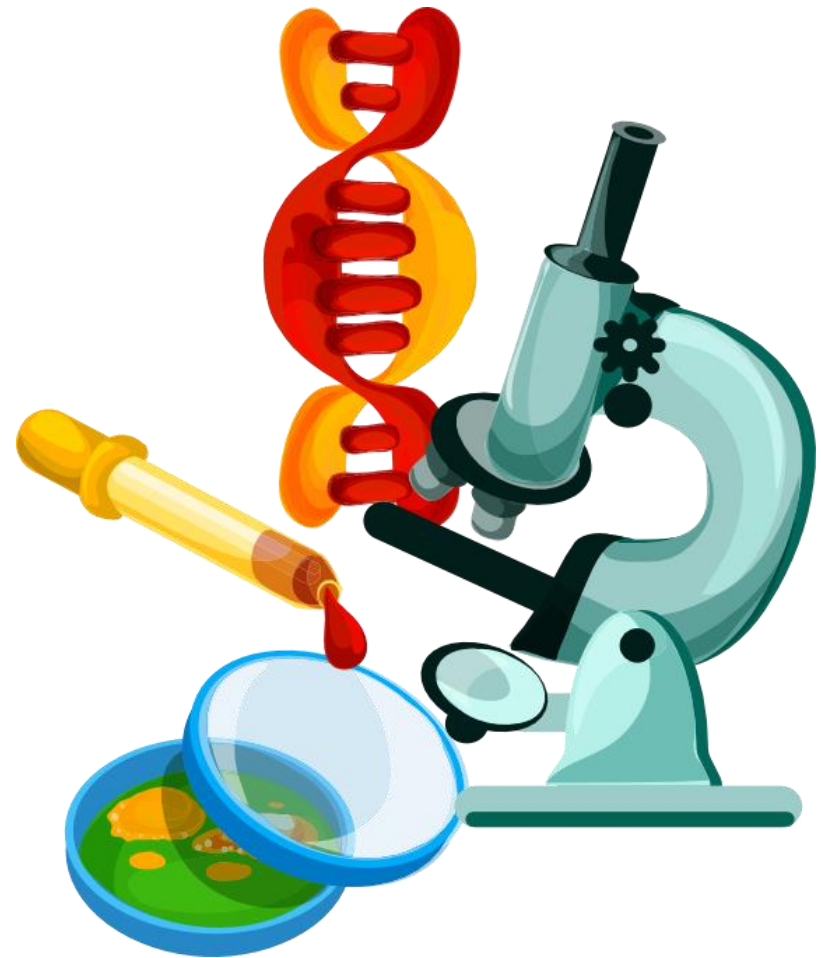
The best answer is because you are interested in the subject and want to learn more.



# Why study Biology?

Biology is relevant to our everyday experience:

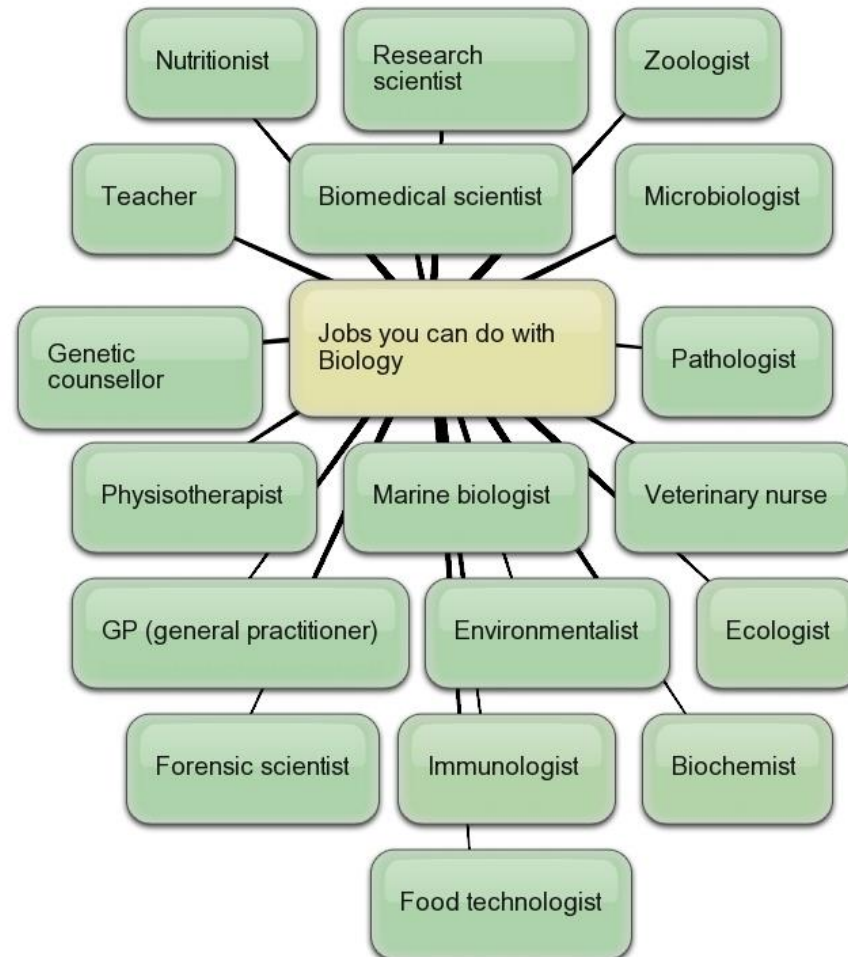
- Medical advances
- Addressing the needs of a growing population
- Meeting the challenges of a reduced biodiversity
- Biotechnology advances

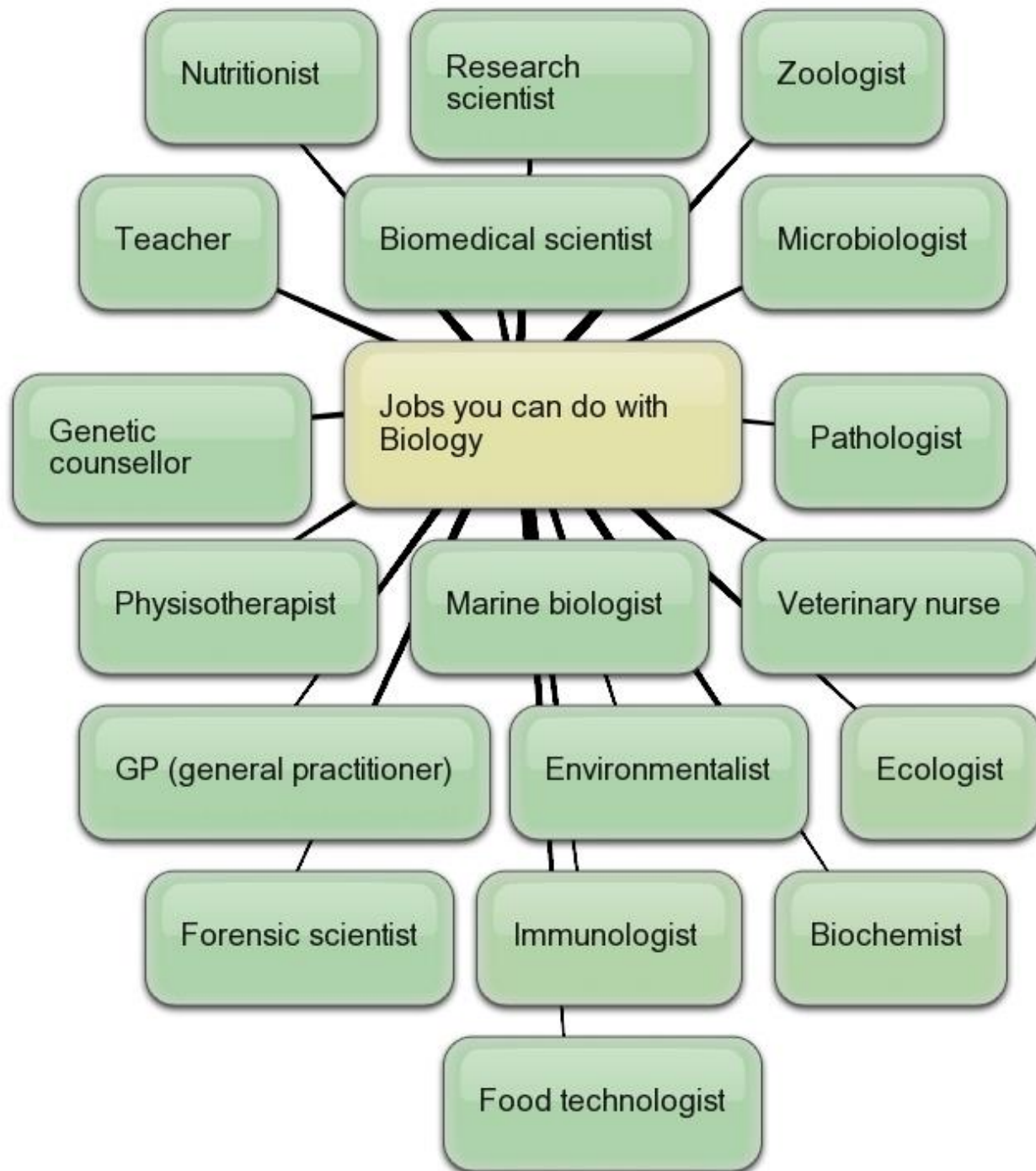


# Transferable Skills

- A-level Biology gives you a detailed insight into the key concepts and principles that underpin our understanding of living organisms and the way they interact with each other and their surroundings.
- It will challenge and develop your ***problem solving, numeracy, communication, experimentation, analytical and teamwork skills.***
- It is one of the subjects ***most commonly required or preferred*** by universities as an entry requirement for degree courses.

# What can you do with a Biology degree?

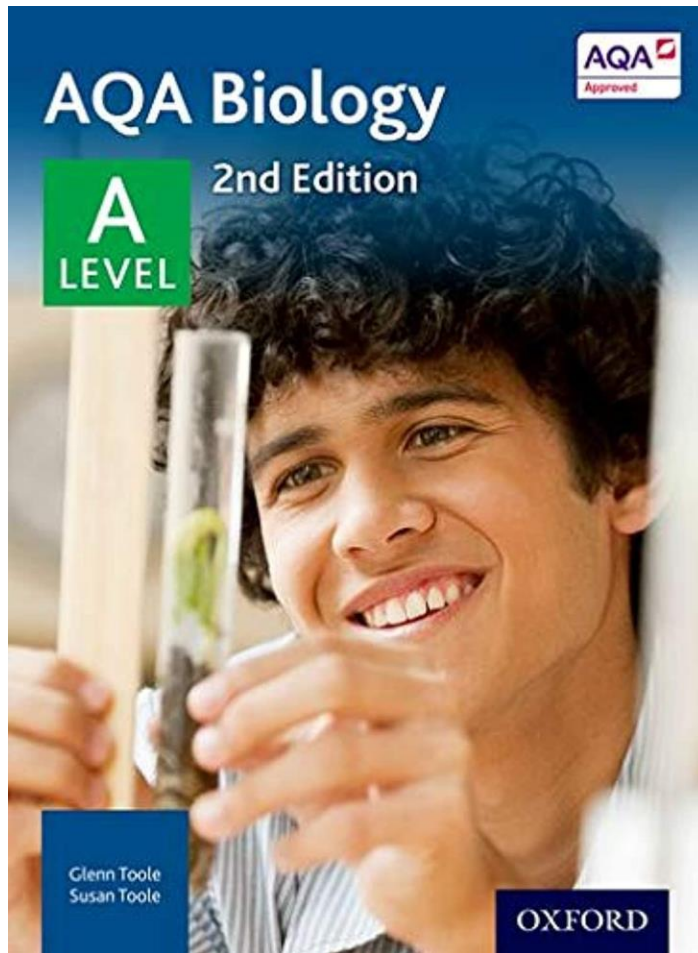




# Entry Requirements

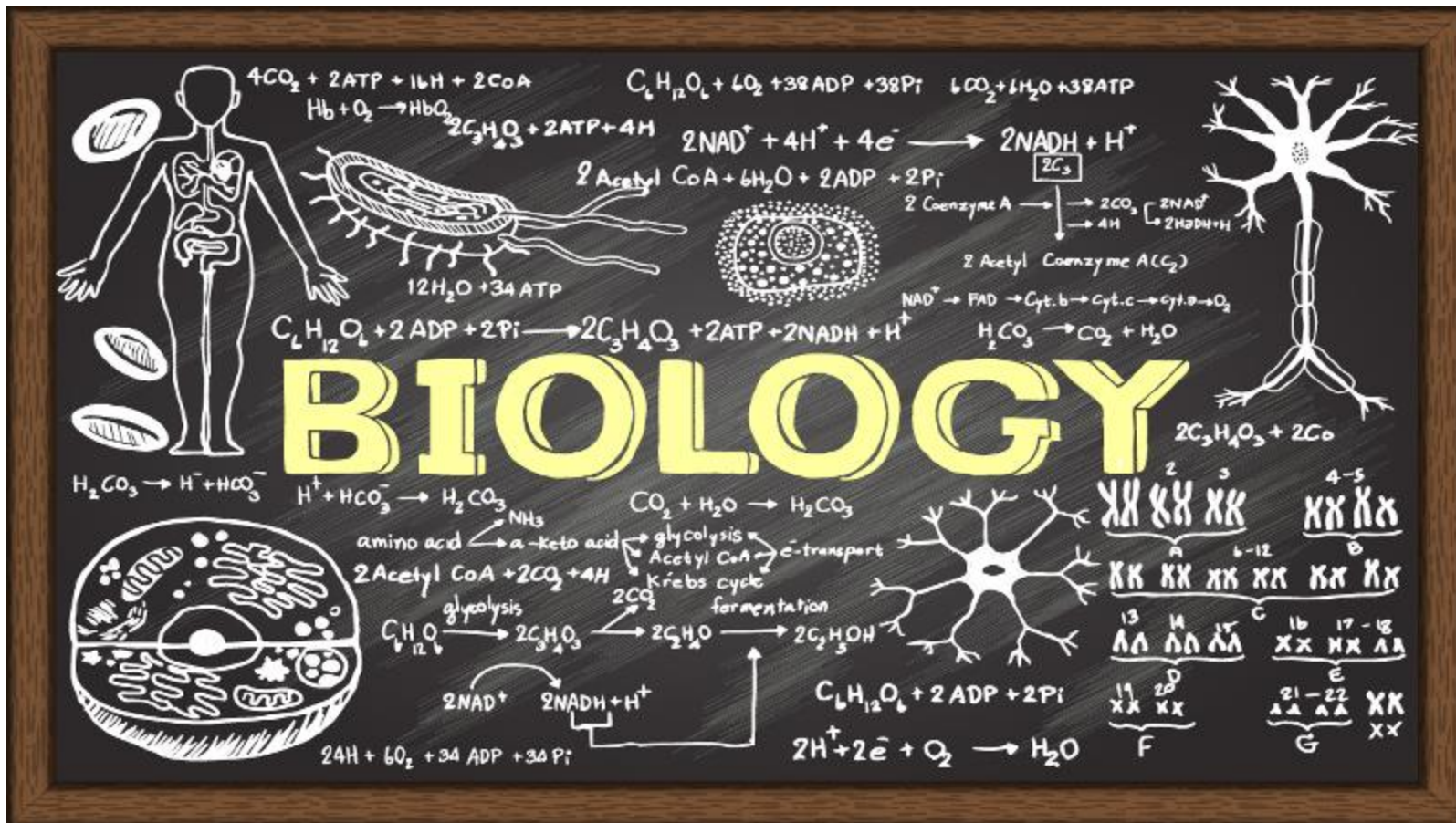
- Grade 6 or higher for GCSE Biology (or grade 6/6 in GCSE Combined Science).
- Grade 5 or higher for GCSE Mathematics.
- The course has some overlap with A-Level Mathematics, with up to 10% of the marks available within written assessments involving maths skills.

# Specification



AQA specification as of  
September 2015

# What you will study ...



**BIOLOGY**

**Photosynthesis:**  
 $6\text{CO}_2 + 12\text{H}_2\text{O} + \text{light energy} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2 + 38\text{ATP}$   
 $4\text{CO}_2 + 2\text{ATP} + 16\text{H} + 2\text{CoA} \rightarrow \text{C}_4\text{H}_8\text{O}_4 + 2\text{ATP} + 4\text{H}$

**Cellular Respiration:**  
 $\text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2 + 38\text{ADP} + 38\text{P}_i \rightarrow 6\text{CO}_2 + 12\text{H}_2\text{O} + 38\text{ATP}$   
 $\text{Hb} + \text{O}_2 \rightarrow \text{HbO}_2$   
 $2\text{C}_3\text{H}_4\text{O}_3 + 2\text{ATP} + 4\text{H} \rightarrow 2\text{Acetyl CoA} + 2\text{ATP} + 4\text{H}$   
 $2\text{Acetyl CoA} + 6\text{H}_2\text{O} + 2\text{ADP} + 2\text{P}_i \rightarrow 2\text{CO}_2 + 2\text{H}_2\text{O} + 2\text{ATP} + 2\text{NADH} + \text{H}^+$   
 $2\text{NAD}^+ + 4\text{H}^+ + 4\text{e}^- \rightarrow 2\text{NADH} + \text{H}^+$   
 $2\text{Coenzyme A} \rightarrow 2\text{CO}_2 \xrightarrow{2\text{NAD}^+} 2\text{NADH} + \text{H}^+$   
 $2\text{Acetyl Coenzyme A (C}_2\text{)}$   
 $\text{NAD}^+ \rightarrow \text{FAD} \rightarrow \text{Cyt. b} \rightarrow \text{Cyt. c} \rightarrow \text{Cyt. b} \rightarrow \text{O}_2$   
 $\text{H}_2\text{CO}_3 \rightarrow \text{CO}_2 + \text{H}_2\text{O}$

**Other Processes:**  
 $\text{H}_2\text{CO}_3 \rightarrow \text{H}^+ + \text{HCO}_3^-$   
 $\text{H}^+ + \text{HCO}_3^- \rightarrow \text{H}_2\text{CO}_3$   
 $\text{CO}_2 + \text{H}_2\text{O} \rightarrow \text{H}_2\text{CO}_3$   
 $\text{amino acid} \xrightarrow{\text{NH}_3} \alpha\text{-keto acid} \rightarrow \text{glycolysis} \rightarrow \text{Acetyl CoA} \rightarrow \text{e}^- \text{ transport}$   
 $2\text{Acetyl CoA} + 2\text{CO}_2 + 4\text{H} \rightarrow \text{Krebs cycle} \rightarrow \text{fermentation}$   
 $\text{C}_6\text{H}_{12}\text{O}_6 \xrightarrow{\text{glycolysis}} 2\text{C}_3\text{H}_4\text{O}_3 \xrightarrow{2\text{CO}_2} 2\text{C}_2\text{H}_4\text{O} \xrightarrow{\text{fermentation}} 2\text{C}_2\text{H}_5\text{OH}$   
 $2\text{NAD}^+ \rightarrow 2\text{NADH} + \text{H}^+$   
 $24\text{H} + 6\text{O}_2 + 34\text{ADP} + 34\text{P}_i \rightarrow 24\text{H}^+ + 2\text{e}^- + \text{O}_2 \rightarrow \text{H}_2\text{O}$

**Genetics:**  
 Karyotype showing pairs of chromosomes labeled A through G.

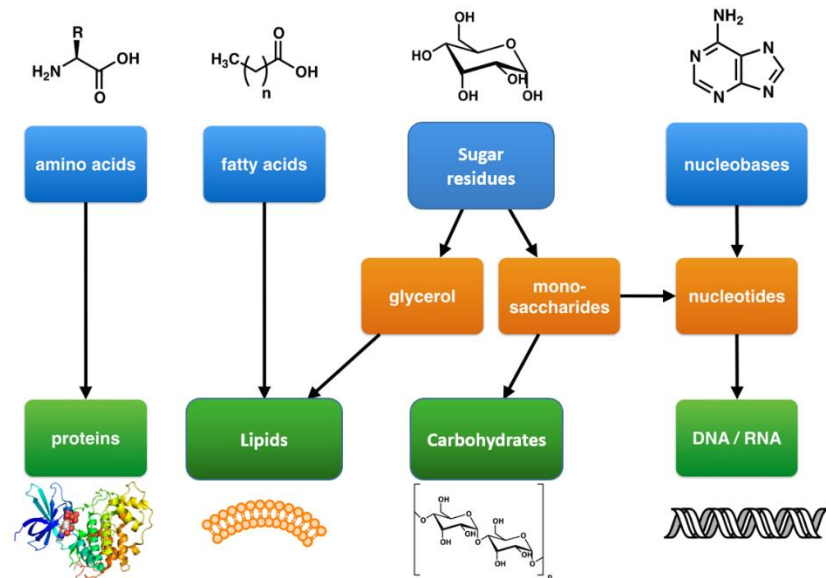
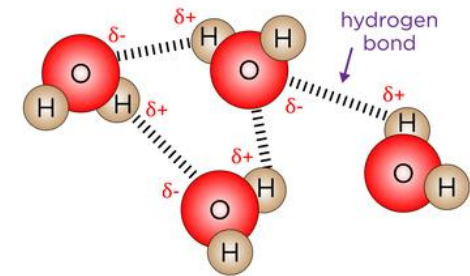
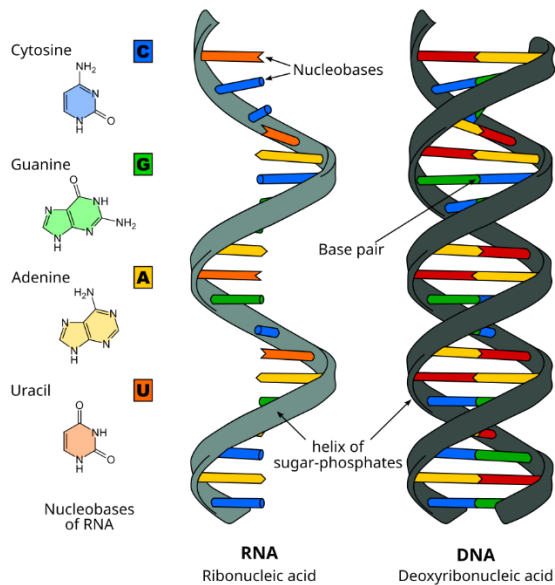
**Diagrams:**  
 - Human figure showing internal organs.  
 - Bacterium with flagella.  
 - Cell with organelles.  
 - Neuron.

# Year 12

- **Biological molecules** (monomers & polymers, carbohydrates, proteins, lipids, nucleic acids, ATP, water)
- **Cells** (structure of prokaryotic and eukaryotic cells; viruses; methods of studying cells; the cell cycle and cell division, transport across membranes, cell recognition and the immune system)
- **Exchange** (surface area to volume ratio, gas exchange, digestion and absorption, mass transport)
- **Genetics** (DNA, genes & chromosomes, DNA & protein synthesis, genetic diversity, taxonomy, biodiversity)

# Year 12

- **Biological molecules** (monomers & polymers, carbohydrates, proteins, lipids, nucleic acids, ATP, water)



# Year 12

- **Cells** (structure of prokaryotic and eukaryotic cells; viruses; methods of studying cells; the cell cycle and cell division, transport across membranes, cell recognition and the immune system)

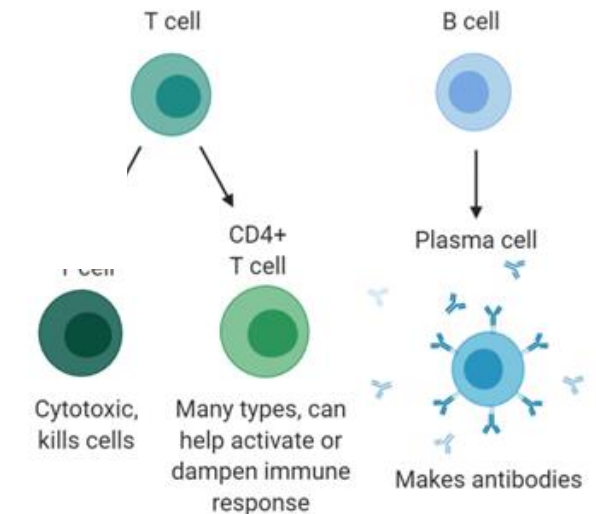
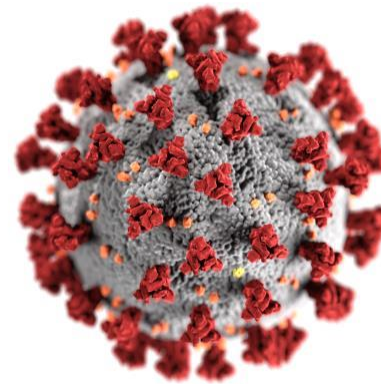
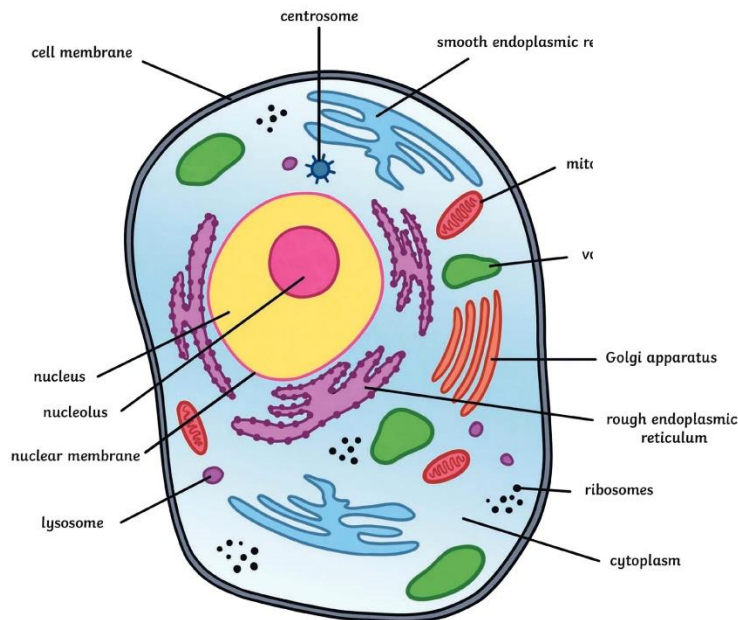
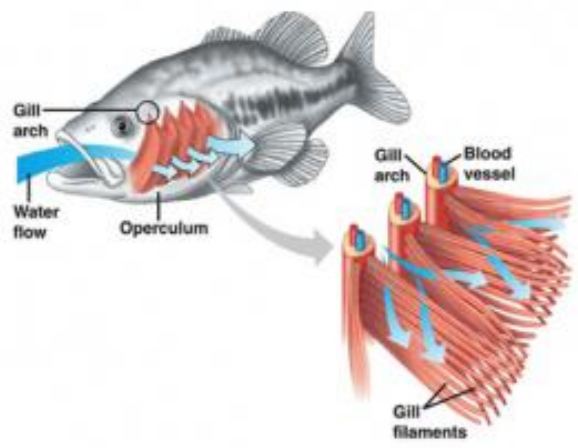


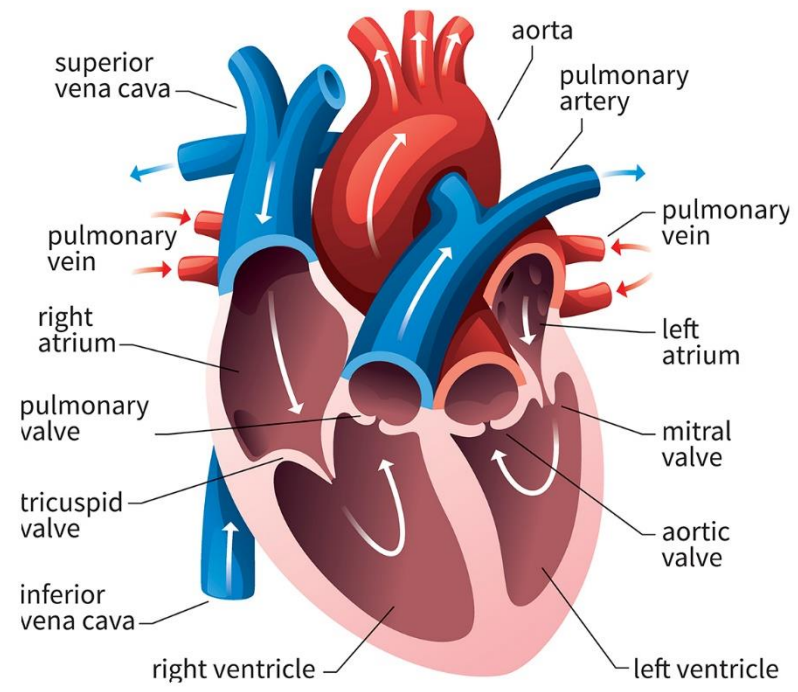
Figure 1: Types of T and B cells

# Year 12

- **Exchange** (surface area to volume ratio, gas exchange, digestion and absorption, mass transport)

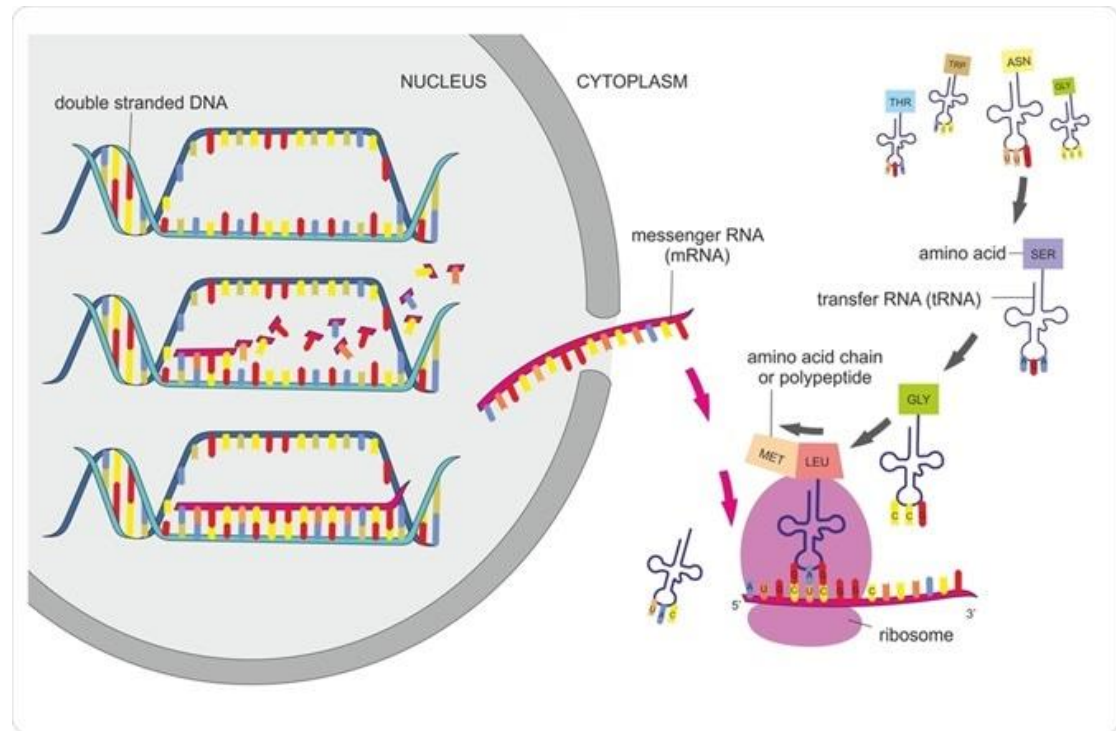
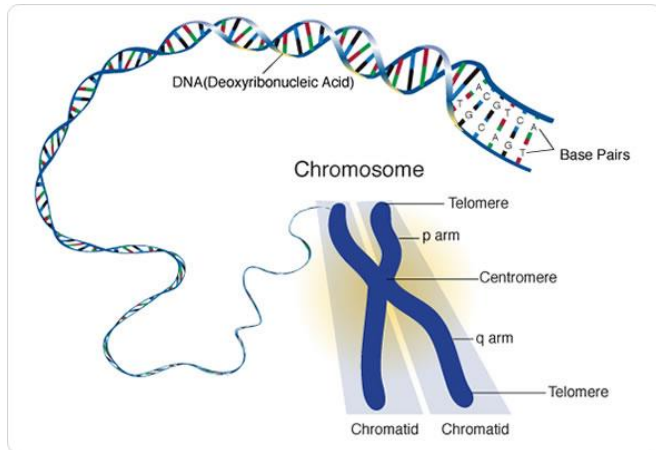


1 cm	2 cm	3 cm
SA = 6 cm <sup>2</sup>	SA = 24 cm <sup>2</sup>	SA = 54 cm <sup>2</sup>
Vol = 1 cm <sup>3</sup>	Vol = 8 cm <sup>3</sup>	Vol = 27 cm <sup>3</sup>
SA:Vol = 6:1	SA:Vol = 3:1	SA:Vol = 2:1



# Year 12

- **Genetics** (DNA, genes & chromosomes, DNA & protein synthesis, genetic diversity, taxonomy, biodiversity)

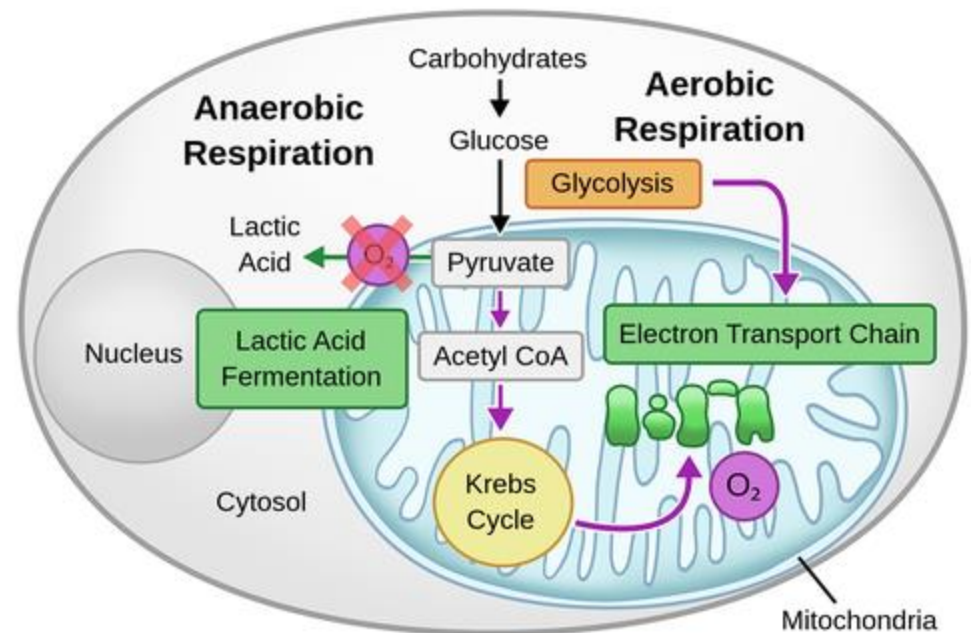
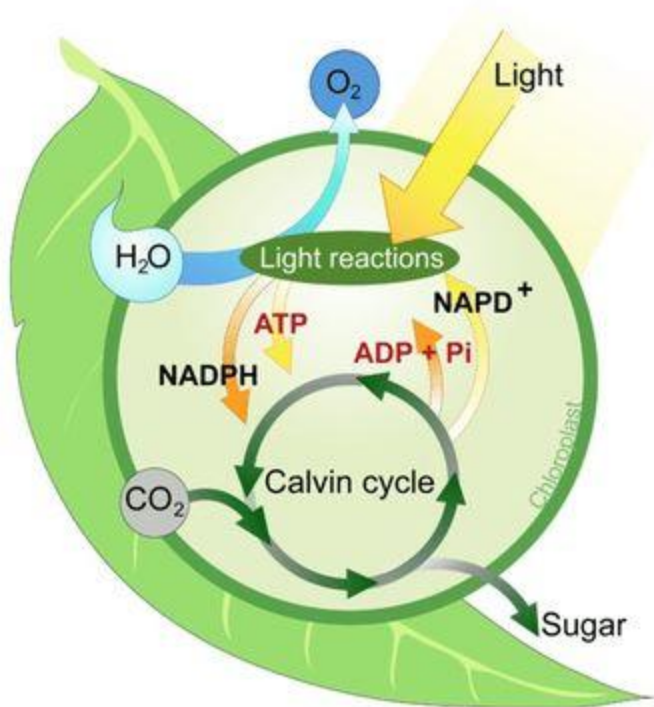


# Year 13

- **Energy transfers between organisms** (photosynthesis, respiration, energy and ecosystems, nutrient cycles)
- **Responses to environment** (survival and response; receptors; control of heart rate; the nervous system; muscle structure and function, homeostasis)
- **Population genetics & evolution** (inheritance; populations; speciation; ecosystems)
- **Control of gene expression** (mutation; totipotency; transcription & translation; cancer genetics; genome research)

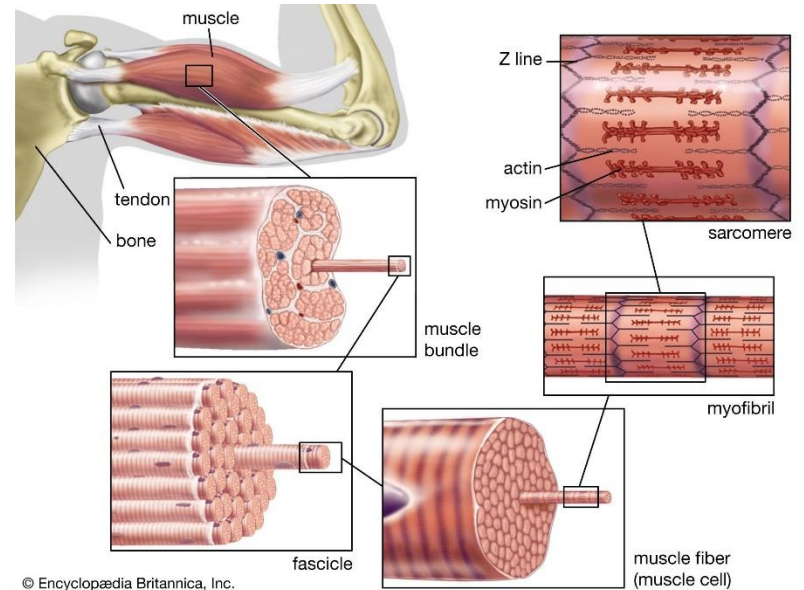
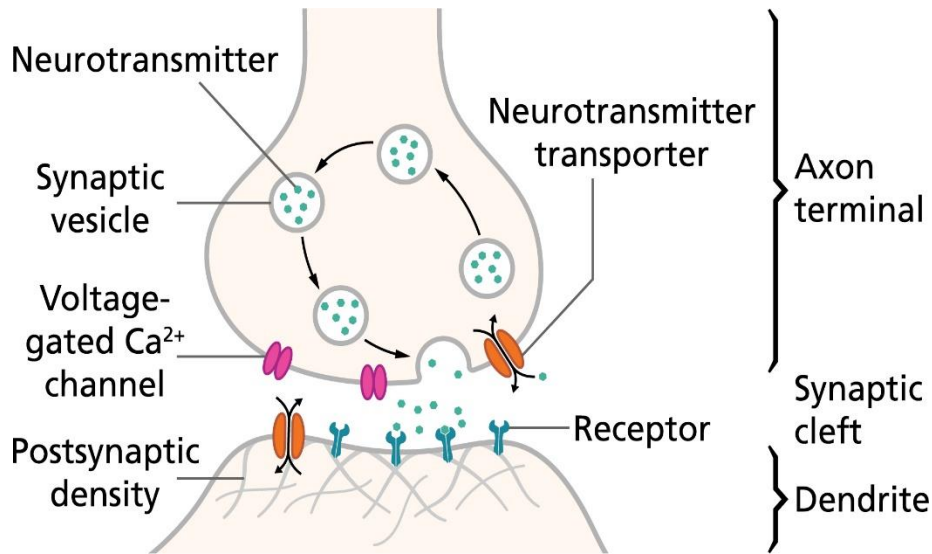
# Year 13

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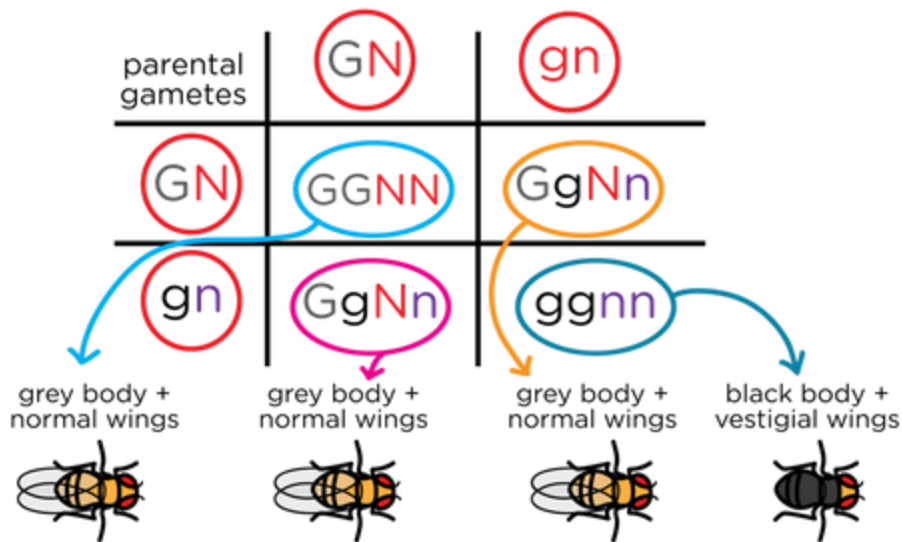


# Year 13

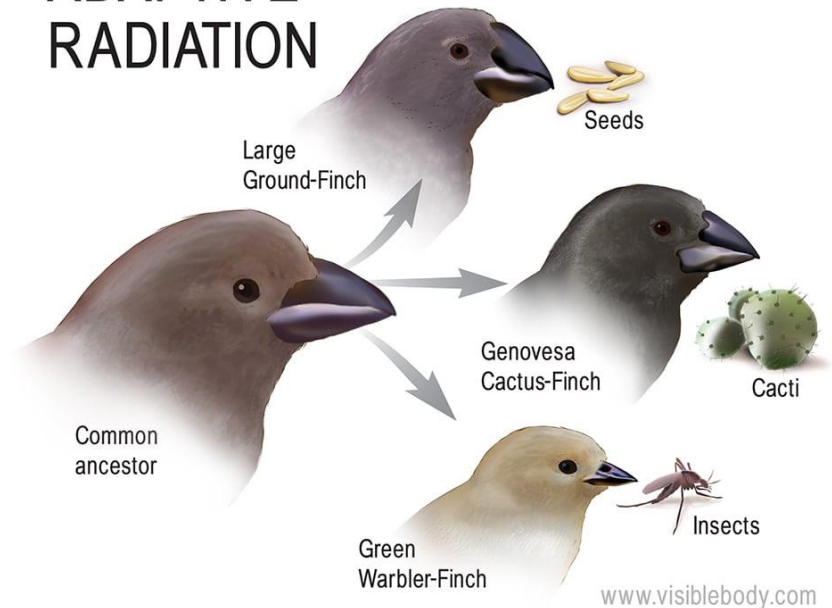
- **Responses to environment** (survival and response; receptors; control of heart rate; the nervous system; muscle structure and function, homeostasis)



- **Population genetics & evolution** (inheritance; populations; speciation; ecosystems)

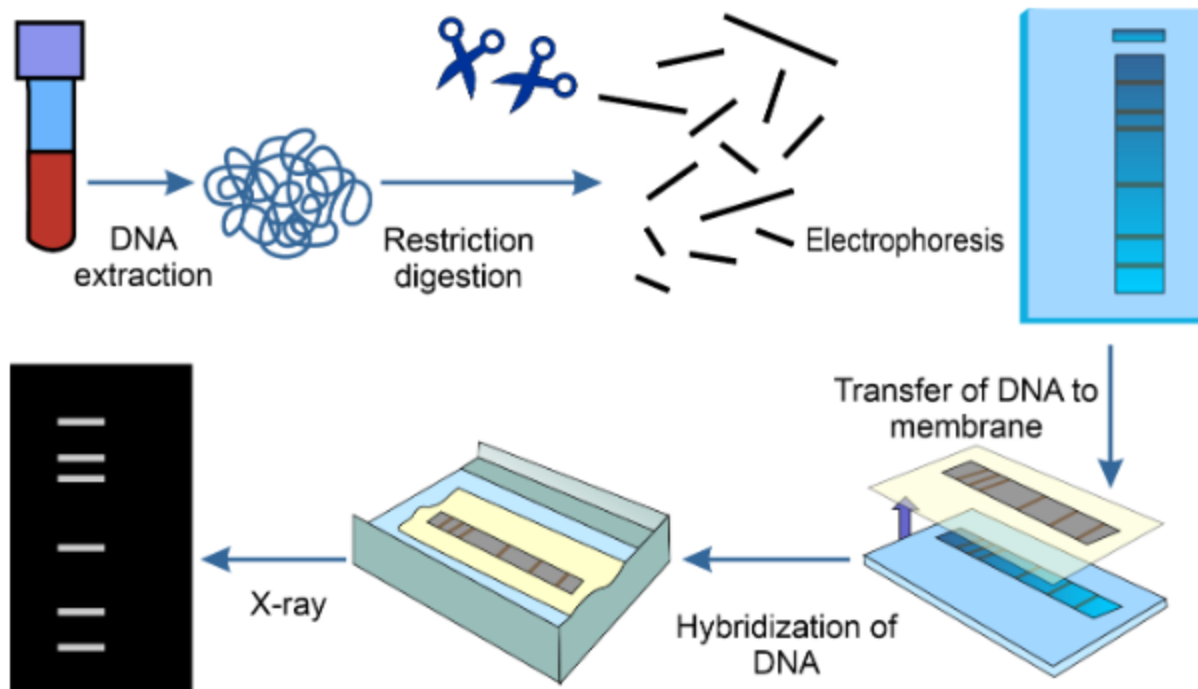


## ADAPTIVE RADIATION



# Year 13

- **Control of gene expression** (mutation; totipotency; transcription & translation; cancer genetics; genome research)



# Terminal Assessment

## Assessments

marksphysicshelp MPH

Paper 1	+	Paper 2	+	Paper 3
<p><b>What's assessed</b></p> <ul style="list-style-type: none"> <li>Any content from topics 1–4, including relevant practical skills</li> </ul>		<p><b>What's assessed</b></p> <ul style="list-style-type: none"> <li>Any content from topics 5–8, including relevant practical skills</li> </ul>		<p><b>What's assessed</b></p> <ul style="list-style-type: none"> <li>Any content from topics 1–8, including relevant practical skills</li> </ul>
<p><b>Assessed</b></p> <ul style="list-style-type: none"> <li>written exam: 2 hours</li> <li>91 marks</li> <li>35% of A-level</li> </ul>		<p><b>Assessed</b></p> <ul style="list-style-type: none"> <li>written exam: 2 hours</li> <li>91 marks</li> <li>35% of A-level</li> </ul>		<p><b>Assessed</b></p> <ul style="list-style-type: none"> <li>written exam: 2 hours</li> <li>78 marks</li> <li>30% of A-level</li> </ul>
<p><b>Questions</b></p> <ul style="list-style-type: none"> <li>76 marks: a mixture of short and long answer questions</li> <li>15 marks: extended response questions</li> </ul>		<p><b>Questions</b></p> <ul style="list-style-type: none"> <li>76 marks: a mixture of short and long answer questions</li> <li>15 marks: comprehension question</li> </ul>		<p><b>Questions</b></p> <ul style="list-style-type: none"> <li>38 marks: structured questions, including practical techniques</li> <li>15 marks: critical analysis of given experimental data</li> <li>25 marks: one essay from a choice of two titles</li> </ul>

# Practical Endorsement

A separate practical endorsement will be taken alongside the A-level.

This will be assessed by teachers and will be based on direct observation of students' competency in a range of skills that are not assessable in written exams.



# Practical Endorsement

The following practicals must be carried out by all students taking this course. Written papers will assess knowledge and understanding of these, and the skills exemplified within each practical.

Required activity	Apparatus and technique reference
1. Investigation into the effect of a named variable on the rate of an enzyme-controlled reaction	a, b, c, f, l
2. Preparation of stained squashes of cells from plant root tips; set-up and use of an optical microscope to identify the stages of mitosis in these stained squashes and calculation of a mitotic index	d, e, f
3. Production of a dilution series of a solute to produce a calibration curve with which to identify the water potential of plant tissue	c, h, j, l
4. Investigation into the effect of a named variable on the permeability of cell-surface membranes	a, b, c, j, l
5. Dissection of animal or plant gas exchange or mass transport system or of organ within such a system	e, h, j
6. Use of aseptic techniques to investigate the effect of antimicrobial substances on microbial growth	c, i
7. Use of chromatography to investigate the pigments isolated from leaves of different plants, eg leaves from shade-tolerant and shade-intolerant plants or leaves of different colours	b, c, g
8. Investigation into the effect of a named factor on the rate of dehydrogenase activity in extracts of chloroplasts	a, b, c
9. Investigation into the effect of a named variable on the rate of respiration of cultures of single-celled organisms	a, b, c, i
10. Investigation into the effect of an environmental variable on the movement of an animal using either a choice chamber or a maze	h
11. Production of a dilution series of a glucose solution and use of colorimetric techniques to produce a calibration curve with which to identify the concentration of glucose in an unknown 'urine' sample	b, c, f
12. Investigation into the effect of a named environmental factor on the distribution of a given species	a, b, h, k, l

# Field Trip

The fieldwork aspect of the course will be completed at Woolley Firs Environmental Centre in Maidenhead.

Students will gain experience in using a range of fieldwork equipment and methods of sampling to obtain data which will then be statistically analysed.

The cost of the trip will £14 (tbc).



# To succeed at A-level Biology

- Be interested and enthusiastic
- Read around the subject and keep up with current advances
- Be organised, methodical and extremely hard-working
- Commit to spending one hour of independent study time per hour of teacher contact time

# Thank you



We look forward to  
welcoming you in  
September!