**2. Using the Microscope**

**1. The Microscope**

**7.6 – Cells**

**3. Plant & Animal Cells**

**What do I need to be able to do?**

•Understand cells as the fundamental unit of living organisms

•Describe the functions of the cell wall, cell membrane, cytoplasm, nucleus, vacuole, mitochondria, ribosomes, and chloroplasts

•Compare the similarities and differences between plant and animal cells

•Understand the role of diffusion in the movement of materials in and between cells

•Identifying areas of high and low concentration to predict the movement of particles by diffusion

•Explain the structural adaptations of some unicellular organisms

•Describe the cycles of materials and energy

•Observe, interpret, and record cell structure using a light microscope





**1.** Carry the microscope with one hand holding the **arm** and one under the **base**

**2.** If necessary, plug in and turn on the microscope

**3.** Rotate the **nosepiece** and select the lowest power **objective lens**

**4.** Place the **specimen slide** onto the **stage** and clip in place

**5.** Look through the **eyepiece lens** and turn the **coarse focus wheel** until the specimen comes into view – take care not to get too close to the slide

**6.** Adjust the **fine focus wheel** until the image in view becomes clear

**7.** To view the specimen in more detail – rotate the nosepiece to a higher power objective lens and repeat steps 5 and 6

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| Nucleus | Contains the genetic information (DNA) that controls the activities of the cell  |
| Cytoplasm | Gel-like substance where chemical reactions occur  |
| Cell membrane | Controls what substances enter/leave the cell  |
| Mitochondria  | Where respiration occurs  |
| Ribosomes  | Where proteins are made  |
| Chloroplasts  | Where photosynthesis occurs  |
| Vacuole  | Filled with cell sap that keeps the cell firm  |
| Cell wall  | Supports the cell  |

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| --- | --- |
| Eyepiece lens  | Magnifies the sample |
| Objective lens  | Magnifies the sample |
| Stage clip | Holds the slide in place |
| Light source/mirror | Directs light through the sample to illuminate it |
| Coarse focus wheel | Brings the specimen into approximate focus  |
| Fine focus wheel | Sharpens the focus quality of the image  |

**To calculate the total magnification of the image:**

*Total magnification = eyepiece lens power x objective lens power*

**To calculate the actual size of the specimen:**

*Actual size = image size ÷ total magnification*

The image size (the size the specimen appears in the microscope view after magnification) can be measured using a ruler

**6. Respiration**

**5. Diffusion**

**7. Specialised Cells**

**4. Unicellular Organisms**

Not all plant and animal cells look like those above. Some have different features that make it better adapted to its function. They are specialised.

Substances enter cells from the blood stream, across the cell membrane, via **diffusion**. Substances leave cells by the same method

Respiration is the chemical reaction in which energy is released from glucose

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| --- | --- | --- | --- |
| Cell | Diagram  | Function  | Features  |
| Red Blood Cell |  | To transport oxygen to respiring cells | No nucleus to maximise surface area  |
| Sperm Cell | Sperm matters | To carry DNA to the egg cell | Lots of mitochondria‘Tail’ |
| Palisade Cell (leaf cell) | GCSE Biology: Palisade Cell Diagram | Quizlet | Absorb light for photosynthesis | Lots of chloroplasts |
| Root Hair Cell | Root hair cell | iBug | Absorb water and mineral ions  | Large surface areaLots of mitochondria |



Flagellum helps the euglena to move around

|  |  |
| --- | --- |
| Aerobic Respiration | Anaerobic Respiration  |
| Occurs in the presence of oxygen  | Occurs with limited/no oxygen |
| Glucose + oxygen 🡪 carbon dioxide + water (+ energy) | **Animal cells:**Glucose 🡪 lactic acid (+ energy)**Plant cells and Yeast (unicellular organism):**Glucose 🡪 ethanol + carbon dioxide (+ energy) |
| ✔releases a lot of energy | ✔energy can be released quickly (e.g. when sprinting) and is not reliant on the delivery of oxygen to cells  |
| ✖ reliant on a constant supply of oxygen to cells | ✖releases a lot less in energy in comparison. Lactic acid causes pain and cramps  |





***Hint – see 7.2 Particles & Their Behaviour***

An amoeba surrounds and engulfs food

Cells are adapted to increase the efficiency of diffusion into and out of the cell by having folded membranes to increase the surface area e.g. villi epithelial cells and root hair cells

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| --- | --- |
| **Key term** | **Definition**  |
| Cell | The smallest functional biological unit, of which all organisms are composed |
| Magnification | The degree to which the apparent size of an image has been made larger |
| Lens | A piece of transparent material with curved sides that can disperse or concentrate light rays to form an image |
| Unicellular | An organism that consists of one cell |
| Organelle | Structures inside a cell  |
| Respiration | A chemical reaction in which energy is released from glucose, a chemical energy store |
| Aerobic | Involving oxygen |
| Anaerobic | A lack/absence of oxygen |
| Diffusion | Movement of particles from an area of high concentration to an area of low concentration |
| Image size  | The size that the specimen appears in the microscope view after being magnified |
| Actual size  | The actual size of the specimen on the slide before magnification |
| Surface area  | The sum of the area of all faces/sides |
| Concentration  | Number of particles in a certain volume |
| Membrane | A thin layer that forms the boundary of cells |

**Link it**

**1.** The chemical formula for glucose is C6H12O6. Can you write a balanced symbol equation for aerobic respiration?

**2**. The chemical formula for lactic acid is C3H6O3. Can you write a balanced symbol equation for anaerobic respiration in humans?

**3a.** How is oxygen transported around the body? Explain any adaptations of the cell

**b.** Why is oxygen transported to cells?

**c.** How does oxygen enter the cell?

**4.** For the three cubes below, measure (in cm) each with a ruler, and calculate the surface area, the volume, and the surface area to volume ratio. Simplify the SA:V ratio so that it the "V" is = 1.

***Hint – think back to 7.2 Particles if you have forgotten how to calculate volume***



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**What is the trend in SA:V ratio as the size of the ‘cell’/cube increases?**

**Why is this important to cells?**

**Grasp it**

**Microscopes and Magnification**

1. Which objective lens would you select first and why?

2. An eyepiece lens has a magnification of x10 and the objective lens with a magnification of x40 is selected. Calculate the total magnification

3. A 0.2 mm is magnified to produce an image with a size of 20 mm. Calculate the magnification

4. There are 1000 micrometres (µm) in 1 mm. Convert 6 cm into micrometres (µm)

**Features of Plant & Animal Cells**

5. Why don’t root hair cells contain chloroplasts?

6. Why do sperm cells contain lots of mitochondria?

7. The figure below shows 4 different cells



A) Which is a plant cell? Give a reason for your answer

B) Which is an animal cell? Give a reason for your answer

**Diffusion**

8. Into which cell would particles diffuse the fastest? Explain your answer



9. Explain the reasons for the shape of a root hair cell.

10. Explain in detail what happens when oxygen diffuses into a cell from the bloodstream.

**Respiration**

11. When would the body utilise anaerobic respiration, rather than aerobic respiration?

12. Why doesn’t the body use anaerobic respiration all the time?

13. An aerobic respiration of yeast cells is used in the alcoholic drinks and bread making industries. Can you suggest reasons why?

**Gas Pressure**

14. Explain why increasing the temperature, increases gas pressure.

15. Explain why decreasing the volume, increases gas pressure

16. Explain why increasing the concentration, increases gas pressure

**Know it**

**Microscopes and Magnification**

1. Name the two different types of lens in a microscope

2. What is a lens?

3. define the term ‘magnification’

4. How would you calculate the total magnification of an image

5. Which objective lens would you select first?

**Features of Plant & Animal Cells**

6. Name all the organelles that are in plants and animal cells

7. Name all the organelles found only in a plant cell

8. What is the difference between a cell wall and a cell membrane?

**Unicellular Organisms**

9. Name all the organelles that a euglena has in common with a plant cell

10. Name all the organelles that an amoeba has in common with an animal cell

11. What is a ‘unicellular’ organism?

**Diffusion**

12. Define diffusion

13. Name two substances that must diffuse into cells from the blood stream

14. Name two substances that must diffuse out of cells into the bloodstream?

15. How are some cells adapted for more efficient diffusion?

**Respiration**

16. Give two similarities between aerobic and anaerobic respiration

17. Give 3 differences between aerobic and anaerobic respiration

18. Write the word equation for aerobic respiration

19. Write the word equation for anaerobic respiration in humans

20. Write the word equation for anaerobic respiration in plant and yeast cells.