

A level biology at the Math



**Sir Joseph Williamson's
Mathematical School**

Course content & information

- **As you can see, most of GCSE biology topics come up in A level biology also, the only difference is that at A level you go into much more detail.**

Subject content year 1:

- Cells
- Biological molecules
- Protein synthesis
- Enzymes
- Maths skills
- Exchange surfaces
- Transport in animals
- Nervous system
- Respiration
- Muscles
- Excretion
- Biodiversity

Subject content for year 2:

- Transport in plants
- Photosynthesis
- Classification
- Disease
- Biotechnology
- Inheritance
- Manipulating Genomes

Examples of student work

Module 2.1: Cell structure

2.1.1 Microscopes

- **Resolution (clarity)** - smallest distance between 2 points still distinguishable as 2 points
- **Magnification** - No. of times larger image appears compared to actual size of object

Timeline of microscopes

Light microscope	Phase contrast	Transmission electron	Scanning electron	Confocal	Scanning electron
(1595)	(1930)	(1931)	(1942)	(1978)	(1979)

Types

- Light microscope (optical)
- Scanning electron (SEM)
- Laser scanning (Confocal)
- Transmission electron (TEM)

- Light microscope
 - Uses lenses + light source / mirror
 - Can view whole - (can view while living specimen)
 - Cheap / easy operation
 - Portable
 - Limited Mag (x1000) - Limited Res (~200nm)

*Must describe what points made.
e.g. give how cells are specialised to meet purpose

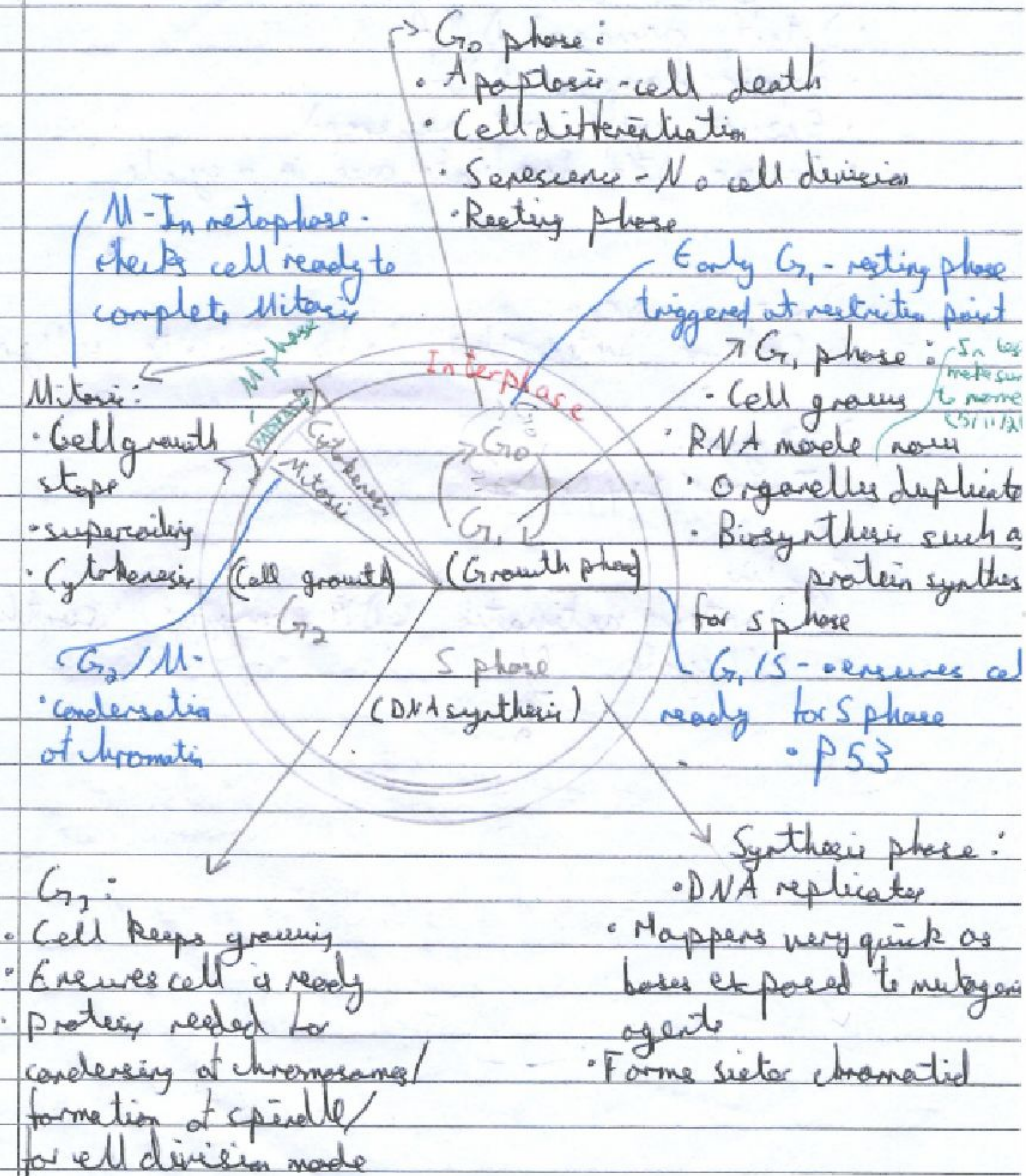
- (c) In more advanced organisms, cells are organised into tissues consisting of one or more types of specialised cells.

Describe how cells are organised into tissues, using **xylem** and **phloem** as examples.

- Xylem is tissue made of dead cells with no cell contents = provide ~~water~~ water ~~system~~ system for continuous flow of water
- Phloem has (transpiration)
- Phloem has companion cells and sieve tubes
- For translocation
 - xylem consists of vessels (cell specialised for this)
 - e.g. cells with no end walls / lignified / no cell contents
 - Transpiration
- Phloem
 - sieve tubes / companion cells
 - e.g. no nucleus - cytoplasm in sieve tubes / very mitochondria in companion cells
 - Translocation

[4]

[Total: 10]



(b) Describe the arrangement and functions of two named components of a cell surface membrane.



In your answer you should use appropriate technical terms, spelled correctly.

Cholesterol is found between phospholipids
Regulates fluidity of membrane

Channel proteins are transmembranes
For facilitated diffusion of polar molecules into cell

Key examiner note - little information was needed but lots of students wrote a lot - waste of time

Entry requirements

- ▶ GCSE 7 In Combined or Triple Biology

Biology degrees are extensive, so as you might expect, careers for biology graduates are equally as wide-ranging. Careers you could pursue with a biology degree include:

- [Research scientist](#)
- [Pharmacologist](#)
- [Biologist](#)
- [Ecologist](#)
- [Nature conservation officer](#)
- [Biotechnologist](#)
- [Forensic scientist](#)
- [Government agency roles](#)
- [Science writer](#)
- [Teacher](#)

Succeeding at A level biology

- ▶ The only way to succeed in A level biology is via determination, organisation, and passion for the subject.
- ▶ This will be vital due to the high amount of content A level biology has, you will regularly need to revisit content to avoid forgetting it.

Teaching schedule and biology department



- ▶ If you decide to take A level biology you will have two teachers :
- ▶ Teacher 1 (main teacher) : covers all content with you who you will see four times a week
- ▶ Teacher 2: covers revision/ folder checks/ assessment who you will see once a week.

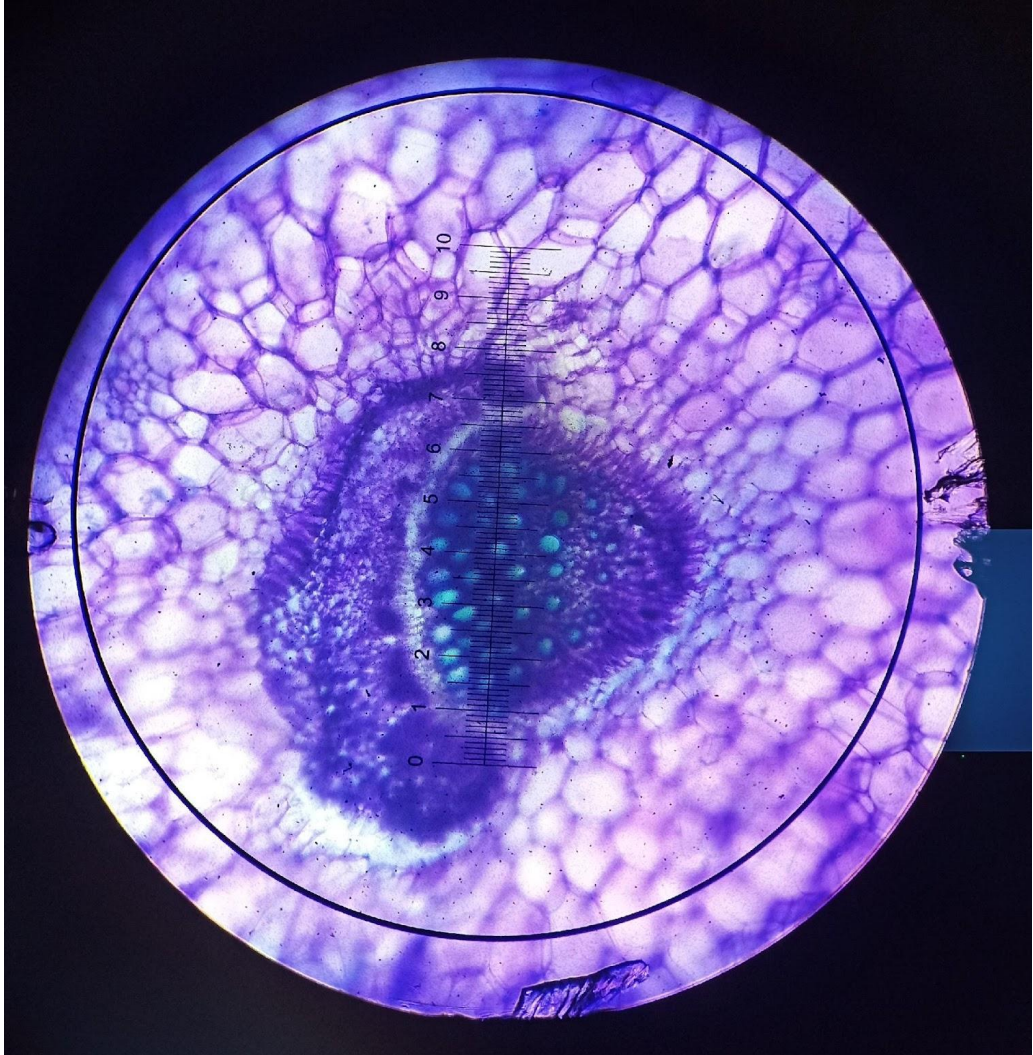
Practicals and the maths aspect to A level biology

The practicals

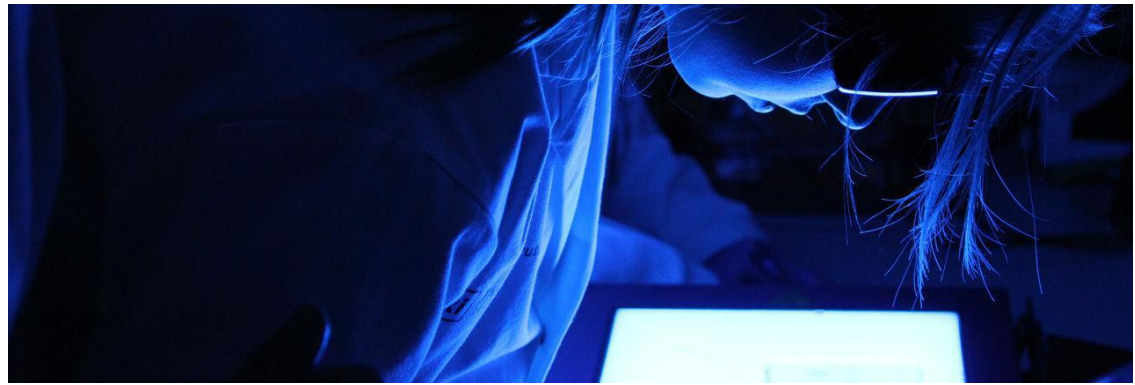
- ▶ There is NO coursework for this course
- ▶ Instead you are given 12 assessed practicals to complete throughout the 2 year course.
- ▶ This work will be completed in the lab.
- ▶ The practicals themselves do not count to your final mark, but you have to have evidence that you have completed them, and there are direct and indirect questions based upon them in your final examinations.
- ▶ Some universities specify a requirement to pass this component of the course

The maths part:

- ▶ Mathematics will account for 10% of marks!
- ▶ You need to be confident with the following aspects of maths: data handling, algebra, logarithms, statistical testing, graphs, geometry and trigonometry



Trips

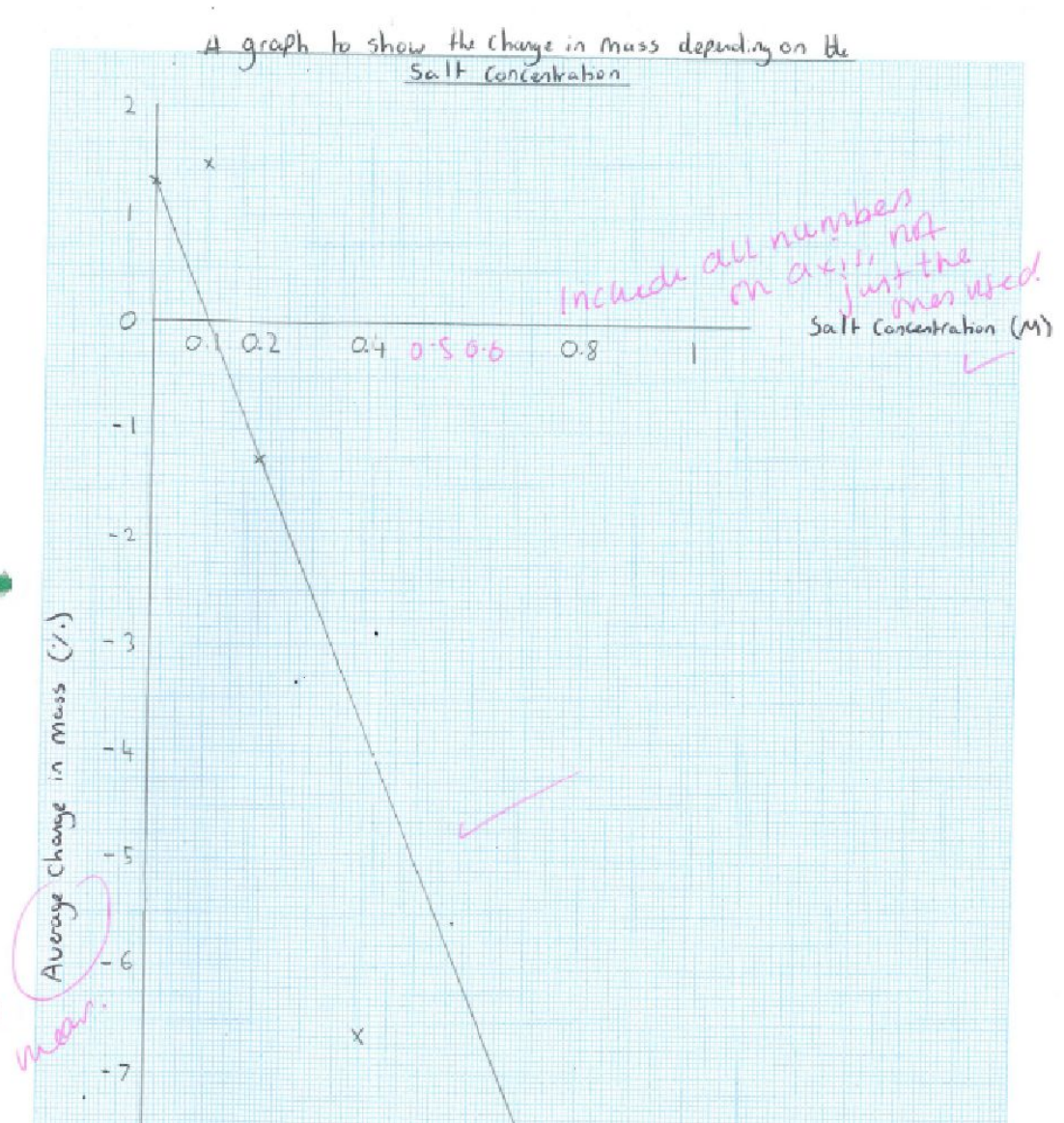
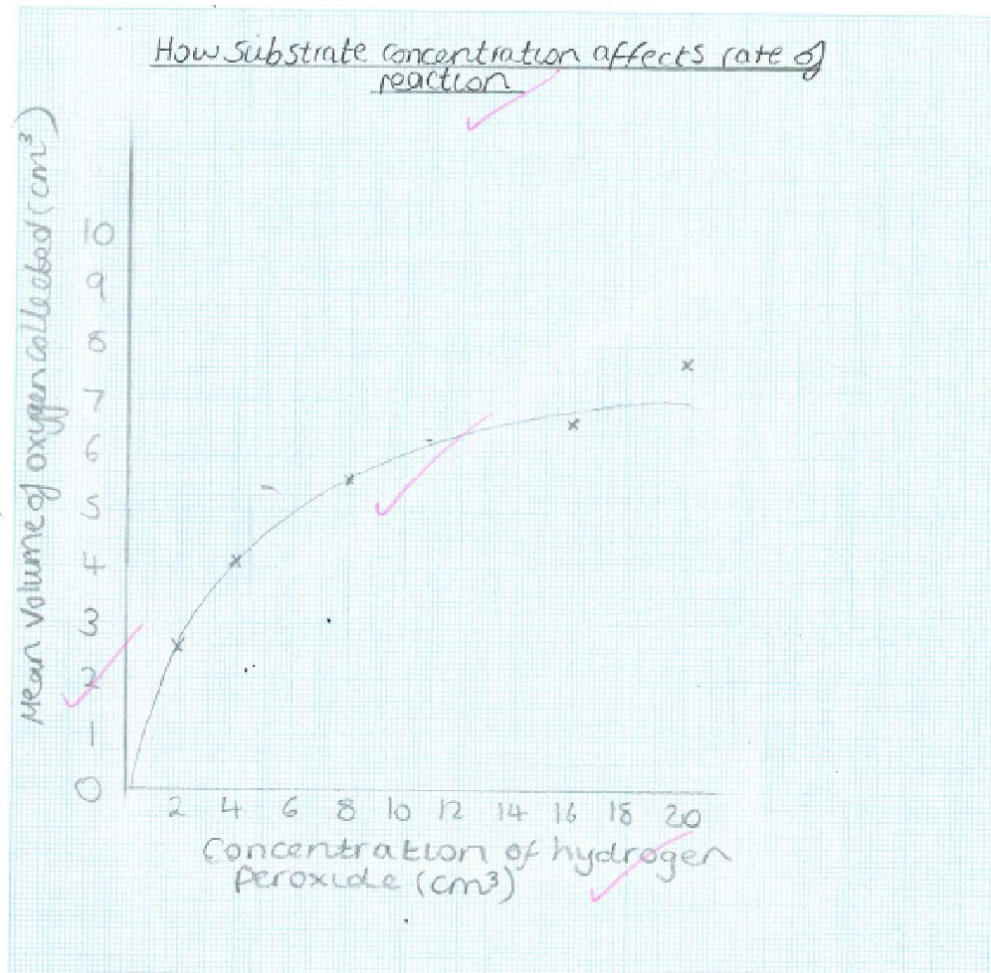


- ▶ Travel to the Royal Institute in London to sequence their own DNA
- ▶ Go to Camber sands to study succession in the sand dune





Examples of student assessments



Red Blood Cell

magnification : $\times 40$

$$1 \text{ cm} = 3 \text{ mm}$$

$$m = \frac{1}{A}$$

Also in per.

Plasma membrane

↳ Separates the interior of the red blood cell from its environment. It's a partially permeable membrane which provides a pathway for substances to move in and out of the cell.

Cytoplasm

↳ A fluid like substance that contains a network of microtubules and threads that helps the cell maintain its shape + holds organelles in place.

→ function / composition for a RBC?

5. The figure shows a cell during mitosis. From the start of mitosis, describe the events that have taken place in this cell to enable it to reach the stage shown in Fig. 4.1.



In prophase, the chromatin (DNA) begins to supercoil, shorten and condense into chromosomes. The nuclear envelope breaks down and spindle fibres begin to form as tubulin proteins in the cytoskeleton thread through the centrioles. In metaphase, the spindle fibres attach to the centromeres of chromosomes. This then allows the sister chromatids to be pulled apart to the poles, as seen in Figure 4.1.

10/5

4. Mitosis and meiosis play an important role in the life cycles of organisms. Fig. 2.1 and Fig. 2.2 The figures represent an outline of the life cycles of two different organisms.

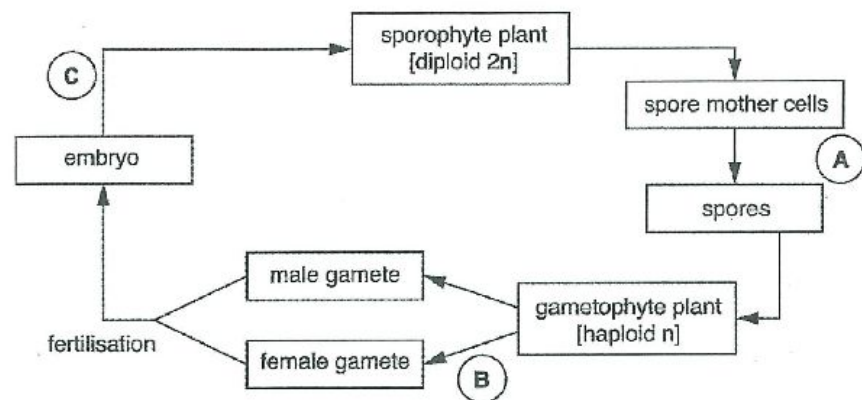
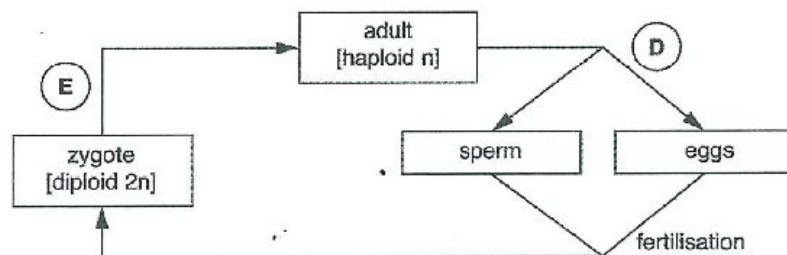


Fig. 2.1



	Mitosis	Meiosis
A	✓	✓
B	✓	✓
C	✓	✓

Place a tick (✓) in each row of the table to indicate the type of nuclear division that occurs at each of the letters A to E.

[3]

	Mitosis	Meiosis
D	✓	✓
E		✓

Assessments



In class assessments

Quality assessed work will be set and marked by teachers which will be kept in your folder
These will be set every six lessons

Folders

All condensed notes, revision resources, practice questions and class tests will all be arranged into lever arch folders which will be checked at least twice a term which is why organisation is vital for a biology student.

Exams:

You will have 3 written paper exams at the end of year 13:

Biological processes 2hours 15 minutes 100 marks	37% of total A level Modules 1,2,3,5
Biological diversity 2 hours 15 minutes 100 marks	37% of total A level Modules 1,2,4,6
Unified biology 1 hour 30 minutes 70 marks	26% of total A level Modules 1,2,3,4,5,6