Sixth Form

A-level Biology Bridging Work Booklet



**Name:**

# **Biology A Level Bridging Work**

**Welcome to A Level Biology!**

This bridging work is designed to help you to bridge the gap between your GCSE Science studies and the A Level Biology course.

###### Why do bridging work?

Preparation is crucial for studying A Level Biology. After completing these exercises you will need to highlight any areas that you really had trouble understanding. We are expecting you to put 100% effort into these tasks to show your commitment. All of these are essential in the understanding of the foundations of biology.

We want you to be successful at A-level Biology and what this takes at GCSE is different to what is required at A-level. Although you have fewer subjects, there are different skills post-16 and the volume of work is greater due to the increased demand of depth and detail.

Bridging work should help you to gauge your current understanding of the subject and introduce you to the depth of understanding that is required for study at post-16.

###### Biology A-level

Studying Biology (or, in fact any subject) at A-level will require you to be highly organised and effective with your own independent work. Not only will you have to balance the workload of this subject and the other subjects you have chosen, you will also be required to commit to the subject and do the very best that you can.

Anyone not completing the work or producing that of a poor quality will be spoken to and asked to re-consider if this is the correct course for you. Please use resources such as the internet and your Biology GCSE notes to help you complete this booklet.

In your Biology lessons you will cover all the theory and practical work required for the course. You are also expected to spend around five hours a week on your Biology work outside of lessons. This will include homework tasks, pre-reading, independent study tasks, making additional notes, reviewing lesson materials and reading around the subject. To allow you to make a start on this, a suggested reading list has been included at the end of this pack.

Your A Level Biology Qualification will cover the following 8 units.

In Year 12 you will cover:

1. Biological molecules
2. Cells
3. Organisms exchange substances with their environment
4. Genetic information, variation and relationships between organisms

In Year 13 you will cover:

1. Energy transfer in and between organisms
2. Organisms respond to changes in their internal and external environment
3. Genetics, population, evolution and ecosystems
4. The control of gene expression

We are going to focus on the basics of the first 4 units in this bridging work…

**You should bring this bridging work with you to your first year 12 Biology lesson in September.**

**If you need to do more preparation……**

When we are at school, additional texts will be available in the school library and a full copy of the specification, past papers etc. can be accessed through the AQA website:

<http://www.aqa.org.uk/subjects/science/as-and-a-level/biology-7401-7402>

* Try ‘Head Start’ to A Level Biology

## Buy on line at: https://[www.cgpbooks.co.uk/](http://www.cgpbooks.co.uk/)

## or on Amazon

* It recaps all the tricky topics from GCSE that A Level builds on. It is ideal preparation for September. It will also be useful for reference throughout the course.

# Useful information and activities

There are a number of activities throughout this resource. The answers to some of the activities are available on our secure website, e-AQA. Your teacher will be able to provide you with these answers.

SI units

Every measurement must have a size (eg 2.7) and a unit (eg metres or ºC). 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 units, there is a standard system of units called the SI units which are used for most scientific purposes.

These units have all been defined by experiment so 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 be derived from the SI base units.

For example, area is measured in square metres (written as m2) 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 multiples of 1000. For example, a distance of 33 000 m would be quoted as 33 km.

The most common prefixes you will encounter are:

|  |  |  |
| --- | --- | --- |
| Prefix | Symbol | Multiplication factor |
| Tera | T | 1012 | 1 000 000 000 000 |
| Giga | G | 109 | 1 000 000 000 |
| Mega | M | 106 | 1 000 000 |
| kilo | k | 103 | 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 | μ | 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 |

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| Activity 1 |
| Which SI unit and prefix would you use for the following quantities?1. The time between heart beats
2. The length of a leaf
3. The distance that a migratory bird travelled each year
4. The width of a cheek cell
5. The mass of a rabbit
6. The mass of iron in the body
7. The volume of the trunk of a large tree
 |

Sometimes, there are units that are used that are not combinations of SI units and prefixes.

These are often multiples of units that are helpful to use. For example, one litre is 0.001 m3, or one day is 86 400 seconds.

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| Activity 2 |
| Choose the most appropriate unit, and estimate the size of each of the following.1. The mass of an elephant
2. The mass of an earthworm
3. The volume of water in a teardrop
4. The volume of water in a pond
5. The time taken for a sunflower to grow
6. The temperature difference between the blood in the heart and in the ear on a cold day
7. The width of a hair
8. The length that your fingernails grow each day
9. The total length of each of the hairs on your head
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| Activity 3 |
| Put the following in order of size:height of an elephant; length of DNA strand; width of a hair; height of a tree;width of a sodium ion; length of a nerve cell; length of a heart; width of a red blood cell; size of a virus; length of a finger; length of a mosquito; length of a human digestive system; width of a field; length of a water molecule. |

# Important vocabulary for practical work

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

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| Activity 4 |
|  | Join the boxes to Accurate | link the wo | rd to its definition.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 ofequipment or technique is used. |  |
|  |  |  |  |  |
|  | Precise |  | A measurement that is close to the true value. |  |
|  |  |  |  |  |
|  | Prediction |  | An experiment that gives the same results whenthe same experimenter uses the same method and equipment. |  |
|  |  |  |  |  |
|  | Range |  | Physical, chemical or biological quantities or characteristics. |  |
|  |  |  |  |  |
|  | Repeatable |  | A variable that is kept constant during anexperiment. |  |
|  |  |  |  |  |
|  | Reproducible |  | A variable that is measured as the outcome of anexperiment. |  |
|  |  |  |  |  |
|  | Resolution |  | This is the smallest change in the quantity being measured (input) of a measuring instrument thatgives 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. |  |

Cells

All life on Earth exists as cells. These have basic features in common.

Activity 5

Complete the table.

|  |  |
| --- | --- |
| Structure | Function |
| Cell-surface membrane |  |
| Chloroplast |  |
| Cell vacuole |  |
| Mitochondria |  |
| Nucleus |  |
| Cell wall |  |
| Chromosomes |  |
| Ribosomes |  |

Draw the structure of a plant cell and an animal cell.

On each cell, add labels showing each of the structures in the table, if they exist.

# Photosynthesis and respiration

Two of the most important reactions that take place in living things are photosynthesis and respiration. They both involve transfer of energy.

Activity 6

Complete the table.

|  |  |  |
| --- | --- | --- |
|  | Photosynthesis | Aerobic respiration |
| Which organisms carry out this process? |  |  |
| Where in the organisms does the process take place? |  |  |
| Energy store at the beginning of the process | Sun |  |
| Energy store at the end of the process |  | In cells |
| Reactants needed for the process |  |  |
| Products of the process |  |  |
| Overall word equation |  |  |
| Balanced symbol equation for the overall process |  |  |

Which of the answers for aerobic respiration would be different for anaerobic respiration? Add these answers to the table in a different colour.

Principles of moving across boundaries

In biology, many processes involve moving substances across boundaries.

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| Activity 7 |
| Match the examples to the principle(s) involved. For each, give a brief description of why it is relevant.Osmosis ExamplesDrinking a sports drink after exerciseGas exchange in the lungsDiffusionAbsorbing nutrientsfrom food into the bodyMoving ions into cellsThe effect of salt on slugsActive transportPenguins huddling together to keep warmPotato pieces get heavier when put in pure waterChanging surface area or lengthPotato pieces getlighter when put in very salty waterCacti do not have thin, large leaves |

Genetic inheritance

Activity 8

Huntington’s disease is an example of a disease where the mutation causing the disease is dominant.

h: normal (recessive) H: mutation (dominant)

|  |  |
| --- | --- |
|  | Paternal alleles |
| H | h |
| Maternal alleles | h |  |  |
| h |  |  |

Cystic fibrosis is an example of a disease where the mutation causing the disease is recessive.

F: normal (recessive) f: mutation (dominant)

f

F

Maternal alleles

f

F

Paternal alleles

For each of the Punnett squares:

* 1. Complete the diagrams to show the alleles for each child.
	2. State which parent and child is:
		+ healthy
		+ has the disease
		+ a carrier.

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| Activity 8 (continued) |
| Each of the following statements is false. Re-write each one so that it becomes true.1. The first Punnett square shows that one in every four children from this couple will have Huntington’s disease.
2. The second Punnett square shows that there is a one in three chance that a child born to this couple will have cystic fibrosis.
3. All children of the second couple will either be carriers or suffer from cystic fibrosis.
4. The percentage of children who are sufferers on the diagram is the same as the percentage of children each couple will have who are sufferers.
5. Having one child who is born with cystic fibrosis means that the next three children will not have the disease.
6. A 50:50 chance is the same as a 0.25 probability.
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Analysing data

Biological investigations often result in large amounts of data being collected. It is important to be able to analyse this data carefully in order to pick out trends.

Activity 9: Mean, media, mode and scatter graphs

A student investigated an area of moorland where succession was occurring. She used quadrats to measure the area covered by different plant species, bare ground and surface water every 10 metres along a transect. She also recorded the depth of soil at each quadrat. Her results are shown in the table.

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| --- | --- |
|  | Area covered in each quadrat A to E in cm2 |
| A | B | C | D | E |
| Bog moss | 55 | 40 | 10 | – | – |
| Bell heather | – | – | – | 15 | 10 |
| Sundew | 10 | 5 | – | – | – |
| Ling | – | – | – | 15 | 20 |
| Bilberry | – | – | – | 15 | 25 |
| Heath grass | – | – | 30 | 10 | 5 |
| Soft rush | – | 30 | 20 | 5 | 5 |
| Sheep’s fescue | – | – | 25 | 35 | 30 |
| Bare ground | 20 | 15 | 10 | 5 | 5 |
| Surface water | 15 | 10 | 5 | – | – |
| Soil depth / cm | 3.2 | 4.7 | 8.2 | 11.5 | 14.8 |

– indicates zero cover. Calculate:

1. the mode area of soft rush in the sample
2. the mean soil depth
3. the median amount of bare ground in the sample.

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| Activity 9: Mean, media, mode and scatter graphs (continued) |
| Use the data from the table to plot a scatter graph of soil depth against the area covered by bare ground, soft rush and bog moss (use different colours or markers for each). |



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| Activity 9: Mean, media, mode and scatter graphs (continued) |
| 1. What conclusions does your graph suggest?
2. How confident are you in these conclusions?
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| Activity 10: Analysing tables |
| Lung cancer, chronic bronchitis and coronary heart disease (CHD) are associated with smoking. Tables 1 and 2 give the total numbers of deaths from these diseases in the UK in 1974.Table 1 MenTable 2 Women |
|  | Age/years | Number of deaths (in thousands) |  |
| lung cancer | chronic bronchitis | coronary heart disease |
|  | 35–64 | 3.2 | 1.3 | 8.4 |
|  | 65–74 | 2.6 | 1.9 | 18.2 |
|  | 75+ | 1.8 | 3.5 | 42.3 |
|  | Total (35–75+) | 7.6 | 6.7 | 68.9 |

|  |  |
| --- | --- |
| Age/years | Number of deaths (in thousands) |
| lung cancer | chronic bronchitis | coronary heart disease |
| 35-64 | 11.5 | 4.2 | 31.7 |
| 65-74 | 12.6 | 8.5 | 33.3 |
| 75+ | 5.8 | 8.1 | 29.1 |
| Total (35-75+) | 29.9 | 20.8 | 94.1 |

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| Activity 10: Analysing tables (continued) |
| 1. Of the men who died aged 35-64 from one of these three causes, what percentage of them died of lung cancer?
2. What percentage of deaths from chronic bronchitis in women happened to women aged 65-74?
3. Deaths from lung cancer drop as people get older. Is there a bigger percentage difference for men or women from 35-64 to 75+?
4. What fraction of coronary heart disease deaths of men over 34 are in the 75+ bracket? What about for women?
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| Activity 11: Analysing complex graphs |
| The volume of air breathed in and out of the lungs during each breath is called the tidal volume. The breathing rate and tidal volume were measured for a cyclist pedaling at different speeds. The graph shows the results.3.0 30**Tidal volume**2.5 252.0 20**Breathing rate****Tidal volume /** 1.5 15**dm3 Breathing****rate / breaths per minute**1.0 100.5 50.0 00 5 10 15 20 25**Cycling speed / km h–1**1. What was the tidal volume when the cycling speed was 17 km h–1?
2. What was the breathing rate when the cycling speed was 8 km h–1?
3. What was the change in breathing rate when the cyclist changed from 10 to 20 km h–1? Express this as a percentage.
4. At what speed did the breathing rate start to increase?
5. The tidal volume increased linearly with cycling speed up to about 10 km h–1. Calculate the increase in volume for each increase in speed of 1 km h–1.
6. For this initial linear section, what is the equation of the tidal volume line? Hint: use *y*=*mx* + *c*
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