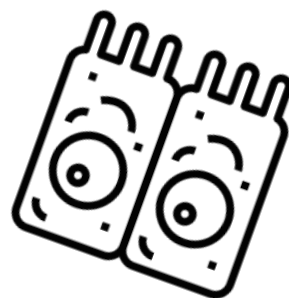
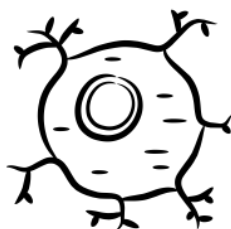
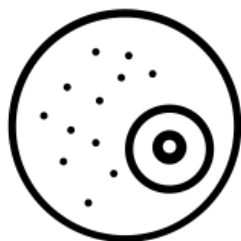




KEDST Biology Summer Study Booklet



Student Name	
Student ID	

Please complete this booklet, which includes activities that will provide the basis for the topics you will study in the first taught Module. There will be a baseline assessment within the first 3 weeks of term, which will include content from this booklet to see what support we need to offer to students.

Contents

Topic 1: Key Biology Terms

Topic 2: Cells and Organelles

Topic 3: Biological Molecules

Topic 4: Genetics

Topic 5: Maths Skills

If you finish the tasks in this booklet and would like to cover additional topics. You may be interested in having a look at the following:

1. Different types of microscopes
2. Factors affecting enzyme activity
3. DNA replication
4. Diffusion, Active Transport and Osmosis
5. Cell division: mitosis and meiosis

Some useful resources include the

[OCR Biology Specification](#)

[Seneca Learning](#)

You do not need to buy any books before the course, but if you really want a book, then we would recommend the 'CGP Headstart to Biology', approx. £4.99.

You can see below an outline for the topics to be covered in first year.

Approximate Timings	First Year Topics
Autumn Term	2.1.1 Cells
	2.1.2 Biological Molecules
	2.1.3 Nucleotides and Nucleic Acids
	2.1.4 Enzymes
	2.1.5 Biological Membranes
	2.1.6 Cell Division
Spring Term	3.1.1 Exchange Surfaces
	3.1.2 Transport in Animals
	3.1.3 Transport in Plants
	4.1.1 Communicable Diseases
Summer Term	4.2.1 & 6.3.1 & 6.3.2 Biodiversity, Ecosystems and Populations
	4.2.2 Classification

Topic 1: Key Biology Terms

Use the biological terms below to complete the definitions in the table. Some terms have not been included to provide an extra challenge.

<p>tissue photosynthesis cytoplasm living organisms high homeostasis internal concentrated</p>	<p>enzyme active transport DNA diffusion protein identical similar</p>	<p>bacteria nucleus active site low dilute water chain</p>
--	--	--

Scientific word	Definition
Activation energy	Energy needed to make a reaction take place
.....	Place on the enzyme molecule where the substrate fits
A..... t.....	Movement of substance against a concentration gradient requiring
.....	A single-celled micro-organism with no nucleus
Cell	Fundamental building block of
Chromosome	Made up from, found in the nucleus
C.....	Found in all living cells where chemical reactions take place
Denatured	When the shape of an enzyme molecule changes so it is not able to function
D.....	Net movement of molecules from an area of concentration to one of concentration
E.....	Biological catalyst that the rate of reaction
Food	Feeding relationship between different organisms in an ecosystem
Gene	A part of DNA that codes for a
H.....	Maintaining a constant environment
Mitosis	Cell division in which two daughter cells are produced
N.....	An organelle that contains the genetic material and controls cell activity

It is very important that you are able to use scientific vocabulary accurately. There are many biological terms that you will be familiar with from your GCSE science course and it is now essential that you can understand and use them appropriately.

Suffix/Prefix	Meaning
A-	
Anti-	
-ase	
Bio-	
Cardio-	
Cyto-	
Di-	
Endo-	
Glyc-	
Haemo-	
Hetero-	
Homo-	
Hydro-	
Hyper-	
Hypo-	
Inter-	
Intra-	
Macro-	
Micro-	
Mono-	
Poly-	
Post-	
Pro-	
Tri-	
Vaso-	

unit	name	Measurement of
m	Metres	
kg	kilograms	
s	seconds	
°C	Degrees celsius	

Notice 's' is the abbreviation for seconds, not 'sec'.

There are several units derived from these basic units that you will come across commonly in biology. These are:

unit	name	Measurement of
cm ³		Volume, usually solids and gases*
	millilitres	Volume, liquids*
	millimetres	length
µm		length
	nanometres	

Notice that cm³ and ml are an equal measure i.e. 1cm³ = 1ml

Standard form	Same as	
x10 ³		X 1,000
x10 ⁻³	milli	÷
10 ⁻⁶	micro	÷ 1,000,000
x10 ⁻⁹		÷ 1,000,000,000

Can you convert (remember to include units!):	
1. 1000 μm in mm	
2. 1 mm in μm	
3. 100 μm in m	
4. 0.1 m in mm	
5. 0.0000001 mm in μm	
6. 87000 μm in mm	

What happened to litres?

Instead of using litres (l), at A level you will be expected to use³ (..... cubed). This avoids confusing l for litres with a number 1. Millilitres are still represented as ml.

At GCSE, you would have written metres per second like this: **m/s**

A levels use a different notation: **ms⁻¹**

The minus sign when present in units tells you that it should be read as 'per':

TASK: fill the gaps

1. per second kgs^{-1}

2. bubbles per minute min^{-1}

3. per dm^{-3}

Scientific word	Definition
Osmosis	Diffusion of from a to a more solution
P.....	Process carried out by in which light is used to produce glucose
Respiration	Process where g..... is broken down to provide energy in all cells
T.....	A group of cells that have a structure and function

Questions

- 1 Where in the cell do the chemical reactions take place?
- 2 In which process is light energy used to produce glucose?
- 3 Define the term 'respiration'.
- 4 What is a gene?
- 5 What is the term used to describe the loss of function by enzymes?
- 6 What is tissue made up of?

Topic 2: Cells and Organelles

One of the first topics you will study is cells and cell structure. Watch the video clip for a recap on cell structure. [Animal and Plant Cells Video Clip](#)

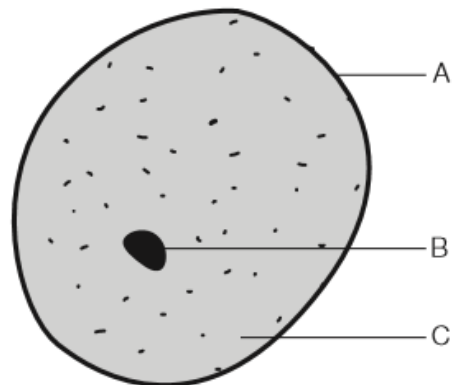
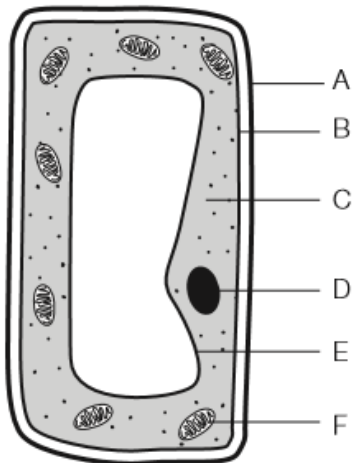
Task 1

Complete the table below, stating the function of each feature. Tick (✓) which cell type the feature is present in and place a cross (✗) where it does not exist.

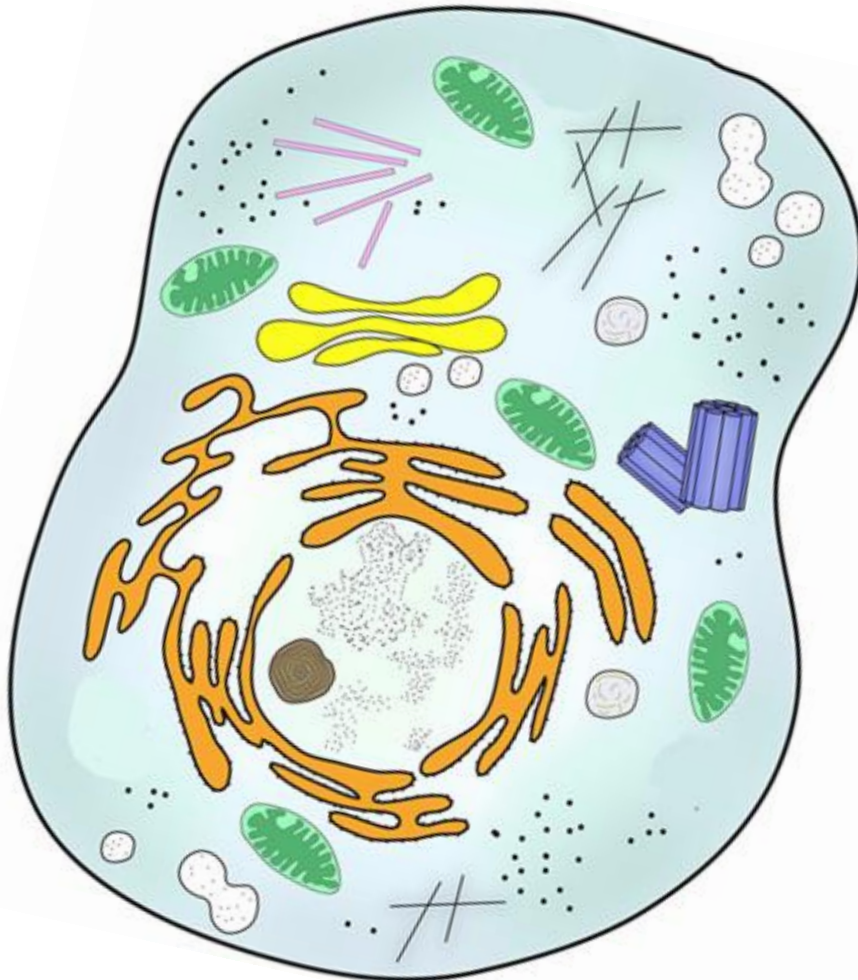
Feature	Function	Plant	Animal
Cellulose cell wall			
Cell (plasma) membrane			
Nucleus			
Cytoplasm			
Large permanent vacuole			

Task 2

Label the plant and animal cells below.

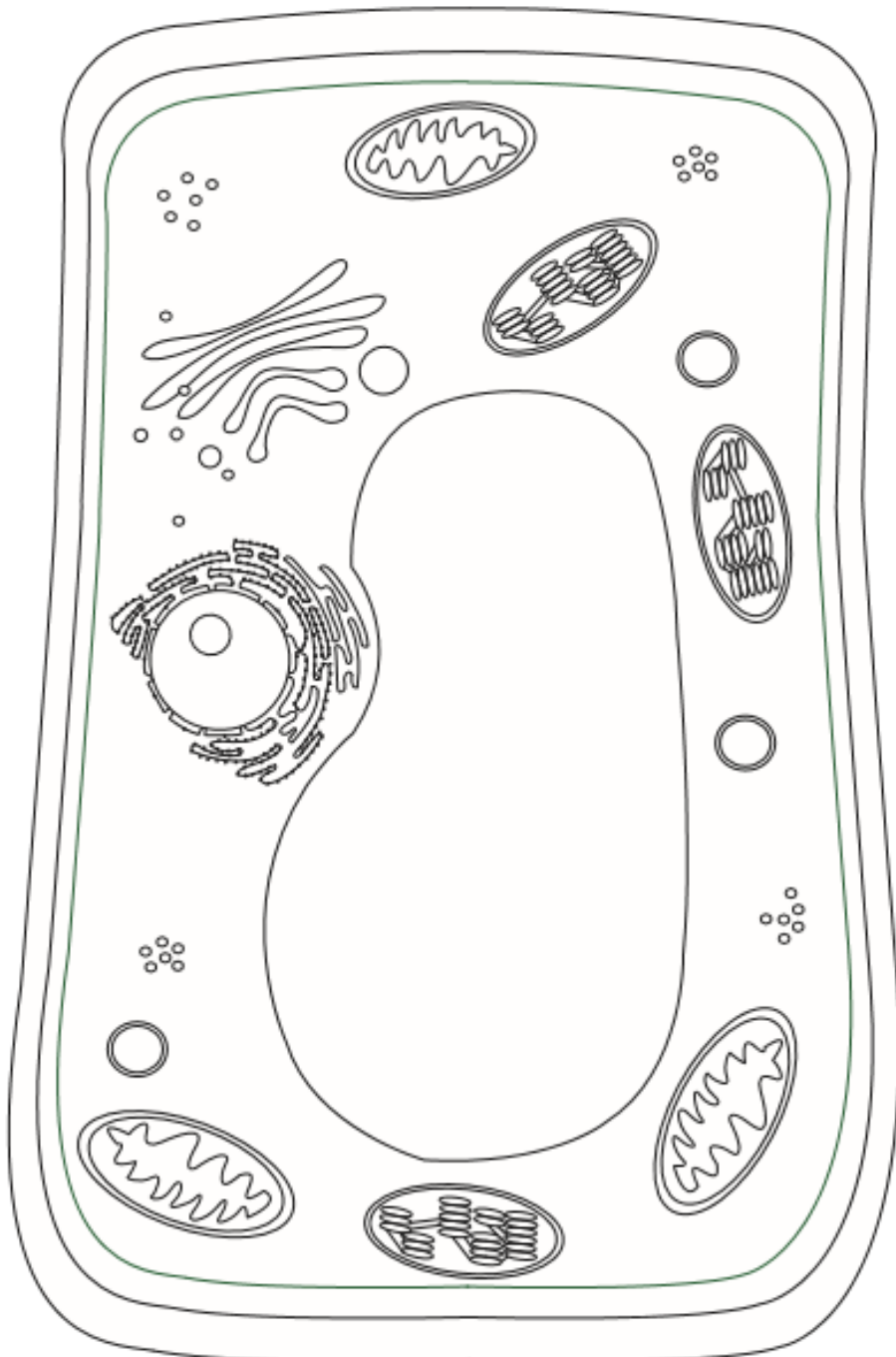


This is a typical animal cell studied at A-level Biology. This video Clip will provide you with a good introduction. [A-level Cells Video Clip](#)
Have a go at labelling the cell and adding the functions of the parts you can label



Plant Cell

Color each part of the plant cell using the color key.



mitochondria - red

nucleus - pink

vacuole - blue

Golgi apparatus - orange

chloroplast - light green

cell wall - dark green

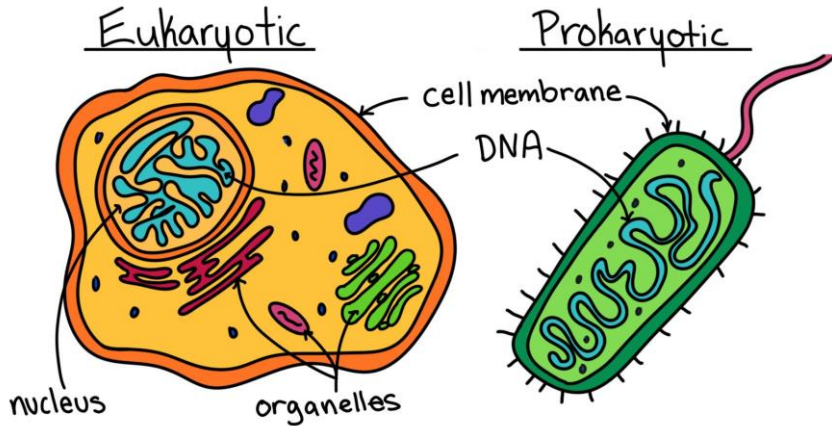
nucleolus - purple

Can you identify any more organelles using your own colour key?

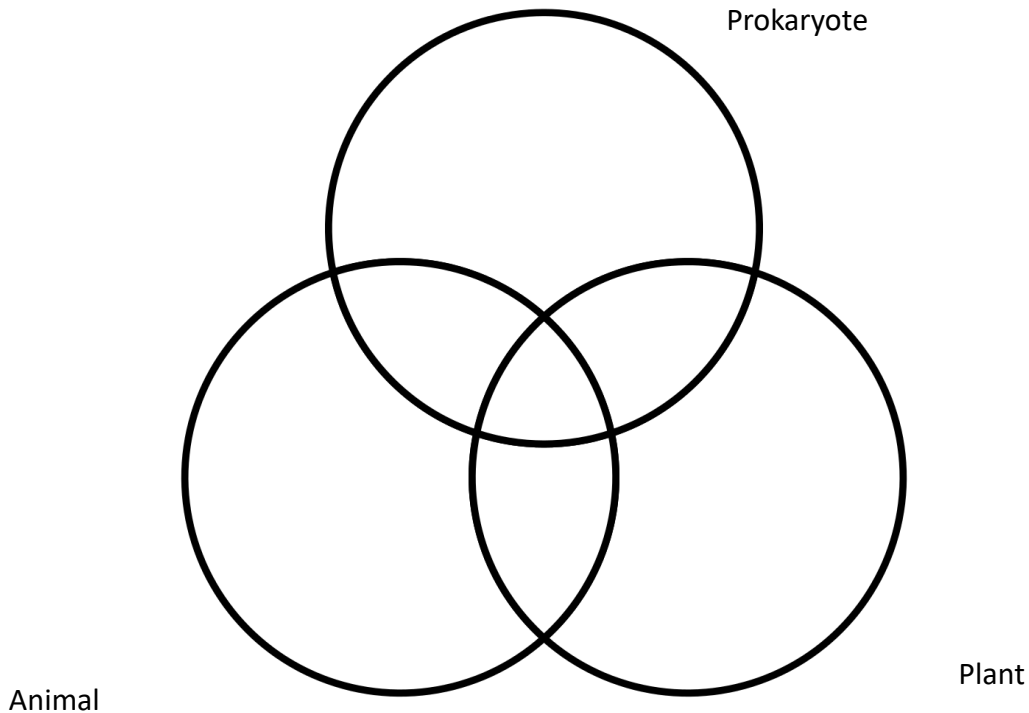
Eukaryotes vs Prokaryotes

At A-level, we study Eukaryotic cells and prokaryotic cells.

Watch this video clip to identify the key features of prokaryotic cells. [Video Clip](#)



Complete the Venn Diagram below to compare Animal, Plant and Eukaryotic cells



Topic 3: Biological Molecules

At GCSE, you will have studied biological molecules, often referred to as 'food groups'. At A-level, the biological molecules you will study are carbohydrates, lipids, proteins and nucleic acids.

Task 1.

Complete the table below by placing a tick (✓) if the statement is correct for each biological molecule or a cross (X) if incorrect

Statement	Carbohydrates	Lipids	Proteins
Major component found in the plant cell wall – cellulose			
Provides thermal insulation			
Can be either found as fats (animals) or oils (plants)			
Needed to build up muscles in animals			
Main compound used in respiration			
Amino acids are the building blocks			
Made up of fatty acids and glycerol			
Examples include enzymes, hormones and haemoglobin			
Includes glucose, sucrose and starch			
Denature/break down at high temperature			

Task 2.

Watch this video clip which is an introduction to biological molecules, their structures and functions. [Biological Molecules Video Clip](#)

While watching the clip, try to complete the following

a) What is a monomer?

b) What is a polymer?

c) Complete the table with the relevant information

	Carbohydrates	Lipids	Proteins	Nucleic Acids
Name of monomers (examples are fine)				
Names of polymers (examples are fine)				
Functions of the biological molecule				
Elements found in this biological molecule				

Biochemical Tests

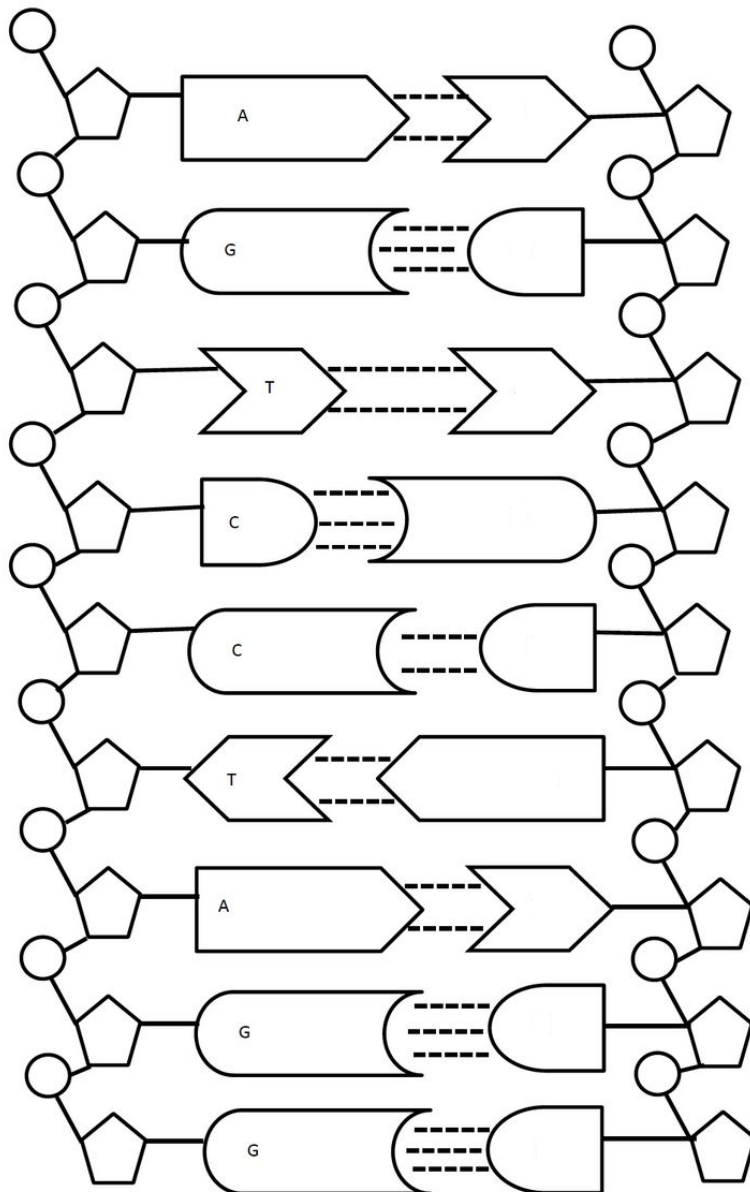
One of the early practicals we carry out is to identify biological molecules. At GCSE, you may have called them food tests. At A-level we refer to them as biochemical tests. Have a go at completing the table below. You may find this video clip useful: [Biochemical Tests Vid Clip](#)

Biological Molecule	Method and chemical used	Positive result
Reducing sugar		
Iodine		
Protein		
Lipid		

Topic 4: Genetics and DNA

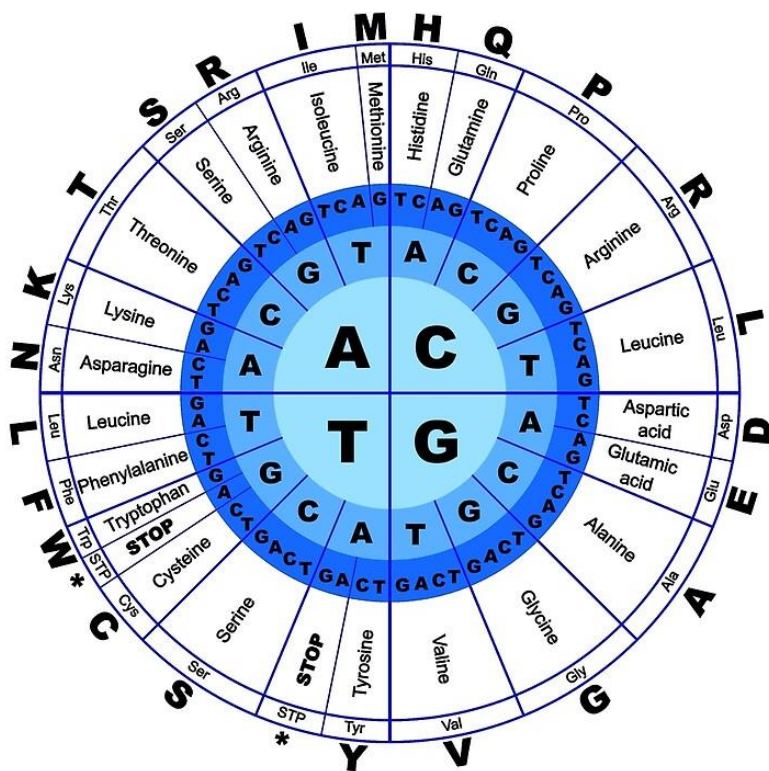
One of the underpinning topics in Biology is Genetics. It is useful to have some background knowledge on DNA structure. Watch the following video clip: [What is DNA](#)
Complete the tasks below

1. Where is DNA stored in a eukaryotic cell?
2. On the diagram below, circle and label **one** DNA nucleotide
3. The letters A,C,G,T are used to represent each of the DNA bases. What names do these letters stand for?
4. On the diagram below, fill in the missing bases using complementary base pairing
5. Use the colouring key to colour in the DNA molecule below



Colouring Key	
Molecule	Colour
Phosphate	Black
Sugar	Purple
T	Yellow
A	Blue
C	Red
G	Green

The Genetic Code



The main role of DNA is to code for amino acids, which are the monomers of proteins.

The genetic code identifies the different combinations of bases that code for each amino acid.

This letter code read from the inside out e.g. GGG codes for glycine
TCA codes for Serine

Video clip

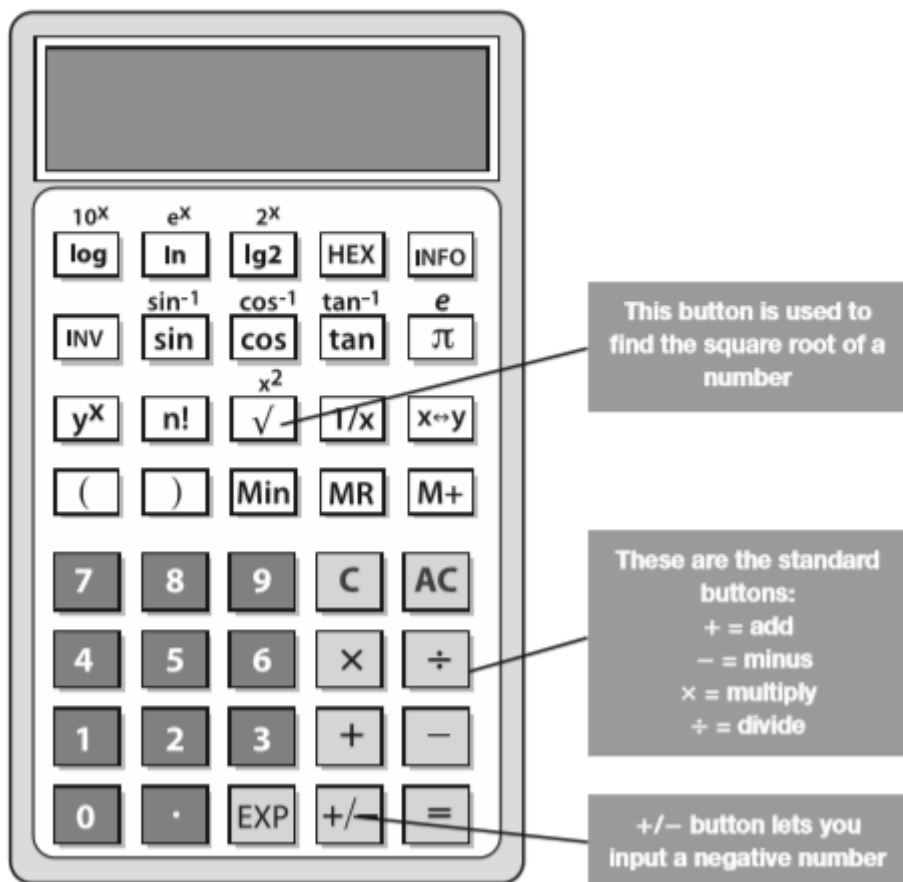
[How does DNA lead to proteins being produced?](#)

1. How many letters code for each amino acid?
2. Is this DNA or RNA?
3. How many different letter codes are there all together?
4. How many different amino acids are there?
5. How many amino acids have more than 1 code?
6. What is the most number of codes for a single amino acid?

Extension: How does the genetic code in bacteria and plants compare to the genetic code in humans?

Topic 5: Maths Skills

You will be required to do some simple maths calculations in Biology, so you need to be confident about using a calculator. You should familiarise yourself with some of the functions on a scientific calculator. Not all calculators are identical – if in doubt, check the instructions that come with your calculator.



Questions

- 1 Calculate the mean value for the following results:
105, 29, 78, 79, 95, 88, 74
- 2 Find out the mean height of boys in a class from the results below:
180cm, 140cm, 155cm, 144cm, 160cm, 188cm, 154cm, 172cm, 156cm

- 3 Calculate the mean length of snail shells from different locations.

Location	Snail shell length/mm
1	44
2	34
3	27
4	30
5	49
6	23
7	33
8	43
Mean	

- 4 The table below shows the concentration of different ions inside algal cells and the concentration of the pond water in which they were found.

Ions	Concentration in the pond water/ mmol dm^{-3}	Concentration inside algal cell/ mmol dm^{-3}
Sodium	1.1	4.8
Chloride	2.5	6.2
Nitrate	2.5	7.4
Potassium	1.2	5.7

Calculate the percentage increase in the concentration of nitrate ions inside algal cells.

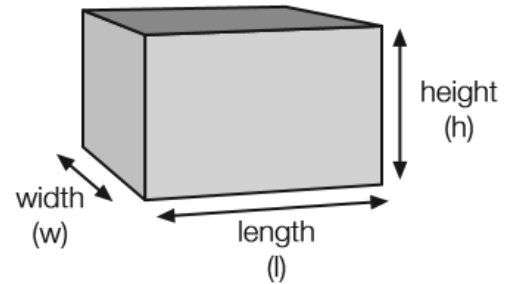
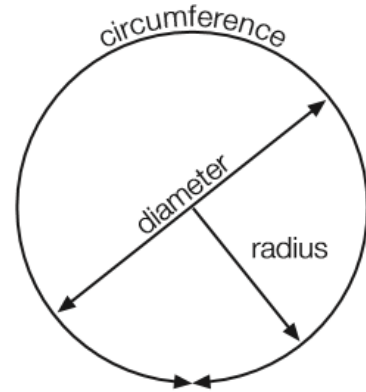
- 5 Over the course of a year, a hospital checked 745 children for asthma. Of those checked, 158 were found to be suffering from asthma. What percentage of the total number of children examined were found to have asthma?
- 6 In an AS Biology exam paper, the total marks were 60. If student A obtained 45 marks, what percentage did this student obtain?
- 7 In an A2 Chemistry exam paper, the total marks were 75. If student B obtained 53 marks, what percentage did this student obtain for the paper?
- 8 A blood cell with a diameter of $15.5\mu\text{m}$ was placed in concentrated salt solution for 24 hours. After this period, the diameter measured was $8.9\mu\text{m}$. Calculate the percentage decrease in the diameter of the cell.

It is important to have an understanding of the surface area and volume of substances and objects in many different situations. Calculating the volume allows us to work out the weight or density of a biological system such as a roots system.

Key terms

Area and volume calculations often involve the same terms, so it is essential that you are familiar with them:

- **circumference**, C — this is the distance around the outside of a circle (imagine putting string around a tin can)
- **diameter**, d — this is the width across the widest part of a circle
- **radius**, r — this is the distance from the centre of a circle to its edge
- **pi** or π — this is a mathematical constant with a value of 3.14 (to two decimal places); it is the ratio between the circumference and the diameter of any circle
- **height** — often shown as 'h'
- **length** — often shown as 'l'
- **width** — often shown as 'w' (you may sometimes see this called depth, or 'd').



Cuboids

These formulae work for both cubes (for example, a sugar cube) and cuboids with rectangular sides (for example, a cardboard box):

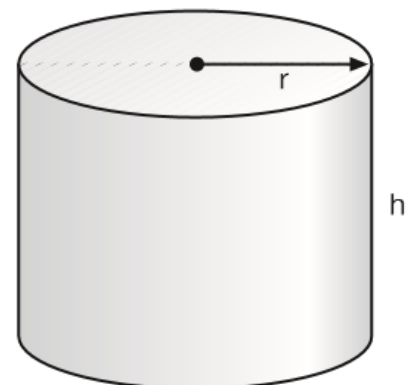
$$\text{surface area of a cuboid} = 2(lh) + 2(lw) + 2(wh)$$

$$\text{volume of a cuboid} = l \times w \times h$$

Cylinders

$$\text{surface area of a cylinder} = 2\pi r^2 + 2\pi rh$$

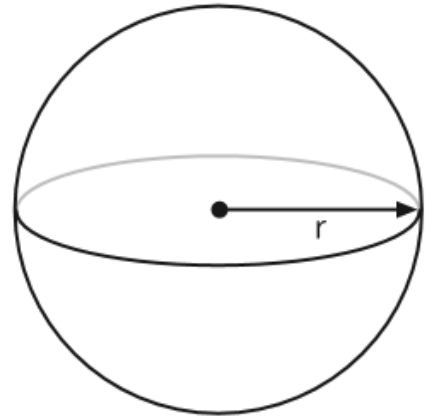
$$\text{volume of a cylinder} = \pi r^2 h$$



Sphere

surface area of a sphere = $4\pi r^2$

volume of a sphere = $\frac{4}{3}\pi r^3$



Questions

- 1 A piece of potato chip has a length of 1cm, a height of 0.5cm and a width of 0.6cm.
 - a) Calculate the volume of the piece of chip.
 - b) Calculate the surface area of the piece of chip.
- 2 A canister containing river water has a height of 35cm and a radius of 15cm. Assume the canister is perfectly cylindrical.
 - a) Calculate the volume of the canister.
 - b) Calculate the surface area of the canister.
- 3 A droplet of blood has a radius of 0.2cm. Assume the droplet is perfectly spherical.
 - a) Calculate the volume of the blood droplet.
 - b) Calculate the surface area of the blood droplet.