

What is understood by the term "cell theory"? **Cells are the smallest units of life.**
 Living things are made of cells, and cells come from pre-existing cells.

Explain why striated muscle, giant algae, fungal hyphae don't quite fit.
 These are exceptions to cell theory, striated muscle and fungal hyphae are 'poly-nucleate'

Is this enough evidence to falsify cell theory?
 No - these are exceptions, there are so many other examples which fit the rule.

Explain why a small surface area to volume ratio limits cell size.
 (most) cells need oxygen and glucose for respiration. the bigger the volume of the cell the more of these they need.

However the bigger the cell volume the smaller the SA to Volume ratio.

As the cell increases in size its need for oxygen increases
 As it increases in size its ability to absorb oxygen by diffusion is less (per unit volume)

Eventually this need for oxygen is greater than the ability to absorb, and that

Describe an example of an emergent property?
 Emergence is when simple components of a system create properties when they operate together which are not seen in the individual components.

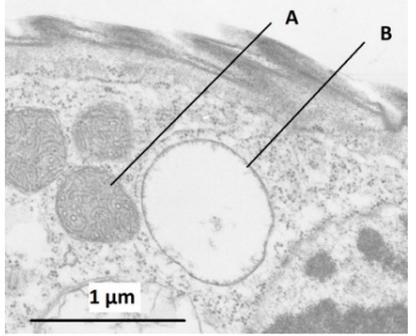
Examples can be found in cells and organs.

The brain is made of neurones which can transmit impulses and connect to others
 An emergent property is the ability to think, or consciousness in the brain.

Briefly explain each of the following:

- Specialized tissues can develop by cell differentiation
 The process of cell differentiation turns off some genes, results in expression of a
- Stem cells can divide and differentiate along different pathways
 By turning off different genes stem cells can become different specialised cells
- Use of stem cells to treat Stargardt's disease
 Stargardt's disease is a genetic condition caused by a single gene mutation in retina cells.
 Stem cells in the retina can regenerate cells which die off in Stargardts disease.
 Medical trials are trying to put stem cells into patients to repair their retina,

Name organelles A & B. Calculate the size of each.



A: mitochondrion 0.5 μm in diameter

B: nucleus

Measure organelle diameter in μm
 Measure scale bar diameter in μm

Draw a simple labelled diagram of a Prokaryote cell

#CLIPBOARD

What is the difference in resolution between electron microscopes and light microscopes?
 Light microscopes have a smaller resolution than electron

Explain how phospholipids form bilayers due to the **amphipathic** properties
 Amphipathic properties are found in molecules like phospholipids which have a hydrophobic and hydrophilic part to the molecule.
 The hydrophobic parts are attracted to each other and keep away from water.
 The hydrophilic parts are attracted to the hydrogen bonding in polar water molecules.

A single layer is not possible, because the hydrophobic would pull

Describe three locations & five functions of membrane proteins.

Location	Function
Plasma membrane of liver cells	Hormone
Inner membrane of mitochondria	Enzymes of aerobic
The membrane of neurone cells	Na ⁺ / K ⁺ pump - active
Epithelial cells of the digestive tract	Protein channels for
Outer membrane of all cell	Proteins used in cell recognition by

Describe how molecules move across membranes by

- simple diffusion, from a high concentration to low concentration,
- facilitated diffusion, from a high concentration to low concentration, through a protein
- osmosis water molecules move from a dilute solution to a more concentrated
- active transport.
 Molecules (e.g. glucose) are moved across a membrane by a

Theories are modified in the light of new evidence and gradually improve.
 List 5 discoveries in the development of the fluid mosaic model of membranes

- Thickness of membranes
- Presence of phospholipids
- Bilayer structure
- Presence of protein

List the stages in cell division by mitosis? Give a detail about each stage.

Mitosis phase	Detail(s)
Prophase	Chromosomes coil up, become visible, nuclear membrane
Metaph	Chromosomes line up on the
Anaphase	Chromatids are pulled apart by
Telophase	Two sets of chromosomes are surrounded by
cytokinesis	The cell divides its cytoplasm in half

What causes the cell cycle & division to go wrong and cause 1° and 2° tumors in cancer? Use the terms cyclins, mutagens, oncogenes and metastasis

Mutagens - cause the mutation of genes.
 Oncogenes are genes which control the cell cycle, and can result in cancer
 To create a 1° tumor a mutagen could cause the creation of an oncogene (from a proto-oncogene)
 This causes a change to the concentration of cyclins and the cell cycle goes out of control.
 Cells divide and a growth of cells appears. (1° tumor)
 The cells in this growth (tumor) can separate from the tumor and move to other parts of the body where they continue dividing to form a 2° tumor.