



Biology

Key Stage 4

Your name:

Your tutor's name:



Module 1 - Cells

Tutorial	Topic
Tutorial 1.1	Cell Structure
Tutorial 1.2	The Cell Cycle
Tutorial 1.3	Stem cells
Tutorial 1.4	Lifestyle and Disease

Learning objectives

At the end of this module, you will be able to:

1. Explain the differences in animal, plant, and bacterial cells and how substances move in and out of them.
2. Understand how to complete calculations relating to the cell cycle and magnification.
3. Explain mitosis, meiosis, and how stem cells are derived and used.
4. Explain the causes and risk factors of cancer, the impacts of smoking, and how Coronary Heart Disease is treated.

Knowledge Check #1

To complete these questions via an online form, go to:

<https://forms.office.com/r/PMwqFk95cU>



1. These three organelles are found only in plant cells
 - a) Cell wall, Chloroplast, Vacuole
 - b) Flagellum, Cell membrane, Chloroplast
 - c) Mitochondria, Cell membrane, Ribosome
 - d) Golgi bodies, nucleus, cell wall
2. Select the incorrect comparison between Diffusion and Osmosis
 - a) Both move down concentration gradients
 - b) Both require energy
 - c) Both Osmosis is water only, diffusion can be movement of any particles
 - d) Osmosis involves the semi-permeable membrane, this is not required for diffusion
3. Select the incorrect info of embryonic stem cells for medical treatment
 - a) No need for stem cell removal from adults
 - b) Cells can differentiate into any cell type (pluripotent)
 - c) There is an ethical consideration involved in the process
 - d) High risk of viral transmission (as would be with adult stem cells)
4. A short section of DNA encoding a protein which determines a characteristic is known as
 - a) Ribosome
 - b) Guanine
 - c) Gene
 - d) Cytosine

Tutorial 1.1 – Cell Structure

In this tutorial you will look at:

- **The structures in animal, plant, and bacteria cells**
- **How cells are viewed under light microscopes, and how to calculate magnification**
- **The differences between three types of cell transport**

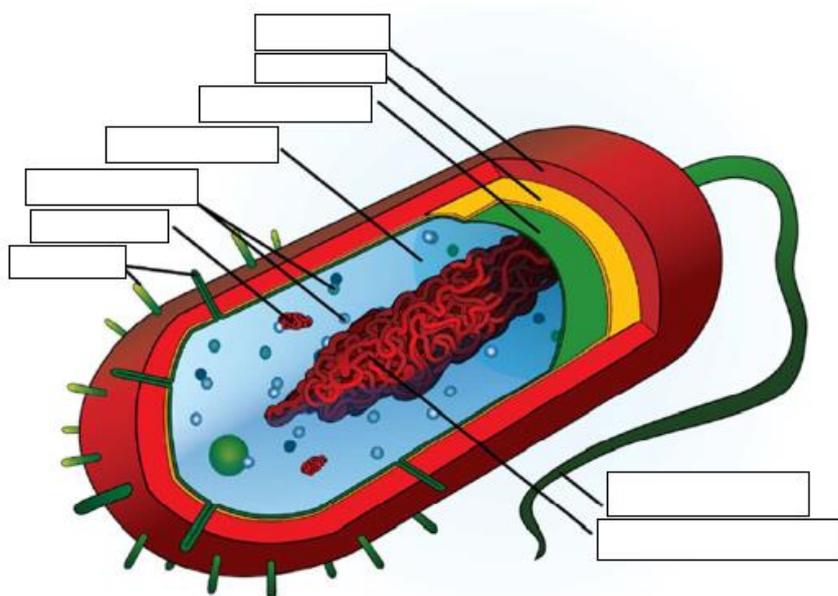
Activity 1

Use your prior knowledge to match the cell component with their function below:

Mitochondria	Semi-permeable structure that controls the movement of substance in and out of the cell
Nucleus	Made from Cellulose; acts to strengthen the cell and support the plant
Cell Membrane	Jelly-like substance containing cell organelles. Where chemical reactions take place
Chloroplast	Where protein synthesis takes place
Cell Wall	The site of respiration in the cell
Ribosome	Contains the genetic material (DNA) of the cell and controls the cell's activities
Permanent Vacuole	Filled with cell sap to maintain cell turgor (pressure)
Cytoplasm	Contains chlorophyll which absorbs light energy for use in photosynthesis

Activity 2

Label the Bacteria cell:



Activity 3

Thinking Question: Bacteria are unicellular, so the cell above is one whole organism. Why might it be useful for a bacterium not to have a nucleus, but to have their DNA free in the cytoplasm?

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Activity 4

Number these stages of preparing a microscope slide in the correct order:

	Place cells on the slide
	Place slide under the microscope to view the sample
	Carefully place the coverslip over the top of the cells
	Stain the cells to help observe their shape and organelles
	Add water droplets to the slide

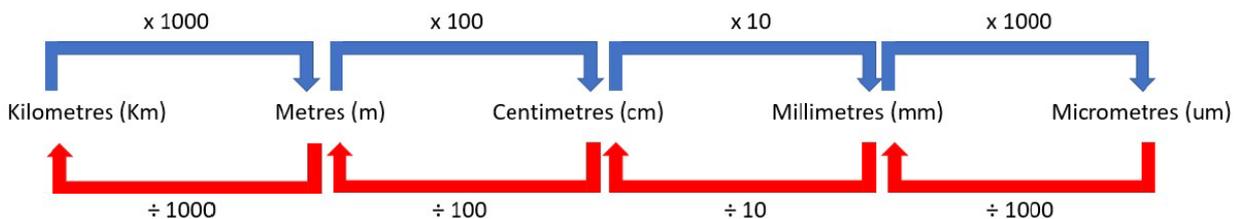
Thinking Question: What risks might you need to consider when conducting a Microscopy experiment?

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Activity 5

Use this space to make notes on the worked example of a magnification question you go through with your tutor:

Hint: when working out cell sizes, always double check your units. You can use the flow chart below to double check your maths!



Try this question: A liver cell is 0.075mm long. When observed down the microscope, the image appears to be 5.1cm. What is the magnification of this microscope?

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Use the space below to try the other examples from the presentation.

Activity 6

List 2 advantages and 2 disadvantages of an electron microscope:

Advantages	Disadvantages

Discussion question: light microscopes use a light source to illuminate a sample for observation. How might an electron microscope work? Discuss with your tutor.

Activity 7

Answer the questions below about cell transport mechanisms:

1. Glucose passes from the blood into body cells by diffusion. What does this mean about the concentration of glucose in the blood and in the body cells? (1)

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2. An onion cell was submerged in pure water. Explain why the onion cell expanded in size and burst open (3)

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3. Suggest why root hair cells have a high number of mitochondria (3)

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Activity 8

There are three different methods by which substances can enter or leave cells: **Diffusion**, **Osmosis**, and **Active Transport**

Convert the written definitions for the three types of cell transport into images. An example could be:

The Nucleus of a cell contains the DNA and controls the cell activities.



Diffusion	
Osmosis	
Active Transport	

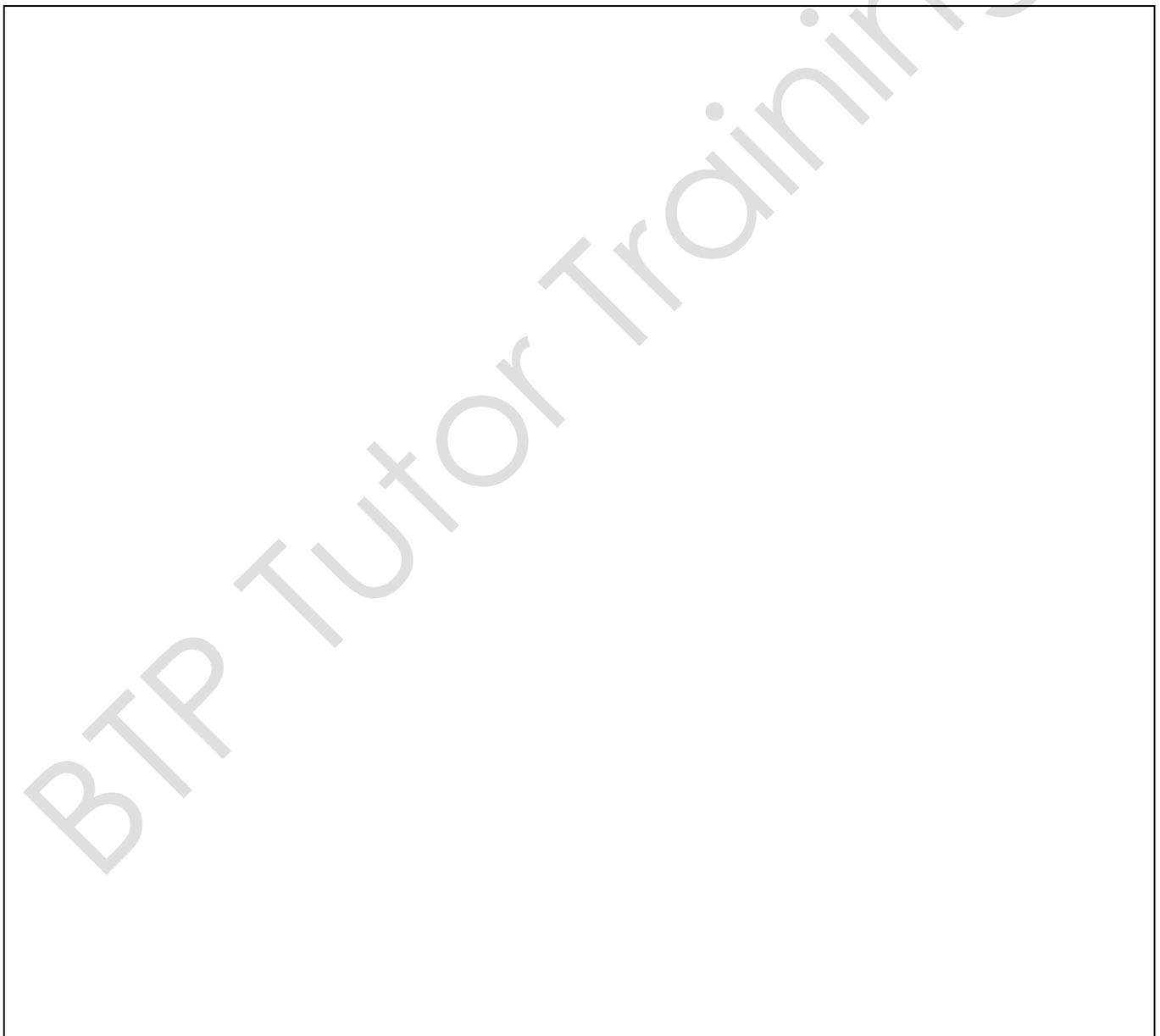
Tutorial 1.2 – The Cell Cycle

In this tutorial you will look at:

- The three parts of the cell cycle.
- How to complete calculations related to the cell cycle.
- Comparing Meiosis with Mitosis

Activity 1

Draw out the 3 stages of the cell cycle.



Activity 2

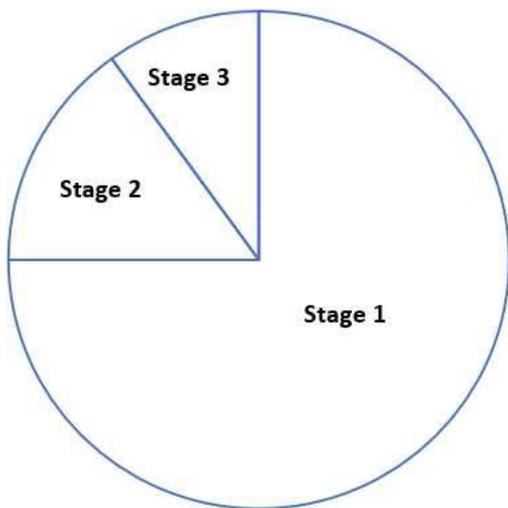
Mitosis lasts for 10% of the cell cycle and takes 40 minutes.

- a) How many minutes does Stage 3 take?
- b) How many minutes must Stage 1 take?

Activity 3

Your turn:

A scientist observes the division of carrot cells under a microscope.



She calculates that Stages 2 and 3 of the Cell Cycle together took 55 minutes.

Calculate the length of Stage 1 in hours and minutes.

Activity 4

Thinking questions:

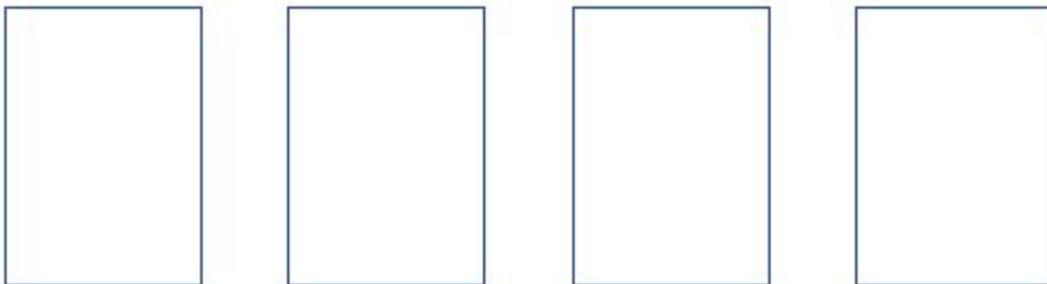
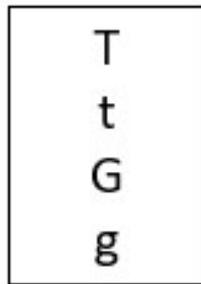
1. The process of Mitosis produces two identical daughter cells with the same number of chromosomes as the parent cell. Which cells in your body would use Mitosis for growth?

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2. Which parts of your body would need to produce daughter cells that did not have the same number of chromosomes as the parent cell?
-

Activity 5

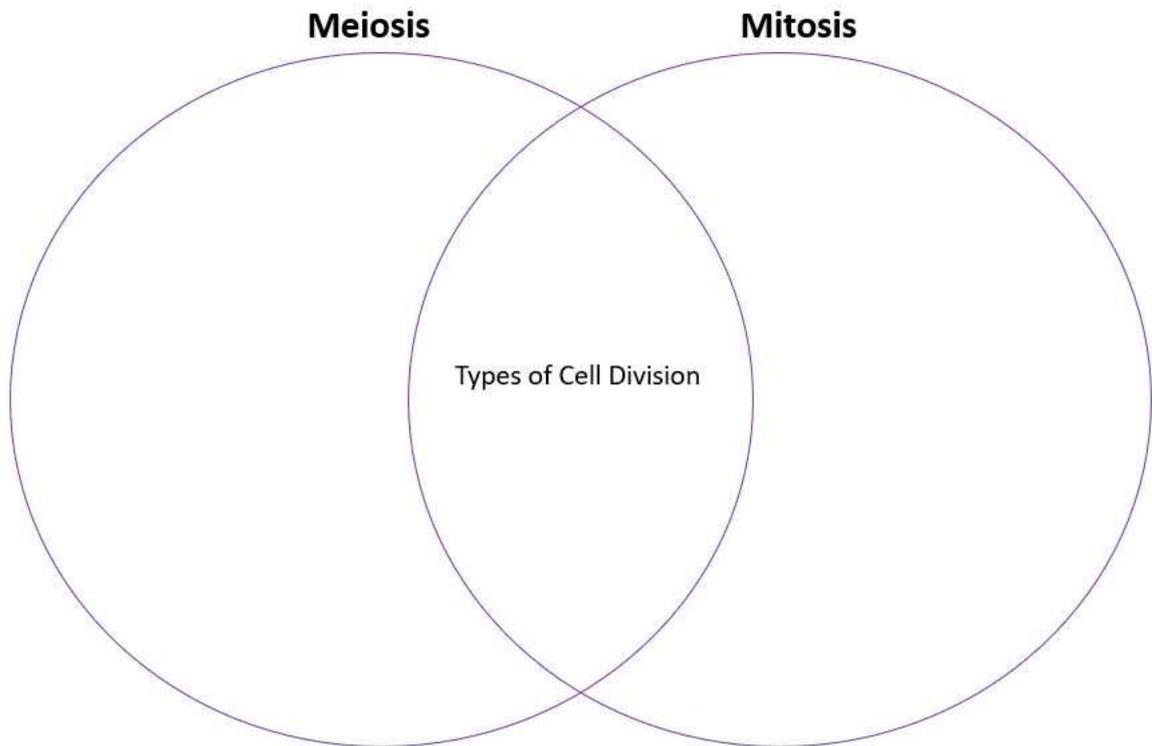
Practice Question: complete the boxes to show how these chromosomes would be inherited in gametes



Activity 6

1. Complete the diagram without looking at your notes in blue pen.
2. Go back and check your notes – add any missing information in red or green (this colour change should help you revise later!)

When you have your Venn diagram, you can start writing.



- Always start with the middle section to discuss the similarities between the two subjects.
- When you start with differences, make a **point** from one circle, and write its **counterpoint** immediately afterwards e.g. "**Meiosis produces 4 daughter cells**, while **Mitosis only produces 2 daughter cells**."

This shows your examiner you understand that you are comparing the two subjects, not just describing them in the same space.

Compare Meiosis and Mitosis with reference to their products (6 marks)

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Thinking question: each egg cell and sperm cell is the result of Meiosis. Why do siblings not all look alike when they have the same mother and father?

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Tutorial 1.3 – Stem Cells

In this tutorial you will look at:

- The two types of stems cells, and how they are derived
- What is meant by ethics, and how this relates to stem cell use.
- Evaluating the use of stem cells in medicine.

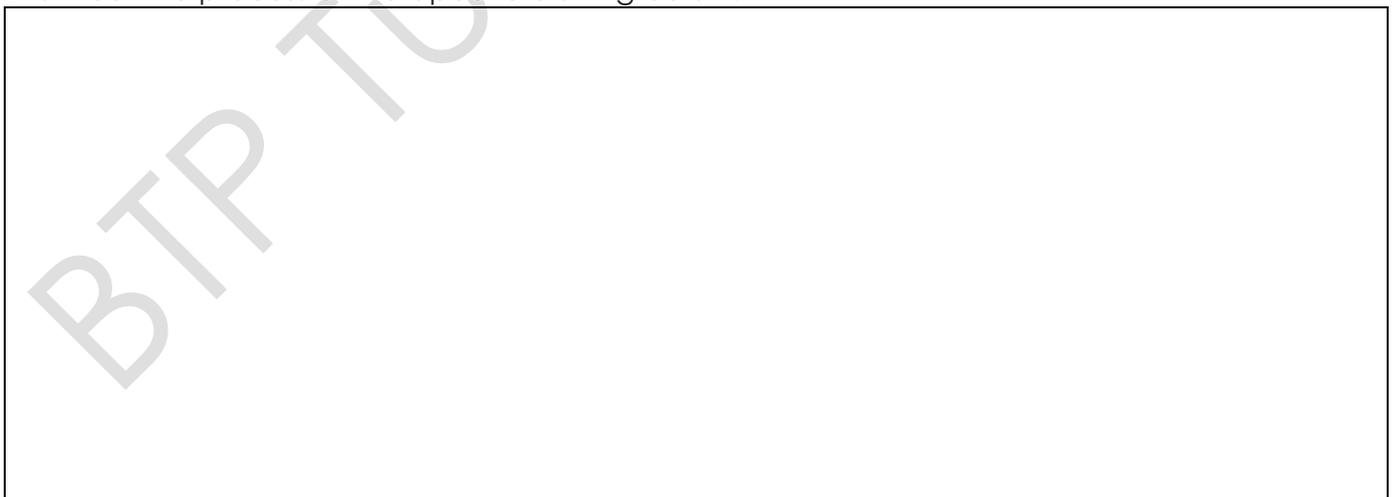
Activity 1

Complete the match up activity to check your keywords:

Stem Cell	Stem cells derived from early-stage embryos which can develop into any body cell type
Embryonic Stem Cell	The ability to develop into any cell type except placenta tissue
Adult Stem Cell	Part of a plant where cell division takes place
Differentiation	A cell that can differentiate into any cell type
Meristem	Cells receive signals to specialise into specific cell types e.g. muscle, blood, bone
Pluripotent	A stem cell found in the adult body which can differentiate into a limited number of cell types
Multipotent	The ability to develop into a limited number of cell types

Activity 2

Draw out the process of therapeutic cloning below.



Activity 4

Read the statements below and write either A (Advantage) or D (Disadvantage) next to them:

Tutorial 1.4 – Lifestyle and Disease

In this tutorial you will look at:

- The causes and associated risk factors related to cancer.
- The impacts of smoking on adults and unborn babies.
- How Coronary Heart Disease develops and how the treatments for this disease work.

Activity 1

Write the definitions of the key terms below.

Carcinogen

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Risk Factor

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Malignant

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Benign

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Mutation

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Disease

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Activity 2

Re-write the false statements correctly here:

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Activity 3

Fill out the table below by summarising the effects of the three main ingredients in cigarettes:

Tar	
Nicotine	
Carbon Monoxide	

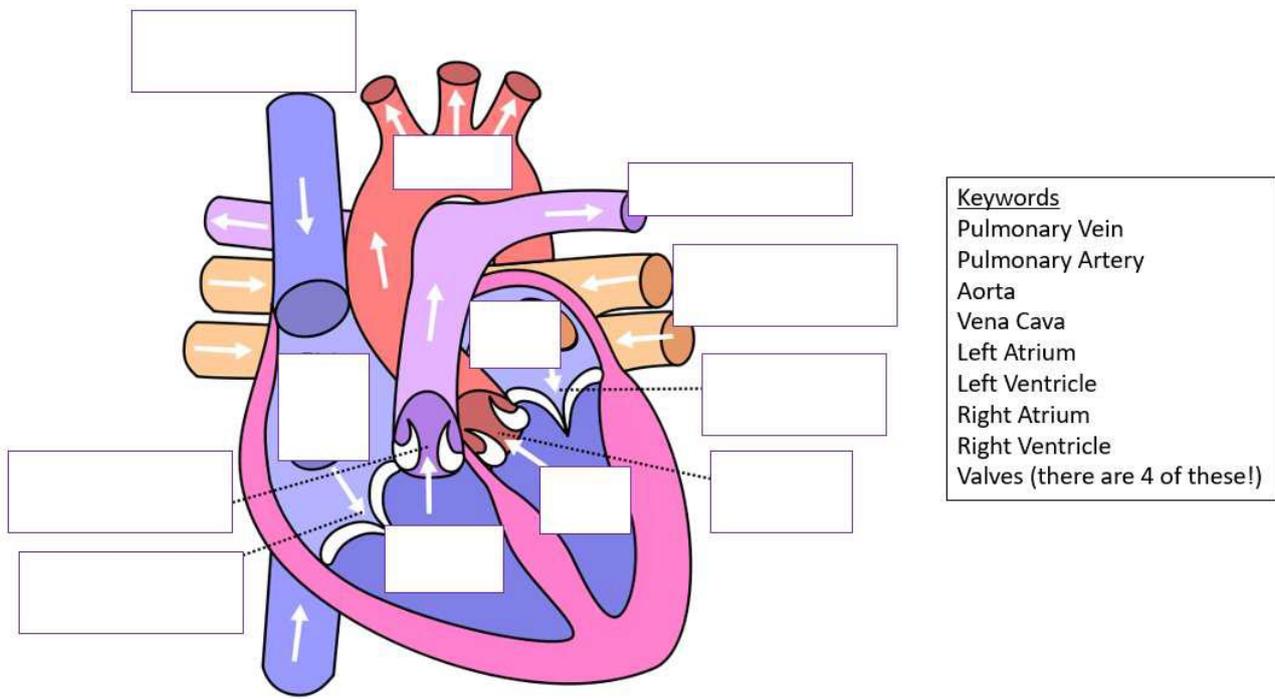
Activity 4

Discussion question: researchers have found that women who smoke are more likely to have babies with low birth weights, why might this be? Make notes below.

Activity 5

Coronary Heart Disease (CHD)

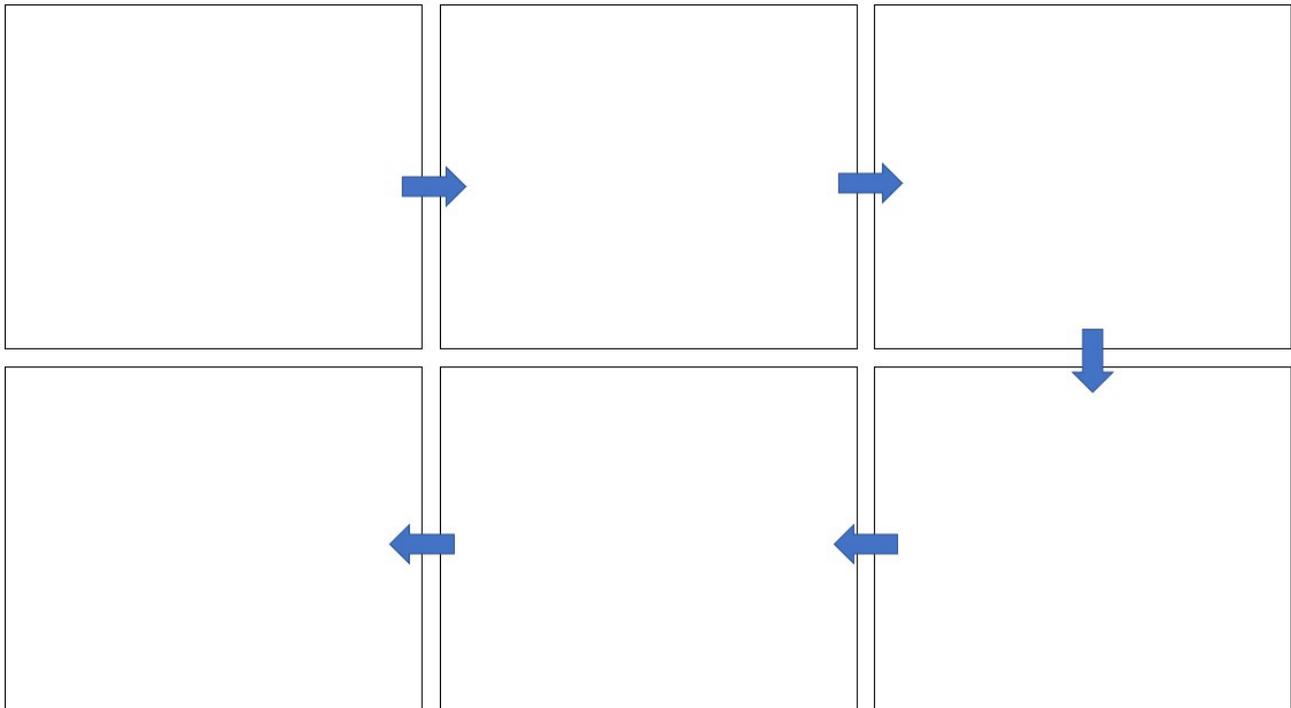
Recap: label the heart with the correct keywords below



Activity 6

Explain how Coronary Heart Disease develops using only images. Use this space to plan your 6 steps before you start drawing.

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.



Activity 7

Consolidate: Use the information from today's lesson to write some exam questions you think you could be asked about lifestyle diseases, then try to answer your questions!

- Example question: Describe the differences between benign and malignant tumours (2)
- Answer: Benign tumours remain localised while malignant tumours travel to other tissues in the bloodstream, causing secondary tumours to develop.

Knowledge Check #2

If you'd prefer to complete these questions via an online form, go to:

<https://forms.office.com/r/YSBZVdeFx1>



1. Cell division producing 2 identical daughter cell is known as
 - a) Mitosis
 - b) Meiosis
 - c) Transfusion
 - d) Reproduction
2. Root hair cells need mitochondria to
 - a) Provide energy to enable them to obtain water through passive transport
 - b) Provide carbon dioxide to enable them to obtain water through active transport
 - c) Provide energy to obtain water through active transport
3. Select the two types of Stem cells that can be derived from humans
 - a) Perinatal and adult stem cells
 - b) Adult and embryonic stem cells
 - c) Cytokine and embryonic stem cells
4. Select the incorrect reason for development of coronary heart disease
 - a) Fats are carried in the bloodstream and deposited in the artery, building up over time.
 - b) The presence of the fats in artery reduces the diameter/space inside the blood vessel reducing blood flow to the heart.
 - c) Proteins are building blocks of the body, which in excess causes coronary heart diseases
5. A skin cell is 0.3mm long. When observed down the microscope, the image appears to be 3cm. What is the magnification of this microscope?
 - a) 1
 - b) 10
 - c) 100
 - d) 1000

Module 1 review

How do you feel now?

This module aimed to help you:

1. Explain the differences in animal, plant, and bacterial cells and how substances move in and out of them.
2. Understand how to complete calculations relating to the cell cycle and magnification.
3. Explain mitosis, meiosis, and how stem cells are derived and used.
4. Explain the causes and risk factors of cancer, the impacts of smoking, and how Coronary Heart Disease is treated.

What next?

Reflection is important because it helps you review and improve the way you approach tasks, rather than just carrying on doing things as you have always done them.

Take a few minutes to think about where you think you did well during the last four tutorials, and what you think you could improve on. Write your thoughts in the boxes below.

What I did well...	What I could have improved on...
What I could do differently to make the most of my next tutorials...	



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