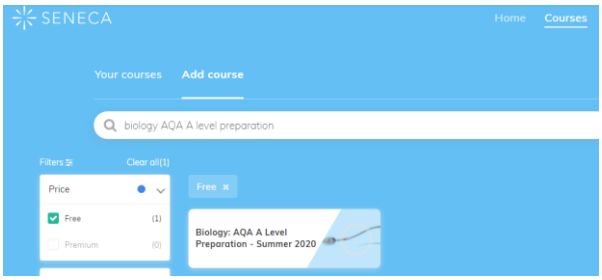
Biology A Level – Preparatory Work 2022

We are really pleased that you have enrolled onto A-level Biology. You are required to bring these completed tasks to your first biology lesson.

At college you will need to start taking responsibility for your own learning and in Biology will be required to prepare notes before coming to lessons. The aim of this is for you to refresh your memory of some of the biology you learned at GCSE and to introduce you to the style of learning you will encounter on the A-level course.

Task 1: Seneca learning - AQA A-level preparation

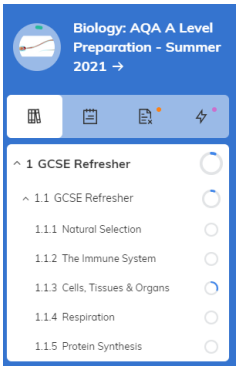
If you have used Seneca Learning for any of your GCSE subjects, then you can simply log into your account search for the following course:



…or click on the link below:
https://app.senecalearning.com/dashboard/courses/add?Price=Free&text=biology+AQA+Alevel+preparation

If you do not have an account, you can enrol for free – see the link below:
https://senecalearning.com/en-GB/

- To refresh your knowledge gained during your GCSE biology Course, **please complete section 1.1 GCSE Refresher course:** (this should take 15-25 minutes)



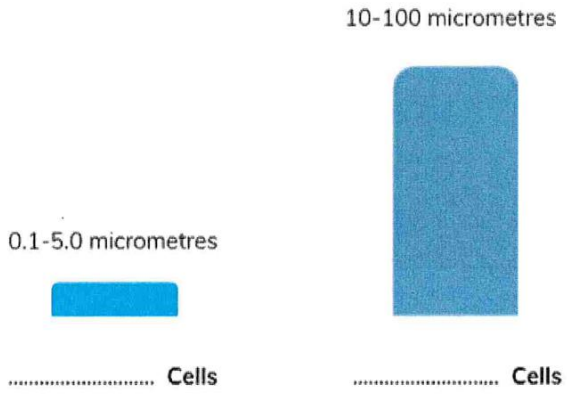
Throughout you're a-level studies you may wish to use Seneca to help consolidate your understanding of A-level biology using the following course:
Seneca - Learn 2x Faster (senecalearning.com)

Task 2: Types of cells

What can you remember from your Biology GCSE

See if you can use your GCSE knowledge to fill in the gaps below:

1. All living organisms are made up of …….
2. There are 2 main types of cells - eukaryotic cells and prokaryotic cells.
   Complete the Diagram

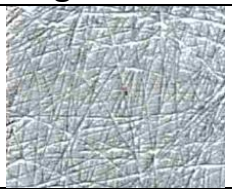
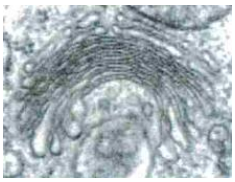
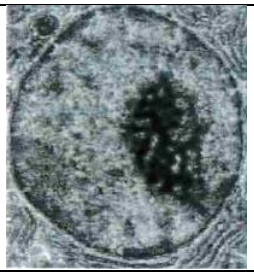
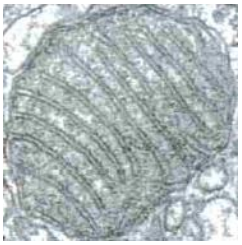


3. Below are some important questions for cell biology.
   Can you use your GCSE knowledge to answer them in the spaces provided?

What are the key features of a prokaryotic cell?	
Where is the genetic information held in prokaryotic cells?	
What kind of cells make up animals?	
What type of cells make up bacteria?	

Task 3: Cell Organelles

Use the internet to look up the structure and function of cell organelles to rearrange the table below. Each organelle name should align with the correct diagram, description of structure and description of function.

Organelle name	Organelle diagram	Description of structure	Description of function
Nucleus		A crescent shaped stack of flattened, membrane-bound sacs called cisternae.	Produce ATP during aerobic respiration
Mitochondrion		Contains DNA which is surrounded by a double membrane called a nuclear envelope. The nuclear envelope has pores which allow the movement of large molecules out of the nucleus.	Site of photosynthesis
Rough Endoplasmic Reticulum (RER)		Organelle found in nearly all cells surrounded by a double membrane consisting of an outer membrane & a highly folded inner membrane. Inside is a fluid matrix containing ribosomes & a loop of DNA.	Provides mechanical strength and support. Stops the cell bursting in dilute solutions i.e., prevents osmotic lysis.
Chloroplast		Composed of cellulose microfibrils in plant cells. These structures also have pores, called plasmodesmata, that allow the cytoplasm of adjacent cells to connect.	Contains the genetic material that is passed on from one generation to the next & provides the code for protein synthesis
Cell wall		Large organelle surrounded by a double membrane. Contains a gel-like fluid called the stroma and internal membranes called thylakoids; these contain chlorophyll.	Site of protein synthesis and used as a transport system for proteins
Golgi body		Consists of a series of flattened, membrane-bound sacs (cisternae) that are linked to the nuclear envelope. This type of ER has ribosomes studded into its membranes.	A variety of functions but its main role is chemically modifying & packaging proteins to be exported from the cell.

Task 4: Prokaryotes and Viruses

You will be given a copy of a textbook to use during the course. Below are scans of pages from an A-level textbook. Your task is to make notes from these pages, summarising the structure of a prokaryotic cell and a virus.

3.6 Prokaryotic cells and viruses

Learning objectives

- → Describe the structure of prokaryotic cells.
- → Distinguish prokaryotic cells from eukaryotic ones.

Specification reference: 3.2.1.2

Although cells come in a diverse variety of size, shape and function, they are of two main types:

- **Eukaryotic cells** are larger and have a nucleus bounded by nuclear membranes (nuclear envelope).
- **Prokaryotic** cells are smaller and have no nucleus or nuclear envelope.

The structure of a generalised prokaryotic cell is shown in Figure 1. The differences between prokaryotic and eukaryotic cells are listed in Table 1.

Structure of a bacterial cell

Bacteria occur in every habitat in the world – they are versatile, adaptable and very successful. Much of their success is a result of their small size, normally ranging from 0.1 to10 µm in length. Their cellular structure is relatively simple (Figure 1). All bacteria possess a **cell wall**, which is made up of murein. This is a polymer of polysaccharides and peptides. Many bacteria further protect themselves by secreting a **capsule** of mucilaginous slime around this wall.

Inside the cell wall is the **cell-surface membrane**, within which is the cytoplasm that contains 70S ribosomes. These ribosomes are smaller than those in the cytoplasm of eukaryotic cells (80S), but nevertheless still synthesise proteins. Bacteria store food reserves as glycogen granules and oil droplets. The genetic material in bacteria is in the form of a **circular strand of DNA**. Separate from this are smaller circular pieces of DNA, called **plasmids**. These can reproduce themselves independently and may give the bacterium resistance to harmful chemicals, such as antibiotics. Plasmids are used extensively as vectors (carriers of genetic information) in genetic engineering. The roles of the main structures in a bacterial cell are summarised in Table 2.

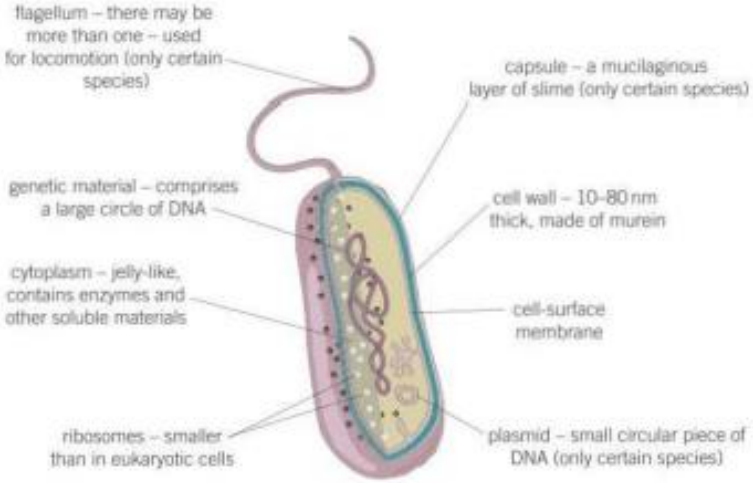
▼ **Table 1** *Comparison of prokaryotic and eukaryotic cells*

Prokaryotic cells	Eukaryotic cells
no true nucleus, only an area where DNA is found	distinct nucleus, with a nuclear envelope
(Pro) DNA is not associated with proteins	DNA is associated with proteins called histones.
some DNA may be in the form of circular strands called plasmids	There are no plasmids and DNA is linear.
no membrane-bounded organelles	membrane-bounded organelles, such as mitochondria, are present
no chloroplasts, only bacterial chlorophyll associated with the cell-surface membrane in some bacteria	chloroplasts present in plants and algae
ribosomes are smaller (70S)	ribosomes are larger (80S)
cell wall made of **murein** (peptidoglycan)	where present, cell wall is made mostly of cellulose (or chitin in fungi)
may have an outer mucilaginous layer called a capsule	no capsule

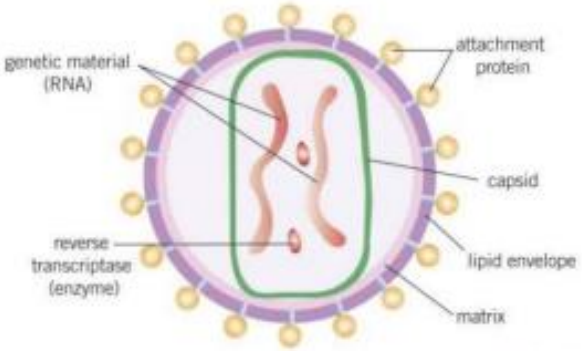
▼ **Table 2** *Roles of structures found in a bacterial cell*

Cell structure	Role
cell wall	physical barrier that excludes certain substances and protects against mechanical damage and osmotic lysis
capsule	protects bacterium from other cells and helps groups of bacteria to stick together for further protection
cell-surface membrane	acts as a differentially permeable layer, which controls the entry and exit of chemicals
circular DNA	possesses the genetic information for the replication of bacterial cells
plasmid	possesses genes that may aid the survival of bacteria in adverse conditions, e.g. produces enzymes that break down antibiotics

▲ **Figure 2** *False-colour TEM of the cholera bacterium,* Vibrio cholerae



▲ **Figure 1** *Structure of a generalised bacterial cell*



▲ **Figure 3** *Structure of the human immunodeficiency virus [HIV]*

Viruses

Viruses are acellular, non-living particles. They are smaller than bacteria, ranging in size from 20–300 nm. They contain **nucleic acids** such as DNA or RNA as genetic material but can only multiply inside living host cells. The nucleic acid is enclosed within a protein coat called the **capsid**. Some viruses, like the human immunodeficiency virus, are further surrounded by a lipid envelope. The lipid envelope, or if this is not present, the capsid, have **attachment proteins** which are essential to allow the virus to identify and attach to a host cell.

Maths link

MS 0.1, see Chapter 22.

Summary questions

1 Table 3 lists some of the features of cells. For the letter in each box, write down **one** of the following:
'present' if the feature always occurs
'absent' if it never occurs
'sometimes' if it occurs in some cells but not others.

▼ **Table 3** *Features of prokaryotic and eukaryotic cells*

Feature	Prokaryotic cell	Eukaryotic cell
nuclear envelope	A	B
cell wall	C	D
flagellum	E	F
ribosomes	G	H
plasmid	I	J
cell-surface membrane	K	L
mitochondria	M	N

2 If a bacterium is 6 µm long and a virus is 150 nm long, calculate how many times larger the bacterium is than the virus.