Section 3.1: Biological Molecules
- 3.1.1 Monomers and Polymers
- 3.1.2 Carbohydrates
- 3.1.3 Lipids
- 3.1.4.1 Proteins
- 3.1.4.2 Enzymes
- 3.1.5.1 Nucleic acid structure
- 3.1.5.2 DNA Replication
- 3.1.6 ATP
- 3.1.7 Water
- 3.1.8 Inorganic Ions

Section 3.2: Cells
- 3.2.1.1 Eukaryotic cells
- 3.2.1.2 Prokaryotic cells and viruses
- 3.2.1.3 Studying cells
- 3.2.2 All cells arise from other cells
- 3.2.3 Transport across cell membranes
- 3.2.4 Cell recognition and the immune system

Section 3.3 Organisms exchange substances with their environment
- 3.3.1 Surface area to volume ratio
- 3.3.2 Gas exchange
- 3.3.3 Digestion and absorption
- 3.3.4.1 Mass transport in animals
- 3.3.4.2 Mass transport in plants

Section 3.4 Genetic information, variation and relationships between organisms
- 3.4.1 DNA, genes and chromosomes
- 3.4.2 DNA and protein synthesis
- 3.4.3 Genetic diversity - mutations and meiosis
- 3.4.4 Genetic diversity and adaptation – natural selection
- 3.4.5 Species and taxonomy
- 3.4.6 Biodiversity
- 3.4.7 Investigating biodiversity
Can you describe the structure of eukaryotic cells, including the:

- Nucleus
- Mitochondria
- Golgi apparatus and Golgi vesicles
- Lysosomes
- Ribosomes
- Rough endoplasmic reticulum and smooth endoplasmic reticulum
Can you describe the structure of eukaryotic cells, including the:

- Chloroplasts
- Cell wall
- Cell vacuole

Can you explain the adaptations of eukaryotic cells? Suggest organelles that you would expect to be numerous and well developed in the following cells:

- Muscle cells
- A sperm cell
- Phagocytes
- Liver cells

Describe any other specialised cells and suggest the cell ultrastructure you would expect them to have to carry out their function efficiently.
<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>What is cell differentiation and what are its advantages?</td>
<td></td>
</tr>
<tr>
<td>How are tissues arranged into organs? Give some examples of organs.</td>
<td></td>
</tr>
<tr>
<td>How are cells arranged into tissues? Give some examples of tissues.</td>
<td></td>
</tr>
<tr>
<td>How are organs arranged into organ systems? Give some examples of organ systems.</td>
<td></td>
</tr>
</tbody>
</table>
Can you explain how prokaryotic cells differ from eukaryotic cells?

Label this prokaryotic cell and explain the role of each part:

Can you explain whether viruses are living or not and why?

Can you describe the structure of virus particles and explain the role of each part:
Can you explain the difference between magnification and resolution?

Before cell fractionation, the tissue is placed in what type of solution?

Can you describe the principles of cell fractionation and ultracentrifugation in separating cell components?

How do you calculate magnification and the size of the real object?

<table>
<thead>
<tr>
<th>Unit</th>
<th>Symbol</th>
<th>Equivalent in metres</th>
</tr>
</thead>
<tbody>
<tr>
<td>kilometre</td>
<td>km</td>
<td></td>
</tr>
<tr>
<td>metre</td>
<td>m</td>
<td></td>
</tr>
<tr>
<td>millimetre</td>
<td>mm</td>
<td></td>
</tr>
<tr>
<td>micrometre</td>
<td>μm</td>
<td></td>
</tr>
<tr>
<td>nanometre</td>
<td>nm</td>
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</tr>
</tbody>
</table>
Can you describe how a light microscope works and explain the limitations of it:

Can you describe how a transmission electron microscope works and explain the limitations of it:

Can you explain how you would use an eyepiece graticule to measure cells:

Can you describe how a scanning electron microscope works and explain the of limitations it:

How did the scientific community distinguish between artefacts and cell organelles?
What happens in mitosis?

Can you describe the behaviour of chromosomes during interphase, prophase, metaphase, anaphase and telophase of mitosis?

Can you explain the role of spindle fibres?

What is mitosis important?
Not all cells, within multicellular organisms, retain the ability to divide.

Eukaryotic cells that do retain the ability to divide show a cell cycle.

Describe the three stages of the cell cycle:

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interphase</td>
<td>The cell prepares for division.</td>
</tr>
<tr>
<td>Nuclear division</td>
<td>The nucleus divides.</td>
</tr>
<tr>
<td>Cytokinesis</td>
<td>The cytoplasm divides.</td>
</tr>
</tbody>
</table>

What can uncontrolled cell division lead to? Explain why.

Some cancer treatments are directed at controlling the rate of cell division. How might they disrupt the cell cycle? What is the problem with these types of drugs?

How do prokaryotic cells divide?

How do viruses replicate?
<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Can you describe and label the fluid-mosaic model of membrane structure?</td>
<td>[Image of fluid-mosaic model]</td>
</tr>
<tr>
<td>Why are phospholipids present in cell membranes?</td>
<td>[Blank]</td>
</tr>
<tr>
<td>Why are proteins present in cell membranes?</td>
<td>[Blank]</td>
</tr>
<tr>
<td>Why are glycoproteins present in cell membranes?</td>
<td>[Blank]</td>
</tr>
<tr>
<td>Why are glycolipids present in cell membranes?</td>
<td>[Blank]</td>
</tr>
<tr>
<td>Why is cholesterol present in cell membranes?</td>
<td>[Blank]</td>
</tr>
<tr>
<td>Explain the permeability of the cell-surface membrane:</td>
<td>[Blank]</td>
</tr>
</tbody>
</table>
What is diffusion? Draw a diagram to help you explain.

What is facilitated diffusion?

Why does simple diffusion happen?

What affects the rate of diffusion?
What is osmosis? Draw a diagram to help you explain.

Why does osmosis happen?

Explain what is meant by the terms solute, water potential and solution:

How does osmosis affect animal cells?

How does osmosis affect plant cells?
What is active transport? What does active transport require?

How could cells be adapted for rapid transport across their internal or external membranes?

Can you explain specific adaptations of specialised cells in relation to the rate of transport across their membranes? E.g. Epithelial cells

Label the diagram to explain active transport:

What are the roles of diffusion and active transport in absorption?

What is co-transport? Use the diagram to explain how the process happens in the intestine:

How does oral rehydration therapy work?
What are the main defence mechanisms of the body?

How does the body distinguish between its own cells and foreign material? Give some examples of foreign material.

What are non-specific responses?

Label the diagram to explain the process of phagocytosis:

What are specific responses?
What are the 2 different types of lymphocytes?

What is cell-mediated immunity? Use the diagram to explain the five steps:

Can you describe the response of T lymphocytes to a foreign antigen?

What is the role of antigen-presenting cells in the cellular response?

How do cytotoxic T cells kill infected cells?
Can you describe the role of helper T cells (TH cells)?

Can you describe the response of B lymphocytes to a foreign antigen?

What is humoral immunity? Use the diagram to explain:

What are plasma cells? What type of immune response do they produce?

What are memory cells? What type of immune response do they produce?
<table>
<thead>
<tr>
<th>Topic 2: Cells - 3.2.4 Cell recognition and the immune system – Antibodies (p111-14)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>What is an antibody?</strong></td>
</tr>
<tr>
<td><strong>What are monoclonal antibodies? How are they produced?</strong></td>
</tr>
<tr>
<td><strong>How can monoclonal antibodies be used to target specific cell types?</strong></td>
</tr>
<tr>
<td><strong>Draw and label the structure of an antibody:</strong></td>
</tr>
<tr>
<td><strong>Can you explain the formation of an antigen-antibody complex?</strong></td>
</tr>
<tr>
<td><strong>Can you describe the ethical issues associated with the use of monoclonal antibodies?</strong></td>
</tr>
<tr>
<td><strong>How can monoclonal antibodies be used in medical diagnosis?</strong></td>
</tr>
<tr>
<td>Question</td>
</tr>
<tr>
<td>-------------------------------------------------------------------------</td>
</tr>
<tr>
<td>What is passive immunity?</td>
</tr>
<tr>
<td>What is a vaccination?</td>
</tr>
<tr>
<td>What is herd immunity?</td>
</tr>
</tbody>
</table>
Can you describe the structure of the human immunodeficiency virus (HIV) and its replication in helper T cells?

Can you explain how antibodies are used in the ELISA test?

Can you explain why antibiotics are ineffective against viruses?

Can you explain how HIV causes the symptoms of AIDS?