

## **OCR Biology A H020**

In preparation for Biology, students need to review the following areas during the summer.

- Cells
- Enzymes
- Digestion
- The Heart and lungs
- Pathogens and disease
- Practical skills

The specification for the course can be found at:

<https://www.ocr.org.uk/Images/171693-specification-accredited-as-level-gce-biology-a-h020.pdf>

### **Books**

Research these at your bookshop or library and select a few to read (\* highly recommended):

- Charles Darwin The origin of species\*
- Matt Ridley Genome: The Autobiography of a Species in 23 Chapters\*
- Richard Dawkins The Selfish Gene; The Blind Watchmaker\*
- Steve Jones Y: The Descent of Men; Almost Like a Whale; Coral
- James Watson DNA: The Secret of Life; The Double Helix
- Lewis Thomas The Lives of a Cell; The Medusa and the Snail
- Barry Gibb The Rough Guide to the Brain
- Armand Marie Leroi Mutants: On the Form, Varieties and Errors of the Human Body
- David S. Goodsell The Machinery of Life
- Ernst Mayr This Is Biology: The Science of the Living World
- George C. Williams Plan and Purpose in Nature
- Steve Pinker The Language Instinct
- Edward O Wilson The Diversity of Life
- Richard Leaky The Origin of Humankind\*

### **Magazines, Newspapers and journals:**

- New Scientist
- Scientific American
- Nature Science
- Biological Sciences Review\*
- British Medical Journal
- HuffPost Science
- Any scientific articles in newspapers (paper or online)

### **Websites:**

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The following websites will help you to do this:

- [www.s-cool.co.uk/alevel/biology](http://www.s-cool.co.uk/alevel/biology)
- [www.cellsalive.com](http://www.cellsalive.com)
- [www.biologymad.com](http://www.biologymad.com)
- [www.spolem.co.uk](http://www.spolem.co.uk)
- [www.biology-innovation.co.uk](http://www.biology-innovation.co.uk)

The essential Maths Skills for A-Level Biology by CGP, ISBN 978-1-84762-323-2 is also very useful.

## Research Tasks on AS Topics:

### 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.

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### **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=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.

### **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=H8WJ2KENIK0>

<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

### **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:**

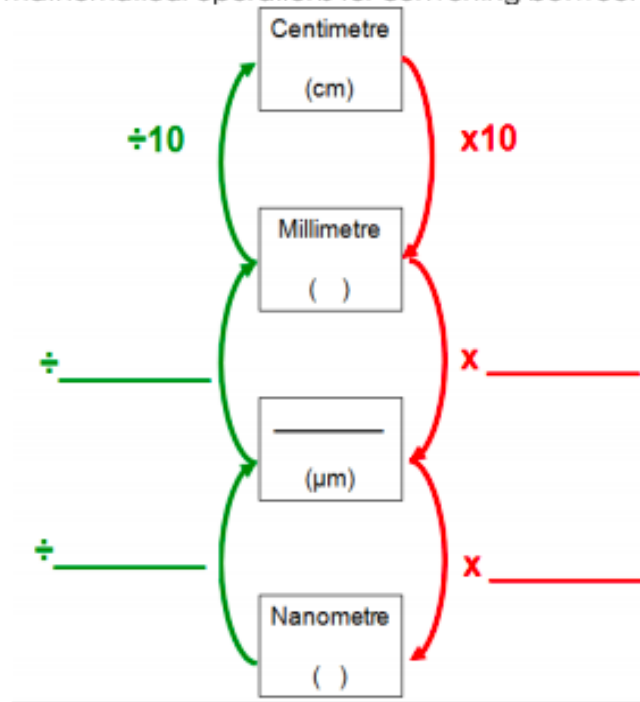
#### **Produce a glossary for the following key words:**

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,

## Year 11 to Year 12 Biology AS/A-Level Bridging Unit Section A: Examination Questions

### Units of measurement

- 1) Complete the diagram below to show: names of the units of measurement, unit symbols, and mathematical operations for converting between units.



- 2) Complete the table below to show the corresponding values in nanometres, micrometres and millimetres for the measurements given in each row. The first row has been completed for you. Add in the correct unit symbols for each answer you give.

<u>Nanometre</u>	<u>Micrometre</u>	<u>Millimetre</u>
5	0.005	0.000005
1		
	1	
		1
	3	
7		
		0.5

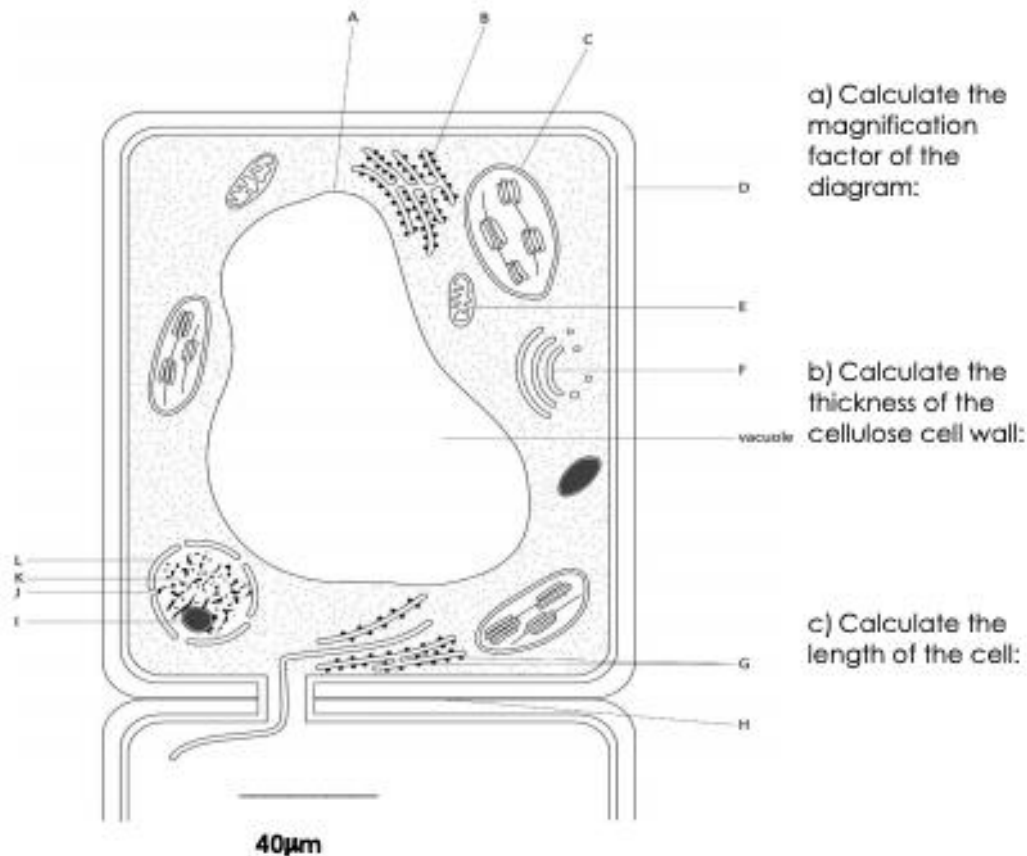
### Magnification and Resolution

1) Define the following terms:

Term	Definition
Magnification	
Resolution	

2) Visible light has a wavelength of 400-700 nm. Calculate the best resolution achievable with a light microscope? Show your working out:

3) The diagram below shows the general structure of a plant cell when viewed under and electron microscope.



a) Calculate the magnification factor of the diagram:

b) Calculate the thickness of the cellulose cell wall:

c) Calculate the length of the cell:

d) Calculate the length of structure C:

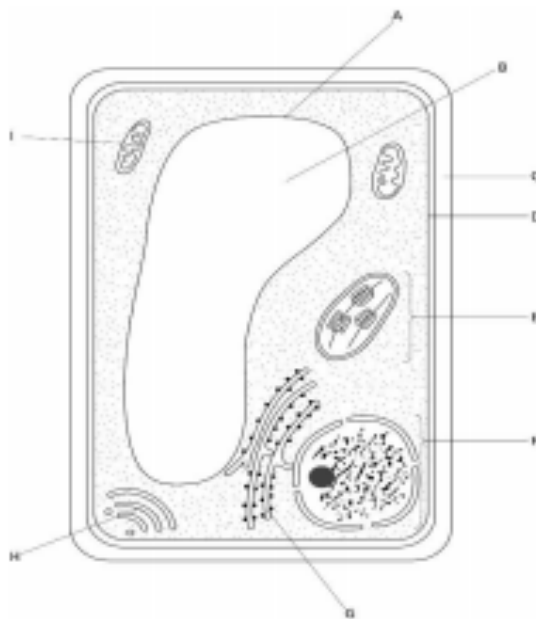
e) Calculate the length of the vacuole:

### Cell structure

- 1) Describe three structures / organelles that are present in generalised plant cells but absent from animal cells.

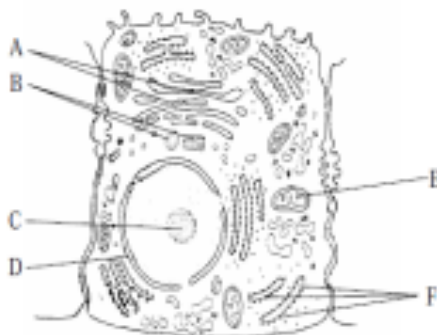
A)  
B)  
C)

- 2) Name the structures in the diagram below



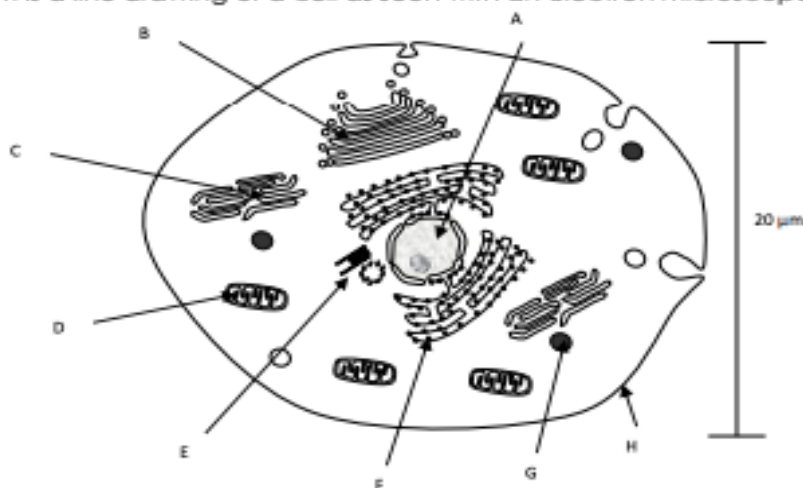
Letter	Structure
A	
B	
C	
D	
E	
F	
G	
H	
I	

- 3) The diagram below shows an electron micrograph of a cell. Name the structures in the diagram.



Letter	Structure
A	
B	
C	
D	
E	
F	

4) The diagram is a line drawing of a cell as seen with an electron microscope.



a) Complete the table by matching the label to the function and then naming the appropriate part. The first one has been completed for you.

Function of Structure	Label	Name of Part of the Cell
Controls the activity of the cell.	A	Nucleus
Protein/polypeptides are made here.		
Aerobic respiration takes place here.		
Produces secretory vesicles.		
Controls the entry of substances into the cell.		
Contains hydrolytic enzymes.		
Makes lipids, including steroids.		

b) With reference to the diagram; is the cell that of an animal or a plant? Give a reason for your answer.



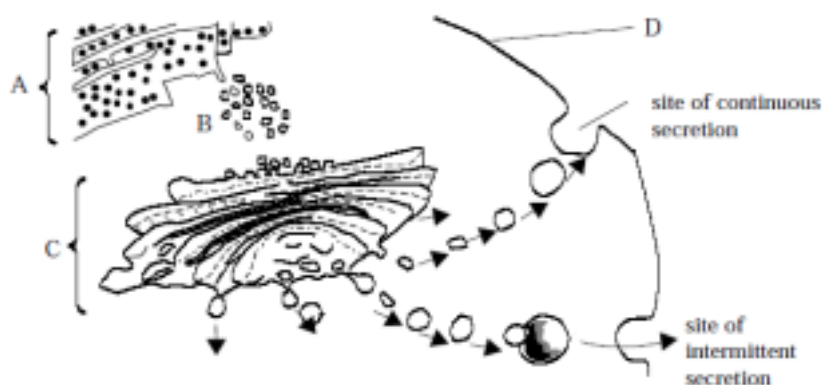
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### Parts of the cell working together

- 1) Complete the paragraph below to describe how organelles in a cell work together to produce and secrete proteins such as hormones

The nucleus carries all the necessary instructions for the cell to function. The code for protein synthesis is carried in the \_\_\_\_\_ which are made of \_\_\_\_\_ or histones. The instructions are \_\_\_\_\_ or copied into mRNA (messenger ribonucleic acid). The mRNA then leaves the nucleus via the \_\_\_\_\_ and travels to the \_\_\_\_\_ where the message is read and translated into protein. The newly manufactured proteins are transported to forming face of Golgi body/apparatus in transport \_\_\_\_\_. Within the Golgi apparatus the proteins are processed. Vesicles are budded off from the maturing face of Golgi and are transferred to the \_\_\_\_\_ for secretion. Glandular cells (e.g. pancreas) contain large amounts of \_\_\_\_\_ (this is encrusted with ribosomes and is where protein synthesis takes place) and Golgi body. These cells also contain many mitochondria since protein synthesis requires a lot of \_\_\_\_\_.

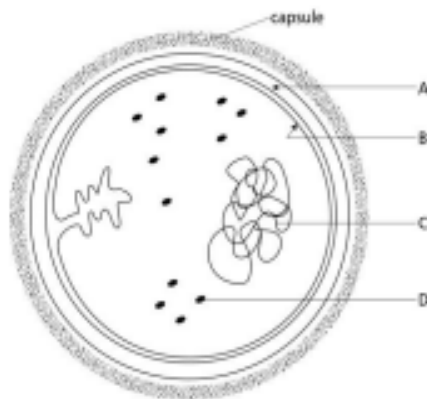
- 2) The diagram below illustrates cellular secretion. Secretion may be continuous or it may be intermittent, only occurring to coincide with some other activity outside the cell.



- Name A, B, C and D.
- State the function of structure B.
- Describe the role of structure C in secretion.

### Prokaryotes and Eukaryotes

- 1) The diagram below shows *Staphylococcus*, which is a prokaryotic cell. Label parts A to D



- 2) The following table compares some features of a prokaryotic and eukaryotic animal cell. Complete the table on the next page by using 'present', 'absent' or a short descriptive phrase. The first has been completed for you.

Cellular Feature	Prokaryotic Cell	Eukaryotic Animal Cell
Cell wall	Present	Absent
Cell surface membrane		
Nucleus		
Membrane bound organelles		
DNA		
Plasmids in the cytoplasm		

## Year 11 to Year 12 Biology AS/A-Level Bridging Unit

### Section B: Biology Research Tasks

Complete **all 3** of the tasks below.

#### Task 1: Protein structure

- a) Find and draw a generalised structure of an amino acid.
- b) Give a general **comparative** description of the primary, secondary and tertiary structure of a protein. [Include terms such as:- polypeptide chains; alpha helices; beta pleated sheets; hydrogen bonds; ionic bonds; disulphide bonds; hydrophobic R-groups; Hydrophilic R-groups; prosthetic groups; conjugated proteins]
- c) Draw the ring structure for  $\alpha$  and  $\beta$  glucose. Learn these structures and list the differences between the two.

#### Task 2: Biological Molecules

The three main groups of biological molecules are: proteins, carbohydrates and lipids. For each group, find out where these molecules are found in a standard animal cell and what their role in that structure is.

#### Task 3: Biology Practical

Find out what the Benedict's test is used for, give an outline of the experimental method and state the difference between a reducing and non-reducing sugar.

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### Section C: Practical Skills

Every measurement must have a size (eg 2.7) and a unit (eg metres or °C)  
Sometimes, there are different units available for the same type of measurement.  
For example, ounces, pounds, kilograms and tonnes are all used as units for mass.

To reduce confusion, and to help with conversion between different unit, there is a standard system of unit called the SI units which are used for most scientific purposes. These have all been defined by experiment to that the size of, say, a metre in the UK is the same as a metre in China.

The seven SI base units are:

Physical quantity	Usual quantity symbol	Unit	Abbreviation
mass	$m$	kilogram	kg
length	$l$ or $x$	metre	m
time	$t$	second	s
electric current	$I$	ampere	A
temperature	$T$	kelvin	K
amount of substance	$N$	mole	mol
luminous intensity	(not used at A-level)	candela	cd

All other units can to derived from the SI base units.

For example, area is measured in square metres (written as  $m^2$ ) and speed is measured in metres per second (written as  $ms^{-1}$ ). It is not always appropriate to use a full unit For example, measuring the width of a hair or the distance from Manchester to London in metres would cause the numbers to be difficult to work with.

Prefixes are used to multiply each of the units. You will be familiar with centi (meaning 1/100), kilo (1000) and milli (1/1000) from centimetres, kilometres and millimetres.

There is a wide range of prefixes. The majority of quantities in scientific contexts will be quoted using the prefixes that are multiple: of 1000. For example, a distance of 33000 m would be quoted as 33 km.

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The most common prefixes you will encounter are:

Prefix	Symbol	Multiplication factor		
Tera	T	$10^{12}$	1 000 000 000 000	
Giga	G	$10^9$	1 000 000 000	
Mega	M	$10^6$	1 000 000	
kilo	k	$10^3$	1000	
deci	d	$10^{-1}$	0.1	1/10
centi	c	$10^{-2}$	0.01	1/100
milli	m	$10^{-3}$	0.001	1/1000
micro	$\mu$	$10^{-6}$	0.000 001	1/1 000 000
nano	n	$10^{-9}$	0.000 000 001	1/1 000 000 000
pico	p	$10^{-12}$	0.000 000 000 001	1/1 000 000 000 000
femto	f	$10^{-15}$	0.000 000 000 000 001	1/1 000 000 000 000 000

### Activity One:

Which SI unit and prefix would you use for the following quantities?

- The time between heart beats
- The length of a leaf
- The distance that a migratory bird travelled each year
- The width of a cheek cell
- The mass of a rabbit
- The mass of iron in the body
- The volume of the trunk of a large tree

## Year 11 into 12 OCR Biology Bridging Material

### Important vocabulary for practical work

You will have come across most of these words used in practical work in your GCSE studies. It is important that you continue to use the right definition for each word.

Activity Two: Join the boxes to link the word to its definition.

Accurate	A statement suggesting what may happen in the future.
Data	An experiment that gives the same results when a different person carries it out, or a different set of equipment or technique is used.
Precise	A measurement that is close to the true value.
Prediction	An experiment that gives the same results when the same experimenter uses the same method and equipment.
Range	Physical, chemical or biological quantities or characteristics.
Repeatable	A variable that is kept constant during an experiment.
Reproducible	A variable that is measured as the outcome of an experiment.
Resolution	This is the smallest change in the quantity being measured (input) of a measuring instrument that gives a perceptible change in the reading.
Uncertainty	The interval within the true value can be expected to lie.
Variable	The spread of data, showing the maximum and minimum values of the data.
Control variable	Measurements where repeated measurements show very little spread.
Dependent variable	Information, in any form, that has been collected.