Your notes

KS3 Science: revision notes

B3.1 Growth and differentiation

Contents

1. Eukaryotic and prokaryotic cells
2. Growing bacteria
3. Moving substances in and out of cells
4. Cell division and stem cells
5. Key terms
6. Quick questions
7. What to do next

Eukaryotic and prokaryotic cells

- **Eukaryotic cells** (animal, plant and fungal cells) have a nucleus that contains their DNA.
- **Prokaryotic cells** (bacteria) are much smaller and have no nucleus. Their DNA is a single loop in the cytoplasm, and they often have **plasmids** (small rings of DNA). They have a cell wall and may have a flagellum (tail) to move.
- Electron microscopes magnify far more than light microscopes and show much finer detail (higher resolution), such as the inside of mitochondria.
- Magnification = image size ÷ actual size. 1 mm = 1000 µm.

Growing bacteria

- Bacteria reproduce by **binary fission** (splitting in two), as often as every 20 minutes when it is warm and there are nutrients. The number doubles each time: 1, 2, 4, 8, 16...
- **Aseptic technique** stops unwanted microbes getting in: sterilise the inoculating loop in a Bunsen flame, use sterile agar plates, lift the lid only a little, and tape the lid on without sealing it completely.
- In school, cultures are incubated at no more than 25 °C, to reduce the chance of growing bacteria that cause disease in humans.

Moving substances in and out of cells

- **Diffusion** is the spreading out of particles from where they are more concentrated to where they are less concentrated. It needs no energy. Oxygen and carbon dioxide move in and out of cells by **diffusion**.
- **Osmosis** is the **diffusion** of water across a **partially permeable membrane**, from a dilute solution to a more concentrated one.
- In pure water, potato pieces gain mass as water moves in by **osmosis**. In a strong sugar solution, they lose mass as water moves out.

- **Active transport** moves substances against a **concentration gradient** (from low to high concentration), using energy from respiration. Root hair cells take in mineral ions this way.

Cell division and stem cells

- **Mitosis** makes two genetically identical cells, for growth and repair. Before a cell divides, it copies its DNA.
- Cancer is caused by uncontrolled cell division, which forms a lump called a **tumour**. Malignant **tumours** can spread around the body.
- **Stem cells** are undifferentiated: they can become many types of cell (**differentiation**). Embryonic **stem cells** can become any type of cell; adult stem cells, such as those in bone marrow, can become only a few types.
- In plants, **meristems** at the tips of roots and shoots contain **stem cells** throughout the plant's life.
- **Stem cells** could treat diseases such as leukaemia or diabetes, but using embryos raises ethical concerns.

Key terms

Eukaryotic cell	A cell with a nucleus, such as an animal or plant cell.
Prokaryotic cell	A cell with no nucleus, such as a bacterium.
Plasmid	A small ring of DNA found in bacteria.
Binary fission	How bacteria reproduce, by splitting in two.
Aseptic technique	Ways of working that stop unwanted microbes getting into a culture.
Diffusion	The spreading of particles from a high concentration to a low concentration.
Concentration gradient	The difference in concentration between two areas.
Osmosis	The diffusion of water across a partially permeable membrane.
Partially permeable membrane	A membrane that lets some substances through but not others.
Active transport	Moving substances against a concentration gradient, using energy.
Mitosis	Cell division that makes two identical cells.
Tumour	A lump of cells made by uncontrolled cell division.
Stem cell	An undifferentiated cell that can become other types of cell.
Differentiation	A cell becoming specialised for a particular job.
Meristem	Plant tissue at root and shoot tips that contains stem cells.

Your notes

Quick questions

Cover the answers and test yourself: remembering is what makes it stick.

1. Which type of cell has no nucleus?
2. What are plasmids?
3. How do bacteria reproduce?
4. A bacterium divides every 20 minutes. Starting with one bacterium, how many are there after one hour?
5. Why are cultures in school incubated at no more than 25 °C?
6. Why is an inoculating loop passed through a flame?
7. What is diffusion?
8. What is osmosis?

Answers

1. A prokaryotic cell, such as a bacterium
2. Small rings of DNA found in bacteria
3. By splitting in two (binary fission)
4. 8
5. To reduce the chance of growing bacteria that cause disease
6. To kill any microbes on it
7. The spreading of particles from a high concentration to a low concentration
8. The movement of water across a partially permeable membrane from a dilute to a concentrated solution

What to do next

Practise 15 questions on this topic

Try 4 exam questions, with mark schemes

Read the lesson, one step at a time

Free revision for GCSE and KS3 at lycolearn.co.uk. Some notes are for one exam board only, and say so in brackets.

Your notes