



The Distance Learning Centre

LEARNING MATERIALS

Course: Biology Double and Single award

Subject: Biology

Topic 1: Sample Materials



Essential reading:

The essential textbook for this topic is either:

Edexcel International GCSE (9-1) Biology (Student Book) (2017) by Jackie Clegg, Sue Kearsey, Gareth Price and Mike Smith. Published by Harper Collins. ISBN-10: 0008236194; ISBN-13: 978-0008236199.

Or

Edexcel International GCSE (9-1) Biology student book, Phil Bradfield and Steve Potter. Pearson Education Ltd (2017) ISBN: 9780435185084


Edexcel International GCSE (9-1) Science Double Award by Brian Arnold, Phil Bradfield, Jim Clark, Penny Johnson, Steve Owen Steve potter, Steve Wolley and Rachel Yu. Pearson Education Ltd (2017) ISBN: 9780435185282,

To find the answers to the questions in the text book you must activate your on-line account and find the answers in the on-line text.



Recommended reading:

[Recommended reading](#) for this topic is listed in the back pages of these learning materials.

If you see this icon  you will be able to listen to how the word is pronounced



Further resources:

Further resources to deepen your learning on specific aspects of this topic are listed throughout these learning materials.



Read and make notes:

Making notes turns reading into studying. Notes should be brief, clear and helpful.

To help your understanding:

- rewrite or summarise what you have learned (avoid copying what you have read)
- note down any questions your studying has raised, either to ask your tutor, or to develop into further research

To help you to remember:

- sum things up to improve long term memory
- write things down to aid motor memory
- use colour, images or patterns to help visual memory

To help you in your assessments:

- record where you will find information (e.g. page numbers)
- keep your notes organised and easy to navigate
- highlight where further reading and research are needed, including any recommended or further reading

use your notes to help you get started on your TAQs



Sample Contents Page

Introduction.....	Error! Bookmark not defined.
1. Characteristics of living organisms	1
1.1 Movement.....	1
1.2 Reproduction.....	1
1.3 Sensitivity	2
1.4 Homeostasis	2
1.5 Growth.....	2
1.6 Respiration	2
1.7 Excretion	3
1.8 Nutrition	3
2. Variety of living organisms	6
2.1 The 'five kingdoms'.....	6
2.2 Cell structures and their functions	6
2.3 The five kingdoms in more detail	Error! Bookmark not defined.
2.3.1 Plants.....	Error! Bookmark not defined.
2.3.2 Animals.....	Error! Bookmark not defined.
2.3.3 Fungi.....	Error! Bookmark not defined.
2.3.4 Protocista.....	Error! Bookmark not defined.
2.3.5 Bacteria (Prokaryotes).....	Error! Bookmark not defined.
2.4 Viruses	Error! Bookmark not defined.
2.5 Pathogens	Error! Bookmark not defined.
Recommended reading	10
Sources and credits.....	10

1. Characteristics of living organisms



Ready, steady, go!

In this section, we will begin by studying the basic principles of biology which are characteristics of life. These are those characteristics that differentiate between living and non-living organisms. This covers section 1.1 of the syllabus

The eight characteristics of living organisms are:

Movement	<p>A good way to remember the eight characteristics of life is to use the acronym, MRS. H. GREN.</p> <p>This gives you the first letter of each of the eight characteristics.</p>
Reproduction	
Sensitivity	
Homeostasis	
Growth	
Respiration	
Excretion	
Nutrition	

Let's look at each of them in turn.

1.1 Movement

Both animals and plants are able to move. Animals can move quickly and from one place to another in search of food, shelter and favourable conditions. Plants, on the other hand, are rooted to a spot and move much more slowly, by responding to external stimuli such as light.

1.2 Reproduction

All animals and plants can reproduce. They multiply in number by producing the next generation of offspring, thus carrying on their genes and ensuring the continuation of their



species. Plants do this by producing seeds, which give rise to new plants of the same species.

Broadly speaking, reproduction is of two main types:

- **Sexual reproduction:** this involves two parents, and the union of two gametes (for example, in human beings).
- **Asexual reproduction:** this is where one parent reproduces itself (for example in strawberry plants and spider plants).

1.3 Sensitivity

Sensitivity means having an awareness of changes in external environments (i.e. the ability to respond to surroundings). Animals respond more quickly to stimuli such as heat, light, touch and chemicals. Plants appear less sensitive and respond more slowly to stimuli such as the direction of sunlight. However, some plants (such as the Venus flytrap) also respond to touch.

1.4 Homeostasis

This is the control of internal conditions (inside the organism) to maintain the best conditions for all of the chemical reactions inside cells. This could include correct water or sugar balance or regulation of temperature.

1.5 Growth

Growth is the increase in size or mass of an organism – such as the growth from a young to an adult animal, or from a seedling to a mature plant.

1.6 Respiration

Energy contained in food is 'unlocked' or 'transferred' to the organism by the process of respiration. Respiration is the breakdown of food (sugar, also known as glucose) using oxygen to produce energy. The energy is then used by the body to drive further chemical reactions.

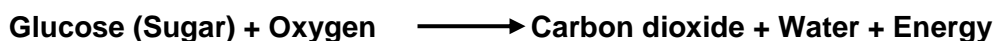
Respiration takes place in the mitochondria of the cell. The energy is released in a controlled way via a series of reactions.

Carbon dioxide and water are also produced during respiration. Carbon dioxide is removed from the body by the lungs, while some of the water is removed from the body and some is used by the body.

There are two types of respiration:

1. **Aerobic respiration** uses oxygen and releases a large amount of energy.
2. **Anaerobic respiration** does not use oxygen and releases much less energy.

The equation for respiration is:



1.7 Excretion

Thousands of chemical reactions take place inside body cells, producing both useful and waste substances. If these accumulate they can be harmful. Excretion deals with this by getting rid of metabolic waste produced by the body, such as urine and carbon dioxide. (Be aware that getting rid of faeces or undigested food is called **egestion**, not excretion).



Important point:

Respiration is not breathing. Breathing (or ventilation) is the intake of oxygen and the removal of carbon dioxide by the lungs. Respiration is as described above (i.e. the breakdown of glucose to release energy). Breathing is involved in respiration in that it provides the oxygen required by respiration and removes the carbon dioxide produced by respiration.

1.8 Nutrition

Both animals and plants need food as a source of energy and growth. Plants make their own food by **photosynthesis**, taking in simple substances like carbon dioxide and water and building them into complex carbohydrate molecules.

Animals cannot make their own food and therefore rely on eating plants or other animals. Animals take in complex substances and break them down into simple, soluble molecules which can be used as a source of energy.



SAQ 1:

1. Which of the following are not characteristics of all living organisms?

- | | | |
|---------------------|----------------|-------------------|
| a) growth | d) egg-laying | d) photosynthesis |
| b) warm-bloodedness | e) respiration | e) excretion |
| c) reproduction | f) sensitivity | f) feeding |



SAQ 2:

Link the descriptions in the specification to the eight characteristics

Specification description	Characteristic
The require nutrition	
The respire	
They excrete their waste	
They respond to their surroundings	
They move	
They control their internal conditions	
They reproduce	
They grow and develop	



SAQ 3:

Which of the eight characteristics are shown by a lit candle, a deciduous tree in winter and a hibernating bear. Indicate with ticks or crosses

	M	Rep	S	H	G	Res	E	N
A lit candle								
A deciduous tree in winter								
A hibernating ground squirrel								



Read and make notes:

All the text books have a section on life processes There are some questions you should try your hand at the end of the section. In the Collins book (10-14) there are answers to the exam type questions in the back of the book for the Pearson's (3-6) the answers can be found on-line and are not in the text book its self.



Watch:

[IGCSE- Biology- Characteristics of Living Organisms](#)



In a nutshell:

This section has now clarified how organisms can be defined as living. Any organism which carries out all of the above processes is described as living.

2. Variety of living organisms



Ready, steady, go!

In this section, we will be looking at the system of classification which categorises all living organisms into 'five kingdoms'. We will also be studying about viruses which do not fit into any of the five kingdoms and are a separate category themselves. This covers 1.2-1.4 of the syllabus

All living organisms can be classified into a number of groups based on certain criteria. These groups are based on what an organism's cells are like.

2.1 The 'five kingdoms'

The simplest way to classify living organisms is according to the '**five kingdoms**': animals, plants, fungi, protocists and bacteria. Viruses are viewed separately, as they are described as 'being on the threshold of life'. Viruses cannot be described as living organisms until they invade a host cell.

All living organisms are made up of cells. All cells can be broadly separated into two categories: **animal cells** (including humans) and **plant cells**. These are eukaryotic cells because they have a nucleus. Bacterial and yeast cells have different structures to animal and plant cells. These are prokaryotic because they have no nucleus.

A cell is described as the 'basic functional unit of life,' which means that it is the smallest organism which is able to live (or in other words, the smallest living organism which is able to carry out the seven characteristics of life).

Organisms that are made up of more than one cell are multicellular and those that are made up of one cell only are unicellular

2.2 Cell structures and their functions

Cells are specialised to carry out specific functions, and they possess structures which are related to their functions. The study of cell structure and function is known as **cytology**.

Animal and plant cells have common features or structures such as a nucleus, cytoplasm, cell membrane, mitochondria and ribosomes. In addition, plant cells also have a cell wall, and often have chloroplasts and a permanent vacuole. Let's look at the diagrams below which show these structures:

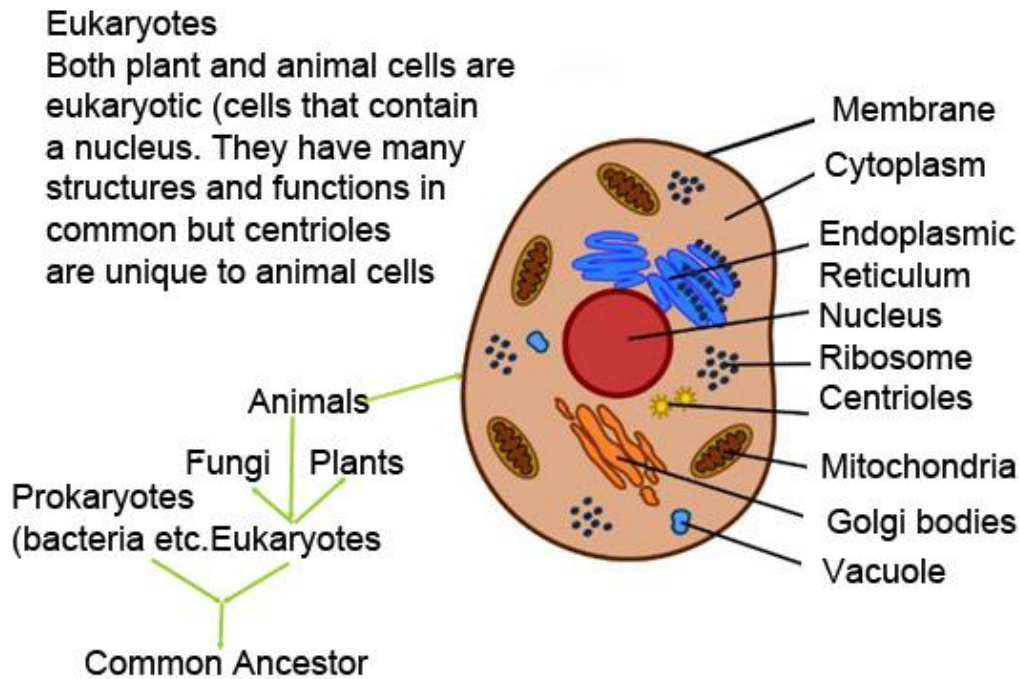


Figure 1: Animal cell structure

Diagram source - <https://owlcation.com/stem/Plant-Cells-vs-Animal-Cells-With-Diagrams>

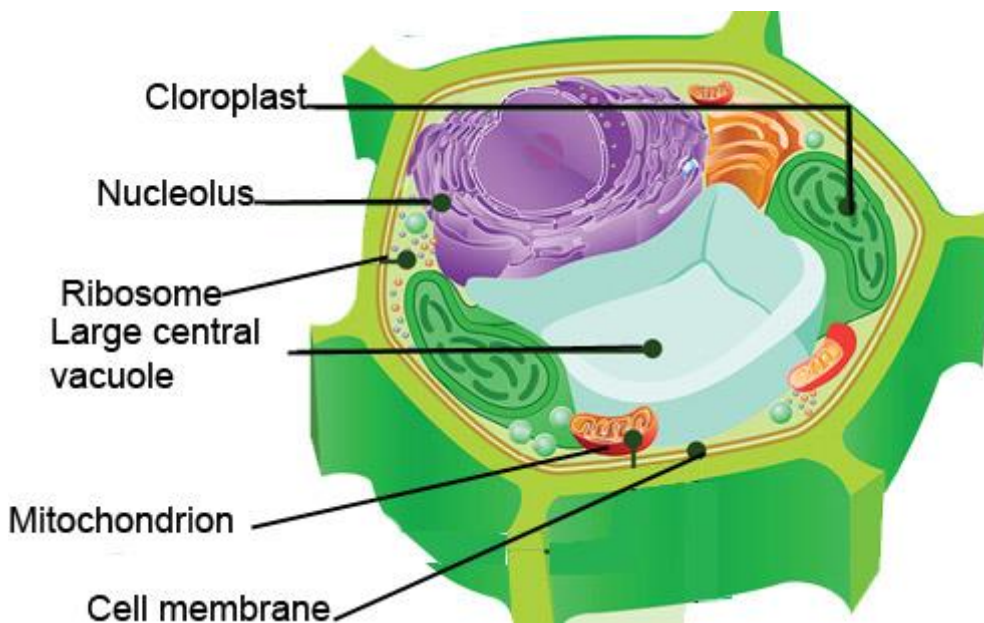


Figure 2: Plant cell structure

Diagram source - <https://biologywise.com/labeled-plant-cell-diagram-functions>

Some structures (or components) within both animal and plant cell share the same types of function, and some plant cells have additional functions.



Table 1: Functions of cell components which are common to both animal and plant cells:

Component	Function
Nucleus	Contains genetic material, which controls the activities of the cell. Known as the 'control centre of the cell'.
Cytoplasm	Chemical processes are controlled by enzymes and most of them take place in the cytoplasm.
Cell membrane	This controls the movement of substances out of and into the cell and is described as being 'selectively permeable'.
Mitochondria	This is where most energy is released by respiration. Mitochondria are known as the 'power houses' of the cell.
Ribosomes	These are the sites of protein synthesis (making or producing).

Table 2: additional components in plant cells – key examples:

Component	Function
Cell wall	The cell wall is made up of cellulose, which provides the plant cell with strength (also found in algae).
Chloroplasts	Contain the green pigment chlorophyll, which absorbs light energy for photosynthesis.
Permanent vacuole	Filled with cell sap to help keep the cell turgid (firm or swollen with water).



SAQ 4:

1. Which one of the following best describes the function of a cell membrane?
 - a) It keeps the cell in shape.
 - b) It controls the substances entering and leaving the cell.
 - c) It controls the substances entering the cell.
 - d) It supports the cell structures.

2. Which of the following structures are:
 - a) in plant and animal cells,
 - b) in plant cells but not in animal cells?

Course: **IGCSE Biology Single and Double Award**

Subject: **Biology**

Topic 1: **Sample Materials**

LEARNING MATERIALS



*cell wall, cytoplasm, cell membrane, mitochondria,
nucleus, central vacuole, chromosomes, cell sap*



Recommended reading

DLC resources

We have found that the best book for the single award is:

Edexcel IGCSE (9-1) Biology (Student Book) (2018) by Jackie Clegg, Sue Kearsey, Gareth Price and Mike Smith. Published by Collins. ISBN-978-0-00-823619-9.

- ***Supporting information for the Investigative Skills aspect of the course can be found in the textbook in the chapter on developing experimental skills (pages 380-404).***

The double award Text book is excellent for physics and chemistry but we have not found it as easy to use as the text above

Edexcel International GCSE (9-1) Science Double Award by Brian Arnold, Phil Bradfield, Jim Clark, Penny Johnson, Steve Owen Steve potter, Steve Wolley and Rachel Yu. Pearson Education Ltd (2017) ISBN: 9780435185282,

To find the answers to the questions in the text book you must activate your on-line account and find the answers in the on-line text.

Sources and credits

Image credits

Section 1: heading	Dake / Wikimedia Commons / CC-BY-SA-3.0
Section 2: heading	Emilian Robert Vicol / Wikimedia Commons / Public Domain
Figure 1	https://owlcation.com/stem/Plant-Cells-vs-Animal-Cells-With-Diagrams
Figure 2	https://biologywise.com/labeled-plant-cell-diagram-functions