

Edexcel IAL Biology A-level

3.1-3.8 - Cell Structure and Microscopy

Flashcards

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What are cells?



What are cells?

Cells are the basic units of all living organisms. All cells contain genetic information in a **nucleus** or **nucleoid**, a cytoplasm and ribosomes



What is a tissue?



What is a tissue?

A group of similar cells which work together to perform a specific function
e.g. muscle tissue, xylem tissue



What is an organ?



What is an organ?

A group of tissues which work together to perform a specific function e.g. brain, heart, kidney



What is an organ system?



What is an organ system?

A group of organs that work together to perform a particular function e.g. nervous system, digestive system



State 8 organelles found in animal cells

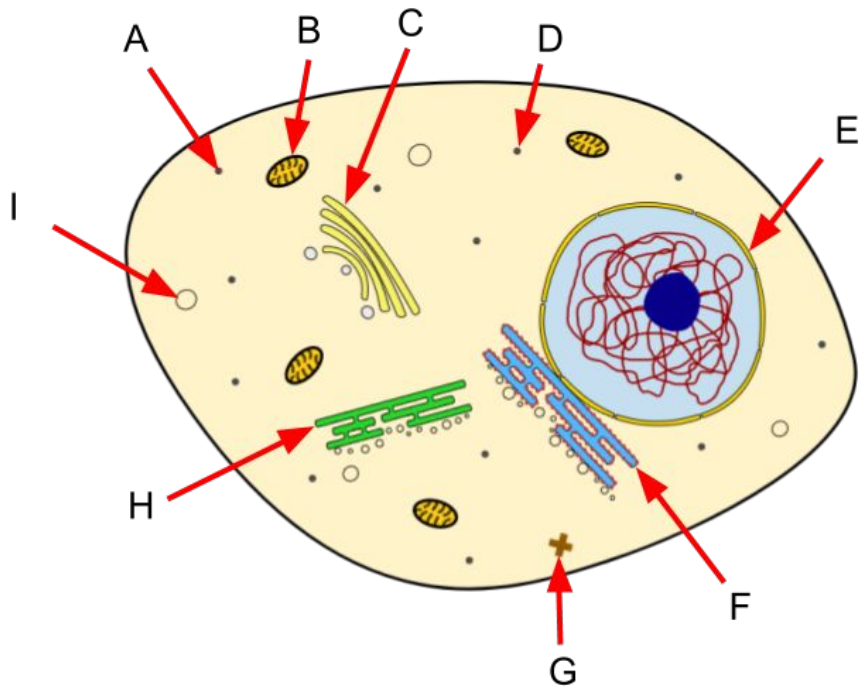


State 8 organelles found in animal cells

- Nucleus
- Mitochondria
- Ribosomes
- Rough endoplasmic reticulum
- Smooth endoplasmic reticulum
- Golgi body
- Centrioles
- Lysosomes

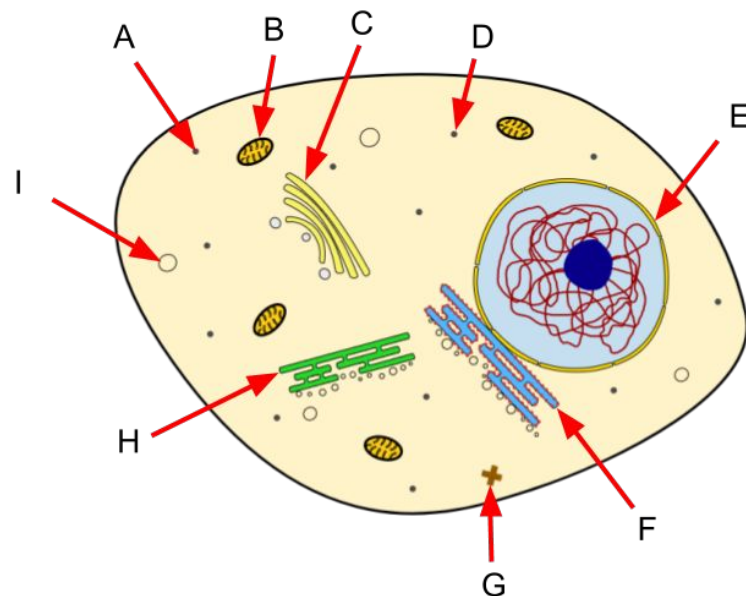


Label the diagram of the cell below

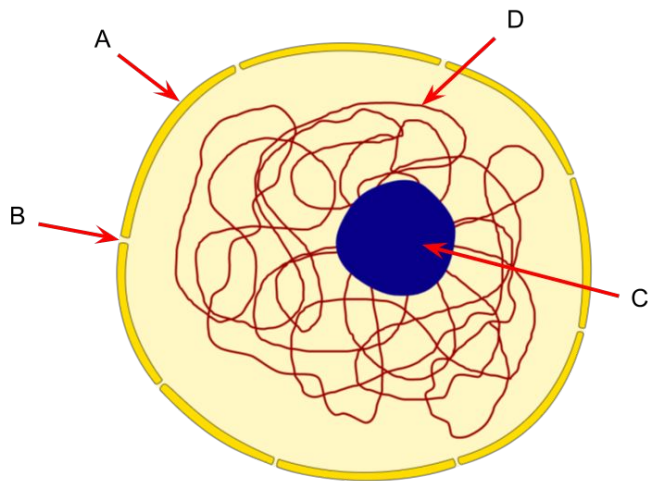


Label the diagram of the cell below

A	Ribosome	B	Mitochondrion
C	Golgi body	D	Cytoplasm
E	Nucleus	F	Rough endoplasmic reticulum
G	Centrioles	H	Smooth endoplasmic reticulum
I	Vesicle/lysosome		

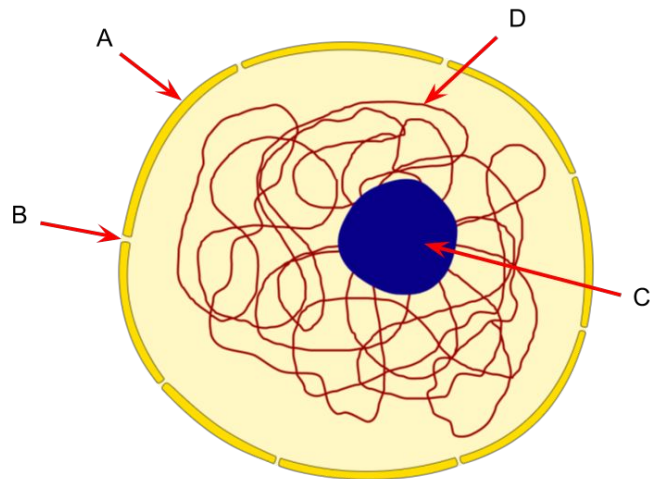


Label this diagram of the nucleus



Label this diagram of the nucleus

A	Nuclear envelope
B	Nuclear pore
C	Nucleolus
D	DNA stored as chromatin



What is the function of the nucleus?



What is the function of the nucleus?

To store and transmit genetic material



What is the function of the nuclear pores?



What is the function of the nuclear pores?

To allow substances to enter and exit the nucleus



What is chromatin?



What is chromatin?

DNA wrapped around histone proteins

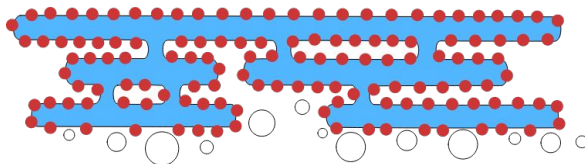


Describe the structure and function of the rough endoplasmic reticulum



Describe the structure and function of the rough endoplasmic reticulum

- Studded with ribosomes (shown in red on the diagram)
- Made up of membranes folded into cisternae
- Synthesises proteins destined to be secreted

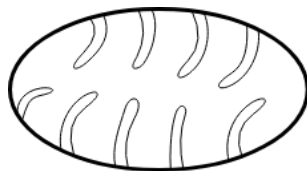


Describe the structure and function of the mitochondria



Describe the structure and function of the mitochondria

- Double membrane folded into cristae
- Fluid-filled matrix inside
- Contains its own DNA (mtDNA)
- Site of ATP production through aerobic respiration



What is the function of lysosomes?



What is the function of lysosomes?

Lysosomes contain hydrolytic enzymes that break down waste



What is the function of vesicles?



What is the function of vesicles?

To transport substances within cells



What is the structure and function of ribosomes?



What is the structure and function of ribosomes?

- Two units made of protein and rRNA (ribosomal ribonucleic acid)
- Synthesise proteins



Describe the structure of the golgi body



Describe the structure of the golgi body

- It is a membrane-bound organelle
- It is folded into cisternae



What is the function of the golgi body?



What is the function of the golgi body?

It modifies and processes lipids and proteins and packages them into vesicles



Describe the structure and function of lysosomes



Describe the structure and function of lysosomes

Membrane-bound vesicles that contain hydrolytic enzymes that break down waste and toxins

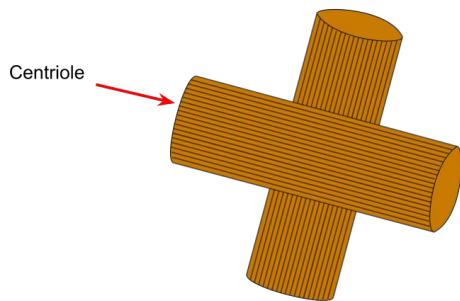


Describe the structure of centrioles

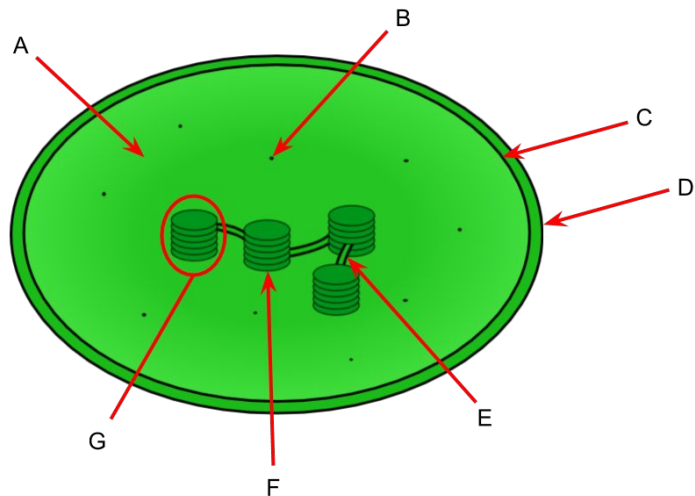


Describe the structure of centrioles

- A cylindrical bunch of protein called tubulin
- Often found in pairs which makes up a structure called a centrosome

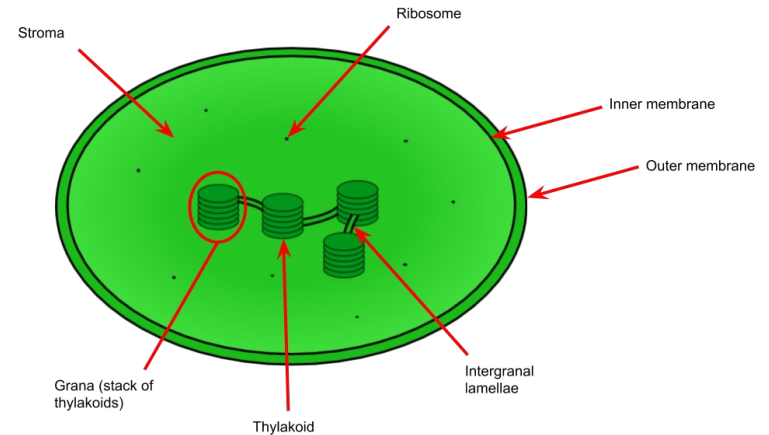


Label this diagram of a chloroplast



Label this diagram of a chloroplast

A	Stroma	E	Intergranal lamellae
B	Ribosome	F	Thylakoid
C	Inner membrane	G	Grana
D	Outer membrane		



What is an intracellular enzyme?



What is an intracellular enzyme?

An enzyme that acts within cells e.g. catalase.



What is an extracellular enzyme?



What is an extracellular enzyme?

An enzyme that is secreted by cells and functions outside of cells e.g. amylase



Describe the steps involved in the production of an **extracellular** enzyme

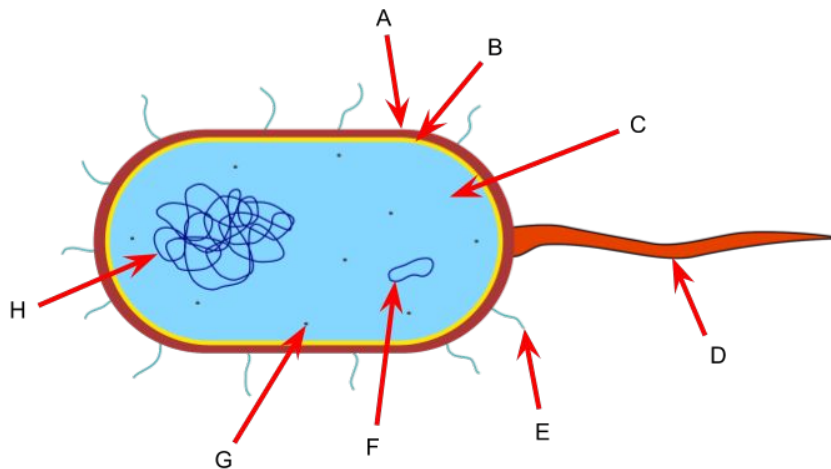


Describe the steps involved in the production of an **extracellular** enzyme

- 1) DNA transcribed to produce mRNA in the nucleus
- 2) mRNA exits the nucleus and travels to a ribosome on the rough endoplasmic reticulum (rER)
- 3) Enzyme synthesised by the ribosomes on the rER in the process of translation
- 4) Enzyme is packaged into a vesicle and sent to the golgi apparatus where it is modified and repackaged.
- 5) The enzyme then leaves the golgi apparatus enclosed in a vesicle and undergoes exocytosis to exit the cell

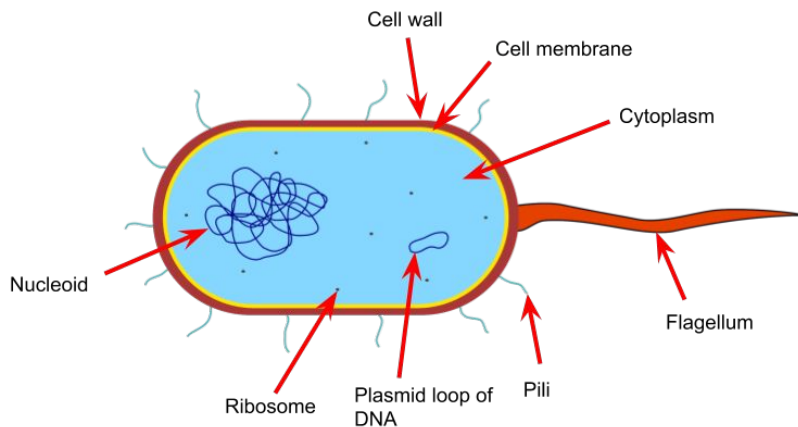


Label this diagram of a prokaryotic cell



Label this diagram of a prokaryotic cell

A	Cell wall (on the outside)	E	Pili
B	Cell membrane (on the inside)	F	Plasmid loop of DNA
C	Cytoplasm	G	Ribosome
D	Flagellum	H	Nucleoid



What is the function of the flagellum?



What is the function of the flagellum?

The flagellum is used to move the cell



What is the function of the pili?



What is the function of the pili?

Pili allow the bacteria to adhere to other cells or to surfaces



What is the function of plasmid DNA?



What is the function of plasmid DNA?

To provide beneficial genes which aid in the survival of the prokaryote. For example, the genes which provide antibiotic resistance



What is the function of the bacterial capsule?



What is the function of the bacterial capsule?

- It prevents the cell from dry environments
- It acts as a **virulence factor** which helps it to resist phagocytosis



What is the magnification of a microscope a measurement of?



What is the magnification of a microscope a measurement of?

How many times bigger an image appears compared to the original object.



What is the formula for calculating magnification?

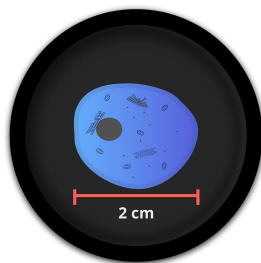


What is the formula for calculating magnification?

Image size = Actual size x Magnification



What is the actual width of this cell in micrometers (μm) if the width of the image is **2cm** and the magnification used is **400x**?



What is the actual width of this cell in **micrometers (μm)** if the width of the image is 2cm and the magnification used is 400x?

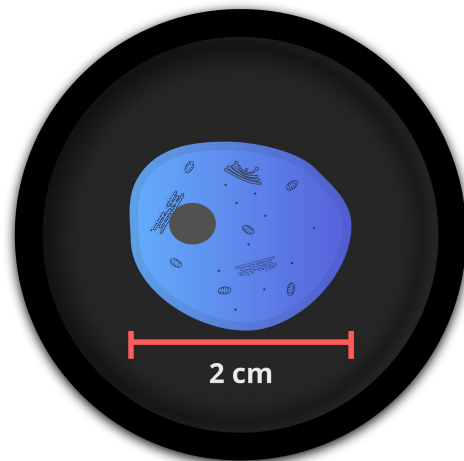
$$2\text{cm} = 20\text{mm} = 20,000 \mu\text{m}$$

$$I = A \times M \text{ rearranges to } A = I / M$$

$$\text{Image size} = 20,000 \mu\text{m}$$

$$\text{Magnification} = 400\text{x}$$

$$20,000 / 400 = 50$$



What is the purpose of staining specimens?



What is the purpose of staining specimens?

- To visually distinguish different parts of a specimen
- To increase contrast as lots of cellular components are transparent



What is differential staining?



What is differential staining?

A form of staining used to distinguish between different parts of a specimen using different types of stains.



How do light microscopes work?

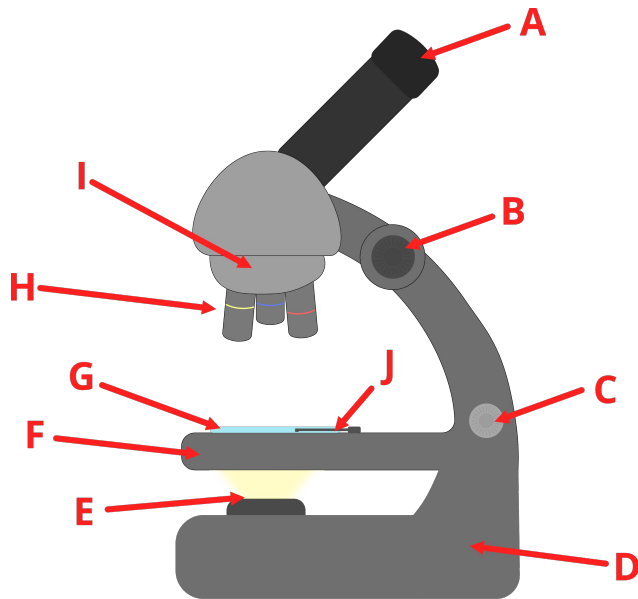


How do light microscopes work?

A type of microscope which uses lenses to magnify **visible light** passed through a specimen

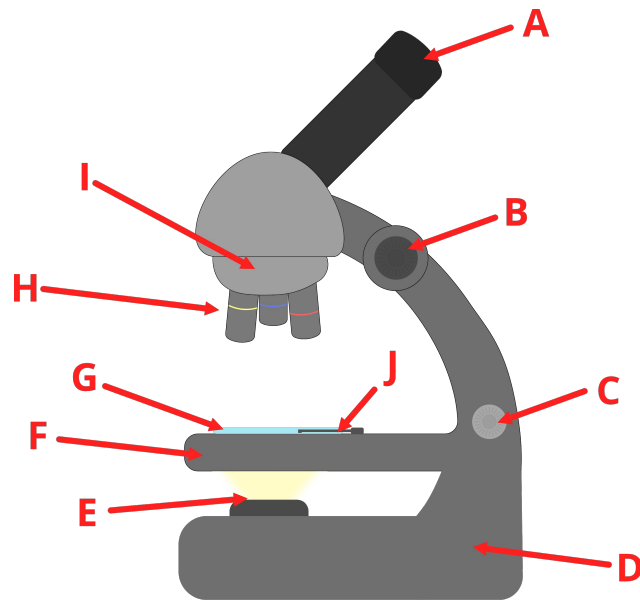


Label this diagram of a light microscope



Label this diagram of a light microscope

A	Eyepiece lens	F	Stage
B	Coarse adjustment knob	G	Slide
C	Fine adjustment knob	H	Objective lenses
D	Microscope base	I	Nosepiece
E	Light source	J	Slide clip(s)



What is resolution?



What is resolution?

It is a measurement of the clarity of an optical instrument. Resolution is defined as the **minimum distance which two separate points can be distinguished** by an optical instrument.



Describe how light microscopes work.

1. Lenses focus rays of light and magnify the image
2. Different structures absorb different amounts and wavelengths of light
3. Reflected light is transmitted to the observer via the objective lens and eyepiece lens



Describe how a Transmission Electron
Microscope (TEM) works.



Describe how a Transmission Electron Microscope (TEM) works.

1. High energy **beam of electrons** passed through a thin slice of specimen
2. More dense structures absorb more electrons so appear darker
3. Image focussed onto a fluorescent screen or photographic plate using magnetic lenses



Describe how a Scanning Electron Microscope (SEM) works



Describe how a scanning electron microscope (SEM) works.

1. Beam of electrons focussed onto the surface of a specimen using electromagnetic lenses
2. Reflected electrons hit a collecting device and are amplified to produce an image on a photographic plate



Why do electron microscopes have a higher **resolution** than light microscopes?



Why do electron microscopes have a higher **resolution** than light microscopes?

Electrons have a much shorter wavelength than light and so can distinguish much smaller structures



What type of microscope typically produces naturally coloured images?



What type of microscope typically produces naturally coloured images?

Light microscopes produce accurately coloured images as visible light is used to visualise the specimen



What type of electron microscope produces two dimensional images?



What type of electron microscope produces two dimensional images?

Transmission electron microscopes produce 2D images as electrons are **passed through** the specimen



Give 5 advantages of light microscopes



Give 5 advantages of light microscopes

- They are cheap
- They are easy to use
- They can visualise living cells
- They are portable and do not always require electricity to operate
- They can visualise whole specimens



Give 2 advantages of electron microscopes compared to light microscopes



Give 2 advantages of electron microscopes compared to light microscopes

- They have a much higher resolution and depth of field
- They have a much higher magnification

