

# AQA Biology GCSE

## 1.1 - Cell Structure

### Flashcards



# What are the two types of cells?



# What are the two types of cells?

- Eukaryotic (plant and animal)
- Prokaryotic (bacteria)



What are the differences between eukaryotic and prokaryotic cells?



What are the differences between eukaryotic and prokaryotic cells?

Prokaryotic cells are much smaller than eukaryotic cells.

Eukaryotic cells contain membrane bound-organelles and a nucleus containing genetic material, while prokaryotes do not.



What is the prokaryotic cell wall composed of?



What is the prokaryotic cell wall composed of?

Peptidoglycan



How is genetic information stored in a prokaryotic cell?





# How is genetic information stored in a prokaryotic cell?

Found free within the cytoplasm as:

- Chromosomal DNA (single large loop of circular DNA)
- Plasmid DNA



# What are plasmids?



# What are plasmids?

- Small, circular loops of DNA found free in the cytoplasm and separate from the main DNA.
- Carry genes that provide genetic advantages e.g. antibiotic resistance.



# What is order of magnitude?



# What is order of magnitude?

A power to the base 10 used to quantify and compare size.



# What is a centimetre (cm)?



What is a centimetre (cm)?

$1 \times 10^{-2}$  metres



# What is a millimetre (mm)?





What is a millimetre (mm)?

$1 \times 10^{-3}$  metres



# What is a micrometre ( $\mu\text{m}$ )?



What is a micrometre ( $\mu\text{m}$ )?

$1 \times 10^{-6}$  metres



# What is a nanometre (nm)?



What is a nanometre (nm)?

$1 \times 10^{-9}$  metres



What is the difference in order of magnitude between a human hair ( $100\ \mu\text{m}$ ) and the HIV virus (length =  $100\ \text{nm}$ )?



What is the difference in order of magnitude between a human hair (length =  $100\ \mu\text{m}$ ) and the HIV virus (length =  $100\ \text{nm}$ )?

$$100\ \mu\text{m} = 10^{-4}\ \text{m}$$

$$100\ \text{nm} = 10^{-7}\ \text{m}$$

$$-4 - (-7) = -4 + 7 = \underline{\underline{3}}$$



List the components of both plant and animal cells (5)





List the components of both plant and animal cells  
(5)

- Nucleus
- Cytoplasm
- Cell membrane
- Mitochondria
- Ribosomes



List the additional cell components found  
in plant cells (3)



List the additional cell components found in plant cells (3)

- Chloroplasts
- Permanent vacuole
- Cell wall



Other than storing genetic information,  
what is the function of the nucleus?



Other than storing genetic information, what is the function of the nucleus?

Controls cellular activities



# Describe the structure of the cytoplasm



## Describe the structure of the cytoplasm

- Fluid component of the cell.
- Contains organelles, enzymes and dissolved ions and nutrients.



# What is the function of the cytoplasm?





What is the function of the cytoplasm?

Site of cellular reactions e.g. first stage of respiration.

Transport medium.



# What is the function of the cell membrane?



What is the function of the cell membrane?

Controls the entry and exit of materials into and out of the cell.



# What is the function of the mitochondria?



What is the function of the mitochondria?

Site of later stages of aerobic respiration  
in which ATP is produced.



# What is the function of the ribosomes?



What is the function of the ribosomes?

Joins amino acids in a specific order during translation for the synthesis of proteins.



# What is the plant cell wall made of?





What is the plant cell wall made of?

Cellulose



What is the function of the plant cell wall?



# What is the function of the plant cell wall?

- Provides strength.
- Prevents the cell bursting when water enters by osmosis.



What does the permanent vacuole  
contain?



What does the permanent vacuole contain?

Cell sap (a solution of salts, sugars and organic acids).



What is the function of the permanent vacuole?



What is the function of the permanent vacuole?

Supports the cell, maintaining its turgidity.



# What is the function of chloroplasts?





# What is the function of chloroplasts?

## Site of photosynthesis



Describe how sperm cells in animals are adapted to their function



# Describe how sperm cells in animals are adapted to their function

- **Haploid nucleus** contains genetic information.
- **Tail** enables movement.
- **Mitochondria** provide energy for tail movement.
- **Acrosome** contains enzymes that digest the egg cell membrane.



Describe how nerve cells in animals are adapted to their function



# Describe how nerve cells in animals are adapted to their function

- **Long axon** allows electrical impulses to be transmitted all over the body from the central nervous system.
- **Dendrites** from the cell body connect to and receive impulses from other nerve cells, muscles and glands.
- **Myelin sheath** insulates the axon and speeds up the transmission of impulses along the nerve cell.



Describe how muscle cells in animals  
are adapted to their function



## Describe how muscle cells are adapted to their function

- **Arrangement of protein filaments** allows them to slide over each other to produce muscle contraction.
- **Mitochondria** to provide energy for muscle contraction.
- **Merged cells in skeletal muscle** allow muscle fibre contraction in unison.



Describe how root hair cells in plants are adapted to their function





Describe how root hair cells in plants are adapted to their function

- **Large surface area** to absorb nutrients and water from surrounding soil.
- **Thin walls** that do not restrict water absorption.



Describe how xylem cells in plants are adapted to their function



Describe how xylem cells in plants are adapted to their function

- **No upper or lower margins between cells** to provide a continuous route for water to flow.
- **Thick, woody side walls** strengthen their structure and prevent collapse.



Describe how phloem cells in plants are adapted to their function



Describe how phloem cells in plants are adapted to their function

- **Sieve plates** let dissolved amino acids and sugars be transported up and down the stem.
- **Companion cells** provide energy needed for active transport of substances along the phloem.



# What is cell differentiation?



# What is cell differentiation?

The process by which cells become specialised.



# Why is cell differentiation important?





# Why is cell differentiation important?

Allows production of different tissues and organs that perform various vital functions in the human body.



At what point in their life cycle do most animal cells differentiate?



At what point in their life cycle do most animal cells differentiate?

Early in their life cycle



For how long do plant cells retain the ability to differentiate?



For how long do plant cells retain the ability to differentiate?

Throughout their entire life cycle



What is the purpose of cell division in mature animals?



What is the purpose of cell division in mature animals?

Repair and replacement of cells



What changes does a cell go through as it differentiates?





What changes does a cell go through as it differentiates?

Becomes specialised through acquisition of different sub-cellular structures to enable a specific function to be performed by the cell.



# Define magnification



## Define magnification

The number of times bigger an image appears compared to the size of the real object.



# Define resolution



## Define resolution

The smallest distance between two objects that can be distinguished.



# How does a light microscope work?



## How does a light microscope work?

Passes a beam of light through a specimen which travels through the eyepiece lens, allowing the specimen to be observed.



What are the advantages of light microscopes? (4)





## What are the advantages of light microscopes? (4)

- Inexpensive
- Easy to use
- Portable
- Observe both dead and living specimens



What is the disadvantage of light microscopes?



# What is the disadvantage of light microscopes?

## Limited resolution



# How does an electron microscope work?



# How does an electron microscope work?

It uses a beam of electrons which are focused using magnets. The electrons hit a fluorescent screen which emits visible light, producing an image.



Name the two types of electron microscope



Name the two types of electron microscope

Transmission electron microscope (TEM)

Scanning electron microscope (SEM)



What is the advantage of electron microscopes?





What is the advantage of electron microscopes?

Greater magnification and resolution.



Why do electron microscopes have a greater magnification and resolution?



Why do electron microscopes have a greater magnification and resolution?

They use a beam of electrons which has a shorter wavelength than photons of light.



How have electron microscopes enabled scientists to develop their understanding of cells?



# How have electron microscopes enabled scientists to develop their understanding of cells?

- Allow small sub-cellular structures (e.g. mitochondria, ribosomes) to be observed in detail.
- Enable scientists to develop more accurate explanations about how cell structure relates to function.



What are the disadvantages of electron microscopes? (4)



## What are the disadvantages of electron microscopes? (4)

- Expensive
- Large so less portable
- Require training to use
- Only dead specimens can be observed



# How can magnification be calculated?





How can the magnification of an image be calculated?

magnification =

size of image / size of real object



# What is standard form?



# What is standard form?

A way of expressing numbers - written as a figure between 1 and 10 multiplied by a positive or negative power of 10.



Write 0.005 in standard form



Write 0.005 in standard form

$$0.005 = 5 \times 10^{-3}$$

The diagram shows the number 0.005 with three red arcs above it. The first arc is labeled '1' and spans from the first zero to the second zero. The second arc is labeled '2' and spans from the second zero to the third zero. The third arc is labeled '3' and spans from the third zero to the digit 5. This illustrates that the decimal point has been moved three places to the right to place the digit 5 in front of the decimal point.



Write 10382 in standard form



Write 10382 in standard form

$$10382 = 1.0382 \times 10^4$$

The number 10382 is shown with red arcs above it, labeled with powers of 10: 4 above the first zero, 3 above the 3, 2 above the 8, and 1 above the 2.



How do bacteria multiply? (biology only)





How do bacteria multiply? (biology only)

Binary fission (simple cell division)



How often do bacteria multiply?  
(biology only)



How often do bacteria multiply? (biology only)

Once every 20 minutes if enough nutrients are available and the temperature is suitable.



State 2 ways in which bacteria can be  
grown (biology only)



State 2 ways in which bacteria can be grown  
(biology only)

- Nutrient broth solution
- Colonies on an agar gel plate



What nutrients make up a nutrient broth solution?



What nutrients make up a nutrient broth solution?

All nutrients required for bacteria to grow including nitrogen for protein synthesis, carbohydrates for energy and other minerals.



What are uncontaminated cultures of  
microorganisms needed for?  
(biology only)





What are uncontaminated cultures of microorganisms needed for? (biology only)

Investigating disinfectant and antibiotic action.



Describe the preparation of an uncontaminated culture using aseptic technique



# Describe the preparation of an uncontaminated culture using aseptic technique

1. Use pre-sterilised plastic Petri dishes or sterilise glass Petri dishes and agar gel before using with an autoclave.
2. Pour the sterile agar gel into the Petri dish and allow time to set.
3. Sterilise the inoculating loop by passing it through a Bunsen burner flame.
4. Dip the inoculating loop into the solution of microorganisms and make streaks with the loop on the surface of the agar.
5. Put the lid on the Petri dish and secure it with tape. Label accordingly then turn and store upside down.
6. Incubate the culture at 25°C in school laboratories.



Why must Petri dishes and culture media be sterilised before use?



Why must Petri dishes and culture media be sterilised before use?

To kill any bacteria already present.



Why must inoculating loops be sterilised  
by passing them through a Bunsen  
burner flame?



Why must inoculating loops be sterilised by passing them through Bunsen burner flame?

To kill any bacteria present on the inoculating loop.



Why must the Petri dish lid be secured with tape and the whole dish stored upside down?





Why must the Petri dish lid be secured with adhesive tape and the whole dish stored upside down?

Stops bacteria in the air contaminating the culture.

The lid is not fully sealed to prevent the growth of anaerobic bacteria in a lack of oxygen.

Upside down to prevent condensation from forming and dripping down onto the colonies.



Why are cultures incubated at  $25^{\circ}\text{C}$  in school laboratories?



Why are cultures incubated at 25°C in school laboratories?

Harmful pathogens are less likely to grow at this temperature.



What is the formula used to calculate cross-sectional area of a bacterial colony or clear area around a bacterial colony?



What is the formula used to calculate cross-sectional area of a bacterial colony or clear area around a bacterial colony?

$$\pi r^2$$

$$= 3.14$$

$r$  = radius (diameter/2)



How is the number of bacteria in a population after a certain time calculated from the mean division time?



# How is the number of bacteria in a population after a certain time calculated from the mean division time?

1. Calculate the number of times the bacteria will divide in the given time period from the mean division time.
2. Use the following equation to calculate the number of bacteria:

Number of bacteria in population at end of time period = number of bacteria at the beginning of the time period  $\times 2^{\text{number of divisions in the time period}}$

Express the answer in standard form if possible.



Calculate the number of bacteria that will be present after 3 hours for a population that divides every 15 mins and has 5 bacterium present now





Calculate the number of bacteria that will be present after 3 hours for a population that divides every 15 minutes and has 5 bacterium present now

$$15 \text{ minutes} = 0.25 \text{ hours}$$

$$3 / 0.25 \text{ hours} = 12 \text{ divisions}$$

$$5 \times 2^{12} = 20480 \text{ or } 2.048 \times 10^4$$

