

SUBJECT: Science

UNIT: B1 Cell Biology



Lesson 1: Review

1. What is found in the nucleus of a cell?
2. How many chromosomes do humans have?

Lesson 2: Key content

1. What are organs made from?
2. Give an example of an organelle

Lesson 3: Osmosis

1. What type of particles move during osmosis
2. Describe the movement of the particles during osmosis

Lesson 4: Osmosis required practical

1. What is the independent variable during the investigation
2. Give an example of an observation

Lesson 6: Microscopy

1. What is the equation for magnification
2. Why are microscopes used

Lesson 7: Microscopy required practical

1. What is added to stain a sample on a slide?
2. How do you focus the image?

Lesson 9: Chromosomes

1. Where are chromosomes found?
2. How many chromosomes does a human have?

Lesson 10: Mitosis and the cell cycle

1. How many daughter cells are there in mitosis?
2. What is the first stage of the cycle?

Lesson 11: Stem cells

1. Where are stem cells found?
2. What is a stem cell?

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Cells

Cells are the building blocks of living organisms. There are lots of different types of cells and the two main types of cells are prokaryotic and eukaryotic cells.

Ambitious Vocabulary

Organelle
Mitochondria
Concentration Mitosis

Exchanging Substances Diffusion

Substances moves from an area of high concentration to an area of low concentration (down a concentration gradient). Occurs in the alveoli in the lungs diffusing oxygen into the blood and carbon dioxide out of the blood. This exchange also occurs in plant leaves. Also occurs in the villi in the small intestine diffusing food molecules into the bloodstream.

Osmosis

The movement of water from a high concentration to a low concentration. Occurs in the root hair cells of plants.

Active Transport

The movement of mineral ions from an area of low concentration to an area of high concentration. Requires energy. Occurs in the root hair cells of plants.

Prokaryotic and Eukaryotic Cells

Prokaryotic – older, simpler cells. Do not have a nucleus or any membrane bound organelles. Often have flagella for movement. Examples: bacterial cells.

Eukaryotic – newer, more complex cells. Have a nucleus and membrane bound organelles. Examples: animal and plant cells.

Animal and Plant Cells

Animal and plant cells are both eukaryotic and have some organelles that are the same however plant cells have three organelles that are different.

Sub-Cellular Structures

Nucleus – controls the cell, contains DNA
Mitochondria – where respiration occurs
Chloroplasts – where photosynthesis occurs
Cell wall – supports the cell
Cell membrane – lets things in and out of the cell
Cytoplasm – where chemical reactions occur
Vacuole – contains cell sap

Microscopes

There are two main types of microscopes: light microscopes and electron microscopes. Light microscopes are cheaper but their magnification and resolution are not as high. Electron microscopes are more expensive and their magnification and resolution are much higher. To set up a microscope; place the slide onto the stage and secure with the clips. Put the lowest objective lens over the slide and look through the eyepiece. Adjust the coarse focus and then the fine focus to bring the image into focus.

$$\text{magnification} = \frac{\text{image size}}{\text{real size}}$$

Required Practical:

Culturing Microorganisms

Use agar jelly which contains nutrients to grow bacterial cultures. Place disks soaked in different antibiotics in different place and record the effect of the antibiotics on the bacteria.

Specialised Cells

Root hair cell – function: absorb water and minerals from soil. Adaptations: large surface area for maximum absorption rate.
Sperm cell: function: fertilise the egg cell. Adaptation: long flagella for movement.
Muscle cell: function: movement. Adaptation: lots of mitochondria for respiration to release energy.
Nerve cell: function: carry electrical signals around the body. Adaptation: long to increase the speed of movement of electrical signals.
Phloem cell: function: transports substances around the plant. Adaptation: pores to allow cell sap to flow. Cells are long and joined end-to-end
Xylem cell: function: transports water around the plant. Adaptation: hollow in the centre, tubes joined end-to-end.

Required Practical Osmosis

Measure the mass of a plant tissue. Place the plant tissue into a sucrose solution. Remove and re-measure the mass.

Independent Variable: concentration of sucrose solution.

Dependent Variable: change in mass.

Control Variables: volume of solution

Conclusion: when drawing a graph of results, where the line crosses the x-axis will indicate the water concentration of the plant.

Chromosomes and Mitosis

In the nucleus of a human cell there are 23 pairs of chromosomes which contain a double helix of DNA. Mitosis is part of the cell cycle that creates new cells. DNA in a cell duplicates and lines up down the middle of the cell. The cell begins to divide and creates two daughter cells which are both genetically identical to the parent cell.

Stem Cells

Embryonic stem cells are undifferentiated and have the potential to turn into any type of cell. Adult stem cells are found in bone marrow and can only turn into some type of cells. Some people are against stem cell research stating that embryos are human life. However, they can be used to cure patients of deadly diseases. Stem cells in plants are called meristems.