

DOT POINT

NSW BIOLOGY MODULES 1 TO 4

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Words to Watch

account, account for State reasons for, report on, give an account of, narrate a series of events or transactions.

analyse Interpret data to reach conclusions.

annotate Add brief notes to a diagram or graph.

apply Put to use in a particular situation.

assess Make a judgement about the value of something.

calculate Find a numerical answer.

clarify Make clear or plain.

classify Arrange into classes, groups or categories.

comment Give a judgement based on a given statement or result of a calculation.

compare Estimate, measure or note how things are similar or different.

construct Represent or develop in graphical form.

contrast Show how things are different or opposite.

create Originate or bring into existence.

deduce Reach a conclusion from given information.

define Give the precise meaning of a word, phrase or physical quantity.

demonstrate Show by example.

derive Manipulate a mathematical relationship(s) to give a new equation or relationship.

describe Give a detailed account.

design Produce a plan, simulation or model.

determine Find the only possible answer.

discuss Talk or write about a topic, taking into account different issues or ideas.

distinguish Give differences between two or more different items.

draw Represent by means of pencil lines.

estimate Find an approximate value for an unknown quantity.

evaluate Assess the implications and limitations.

examine Inquire into.

explain Make something clear or easy to understand.

extract Choose relevant and/or appropriate details.

extrapolate Infer from what is known.

hypothesise Suggest an explanation for a group of facts or phenomena.

identify Recognise and name.

interpret Draw meaning from.

investigate Plan, inquire into and draw conclusions about.

justify Support an argument or conclusion.

label Add labels to a diagram.

list Give a sequence of names or other brief answers.

measure Find a value for a quantity.

outline Give a brief account or summary.

plan Use strategies to develop a series of steps or processes.

predict Give an expected result.

propose Put forward a plan or suggestion for consideration or action.

recall Present remembered ideas, facts or experiences.

relate Tell or report about happenings, events or circumstances.

represent Use words, images or symbols to convey meaning.

select Choose in preference to another or others.

sequence Arrange in order.

show Give the steps in a calculation or derivation.

sketch Make a quick, rough drawing of something.

solve Work out the answer to a problem.

state Give a specific name, value or other brief answer.

suggest Put forward an idea for consideration.

summarise Give a brief statement of the main points.

synthesise Combine various elements to make a whole.

Introduction

What the book includes

This book provides questions and answers for each dot point in the NSW Biology Stage 6 Syllabus for each module in the Year 11 Biology course:

- Module 1 Cells As the Basis Of Life
- Module 2 Organisation Of Living Things
- Module 3 Biological Diversity
- Module 4 Ecosystem Dynamics

Format of the book

The book has been formatted in the following way:

1.1 Subtopic from syllabus.

1.1.1 Assessment statement from syllabus.

1.1.1.1 First question for this assessment statement.

1.1.1.2 Second question for this assessment statement.

The number of lines provided for each answer gives an indication of how many marks the question might be worth in an examination. As a rough rule, every two lines of answer might be worth 1 mark.

How to use the book

Completing all questions will provide you with a summary of all the work you need to know from the syllabus. You may have done work in addition to this with your teacher as extension work. Obviously this is not covered, but you may need to know this additional work for your school exams.

When working through the questions, write the answers you have to look up in a different colour to those you know without having to research the work. This will provide you with a quick reference for work needing further revision.

Dot Points

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MODULE 1

Cells As the Basis Of Life



In this module you will:

- ⦿ Examine the structure and function of organisms at both the cellular and tissue levels.
- ⦿ Describe how organisms facilitate the efficient provision and removal of materials to and from all cells.
- ⦿ Explore biochemical processes through the application of the Working Scientifically skills processes.
- ⦿ Investigate the study of microbiology and the tools that scientists use in this field.
- ⦿ Use these tools to assist in making predictions and solving problems of a multidisciplinary nature.
- ⦿ Engage with all the Working Scientifically skills for practical investigations involving the focus content to collect, process and analyse data and identify trends, patterns and relationships related to cell structure and function.

1.1 Cell structure.

INQUIRY QUESTION

What distinguishes one cell from another?

1.1.1 Investigate different cellular structures, including but not limited to:

- **Examining a variety of prokaryotic and eukaryotic cells.**
- **Describing a range of technologies that are used to determine a cell's structure and function.**

1.1.1.1 Distinguish between a prokaryote and a eukaryote.

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1.1.1.2 The prokaryotes make up two of the three domains of living things. What are these domains and name some examples that are in each domain.

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1.1.1.3 What is the Gram stain and how is it used in identifying prokaryotes?

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1.1.1.4 Draw a labelled diagram to show the generalised structure of a prokaryote.

1.1.1.5 Complete the table to summarise the structure and function of parts of a prokaryote cell.

Component	Structure	Function
Cell wall		
Capsule		
Plasma membrane		
Cytoplasm		
Fimbriae		
Pili		
Flagella		
Ribosome		
Nucleoid		
Plasmid		

1.1.1.6 Which groups of organisms are eukaryotes and give an example of each.


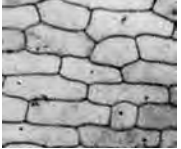

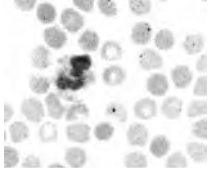


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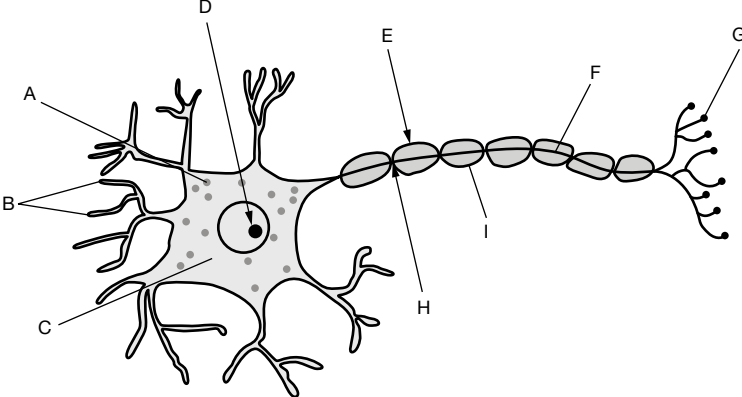
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1.1.1.7 Draw a labelled diagram of a group of plant cells and a group of animal cells to show the main characteristics seen under a light microscope.

1.1.1.8 For each of the following diagrams, draw an arrow and label the nucleus, cytoplasm and cell wall, chloroplasts and vacuoles if applicable.

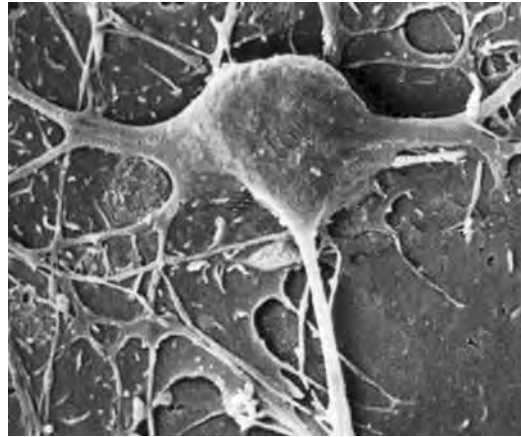
<p>Stained human cheek epithelial cells</p> 	<p>Wet mount onion epithelium</p> 	<p>Stained onion epithelium</p> 
<p>Blood cells</p> 	<p>Plasma cell with Wright stain</p> 	<p>Stained leaf</p> 

1.1.1.9 Neurons are specialised eukaryotic cells that send information within the body of many animals. Complete the table by labelling the diagram and summarising neuron structure and functioning.

Part	Function
Neuron definition	
Diagram	
Axon	
Dendrite	
Myelin sheath	
Nissl substance	
Schwann cell	
Node of Ranvier	

1.1.1.10

(a) The diagram shows a photomicrograph of a neuron. Label the main parts of the neuron.



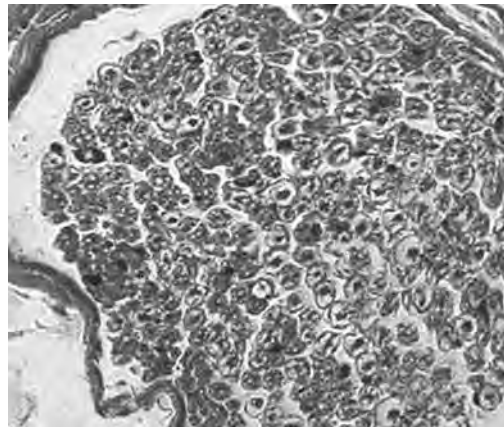
(b) Identify the type of instrument that took the above picture and justify your answer.

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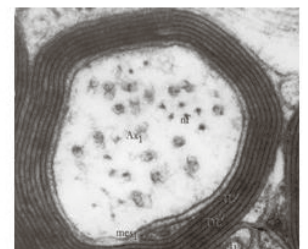
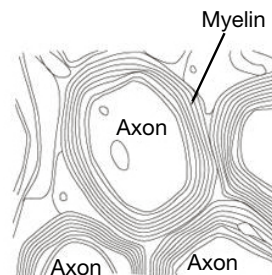
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1.1.1.11 The diagram shows a cross-section of a peripheral nerve. Identify one neuron and its associated axon.



1.1.1.12 The diagram shows the myelin sheath around an axon.



Outline the importance of the myelin sheath in the conduction of an action potential.

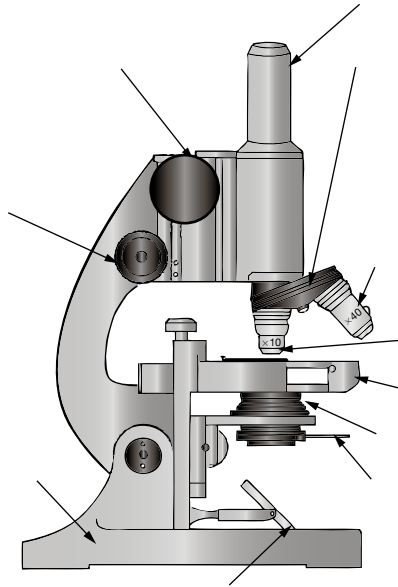
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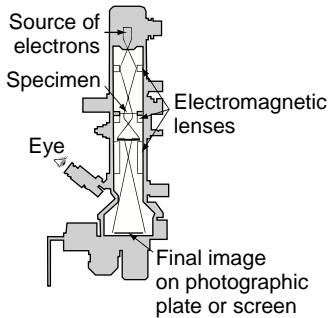
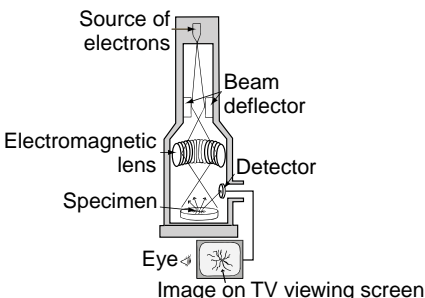
1.1.1.13 Annotate the diagram of the light microscope identifying each part and outlining the function of that part.



1.1.1.14 Complete the table to compare the light microscope with the electron microscope.

Feature	Light microscope	Electron microscope
Magnification		
Resolution		
Stains		
Living specimen		
Mounting		
Focusing		
Energy source for viewing		

1.1.1.15 For each of the following microscopes, discuss how its development helped advance the cell theory.

Date	Microscope	How it advanced cell theory
1665		Robert Hooke's microscope.
1833		Robert Brown's microscope.
20th century		Modern light microscopes.
20th century	 <p>Source of electrons Specimen Electromagnetic lenses Eye Final image on photographic plate or screen</p>	Transmission electron microscope.
20th century	 <p>Source of electrons Beam deflector Electromagnetic lens Specimen Detector Eye Image on TV viewing screen</p>	Scanning electron microscope.

1.1.1.16 Outline some rules you need to follow when using a light microscope.

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1.1.1.17 Distinguish between magnification and resolution.

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1.1.1.18 The diagram shows the letter 'e' as seen under a light microscope.
Discuss why viewing the letter 'e' under the microscope shows important aspects of the viewed image of an object.



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1.1.1.19 Outline the steps you would take to prepare a wet mount slide of a specimen to be viewed under a light microscope.

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1.1.1.20 The diagram shows a stereo microscope. Describe the main features of a stereo microscope and when it is likely to be used.

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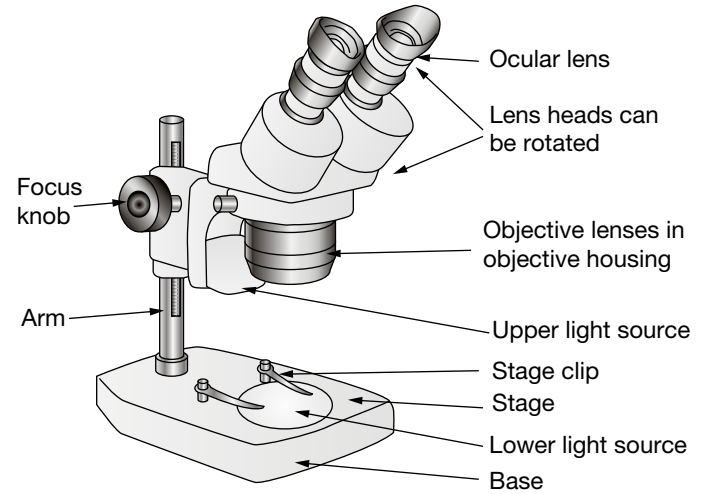
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1.1.1.21 Complete the table to summarise the use of common stains used in light microscopy.

Stain	Its use
Iodine solution	
Toluidine blue	
Eosin Y	
Neutral red	
Methylene blue	
Aceto-orcein	
Sudan III	
Phloroglucinol	

1.1.1.22 Johannes Evangelista Purkinje (1787-1869) was the first person to use a microtome to prepare thin sections of nervous tissue. Outline why microtomes are important in microscopy.

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1.1.1.23 Use examples to explain why the development of staining techniques has been important in the development of the cell theory.

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1.1.1.24 State the cell theory.

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1.1.1.25 Explain how the development of new technologies is linked with the development of the cell theory.

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1.1.1.26 Discuss some advantages and disadvantages of staining.

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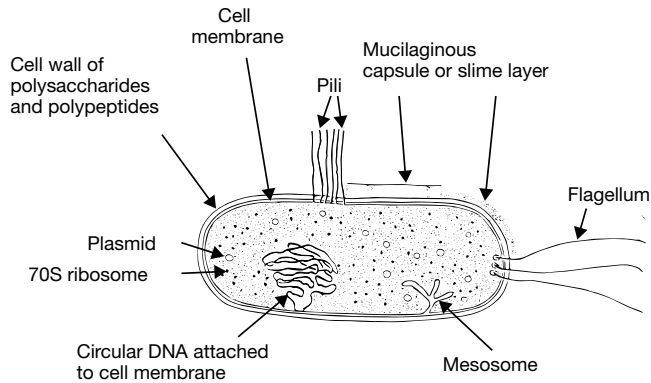
Answers



Module 1 Cells As the Basis Of Life

- 1.1.1.1** A prokaryote does not have membrane bound organelles, e.g. nucleus, mitochondria or chloroplasts whereas a eukaryote has membrane bound organelles, e.g. nucleus and mitochondria.
- 1.1.1.2** The prokaryotes are in the Archaea domain, e.g. extremophiles such as methanogens *Methanosarcina*, halophiles *Halobacterium* and thermophiles *Thermococcus* and in the bacteria domain, e.g. cyanobacteria *Nostoc* and nitrogen fixing bacteria *Rhizobia*.
- 1.1.1.3** The Gram stain was instigated by Christian Gram in 1884 and shows two different kinds of bacterial cell walls – Gram negative stain red, Gram positive stain purple. Gram positive bacteria have a thick layer of peptidoglycan (50% to 90%) in their cell wall while Gram negative bacteria have a thinner layer of peptidoglycan (10% envelope).

1.1.1.4

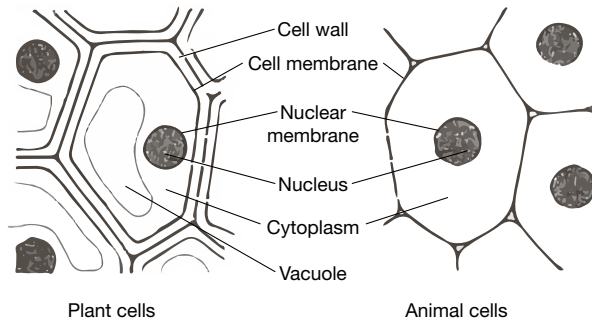


1.1.1.5

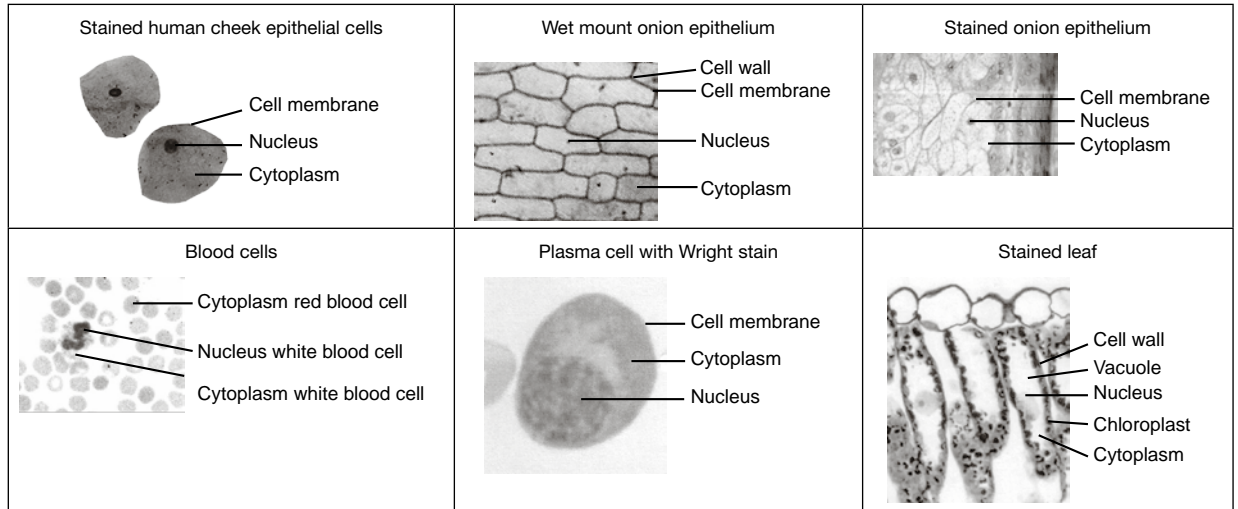
Component	Structure	Function
Cell wall	Bacterial cell walls contain peptidoglycan (sugar polymers cross-linked by short polypeptides). Archaeal cell walls contain polysaccharides and protein with no peptidoglycan.	Protect cell, gives cell shape.
Capsule	Cell wall can be covered by a capsule layer of polysaccharide or protein.	Capsule allows bacteria to attach to other cells, e.g. to form a colony or to adhere to a substrate or pathogens attach to host.
Plasma membrane	Phospholipid bilayer with wide variety of fatty acids present.	Controls substances in/out of cell.
Cytoplasm	Gel-like substance composed mainly of water with salts, enzymes, cell components and various organic molecules.	Most cellular activities occur in the cytoplasm.
Fimbriae	Protein tubes that extend from outer membrane. Usually short and present in large numbers.	Assist attaching to surfaces and other cells. Some used for motility.
Pili	Protein tubes that extend from outer membrane. Usually longer and fewer in number than fimbriae.	Sex pili used during conjugation and transfer of DNA.
Flagella	Protein structure with one end embedded in cells wall and plasma membrane. Can be concentrated at the end(s) or scattered over the surface.	Used for motility and cellular locomotion.
Ribosome	70S ribosome consisting of two units – a small unit (30S) and a large unit (50S). (The S stands for Svedberg unit which is a measure of time in sedimentation process during centrifuging).	Responsible for protein synthesis as site of translation of mRNA code into a polypeptide.
Nucleoid	Area that contains the single bacterial DNA circular molecule.	DNA hold the hereditary genetic information of the prokaryote.
Plasmid	Small circular DNA molecule that is not part of the chromosomal DNA and can replicate independently. Carries accessory genes.	Genes aid survival in stress situations, e.g. some plasmids give antibiotic resistance.

- 1.1.1.6** Eukaryotes include plants, e.g. couch grass, eucalypts, animals, e.g. kangaroos, sharks, fungi, e.g. yeast, mushrooms, protists, e.g. euglena.

1.1.1.7



1.1.1.8



1.1.1.9

Part	Function
Neuron definition	A nerve cell – the functional unit of the nervous system.
Diagram	
Axon	Long process that carries nerve impulses away from the nerve cell body to another nerve cell or effector.
Dendrite	Short processes that carry nerve impulses into the nerve cell body.
Myelin sheath	Insulating coat of cell membrane of Schwann cell that protects axon from damage and speeds up the movement of nerve impulses.
Nissl substance	Granular bodies found in neurons of rough endoplasmic reticulum and site of protein synthesis.
Schwann cell	Type of glial cell that forms the myelin sheath around axon in peripheral nervous system.
Node of Ranvier	Is a gap in the myelin sheath between adjacent Schwann cells that speeds up transmission of nerve impulses as the impulse jumps from one node to the next.