ST CHRISTOPHER'S SIXTH FORM

BIOLOGY

BRIDGING UNIT

Biology

Welcome!

We are excited that you are considering studying A-level Biology and are looking forward to working with you. This bridging unit has been designed to help you decide if A-level Biology is for you, and to prepare you for the first year of study.

A-level Biology is considered by the top universities in the country as being highly challenging, due to the skills required. Students are expected to apply their biological knowledge and understanding to many different and unfamiliar contexts, combined with reaching clear scientific conclusions. Recalling facts is only about 20% of an exam paper!

The course also requires students to deal with a large amount of mathematics including **data analysis, working with equations and statistical analysis.** There are no tricks or short-cuts when it comes to succeeding in Biology; it comes down to hard work, determination and a real desire to succeed.

At St Christopher's, we follow the **OCR Biology A specification**.

In Year 1 you will study:

- Module 1 – Development of practical skills in biology
- Module 2 – Foundations in biology
- Module 3 – Exchange and transport
- Module 4 – Biodiversity, evolution and disease

In Year 2 you will study:

- Module 1 – Development of practical skills in biology
- Module 5 – Communication, homeostasis and energy
- Module 6 – Genetics, evolution and ecosystems

The exam specification can be found using the following link:
https://www.ocr.org.uk/Images/171736-specification-accredited-a-level-gce-biology-a-h420.pdf

The modules are split into topics and will be taught through a mixture of theory and practical lessons, with a variety of teaching methods. Your progress will be assessed regularly and these assessments will provide you with valuable feedback so you clearly know your areas of strength and how to improve your grade.

What resources do I need?

You will need the following for your Biology lessons:

- ✓ A4 lever arch folder
- ✓ Scientific calculator (the one you used for GCSE will be fine)
- ✓ Ruler, pens and pencils
- ✓ A4 lined paper

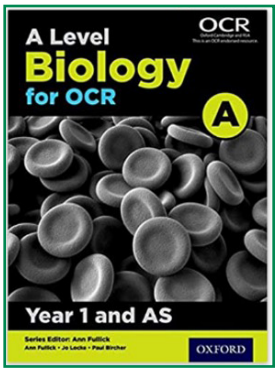
You might also want to buy some file dividers and plastic wallets to organise your work.

Textbooks

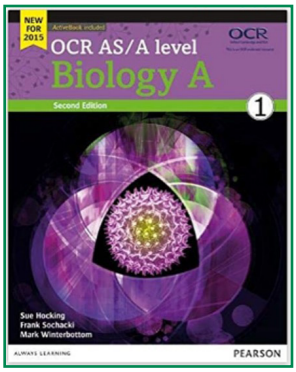
Textbooks are **not** essential for the A-level course as all resources will be made available online. If you would like to purchase a textbook, however, the following are suitable for the OCR Biology course.

Year 1:

A Level Biology for OCR A: Year 1 and AS
Authors: Ann Fullick, Paul Bircher, Jo Locke
Publisher: Oxford University Press
ISBN 13: 978-0198351917

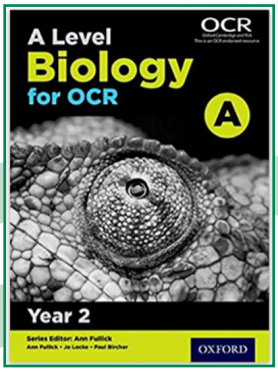


OCR AS/A level Biology A Student Book 1
Authors: Sue Hocking, Frank Sochacki, Mark Winterbottom
Publisher: Pearson Education
ISBN 13: 978-1447990796

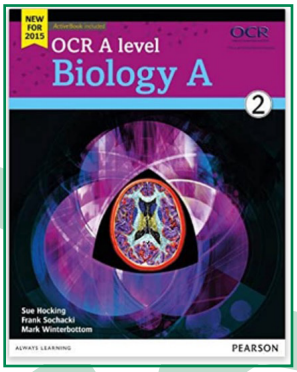


Year 2:

A Level Biology for OCR A: Year 2
Authors: Ann Fullick, Paul Bircher, Jo Locke
Publisher: Oxford University Press
ISBN 13: 978-0198357643



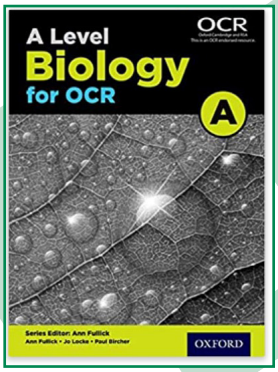
OCR AS/A level Biology A Student Book 2
Authors: Sue Hocking, Frank Sochacki, Mark Winterbottom
Publisher: Pearson Education
ISBN 13: 978-1447990802



Year 1 and 2:

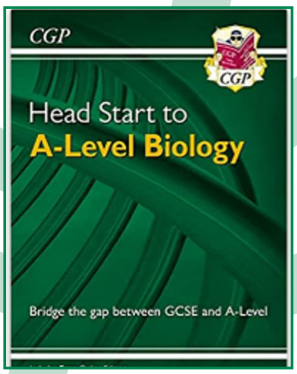
The following text book covers both years of the course:

A Level Biology for OCR A
Authors: Ann Fullick, Paul Bircher, Jo Locke
Publisher: Oxford University Press
ISBN 13: 978-0198351924



If you can't wait to get started, **"Head start to A-Level Biology"** by CGP recaps important GCSE topics, with study notes, examples and practice questions to test your understanding.

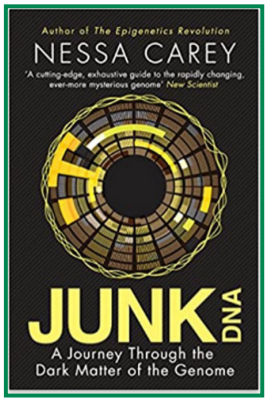
Again this is not essential for the course.



Biology

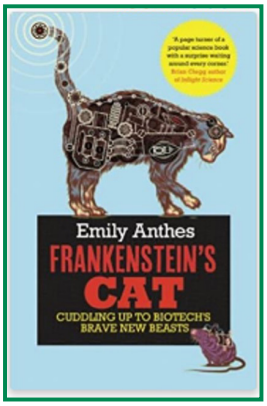
Extra reading

The books below are popular science books and are great for extending your understanding of Biology if you have any spare time over the summer.



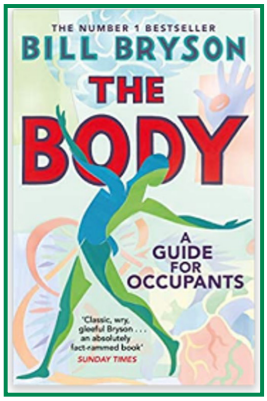
Junk DNA: A Journey Through the Dark Matter of the Genome

This book explains the relevance of 'junk DNA' - the 98% of DNA that was written off due to the fact that it didn't code for proteins. This book will deepen your understanding of the world of Genetics.



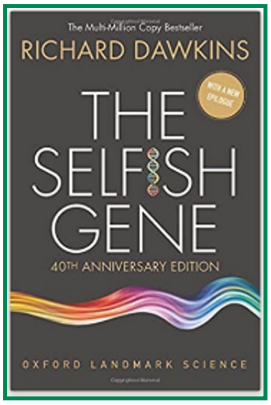
Frankenstein's Cat: Cuddling up to Biotech's brave new beasts

Discover how glow in the dark fish are made, as well as other breakthroughs in biotechnology.



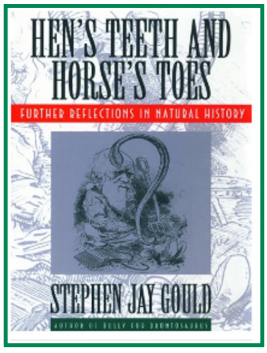
The Body: A Guide for Occupants

Packed with scientific facts and answers to conundrums such as why we don't fall out of bed when we are asleep.



The Selfish Gene

As influential today as when it was first published, Dawkins's ideas helped to explain what was going on inside genomes long before DNA sequencing became routine.



Hen's Teeth and Horse's Toes: Further Reflections in Natural History

Studying Geography as well? This book introduces the reader to the area of Evolutionary Biology.

Websites

The following are a list of Biology related websites that you might like to look at over the summer.

- http://nobelprize.org – details the history of the best scientific discoveries
- http://nature.com – the site of the scientific journal
- http://royalsociety.org – podcasts, news and interviews with scientists about recent scientific developments
- http://www.nhm.ac.uk – the London Natural History Museum's website with lots of interesting educational material
- http://www.bmj.com – the website of the British Medical Journal
- http://www.bbc.co.uk/news/science_and_environment - the BBC news page for Science and the Environment
- https://www.biologyinmotion.com/ - original, entertaining and interactive biology learning activities
- https://www.biologyonline.com/ - useful site for biological information, ideal for homework, research projects and general interest.
- https://www.cellsalive.com/ - cell biology images and animations
- https://www.stem.org.uk/big-picture - covering a wide range of topics that provide wider context to the post-16 biology curriculum.

Podcasts/Talks

The following are some podcasts that you might like to view over the summer.

- **https://www.bbc.co.uk/programmes/b00snr0w/episodes/downloads**
  Consistently topping the UK's science and medicine podcast chart, this extended version of the Radio 4 programme features expert guests and more irreverent contributors discussing big scientific questions or news. Witty, fun and informative, it is presented by physicist Brian Cox and comedian Robin Ince.

- **https://www.bbc.co.uk/programmes/b015sqc7/episodes/downloads**
  Professor Jim Al-Khalili talks to leading scientists about their life and work, finding out what inspires and motivates them and asking what their discoveries might do for us in the future.

Learning Tasks

In the remainder of this booklet you will find **LEARNING TASKS** that will help you to review GCSE Biology and prepare for the A-level course at St. Christopher's.

You will need to complete your own research using textbooks and the internet. This will put you in a good position to start the course.

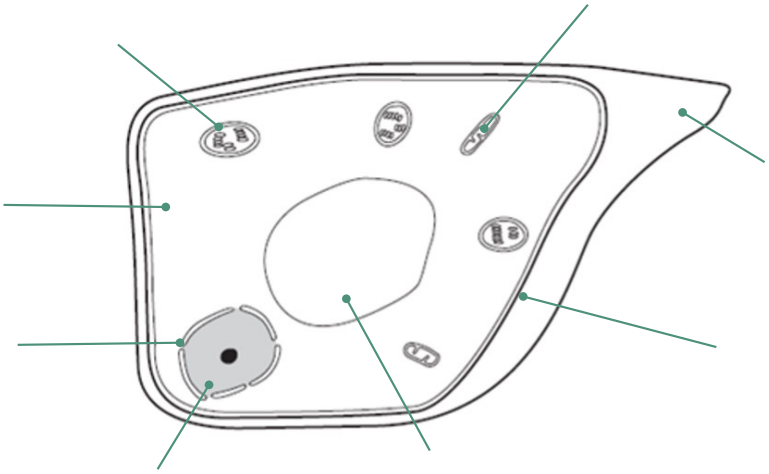
Please bring this completed piece of work with you when you start at St. Christopher's. If printing from the web, you only need to print out learning tasks sections 1 and 2. PLEASE PUT YOUR NAME ON THIS.

Good luck and enjoy your summer!
Mrs Smith and the A-level Biology department.

Learning Tasks Section 1 – Key Biological Knowledge and Understanding

1. Label the diagram of the **plant cell** using the organelles (parts of cells) in the box below (you will need to research the ones you don't know):

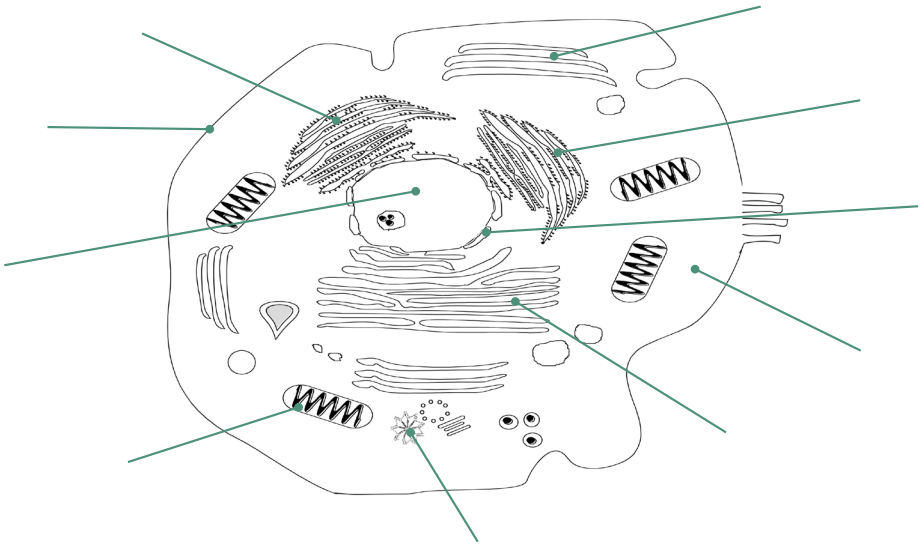
Cell surface membrane	Cytoplasm	Nucleus	Nuclear membrane
Mitochondria	Cell wall	Chloroplast	Large permanent vacuole



[8]

2. Label the diagram of the **animal cell** using the organelles (parts of cells) in the list below (you will need to research the ones you don't know):

Cell surface membrane	Cytoplasm	Nucleus	Nuclear membrane	Ribosomes
Mitochondria	Smooth endoplasmic reticulum	Rough endoplasmic reticulum	Golgi body	Centrioles



[10]

Please note that smooth endoplasmic reticulum, rough endoplasmic reticulum, the Golgi body and ribosomes are also found in plant cells.

3. **Match** the organelles present inside cells to their function (job) by writing the correct number next to the organelle name.

Organelle
Cell surface membrane
Cytoplasm
Nucleus
Golgi body/apparatus
Rough endoplasmic reticulum (rough ER)
Smooth endoplasmic reticulum (smooth ER)
Ribosomes
Cell wall (plant cell)
Chloroplast (plant cell)
Mitochondria

Function
1. Controls the activities in the cell.
2. The site of photosynthesis.
3. A strong outer barrier, made of cellulose in plant cells, which provides support to the cell.
4. Controls which molecules enter and leave the cell. Is selectively permeable.
5. Proteins are made here and transported around the cell by this organelle.
6. The site of most chemical reactions in the cell. Mainly made up of water with dissolved solutes.
7. Proteins and lipids are modified and packaged into glycoproteins and glycolipids.
8. Protein synthesis takes place here.
9. This is where aerobic respiration takes place.
10. The site of production and transport of lipids.

[10]

4. **Match** up the key words to their correct definitions.

Keyword
Diffusion
Active transport
Osmosis

Definition
The movement of water molecules from a dilute solution to a more concentrated solution, across a partially permeable membrane
The passive movement of particles of a substance from a high concentration to a low concentration, down a concentration gradient.
The movement of particles of a substance from a low concentration to a high concentration, against a concentration gradient, using ATP energy and a carrier protein.

[3]

5. There are two forms of nuclear division, **mitosis** and **meiosis**. Complete the table below to describe the main differences between **mitosis** and **meiosis** in humans.

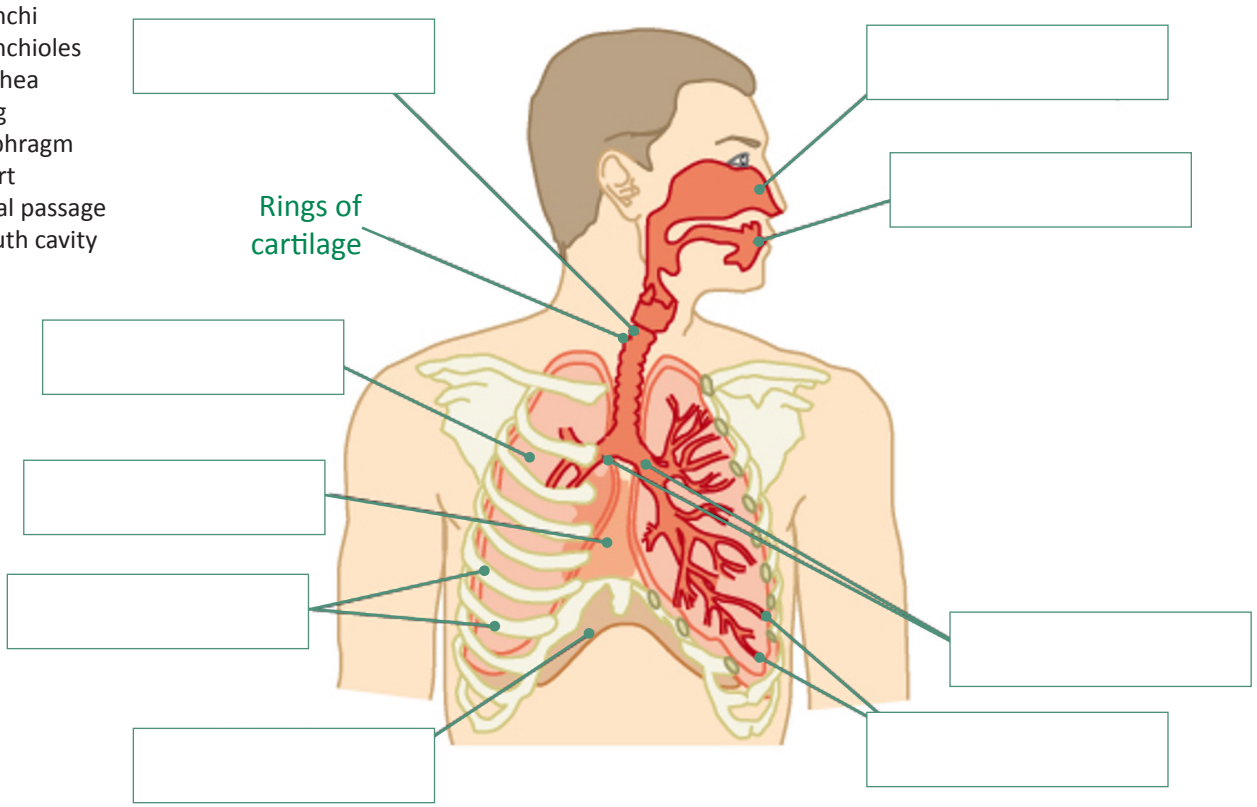
Type of nuclear division	Name the type of cells that are made (body cells or gametes)	Number of divisions	Number of daughter cells made
Mitosis			
Meiosis			

[3]

6. There are **two** parts to this question:

i. Label the following structures on the diagram below:

- Bronchi
- Bronchioles
- Trachea
- Lung
- Diaphragm
- Heart
- Nasal passage
- Mouth cavity
- Ribs



[9]

ii. Explain the process of inhaling and exhaling using the terms volume and pressure.

.....

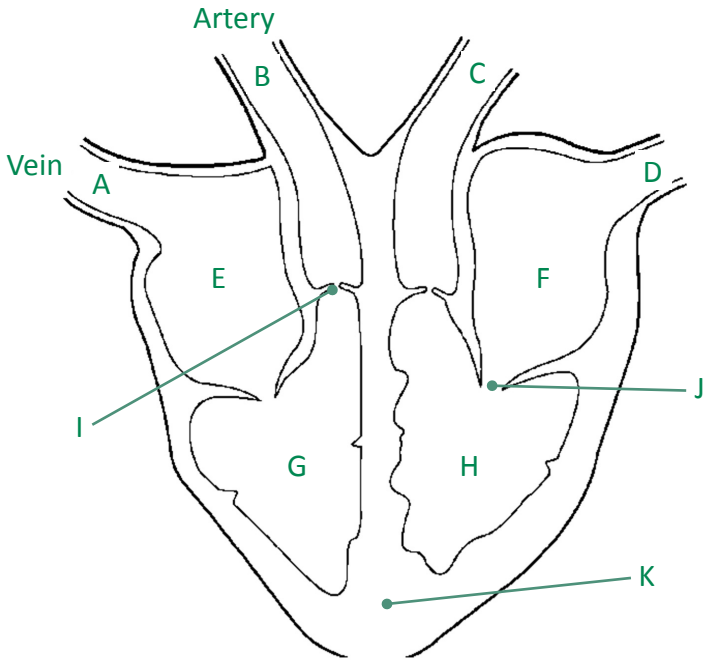
.....

.....

.....

[2]

7. **Name** the structures **A-K** shown on the diagram of the **heart** below:

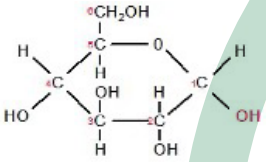
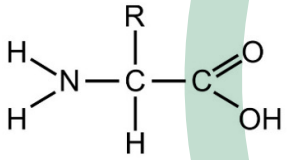
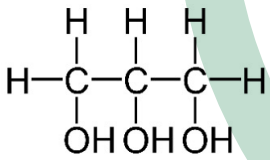
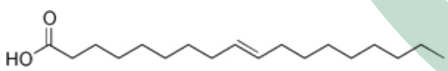


Write your responses below:
A:
B:
C:
D:
E:
F:
G:
H:
I:
J:
K:

[11]

8. There are **two** parts to this question:

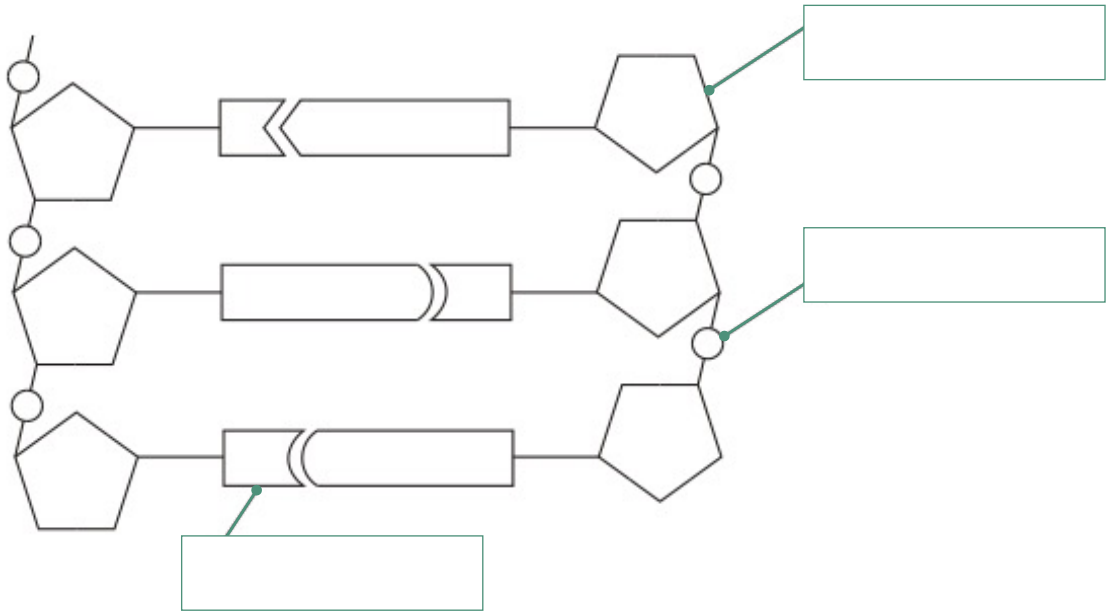
   i. Match up the diagrams of the biological molecules shown below to their correct name.

Diagram of biochemical molecule	Name of biochemical molecule
	Amino acid
	Glycerol
	Fatty acid
	Alpha glucose

[4]

ii. Label the diagram of **DNA** with the following labels:

Base	Pentose sugar (deoxyribose)	Phosphate group



[3]

9. You will need to be able to calculate the size of objects under a microscope. The following equation will help you to do this:

$$\text{Magnification} = \frac{\text{size of image}}{\text{size of real object}}$$

Use the equation above to complete the table below. You will need to rearrange this equation for some of your calculations.

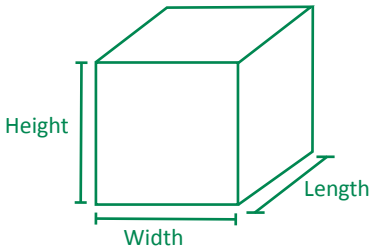
Size of image (mm)	Magnification	Size of real object (mm)
10	.....	0.002
	400	0.05
10	.....	0.006

[3]

10. Surface area to volume ratio is very important in biology. It makes a big difference to the way animals can exchange substances with the environment. The surface area to volume ratio of organisms can be modelled with cubes of different sizes.

i. Complete the table below to show what happens to surface area to volume ratio as the length of the side of the cube is increased.

Area of side = Length x Width



Area of Cube = Length x Width x 6
Volume of Cube = Length x Width x Height

Length of side of a cube (cm)	Surface area of whole cube (cm^2) (Area of one side x 6 sides)	Volume of cube (cm^3) (length x width x height)	Surface area to volume ratio
1	6	1	6:1
2	.....	.....	..... :1
3	.....	.....	..... :1

[3]

ii. Use your results to state what happens to surface area to volume ratio as the length of the side of the cube is increased.

.....

.....

.....

.....

.....

[1]

11. **Match** up the biodiversity key words on the left to their correct definition:

Keyword	Definition
Habitat	All the populations of different species living in a habitat.
Population	The place where an organism lives.
Community	A physical area that includes all the living organisms and non-living components and their interactions with each other.
Niche	A group of organisms of the same species living in the same area at a particular time.
Ecosystem	The role of a species in an ecosystem.

[5]

12. Transpiration is the loss of water vapour from the aerial parts of plants via the stomata. Decide whether the following conditions would increase or decrease the rate of transpiration from leaves.

Condition	Would the rate of transpiration increase or decrease?
Increased temperature	
Decreased humidity	
Decreased light intensity	
Decreased air movement	
Leaf surface covered with less hairs	

[5]

Evaluation

Question	Topic area	Mark	What could you do to improve?
1	Plant cell structure	/8	
2	Animal cell structure	/10	
3	Organelle functions	/10	
4	Diffusion, active transport and osmosis	/3	
5	Nuclear division	/3	
6	Lung structure	/11	
7	Heart structure	/11	
8	Biological molecules	/7	
9	Magnification	/3	
10	Surface area: volume	/4	
11	Biodiversity	/5	
12	Factors affecting the rate of transpiration	/5	
	TOTAL	/80	
	PERCENTAGE	%	
	GRADE		

Learning Tasks Section 2 - Maths Skills from GCSE

PART 1 - Converting Units

Units and Prefixes

Scientists use the **International System of Units** (SI, abbreviated from the French *Système international (d'unités)*). This is the modern form of the metric system, and is the most widely used system of measurement. It comprises a coherent system of units of measurement built on seven base units. In biology, the most commonly used SI base units are metre (m), kilogram (kg), second (s), and mole (mol). Biologists also use SI derived units, such as square metre (m2), cubic metre (m3), degree Celsius (°C), and litre (l).

To accommodate the huge range of dimensions in our measurements they may be further modified using appropriate prefixes. For example, one thousandth of a second is a millisecond (ms). The table below shows the prefixes you will come across most frequently in biology.

Factor	Name	Symbol
10^{3}	kilo	k
10^{-1}	deci	d
10^{-2}	centi	c
10^{-3}	milli	m
10^{-6}	micro	µ
10^{-9}	nano	n

Division	Prefix	Length		Mass		Time	
one thousand millionth	nano	nanometre	nm	nanogram	ng	nanosecond	ns
one millionth	micro	micrometre	mm	microgram	mg	microsecond	ms
one thousandth	milli	millimetre	mm	milligram	mg	millisecond	ms
one hundredth	cent	centimetre	cm				
whole unit		metre	m	gram	g	second	s
one thousand times	kilo	kilometre	km	kilogram	kg		

When completing calculations, it is important to express your answer using sensible numbers. For example, an answer of 6230 µm would have been more meaningful expressed as 6.2 mm.

If you convert between units and round numbers properly, it allows quoted measurements to be understood within the scale of the observations.

To convert 488 889 m into km:

A kilo is 10^{3} so you need to divide by this number, or move the decimal point three places to the left.
488 889 ÷ 103 = 488.889 km

However, suppose you are converting from mm to km: you need to go from 10^{3} to 10^{-3}, or move the decimal point six places to the left.
333 mm is 0.000 333 km

Alternatively, if you want to convert from 333 mm to nm, you would have to go from 10^{-9} to 10^{-3}, or move the decimal point six places to the right.
333 mm is 333 000 000 nm

Practice Questions

1. Calculate the following conversions:

   a) 0.004 m into mm

   .....

   b) 130 000 ms into s

   .....

   c) 31.3 ml into µl

   .....

   d) 104 ng into mg

   .....

2. Give the following values in a different unit so they make more sense to the reader. Choose the final units yourself. (Hint: make the final number as close in magnitude to zero as you can. For example, you would convert 1000 m into 1 km.)

   a) 0.000 057 m

   .....

   b) 8 600 000 µl

   .....

   c) 68 000 ms

   .....

   d) 0.009 cm

   .....

PART 2 - Powers and Indices, and Standard Form

Powers and Indices

Ten squared = 10 × 10 = 100 and can be written as 10^2. This is also called 'ten to the power of 2'.

Ten cubed is 'ten to the power of three' and can be written as $10^3 = 1000$.
The power is also called the index.

Fractions have negative indices:

- one tenth = $10^{-1} = 1/10 = 0.1$
- one hundredth = $10^{-2} = 1/100 = 0.01$
- one thousandth = $10^{-3} = 1/1000 = 0.001$

Any number to the power of 0 is equal to 1, for example, $29^0 = 1$.
If the index is 1, the value is unchanged, for example, $17^1 = 17$.

When multiplying powers of ten, you must **add** the indices.
So 100 × 1000 = 100 000 is the same as $10^2 \times 10^3 = 10^{2+3} = 10^5$

When dividing powers of ten, you must **subtract** the indices.
So 100/1000 = 1/10 = 10^{-1} is the same as $10^2/10^3 = 10^{2-3} = 10^{-1}$

But you can only do this when the numbers with the indices are the same.
So $10^2 \times 2^3 = 100 \times 8 = 800$

And you can't do this when adding or subtracting.
$10^2 + 10^3 = 100 + 1000 = 1100$
$10^2 - 10^3 = 100 - 1000 = -900$

Remember: You can only add and subtract the indices when you are multiplying or dividing the numbers, not adding or subtracting them.

Practice Questions

1. Calculate the following values. Give your answers using indices.

a) $10^8 \times 10^3$

.....

b) $10^7 \times 10^2 \times 10^3$

.....

c) $10^3 + 10^3$

.....

d) $10^2 - 10^{-2}$

.....

2. Calculate the following values. Give your answers with and without using indices.

a) $10^5 \div 10^4$

.....

b) $10^3 \div 10^6$

.....

c) $10^2 \div 10^{-4}$

.....

d) $100^2 \div 10^2$

.....

Standard Form

Sometimes biologists need to work with numbers that are very small, such as dimensions of organelles, or very large, such as populations of bacteria.

In such cases, the use of scientific notation or standard form is very useful, because it allows the numbers to be written easily.

Standard form is expressing numbers in powers of ten, for example, 1.5×10^7 microorganisms.

Look at this worked example. The number of cells in the human body is approximately 37 200 000 000 000. To write this in standard form, follow these steps:

Step 1:
Write down the smallest number between 1 and 10 that can be derived from the number to be converted.
In this case it would be 6.39

Step 2:
Write the number of times the decimal place will have to shift to expand this to the original number as powers of ten. On paper this can be done by hopping the decimal over each number like this:

until the end of the number is reached.

In this example that requires 10 shifts, so the standard form should be written as 6.39×10^{10}.

For very small numbers the same rules apply, except that the decimal point has to “hop” backwards. For example, 0.000 000 45 would be written as 4.5×10^{-7}.

Practice questions

1. Change the following values to standard form.

   a) 3060 kJ

   .....

   b) 140 000 kg

   .....

   c) 0.000 18 m

   .....

   d) 0.000 004 m

   .....

2. Give the following numbers in standard form.

   a) 100

   .....

   b) 10 000

   .....

   c) 0.01

   .....

   d) 21 000 000

   .....

3. Give the following as decimals.

   a) 10^{-3}

   .....

   b) 4.7×10^{-2}

   .....

   c) 1.2×10^{-4}

   .....

   d) 7.96×10^{-3}

   .....

PART 3 - Decimal Numbers and Significant Figures

Decimal Numbers

A decimal number has a decimal point. Each figure **before** the point is a whole number, and the figures **after** the point represent fractions.

The number of decimal places is the number of figures **after** the decimal point. For example, the number 47.38 has 2 decimal places, and 47.380 is the same number to 3 decimal places.

In science, you must write your answer to a sensible number of decimal places.

Practice questions

1. New antibiotics are being tested. A student calculates the area of clear zones in Petri dishes in which the antibiotics have been used. List these in order from smallest to largest.

   0.214 cm^2 0.03 cm^2 0.0218 cm^2 0.034 cm^2

   .....

2. A student measures the heights of a number of different plants. List these in order from smallest to largest.

   22.003 cm 22.25 cm 12.901 cm 12.03 cm 22 cm

   .....

Significant Figures

When you use a calculator to work out a numerical answer, you know that this often results in a large number of decimal places and, in most cases, the final few digits are 'not significant'. It is important to record your data and your answers to calculations to a reasonable number of significant figures. Too many and your answer is claiming an accuracy that it does not have, too few and you are not showing the precision and care required in scientific analysis.

Numbers to 3 significant figures (3 s.f.):
7.88 25.4 741

Bigger and smaller numbers with 3 significant figures:
0.000 147 0.0147 0.245 39 400 96 200 000

(notice that the zeros before the figures and after the figures are **not** significant – they just show you how large the number is by the position of the decimal point).

Numbers to 3 significant figures where the zeros **are** significant:
207 4050 1.01

(any zeros between the other significant figures are significant).

Standard form numbers with 3 significant figures:
9.42×10^{-5} 1.56×10^{8}

If the value you wanted to write to 3.s.f. was 590, then to show the zero was significant you would have to write:
590 (to 3.s.f.) or 5.90×10^{2}

Remember: For calculations, use the same number of figures as the data in the question with the lowest number of significant figures. It is not possible for the answer to be more accurate than the data in the question.

Practice questions

1. Write the following numbers to **i** 2 s.f. and **ii** 3 s.f.

		i	**ii**
a)	7644 g	.....	.....
b)	27.54 m	.....	.....
c)	4.3333 g	.....	.....
d)	5.995×10^{2} cm^{3}	.....	.....

2. The average mass of oxygen produced by an oak tree is 11800 g per year. Give this mass in **standard form** and quote your answer to **2 significant figures**.

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Learning Tasks Section 3 - Retrieval Questions

PART 1 - Practical Science Key Terms

You need to be confident about the definitions of terms that describe measurements and results in A-level Biology.

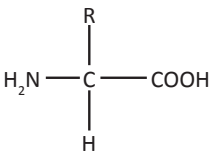
Try to Learn the answers to the following questions below, then cover the answers column with a piece of paper and write as many answers as you can. Check and repeat. Start with the ones you have covered at GCSE.

When is a measure valid?	When it measures what it is supposed to be measuring
When is a result accurate?	When it is close to the true value
What are precise results?	When repeat measurements are consistent/agree closely with each other
What is repeatability?	How precise repeated measurements are when they are taken by the **same** person, using the **same** equipment, under the **same** conditions
What is reproducibility?	How precise repeated measurements are when the they are taken by **different** people, using **different** equipment
What is the uncertainty of a measurement?	The interval within which the true value is expected to lie
Define measurement error?	The difference between a measured value and the true value
What type of error is caused by results varying around the true value in an unpredictable way?	Random error
What is a systematic error?	A consistent difference between the measured values and the true values
What does zero error mean?	A measuring instrument gives a false reading when the true value should be zero
Which variable is changed or selected by the investigator?	Independent variable
What is a dependent variable?	A variable that is measured every time the independent variable is changed
Define a fair test.	A test in which only the independent variable is allowed to affect the dependent variable
What are control variables?	Variables that should be kept constant to avoid them affecting the dependent variable

PART 2 - Biological Molecules

The topic of "Biological molecules" is one of the first you will study in Year 1. It forms the foundations of many subsequent topics and involves looking at the structure and function of a variety of important molecules essential for life.

Try to Learn the answers to the following questions below, then cover the answers column with a piece of paper and write as many answers as you can. Check and repeat. Start with the ones you have covered at GCSE.

What are monomers?	Smaller units from which larger molecules are made
What are polymers?	Molecules made from a large number of monomers joined together
What is a condensation reaction?	A reaction that joins two molecules together to form a chemical bond whilst eliminating of a molecule of water
What is a hydrolysis reaction?	A reaction that breaks a chemical bond between two molecules and involves the use of a water molecule
What is a monosaccharide?	Monomers from which larger carbohydrates are made
How is a glycosidic bond formed?	A condensation reaction between two monosaccharides
Name the three main examples of polysaccharides.	Glycogen, starch, cellulose
Describe Benedict's test for reducing sugars.	Gently heat a solution of a food sample with an equal volume of Benedict's solution for five minutes, the solution turns orange/brown if reducing sugar is present
Name the two main groups of lipids.	Phospholipids, triglycerides (fats and oils)
Give four roles of lipids.	Source of energy, waterproofing, insulation, protection
What is an ester bond?	A bond formed by a condensation reaction between glycerol and a fatty acid
Describe the emulsion test for lipids.	Mix the sample with ethanol in a clean test tube, shake the sample, add water, shake the sample again, a cloudy white colour indicates that lipid is present
What are the monomers that make up proteins?	Amino acids
Draw the structure of an amino acid.	
How is a peptide bond formed?	A condensation reaction between two amino acids
What is a polypeptide?	Many amino acids joined together
Describe the biuret test for proteins.	Mix the sample with sodium hydroxide solution at room temperature, add very dilute copper(II) sulphate solution, mix gently, a purple colour indicates that peptide bonds are present
How does an enzyme affect a reaction?	It lowers the activation energy
Give five factors which can affect enzyme action.	Temperature, pH, enzyme concentration, substrate concentration, inhibitor concentration
What is a competitive inhibitor?	A molecule with a similar shape to the substrate, allowing it to occupy the active site of the enzyme
What is a non-competitive inhibitor?	A molecule that changes the shape of the enzyme by binding somewhere other than the active site

PART 3 - Cell Structure

The study of "cell structure" again forms the foundations of many subsequent topics. This topic involves looking at the ultrastructure of the cell (the fine detail you see with an electron microscope) and the use of different microscopes when looking at cells.

Try to Learn the answers to the following questions below, then cover the answers column with a piece of paper and write as many answers as you can. Check and repeat. Start with the ones you have covered at GCSE.

What is the formula to calculate magnification?	Magnification = $\frac{\text{Size of image}}{\text{Actual size of object}}$
Why are cells stained before being viewed with a light microscope?	Staining increases contrast between different cell components, makes them visible, and allows them to be identified
What is an eyepiece graticule?	A glass disc that fits on top of the eyepiece lens that is marked with a fine scale from 1 to 100
What is a stage micrometer?	A microscope slide with a very accurate scale in micrometers (μ) engraved on it
What is a scientific drawing?	A labelled line drawing that is used to highlight particular features and does not include unnecessary detail or shading, it should always have a title and state the magnification
What is magnification?	How many times larger an image is than the actual size of the object being viewed
What is resolution?	The ability to see individual objects as separate entities
What is the function of the nucleus?	Controls the metabolic activities of the cell as it contains genetic information in the form of DNA
What is the nucleolus?	Area within the nucleus that is responsible for producing ribosomes
What is the function of the mitochondria?	Site of production of ATP in the final stages of cellular respiration
What are vesicles?	Membranous sacs that are used to transport materials in the cell
What are lysosomes?	Specialised forms of vesicles with hydrolytic enzymes that break down waste material in cells
What is the role of the cytoskeleton	Controls cell movement, movement of organelles within the cell, and provides mechanical strength to the cell
Name the three types of cytoskeletal filaments.	Microfilaments, microtubules, and intermediate fibres
Give two types of extension that protrude from some cells.	Flagella (whip-like protrusions) and cilia (tail-like protrusions)
What is the endoplasmic reticulum (ER)?	A network of membranes enclosing flattened sacs called cistemae
What are the functions of the two types of ER?	Smooth ER - lipid and carbohydrate synthesis, and storage Rough ER - Synthesis and transport of proteins
What is the function of the Golgi apparatus?	Plays a part in modifying proteins and packaging them into vesicles

**“For I know the plans I have for you,” declares the Lord,
“plans to prosper you and not to harm you,
plans to give you hope and a future.”**

Jeremiah 29:11

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