Biology Paper 1
Exam: Tuesday 17th May

Topic 1: Cell biology
Topic 2: Organisation
Topic 3: Infection and Response
Topic 4: Bioenergetics

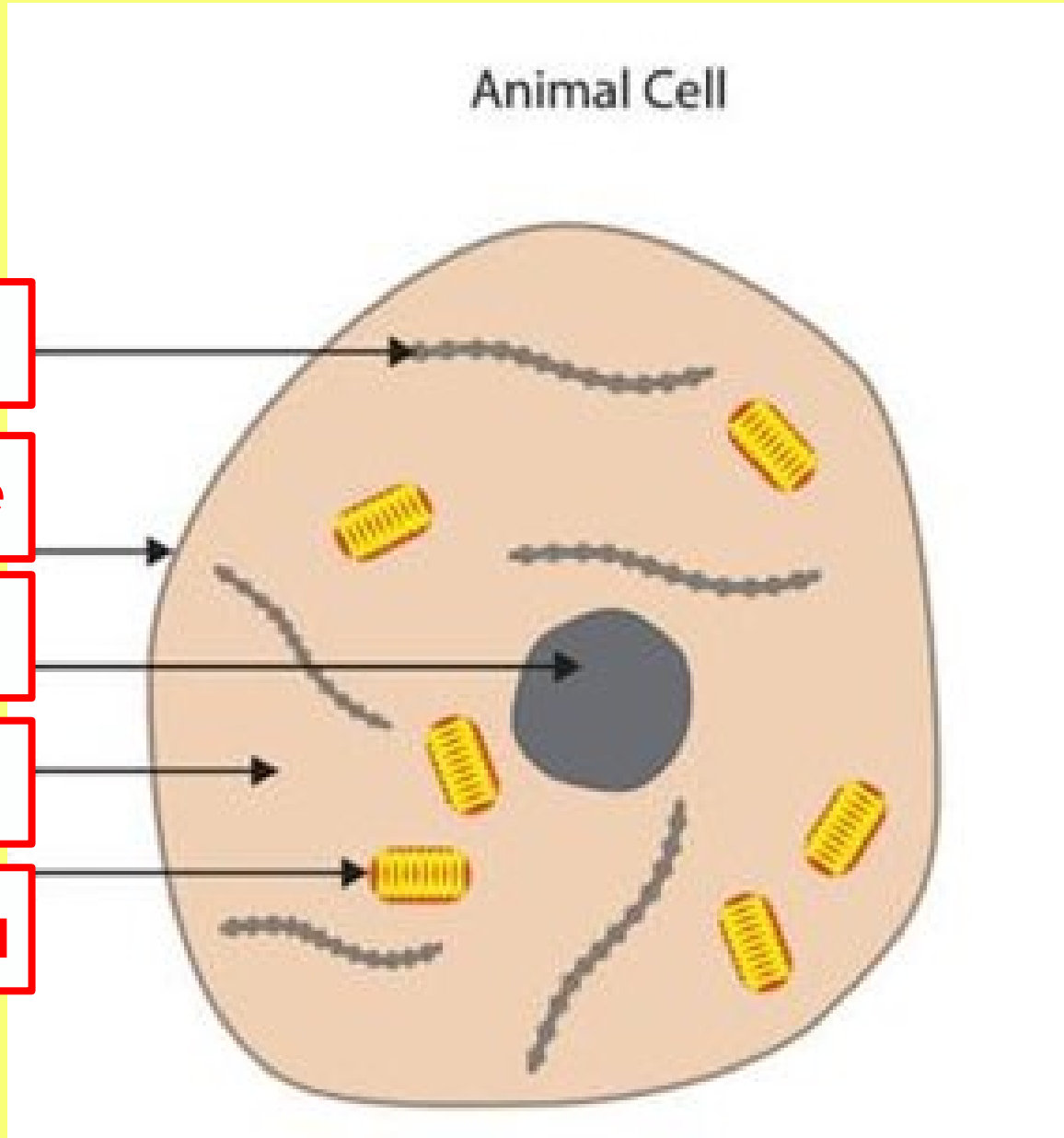
Examination
Biology Paper 1 – 1hr 15m 70 marks 16.7% of GCSE
Biology Paper 2 – 1hr 15m 70 marks 16.7% of GCSE
Chemistry Paper 1 – 1hr 15m 70 marks 16.7% of GCSE
Chemistry Paper 2 – 1hr 15m 70 marks 16.7% of GCSE
Physics Paper 1 – 1hr 15m 70 marks 16.7% of GCSE
Physics Paper 2 – 1hr 15m 70 marks 16.7% of GCSE

check!

Topic 1: Cell Biology

Topic	Slide number	Booklet page number	Exam Questions
Cells, specialised cells and microscopy	3-29	3-10	3-8
Chromosomes, cell division and stem cells	30-35	11-12	9-14
Transporting substances	36-50	13-19	15-23

Animal Cells (page 3)



ribosome

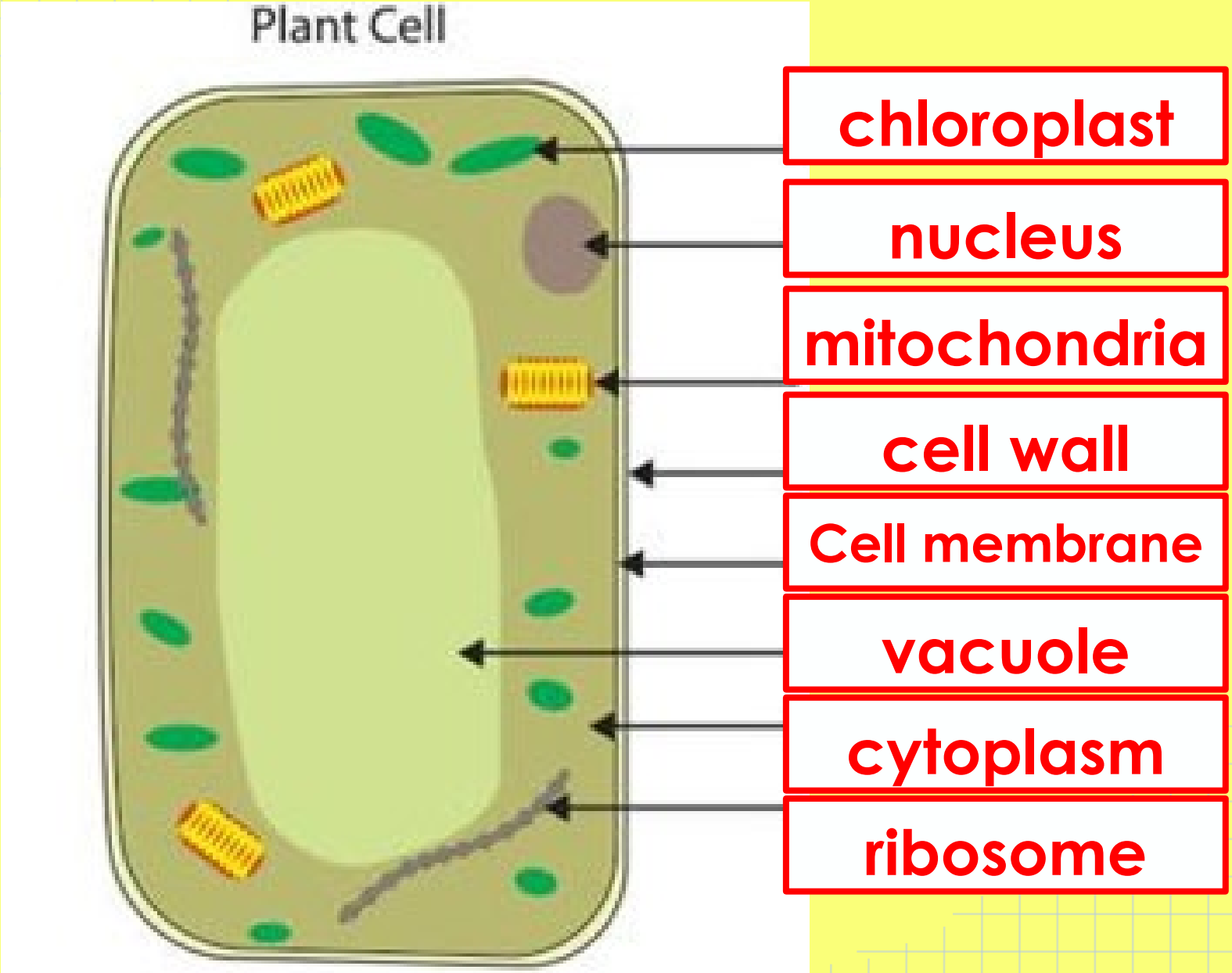
Cell membrane

nucleus

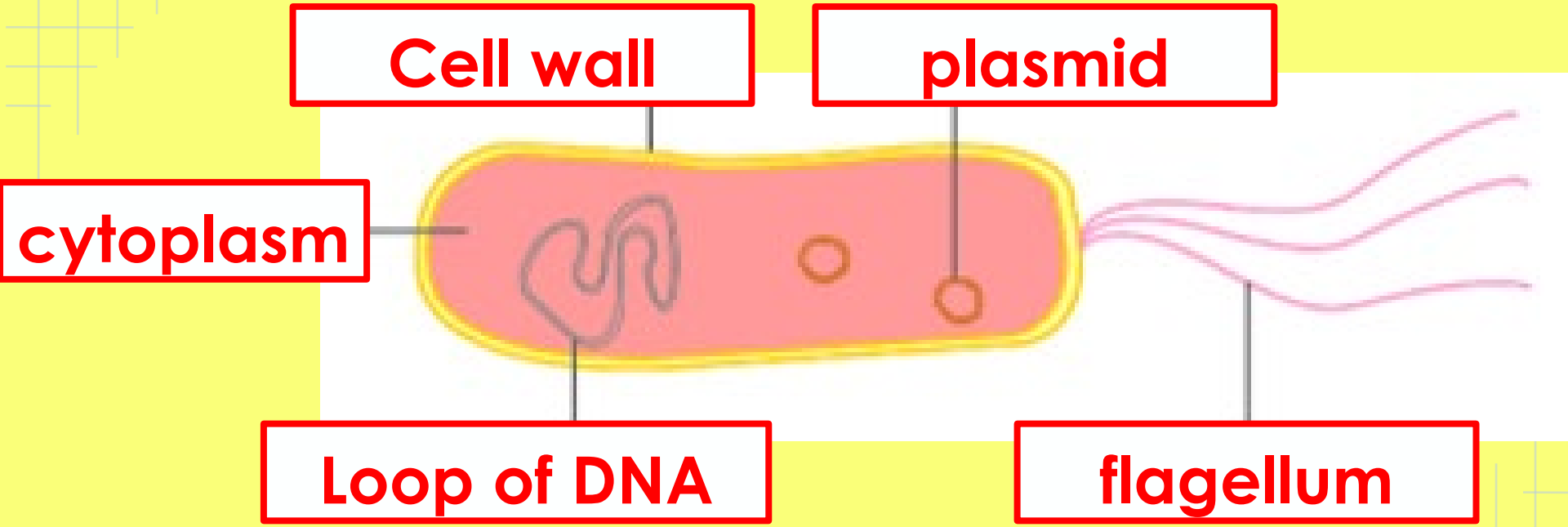
cytoplasm

mitochondria

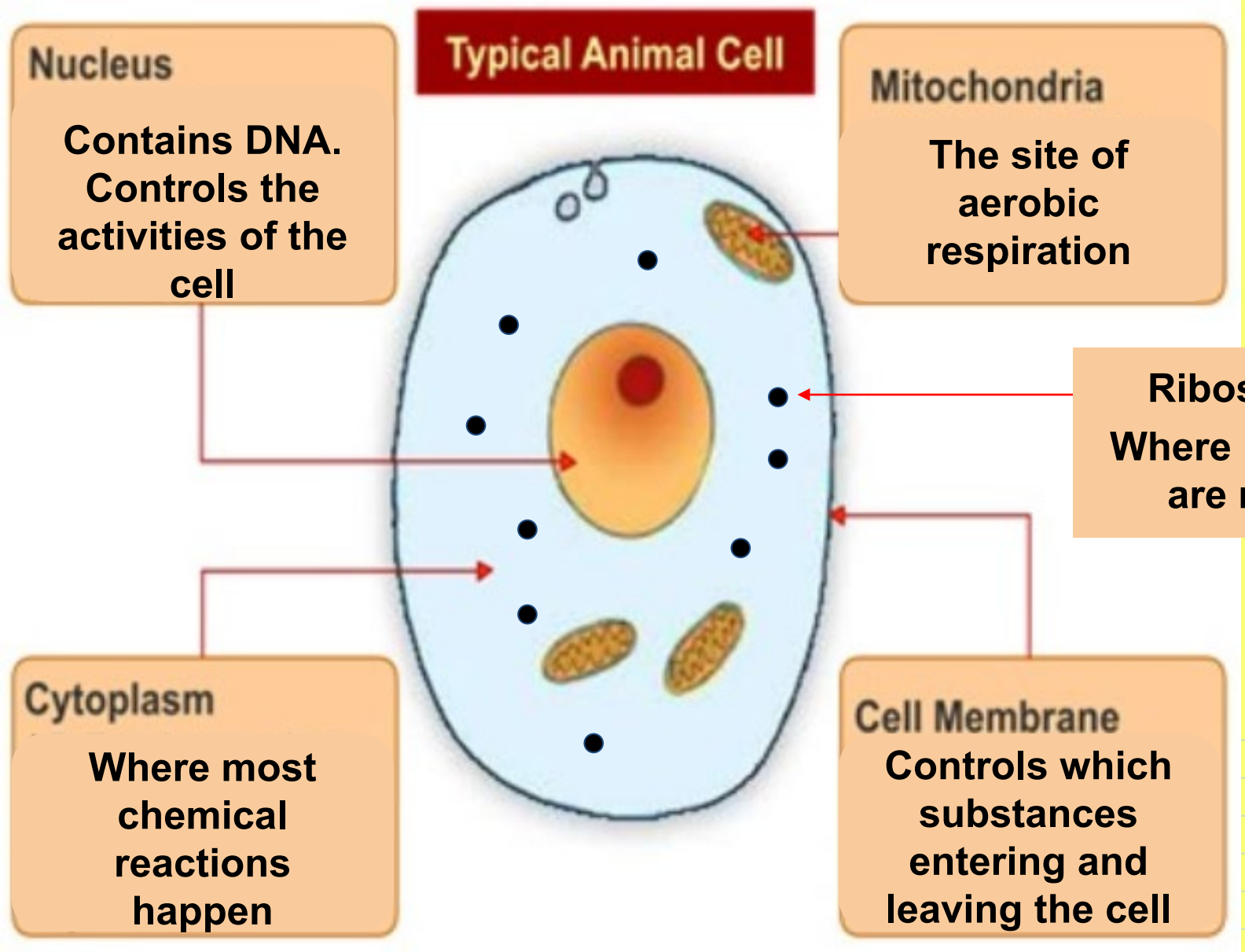
Plant Cells (page 3)



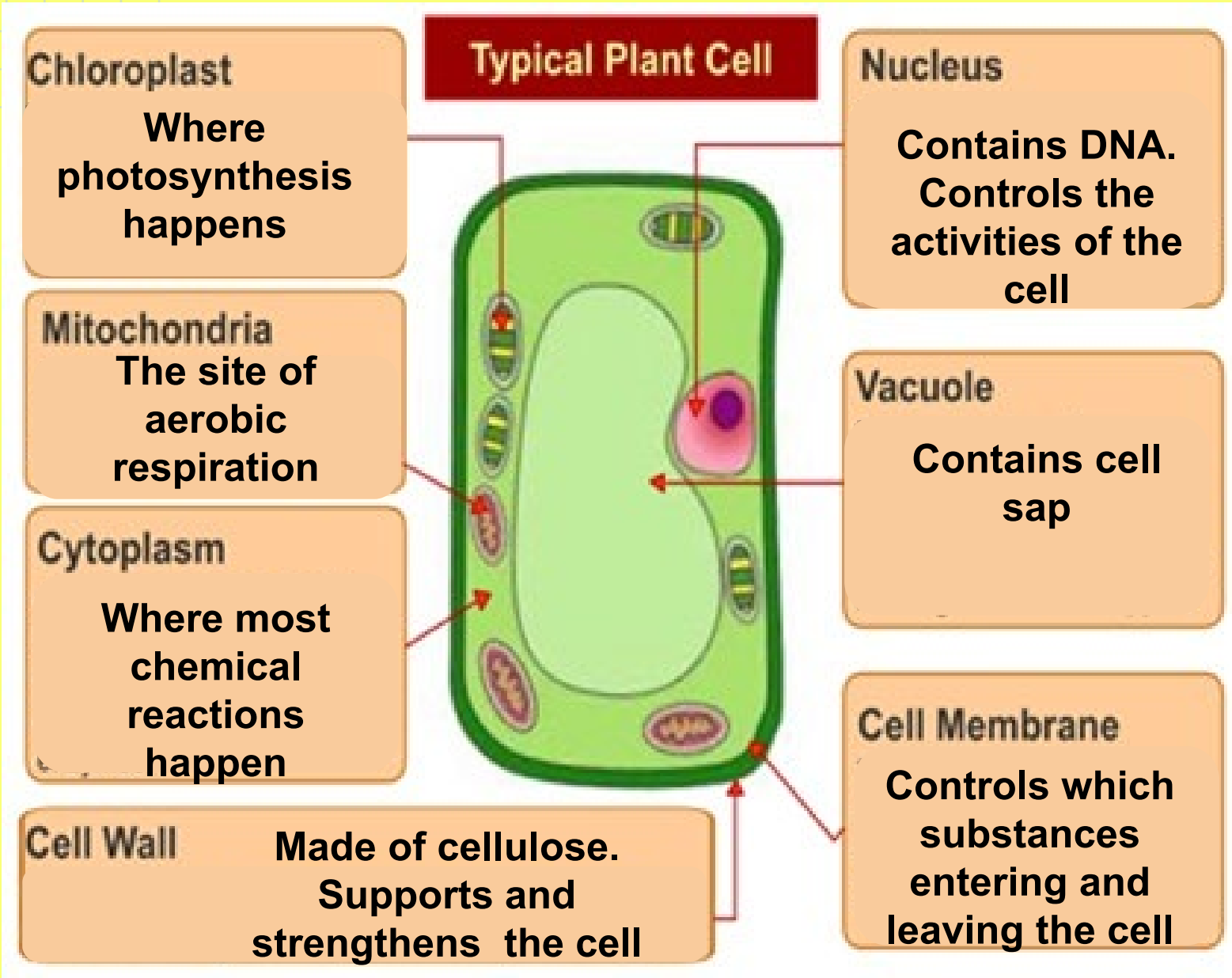
Bacteria Cells (page 3)



Functions of the Parts of Cells (page 4)



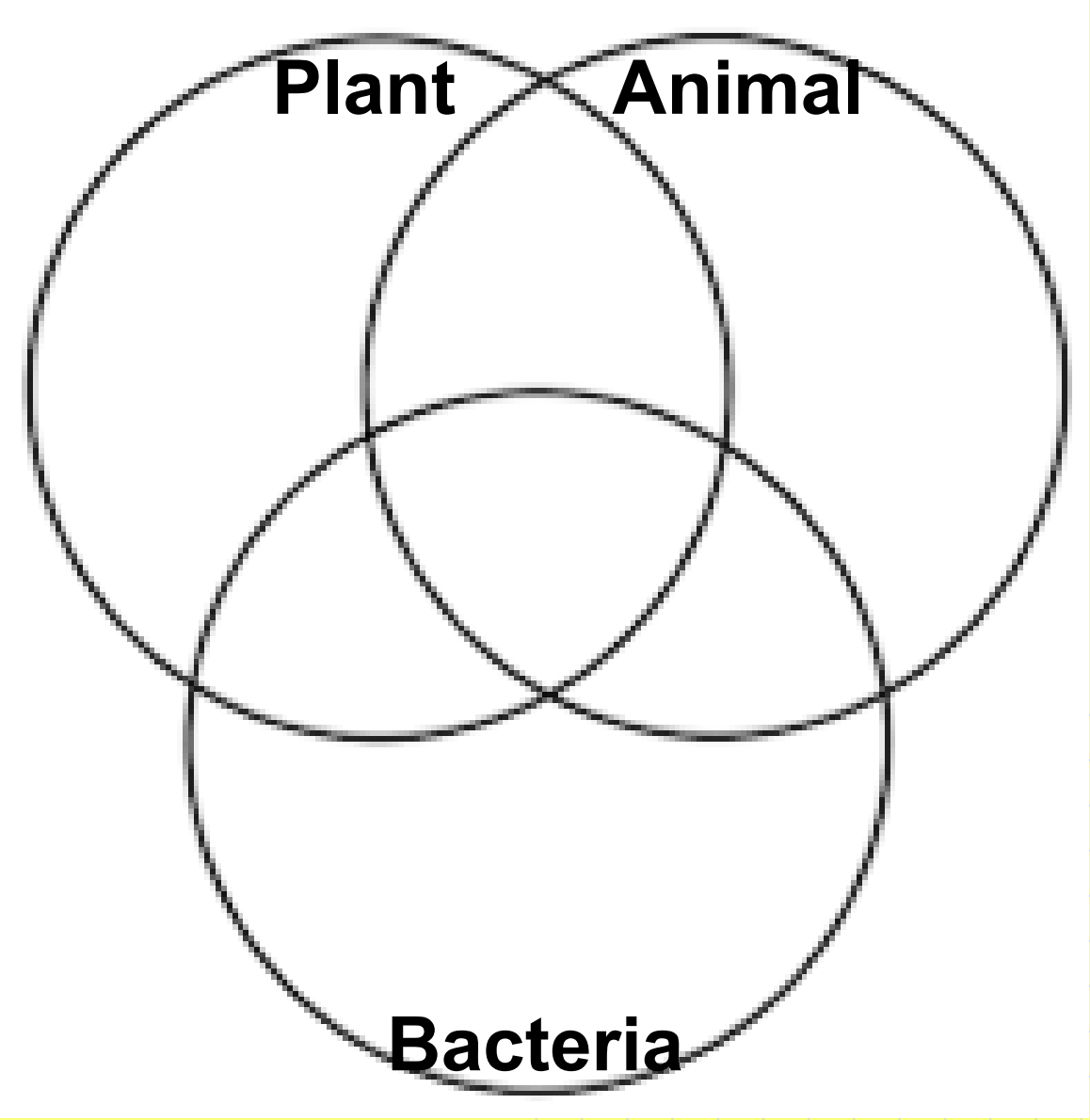
Functions of the Parts of Cells (page 4)



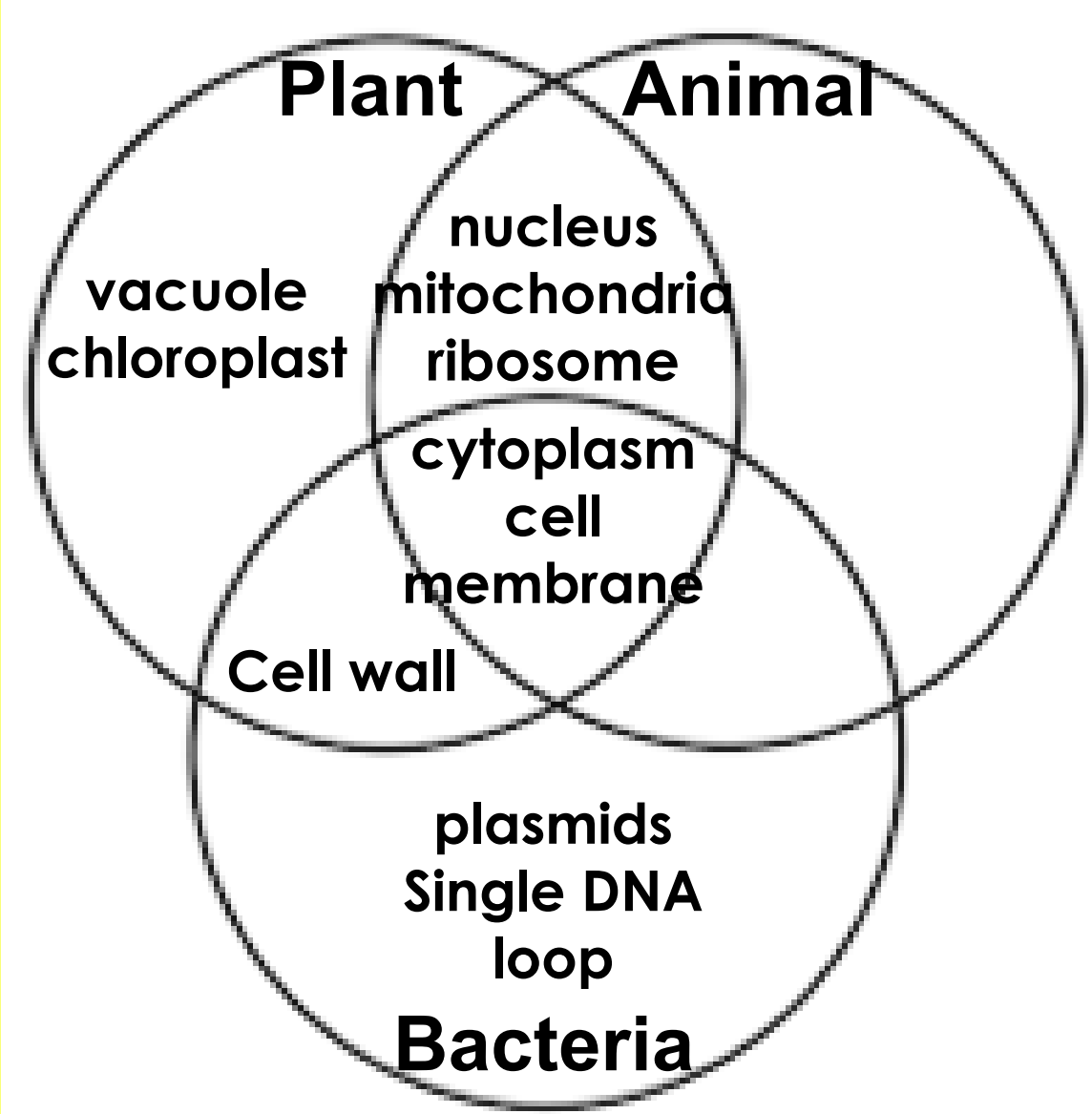
Comparing Cells (page 4)

Add the following words to the Venn Diagram

vacuole
Cell membrane
nucleus
cell wall
mitochondria
chloroplast
cytoplasm
plasmid
ribosome
Single DNA loop



B1 - Comparing Cells (page 4)



Comparing Cells (page 5)

Extension Tasks:

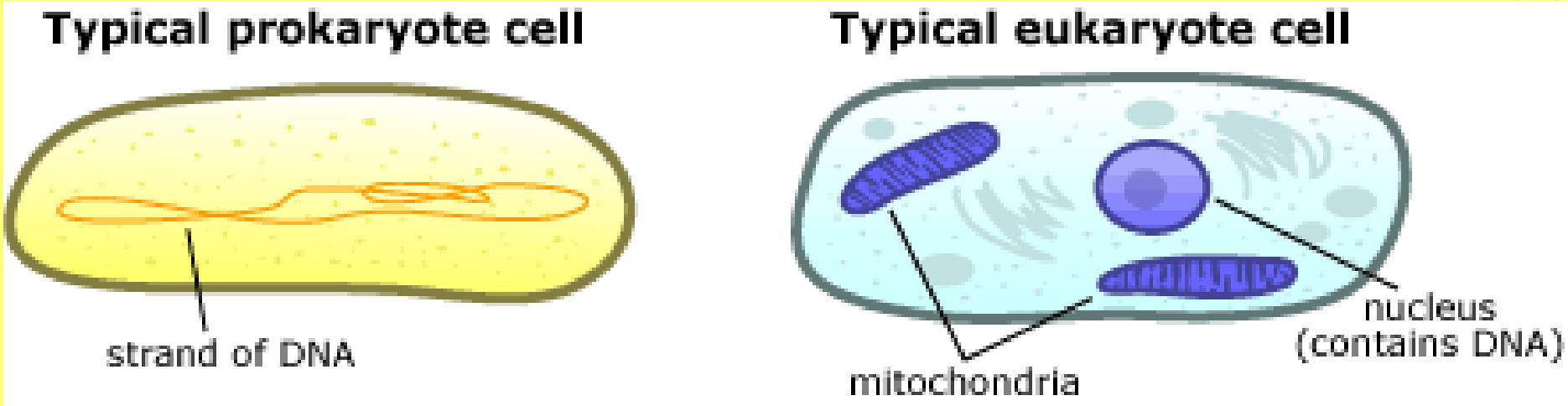
1. Use your Venn diagram to compare a plant and an animal cell.

2. Use your Venn diagram to compare a plant and a bacteria cell

Eukaryotes and Prokaryotes (page 5)

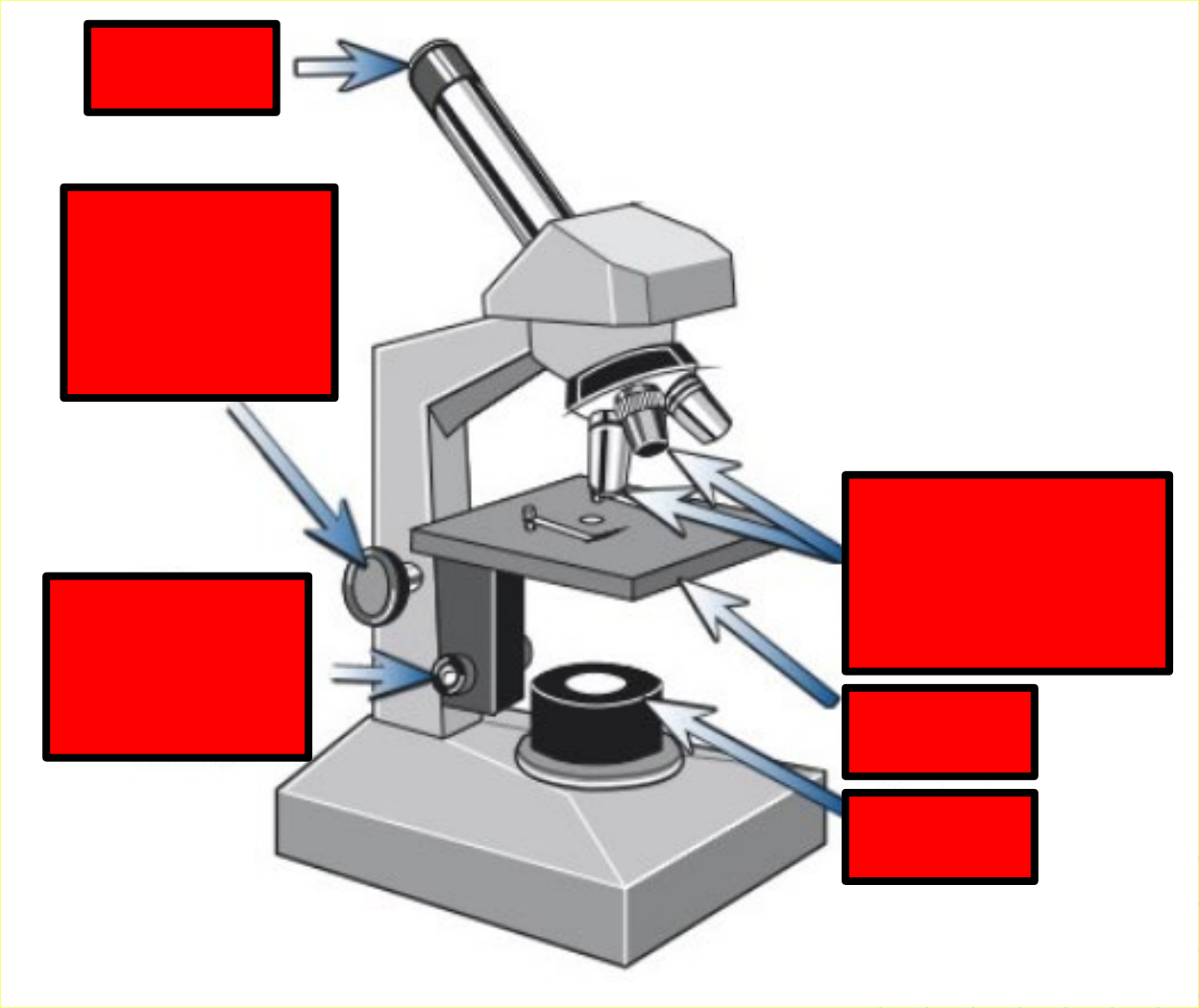
Eukaryotic cells are complex cells. Examples are _____animal_____ and _____plant_____ cells.

Prokaryotic cells are more simple. They do not have _____a nucleus_____. An example is a _____bacteria_____ cell.



Using Microscopes (page 5)

Label the microscope….



Magnification and Resolution (page 6)

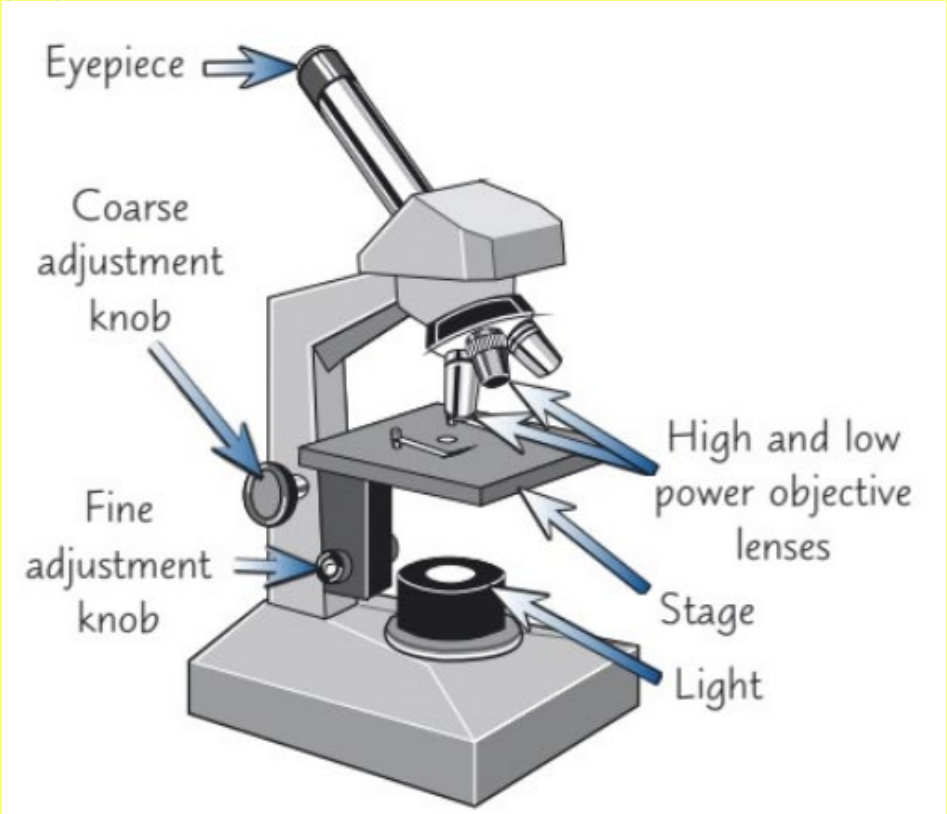
What does ‘magnification’ mean?
What does ‘resolution’ mean?

Magnification and Resolution (page 6)

The magnification is **how many times bigger an image is, compared to an object**.
As Rashford's head has been magnified, it has lost resolution. This is the **ability to tell the difference between 2 points on a picture**. The magnified image has low resolution - it is blurry.

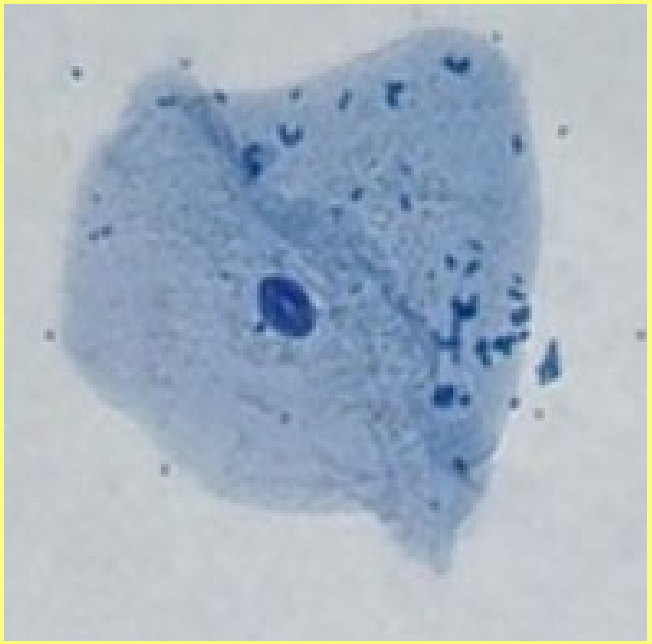
Types of Microscope (page 6)

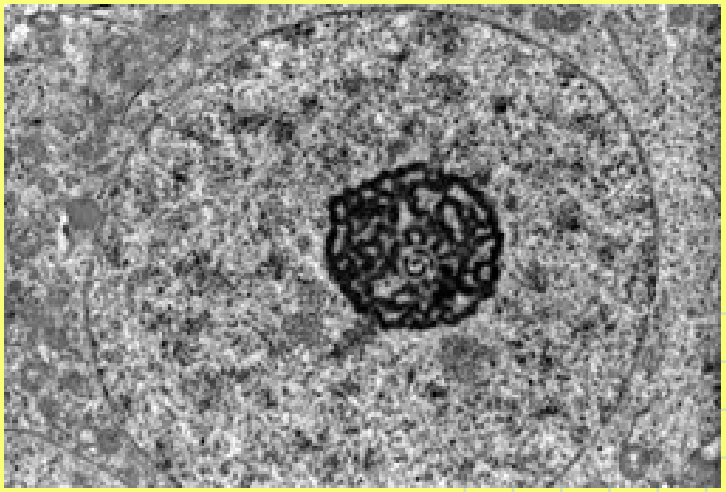
There are two types of microscope: the light microscope and the electron microscope.



Types of Microscope (page 6)

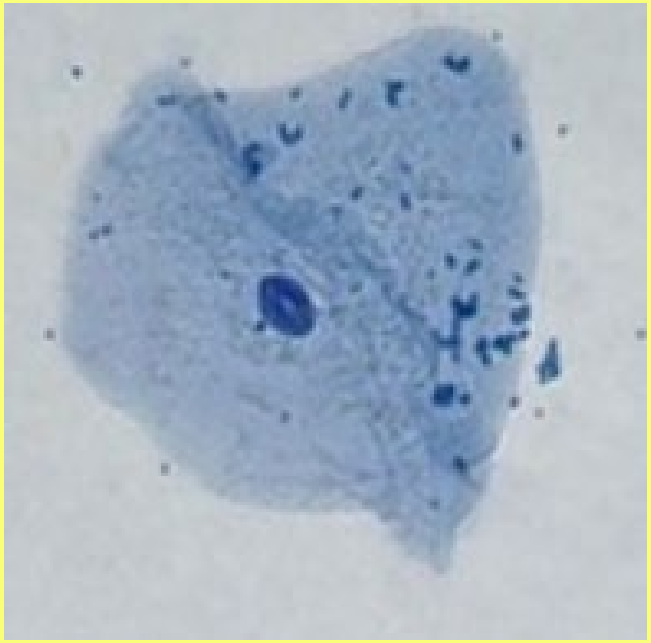
1. Which microscope was invented first?
2. Why did the invention of the more advanced microscope increase our understanding of cells?
3. Which image was taken with the electron microscope? How do you know?

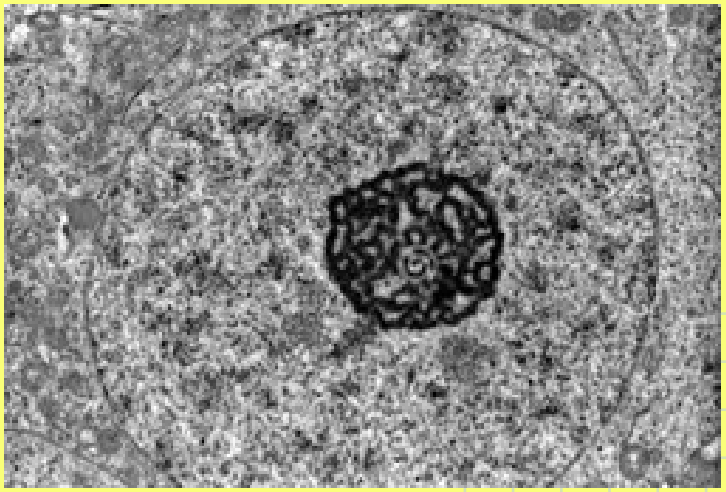




Types of Microscope (page 6)

1. The light microscope
2. It allowed us to see sub-cellular structures (little parts of cells)
3. The image on the right. It has a higher resolution.





Using a Microscope (page 7)

Put this method of using a light microscope into the correct order.

- Move the fine adjustment to get a clear image
- Move the stage down until the image is roughly in focus
- Clip the slide onto the stage
- Twist the coarse adjustment to move the stage up to just below the objective lens
- Get a bigger image by using an objective lens with a higher magnification
- Start with the lowest magnification objective lens

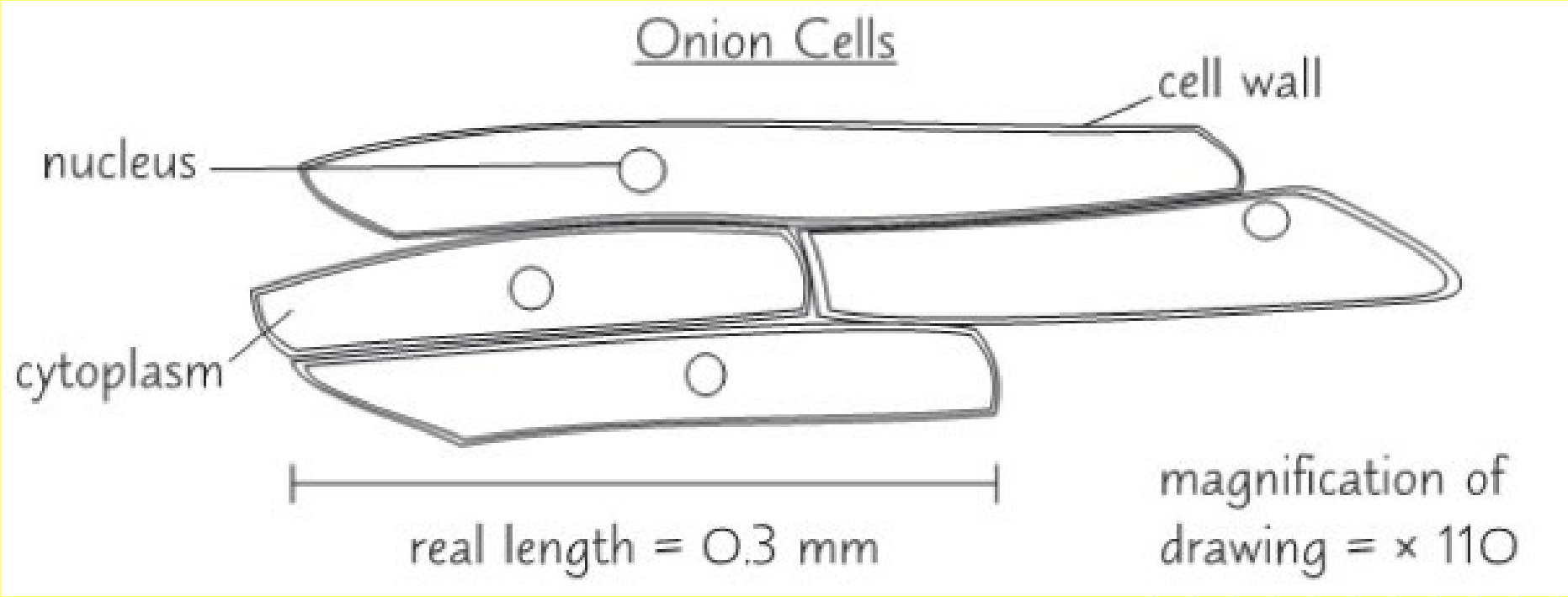
Using a Microscope (page 7)

Move the fine adjustment to get a clear image	5
Move the stage down until the image is roughly in focus	4
Clip the slide onto the stage	1
Twist the coarse adjustment to move the stage up to just below the objective lens	3
Get a bigger image by using an objective lens with a higher magnification	6
Start with the lowest magnification objective lens	2

Microscope Observations (page 7)

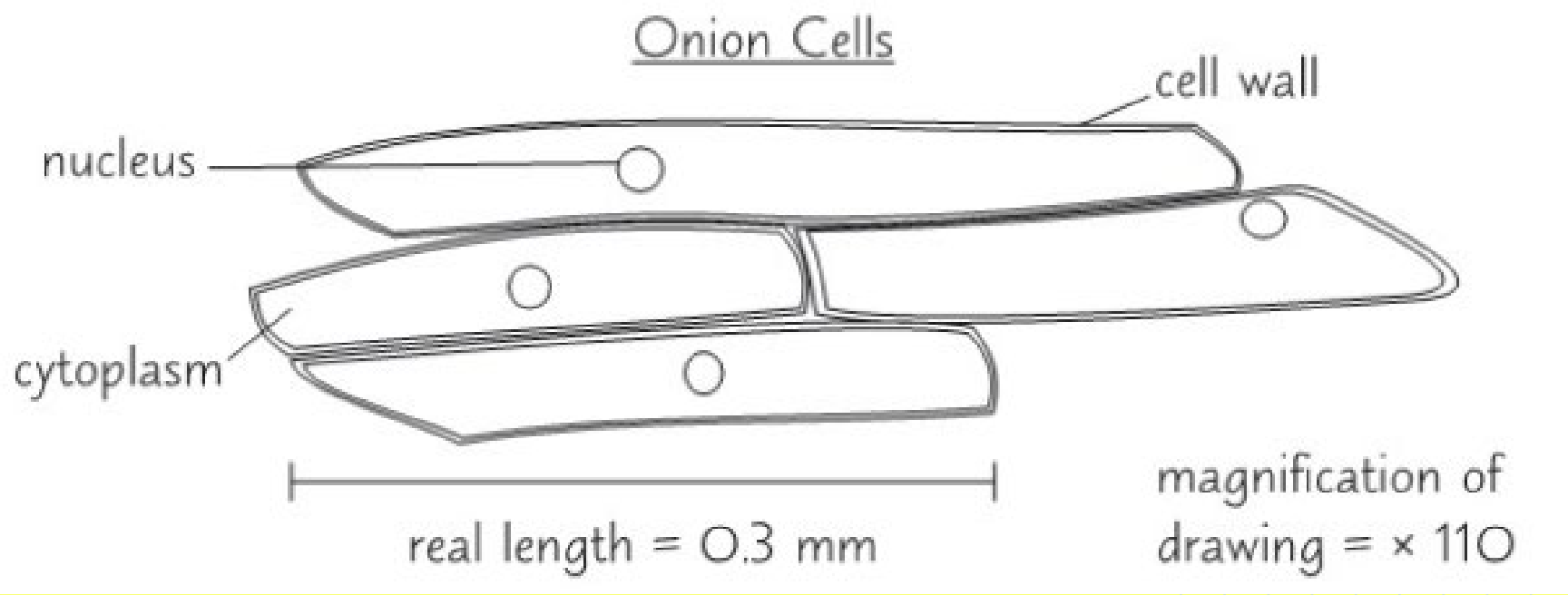
Here is a good quality drawing of the onion cells viewed under a student's microscope.

What makes the diagram 'good quality'?



Microscope Observations (page 7)

- Sharp pencil used
- Smooth outlines of the key features - no sketching
- No shading or colouring in
- Labelled with lines which don't cross
- Title, scale and magnification are all included

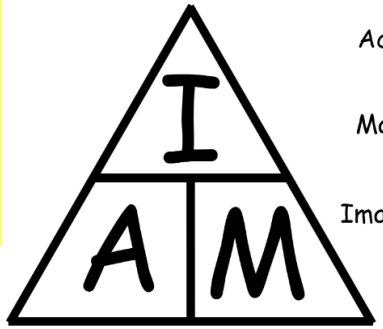


Microscope Calculations (page 8)

Length can have lots of units, including m, mm, and μm.

m ⇄ mm ⇄ μm (× 1000 / ÷ 1000)

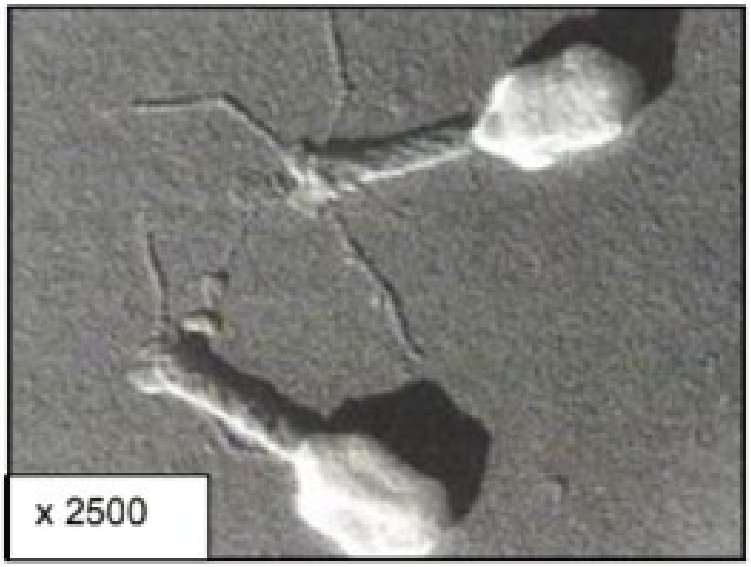
MULTIPLY to go from a bigger unit to a smaller unit.



Actual Image = Image Size / Magnification

Magnification = Image Size / Actual Image

Image Size = Actual x Magnification



Q: What is the actual size of the head of this virus?

Step one:
Measure the length of the head (image size): 17mm

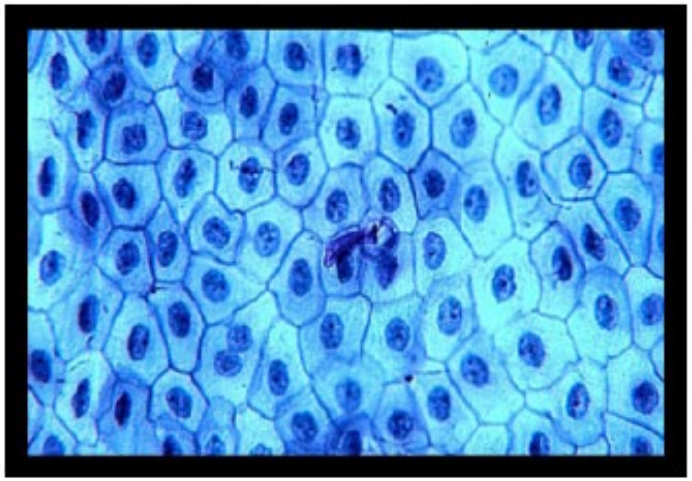
Step two:
Convert this measurement into μm : 17000μm

Step three:
What is the magnification? x 2500

Step four:
rearrange the equation to make actual size the subject:

actual size of image = size of image ÷magnification
= 17000 ÷ 2500
= 6.8 μm

Microscope Calculations (page 9)

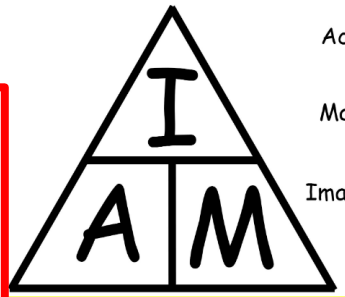


Magnification is x100
What is the actual size of one of these epithelial cells?

Step 1: Measure the length of the cell
Step 2: Convert into μm
Step 3: What is the magnification?
Step 4: Make **actual size** the subject of the equation
Step 5: Calculate the answer

If the actual length of this chloroplast is 10μm, what is the magnification?

Step 1: Measure the length of the cell
Step 2: Convert into μm
Step 3: What is the actual length?
Step 4: Make **magnification** the subject of the equation
Step 5: Calculate the answer

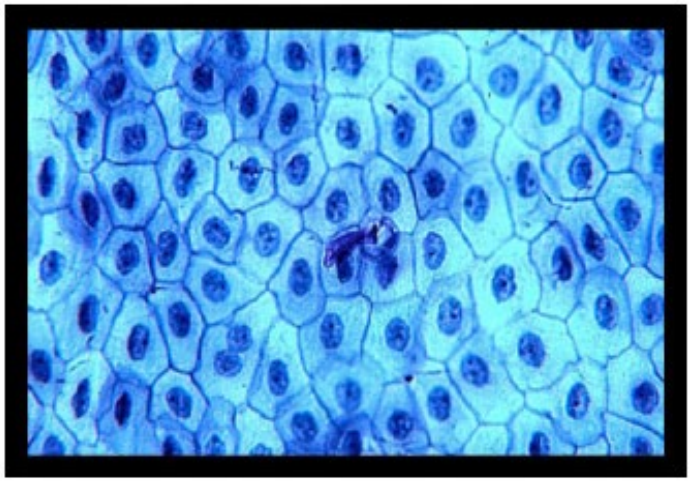


Actual Image = $\frac{\text{Image Size}}{\text{Magnification}}$

Magnification = $\frac{\text{Image Size}}{\text{Actual Image}}$

Image Size = Actual x Magnification

Microscope Calculations (page 9)

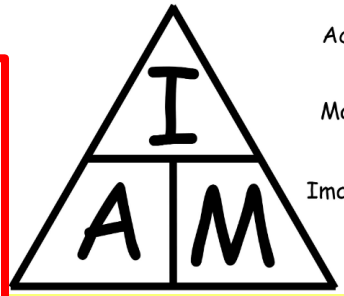


Magnification is x100
What is the actual size of one of these epithelial cells?

Step 1: 12mm
Step 2: 12000µm
Step 3: magnification = 100
Step 4: A = I ÷ M
Step 5: A = 12000 ÷ 100 = 120µm

If the actual length of this chloroplast is 10µm, what is the magnification?

Step 1: 100 mm
Step 2: 100000 µm
Step 3: Actual length = 10µm
Step 4: M = I ÷ A
Step 5: 100000 ÷ 10 = 10000



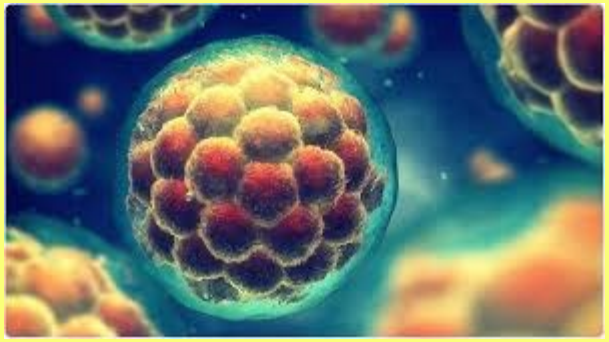
Actual Image = $\frac{\text{Image Size}}{\text{Magnification}}$

Magnification = $\frac{\text{Image Size}}{\text{Actual Image}}$

Image Size = Actual x Magnification

Specialised Cells (page 10)

When an egg is first fertilised, it starts to divide.
At first, the cells are **undifferentiated**. What does this mean?
Cells then start to **differentiate**.
What does this mean?
Some plant cells can differentiate at any point in their lives. **Most** animal cells cannot do this.



Specialised Cells (page 10)

When an egg is first fertilised, it starts to divide.
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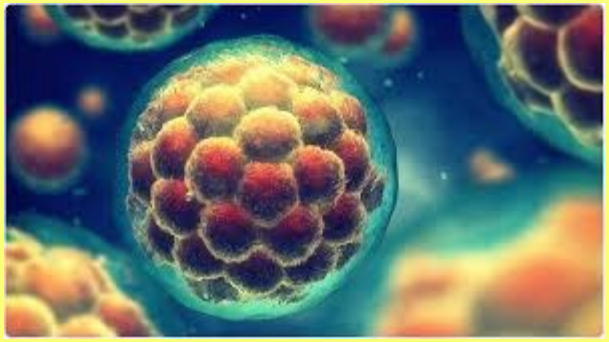
What does this mean?



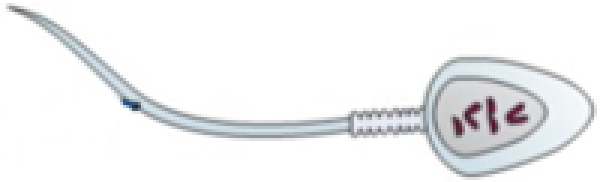
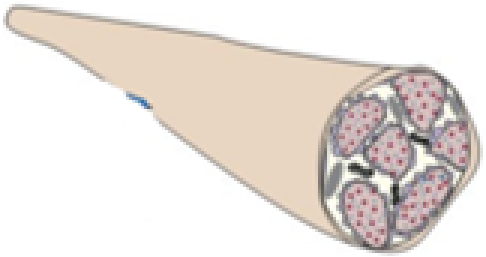
The cell is not specialised - it can turn into any other type of cell.

Cells then start to **differentiate**. What does this mean?

It develops into a specialised cell.
Eg a sperm cell or nerve cell

Some plant cells can differentiate at any point in their lives. **Most** animal cells cannot do this.

Specialised Cells (page 10)

Specialised Cell	Function	Adaptation
Sperm Cell 	To swim to the egg	Flagellum (tail) Mitochondria - release energy Enzymes in head to help penetrate egg
Nerve Cell 	To carry nerve impulses through the body	Long - to carry impulses long distances from CNS to muscles Insulated with a fatty sheath - speeds up impulses
Muscle Cell 	To contract to allow movement	Lots of mitochondria to release energy through respiration

Specialised Cells (page 10)

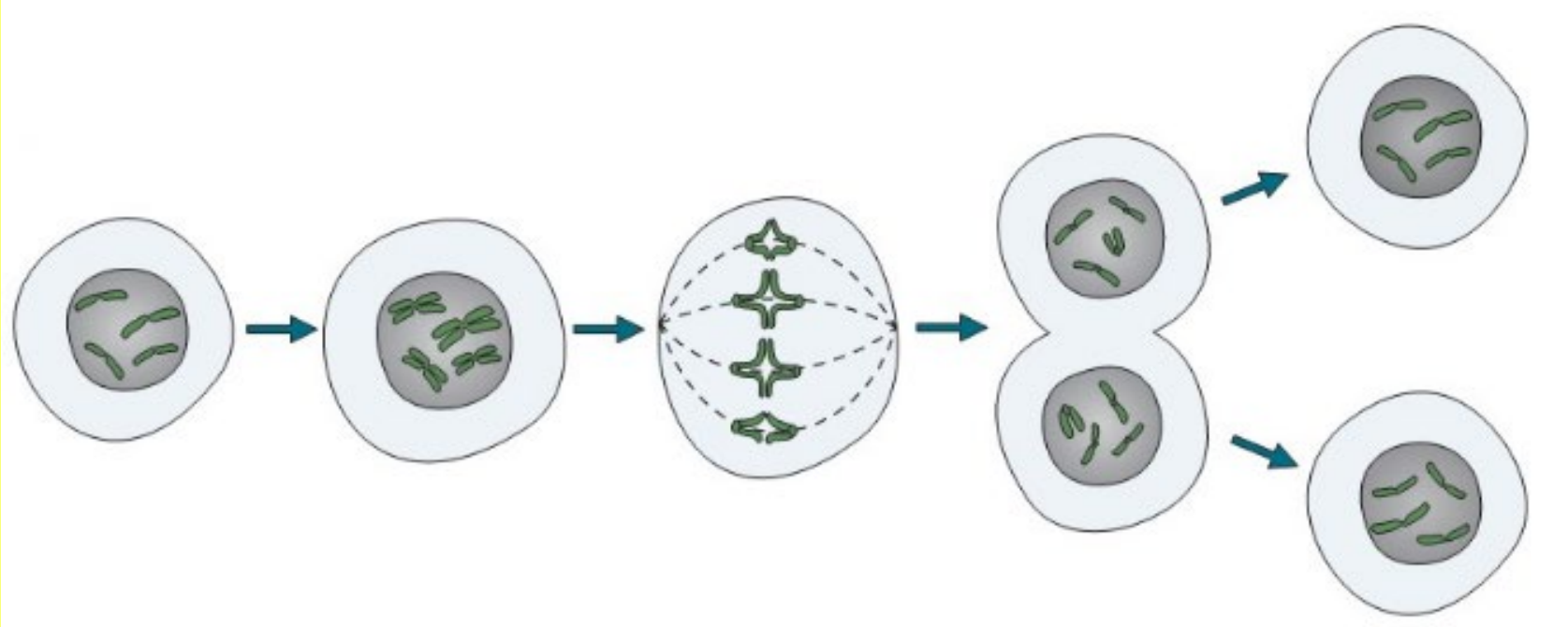
Specialised Cell	Function	Adaptation
Root Hair Cell 	Absorb water and nutrients from soil	Large surface area and thin walls to speed up the rate of absorption
Xylem 	Transports water around the plant	Hollow ends to make a tube for water to travel through Thick cell walls to help support the plant
Phloem 	Transports dissolved sugar and amino acids around the plant	Cells close to the phloem provide energy to transport the substances

B1 - Cell Biology

Complete the exam questions on pages 3-8 of the exam question booklet

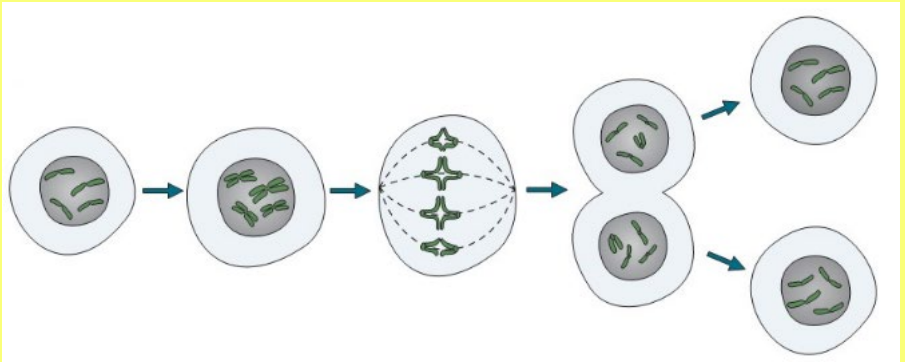
Mitosis (page 11)

Mitosis is part of the cell cycle, where cells divide.
This kind of cell division is done so organisms can grow and repair themselves.
Cells which have divided by mitosis are genetically identical to the parent cell.



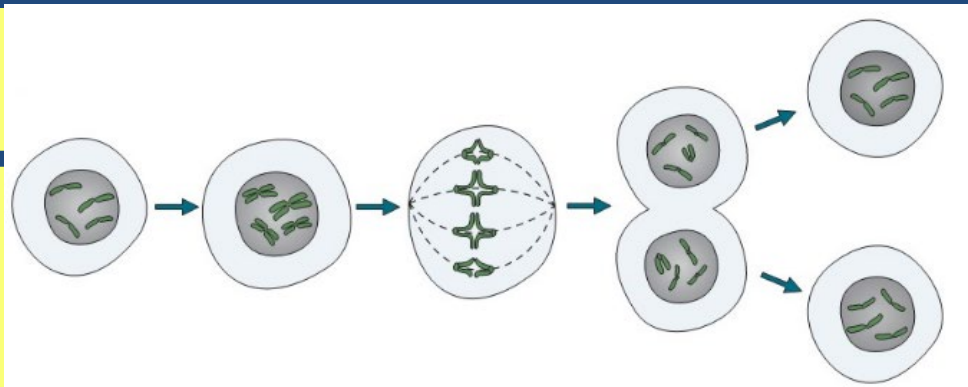
Mitosis (page 11)

Put the stages of the cell cycle in order.
Use the diagram to help.



- DNA replicates to make 2 copies of each chromosome
- One set of DNA is pulled to each side of the cell
- The nucleus divides
- The cytoplasm and cell membranes divide and two identical cells are formed
- The cell grows and increase the number of mitochondria and ribosomes
- The DNA lines up down the centre of the cell

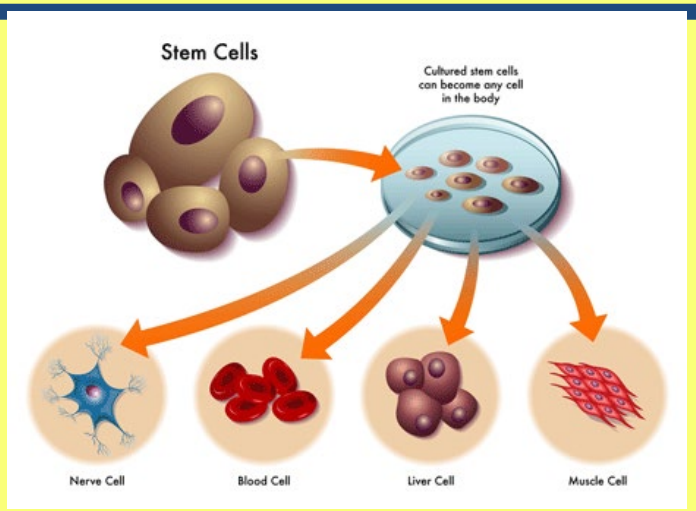
Mitosis (page 11)



Check your answers….

DNA replicates to make 2 copies of each chromosome	**2**
One set of DNA is pulled to each side of the cell	**4**
The nucleus divides	**5**
The cytoplasm and cell membranes divide and two identical cells are formed	**6**
The cell grows and increase the number of mitochondria and ribosomes	**1**
The DNA lines up down the centre of the cell	**3**

Stem Cells - Key Information (page 12)



A stem cell is an undifferentiated cell which can become another type of cell. There are 2 sources of stem cells in humans:

Embryos

Advantages: can become most other types of cell. Used to treat disease eg diabetes/paralysis. Not rejected by the body

Disadvantages: Can cause transfer of viruses, ethical issues - embryos area potential life, religious objections - should not 'play god'.

Adult Stem Cells

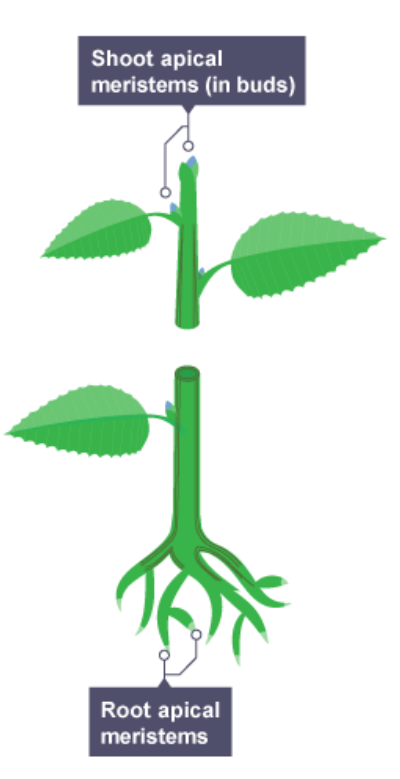
Advantages: can form some other types of cell eg blood cells from bone marrow. Not rejected by the body

Disadvantages: Can cause transfer of viruses, can differentiate into fewer types of cells than embryos

Stem Cells - Key Information (page 12)

Plants also have stem cells - called meristem tissue

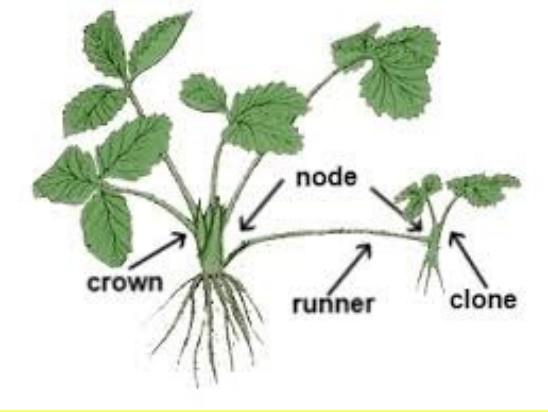
Meristem tissue can differentiate into any other type of plant cell, at any point in the plant's life



Advantages

Can clone rare plants to stop them from going extinct

Can clone plants which have special features, eg resistance to a disease or a very nice tasting fruit.



B1 - Cell Biology

Complete the exam questions on pages 9-14 of the exam question booklet

Diffusion (page 13)

Some substances move around an organism by diffusion.

Diffusion is:
the spreading out of the particles from an area of higher concentration to an area of lower concentration.

For example:
Oxygen and carbon dioxide diffuse in and out of the lungs during gas exchange
Urea diffuses from cells into the blood plasma where it is taken to the kidney

Diffusion (page 13)

Factors which speed up the rate of diffusion are:

- A big difference in concentrations (large concentration gradient)
- Warmer temperature
- Large surface area of the membrane
- Only a short distance for the substance to diffuse

Diffusion (page 13)

Describe how the gills of a fish and the filaments of an axolotl are adapted for efficient diffusion.

Diffusion (page 14)

- Large surface area
- A good blood supply to keep a large difference in concentration
- Thin walls so the substances do not have to diffuse far

- Large surface area
- A good blood supply to keep a large difference in concentration
- Thin walls so the substances do not have to diffuse far

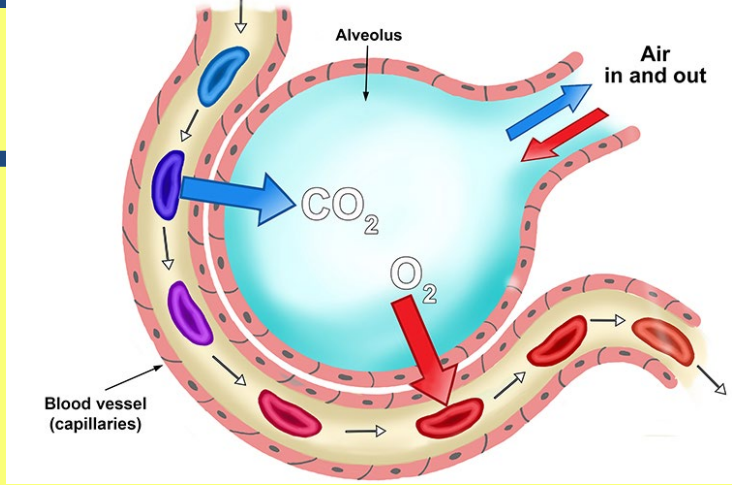
Diffusion (page 14)

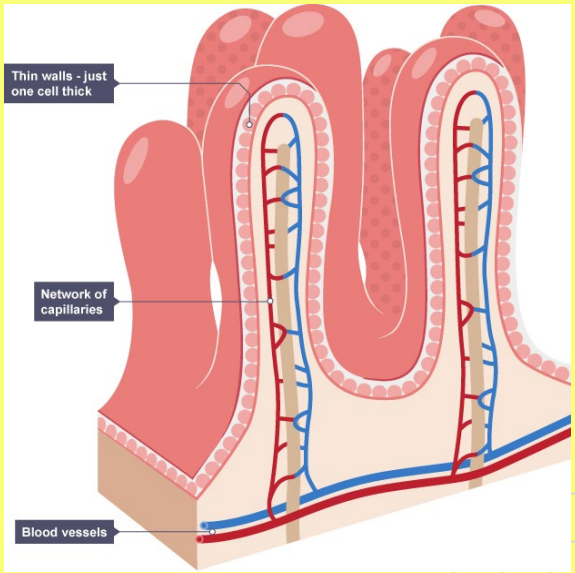
Diffusion takes place in other areas of our bodies and the bodies of plants.

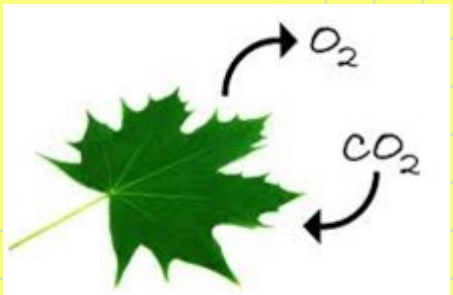
For example:

- In alveoli in our lungs
- The villi of our small intestine
- The leaves and roots of plants

The factors that speed up the rate of diffusion are the **same** in all living things.



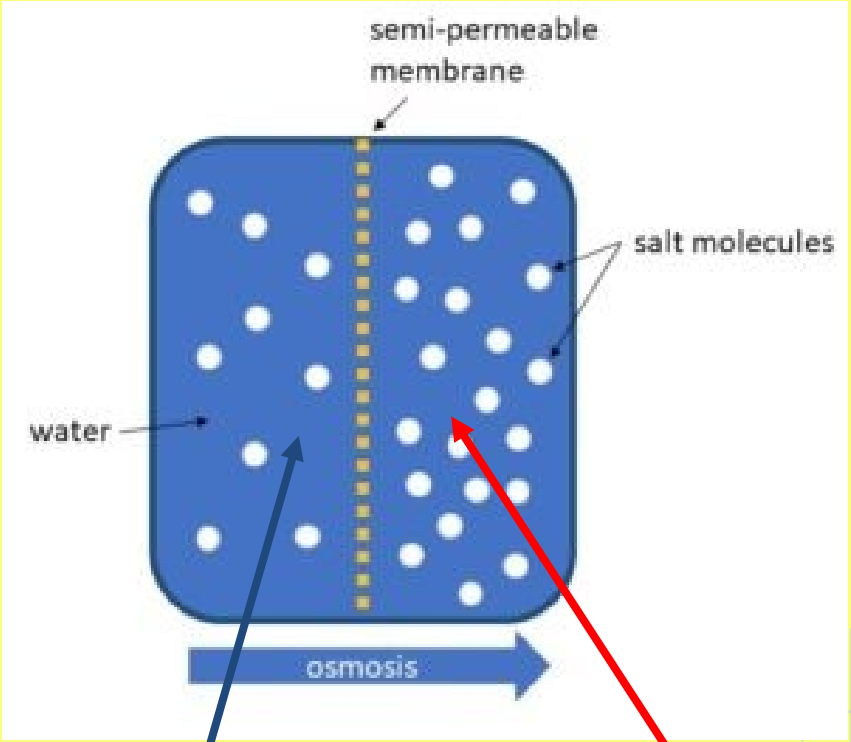




Osmosis (page 15)

Water may move across cell membranes by **osmosis**.

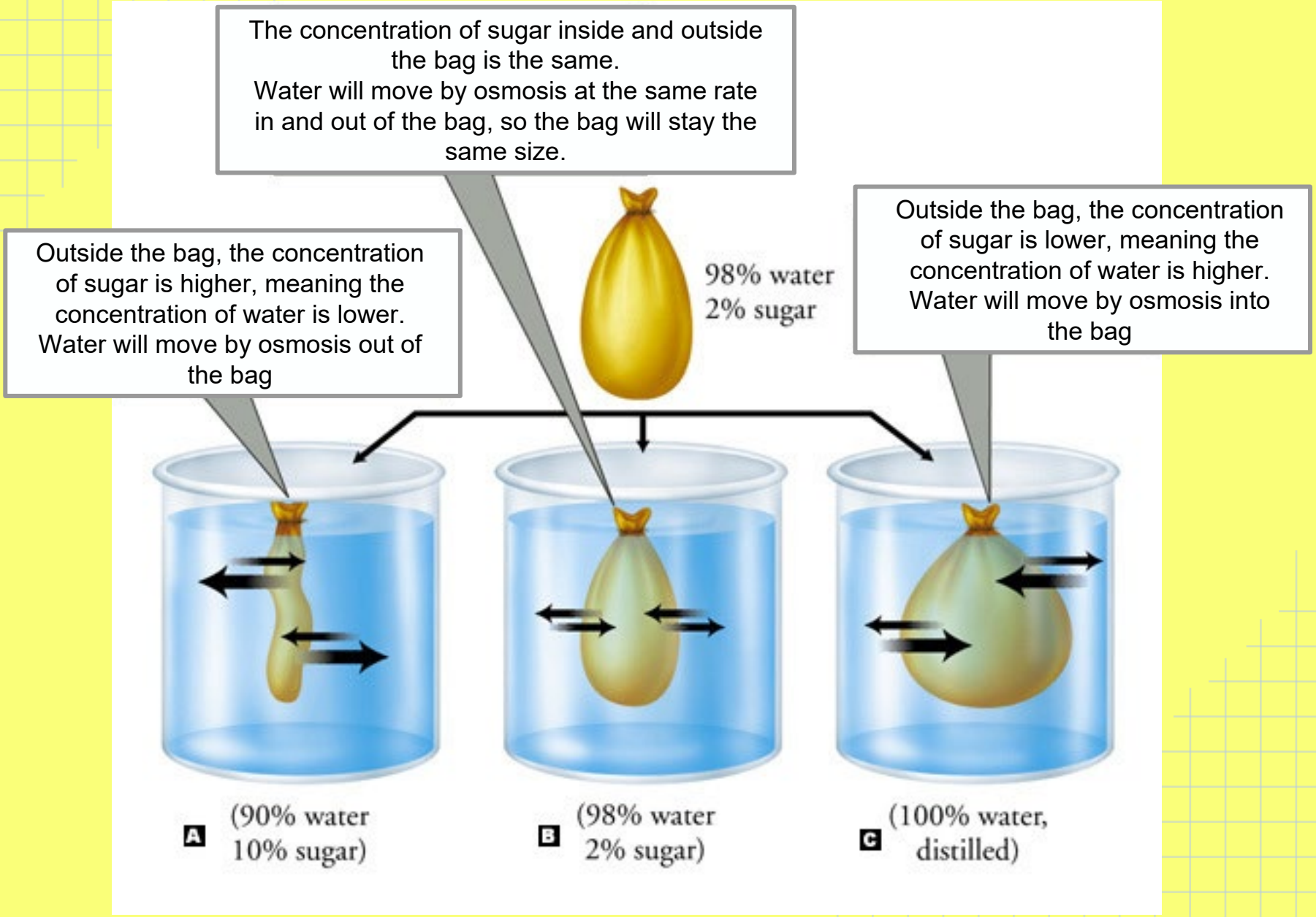
*'Osmosis is the diffusion of water from an area of high **water** concentration to an area of low **water** concentration through a partially permeable membrane.'*



Not much salt = high water concentration

Lots of salt = low water concentration

Osmosis (page 15)



Osmosis (pages 16 and 17)

1. Why is important that the potatoes are all t same diameter?
2. Why do we cut the ends off the potato cylinders?
3. Why do we use a bung on top of the test tube?
4. How do we remove the excess water from the potatoes?
5. How do we work out the change in length?
6. What does a negative change in length mean?
7. What does a positive change in length mean?
8. How do we calculate the percentage change in mass?
9. How can we use our results to work out the concentration of the potato?

Osmosis (pages 16 and 17)

1. Why is important that the potatoes are all the same diameter?
   To make it easier to compare the potatoes
2. Why do we cut the ends off the potato cylinders?
   The water can't pass through the potato skin (it is impermeable)
3. Why do we use a bung on top of the test tube?
   To stop water from evaporating
4. How do we remove the excess water from the potatoes?
   Dab the potato with blotting paper
5. How do we work out the change in length?
   Final length - initial length
6. What does a negative change in length mean?
   The potato has got shorter
7. What does a positive change in length mean?
   The potato has got longer
8. How do we calculate the percentage change in mass?

$$\frac{\text{Final Mass - Initial Mass}}{\text{Initial Mass}} \times 100$$

9. How can we use our results to work out the concentration of the potato?
   Look for the concentration where there is no change in the mass of the potatoes. This is the concentration of the potato. It is where the line crosses the x axis.

Osmosis (page 17)

- Calculate the change in mass of each potato.

Change in mass = final mass – initial mass

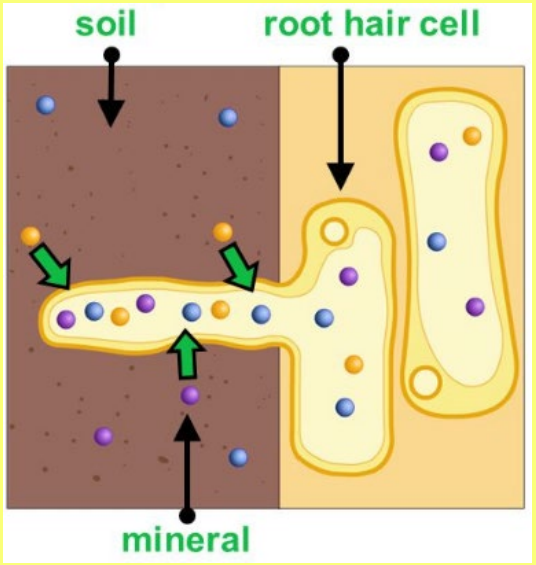
- Calculate the **percentage** gain and loss of mass

$$\frac{\text{Final Mass - Initial Mass}}{\text{Initial Mass}} \times 100$$

Test tube	*Concentration of sugar solution* (M)	*Initial mass of potato cylinder* (g)	*Final mass of potato cylinder* (g)	*Change in mass of potato cylinder* (g)	*Percentage change in mass of potato*
A	0·1	2·0	2·2		
B	0·2	2·0	2·1		
C	0·3	2·0	1·8		
D	0·4	2·0	1·7		
E	0·5	2·0	1·5		

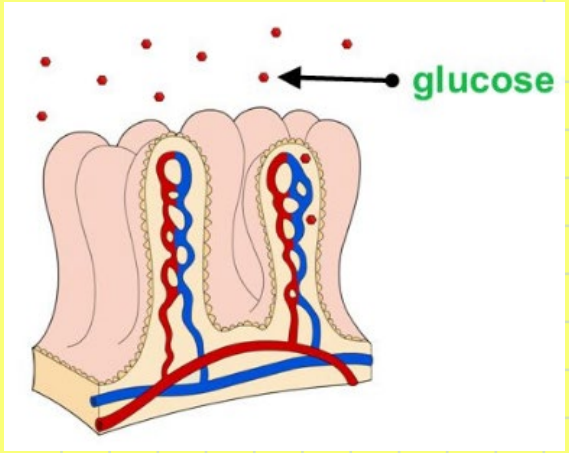
Active Transport (page 18)

Active transport moves substances from a low to a high concentration **against** the concentration gradient.
This needs **energy** which comes from **respiration**.



Examples

- Root hair cells absorb minerals ions which are in a low concentration in the soil. Plants need ions for healthy growth.
- Sugar is absorbed from a low concentration in small intestine, into the blood which has a higher sugar concentration. Sugar molecules are used for cell respiration.

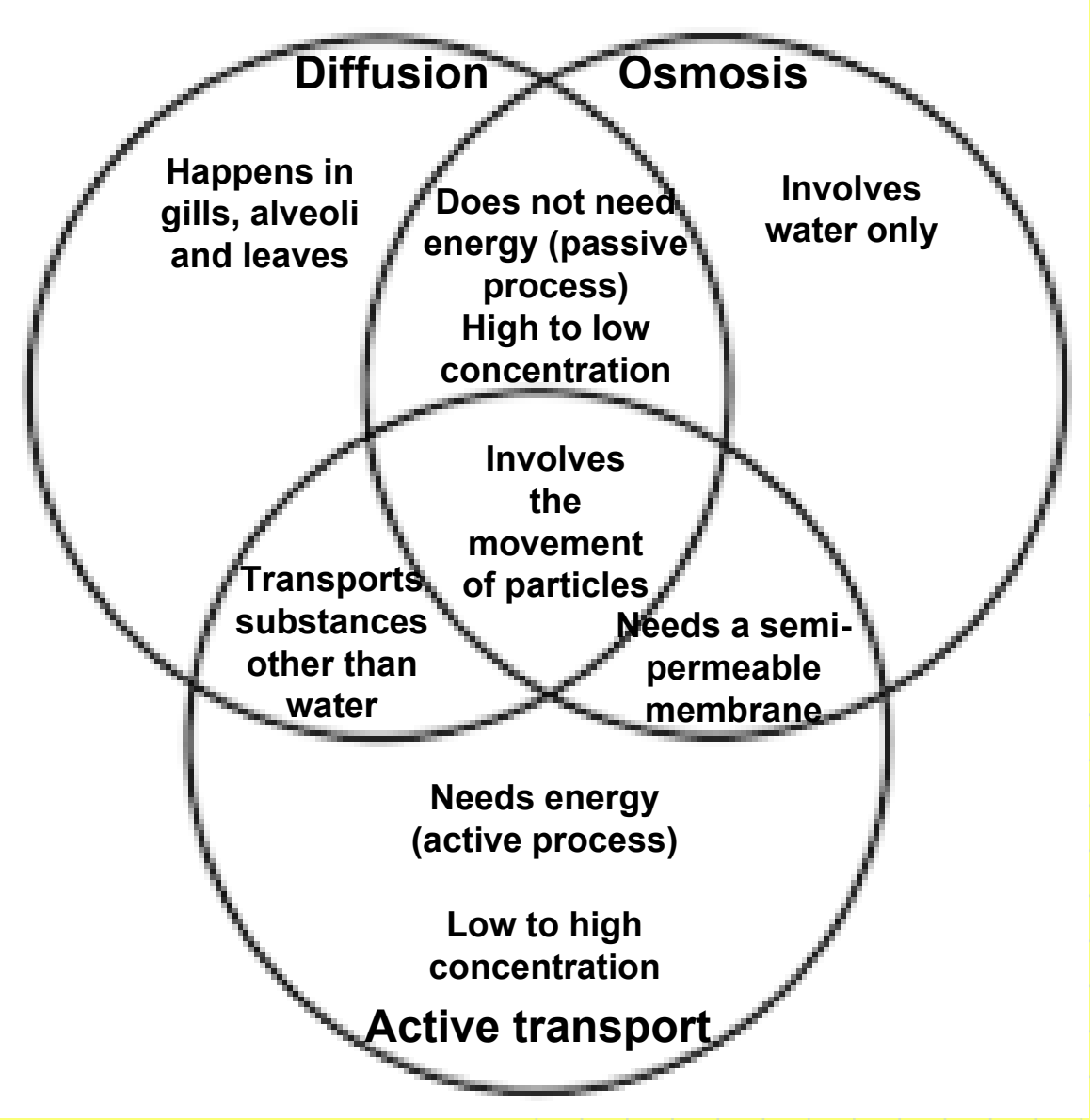


Comparing Transport (page 18)

Use the Venn diagram to start to compare the three methods

Think about:

- the type of particles which move
- where it happens
- concentrations
- if it needs energy

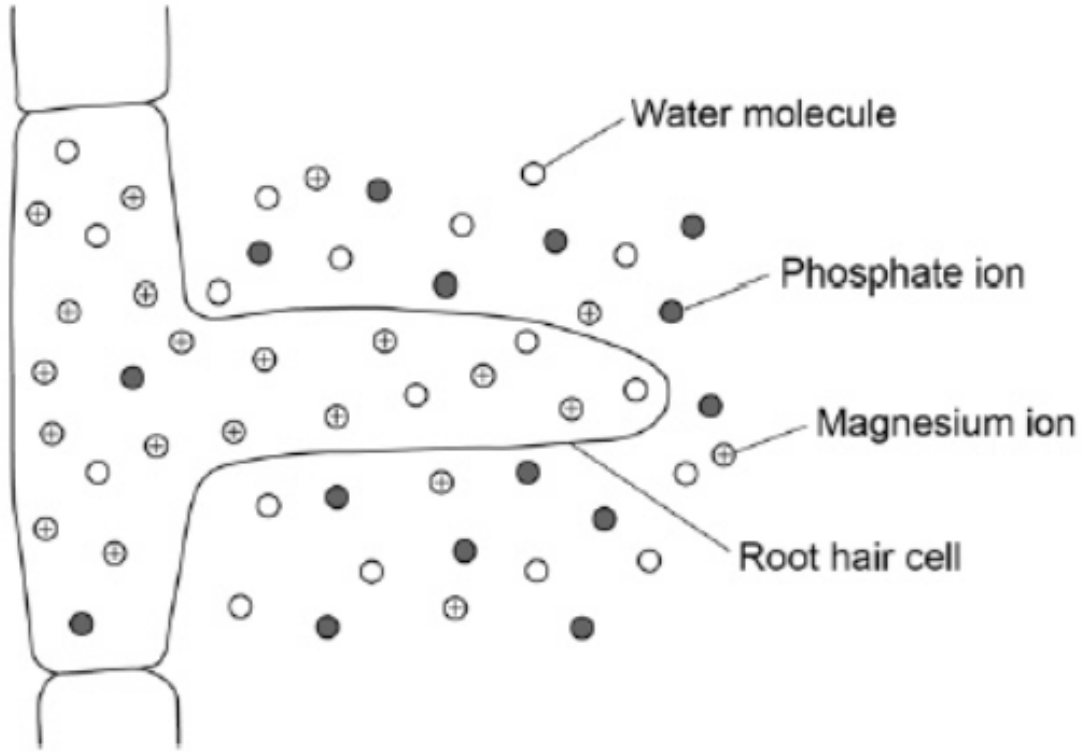


Different Transport Methods (page 19)

Particles can move into and out of cells by different processes.

Figure 2 shows different particles inside and outside a root hair cell.

Figure 2



Explain the processes by which the different particles would enter the root hair cell.

- Where is the concentration of each substance low and high?
- Decide which transport method each substance moves by
- What do you know about each process?

Different Transport Methods (page 19)

Indicative content

- water is absorbed by osmosis
- osmosis is a passive process, or described
- water in soil is at a higher concentration than inside cell
- water moves down concentration gradient
- through a partially permeable membrane
- phosphate ions absorbed by diffusion
- diffusion is a passive process, or described
- phosphate ions are in a higher concentration in soil than inside cells
- magnesium ions are absorbed by active transport

B1 - Cell Biology

Complete the exam questions on pages 15-23 of the exam question booklet

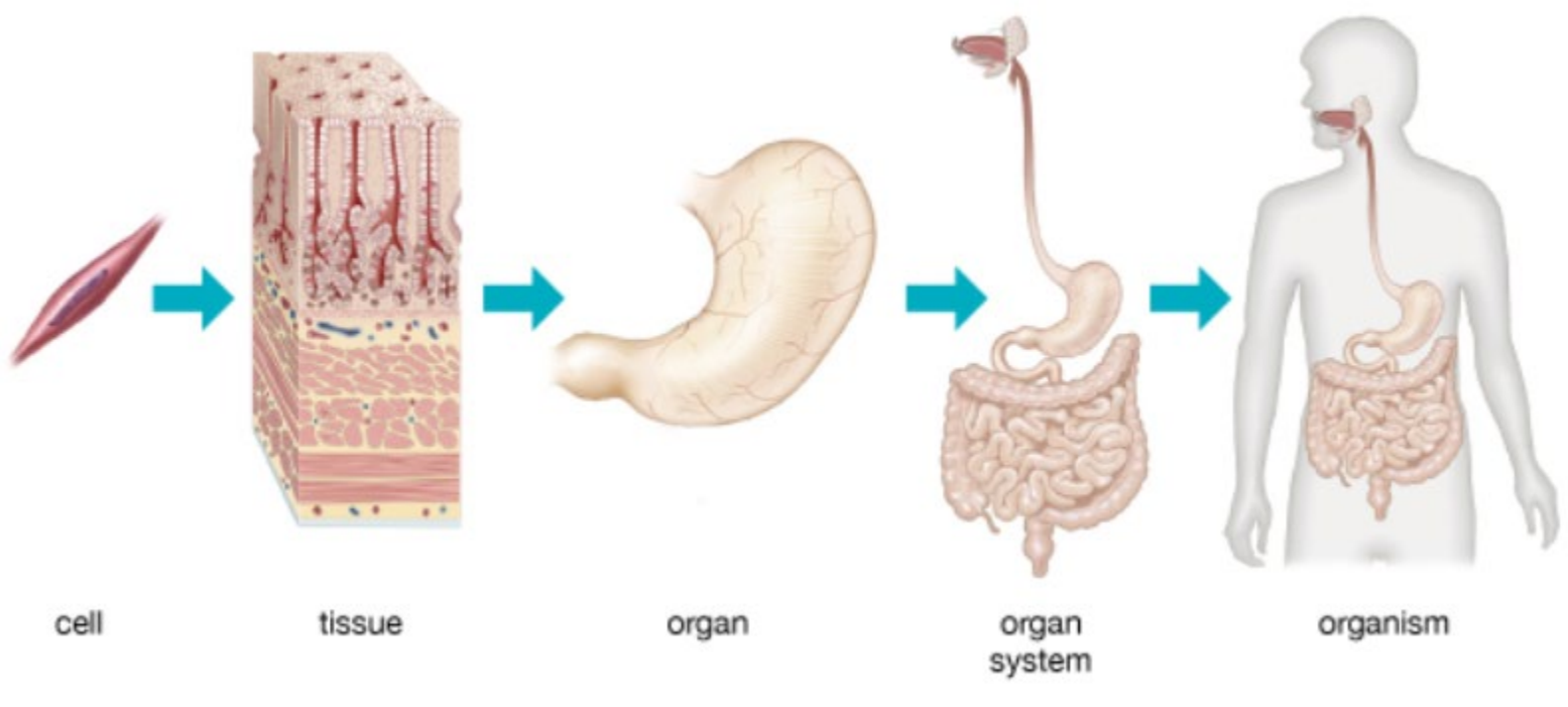
B2 - Organisation

Topic	Slide number	Booklet page number	Revision guide page
Digestive system and enzymes	52-71	20-26	24-27
Food tests (RP)	72-76	27-28	28
Breathing system	77-80	29	29
Circulatory system, blood and cardiovascular disease	81-103	30-37	30-34
Non communicable diseases	104-111	38-40	35-37
Plant systems	112-118	41-43	38-40

Organisation (page 20)

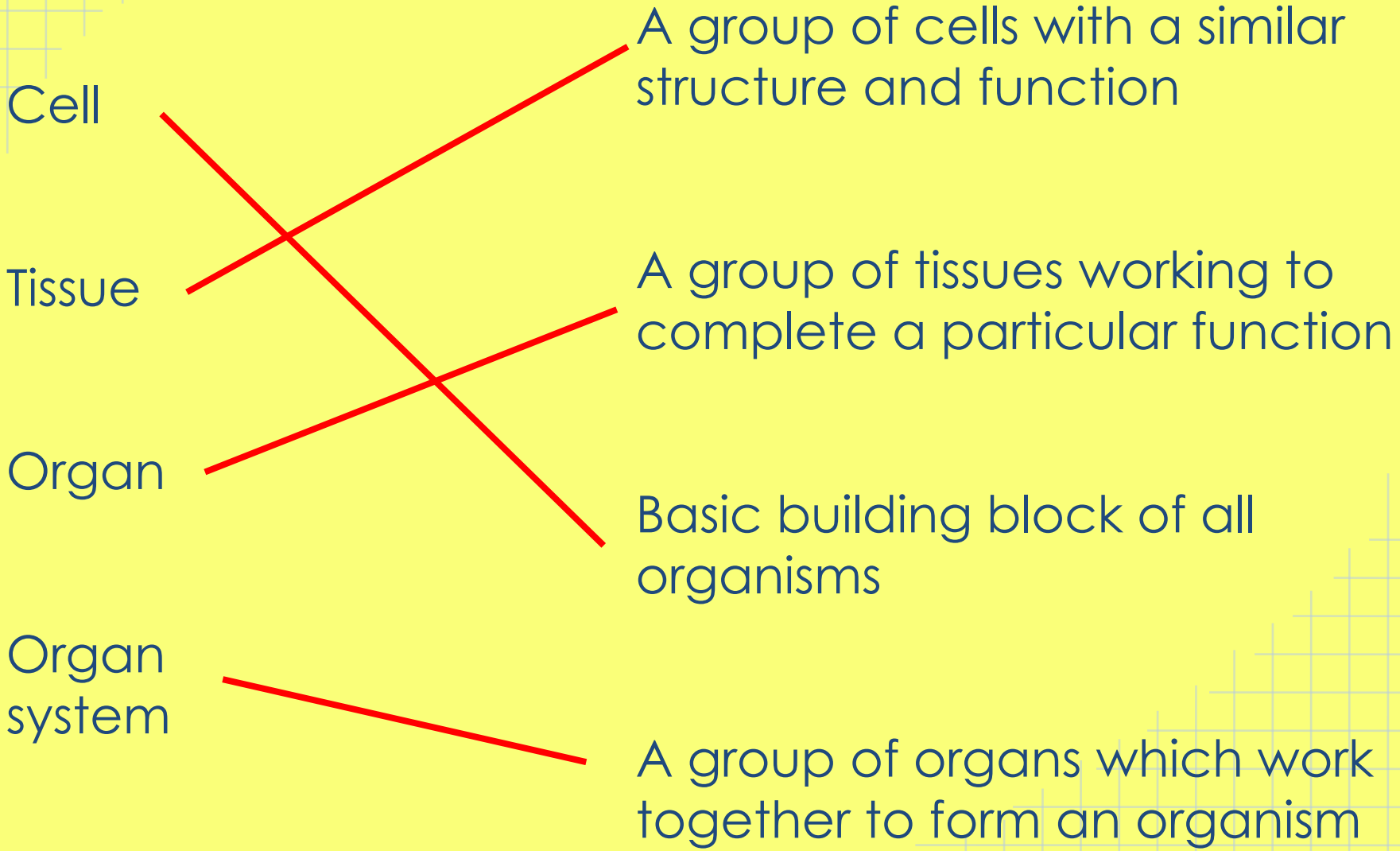
Put these words in order, starting with the smallest level of organisation:

Tissue organ system organism cell organ



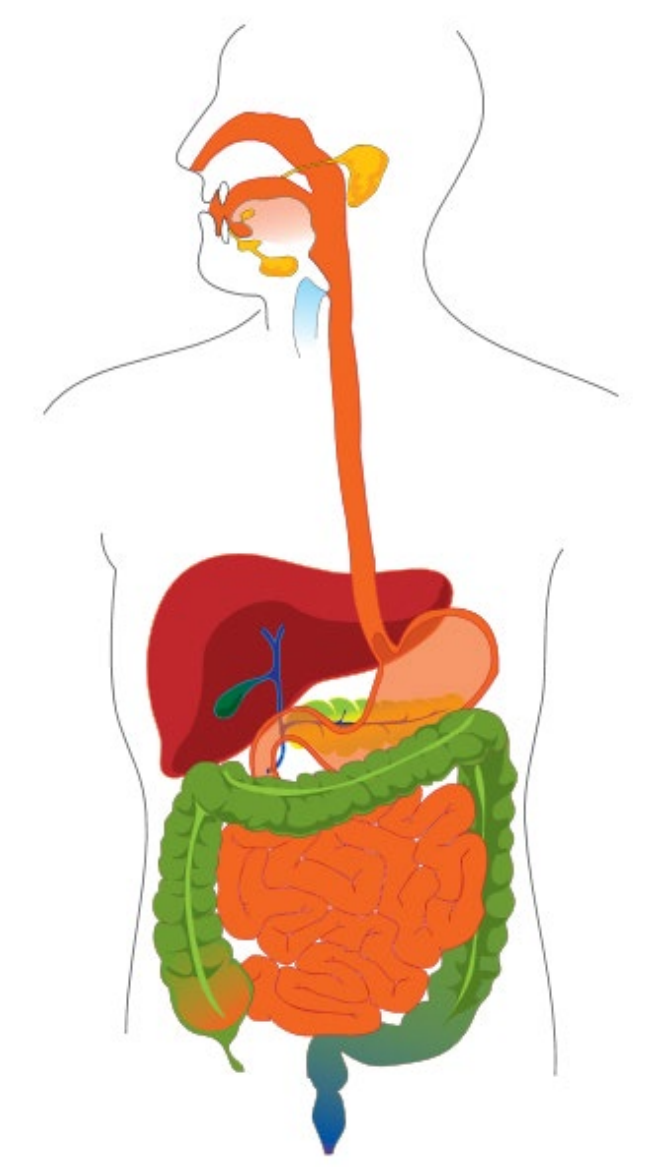
Organisation (page 20)

Match up the word with the definition



The Digestive System (page 20)

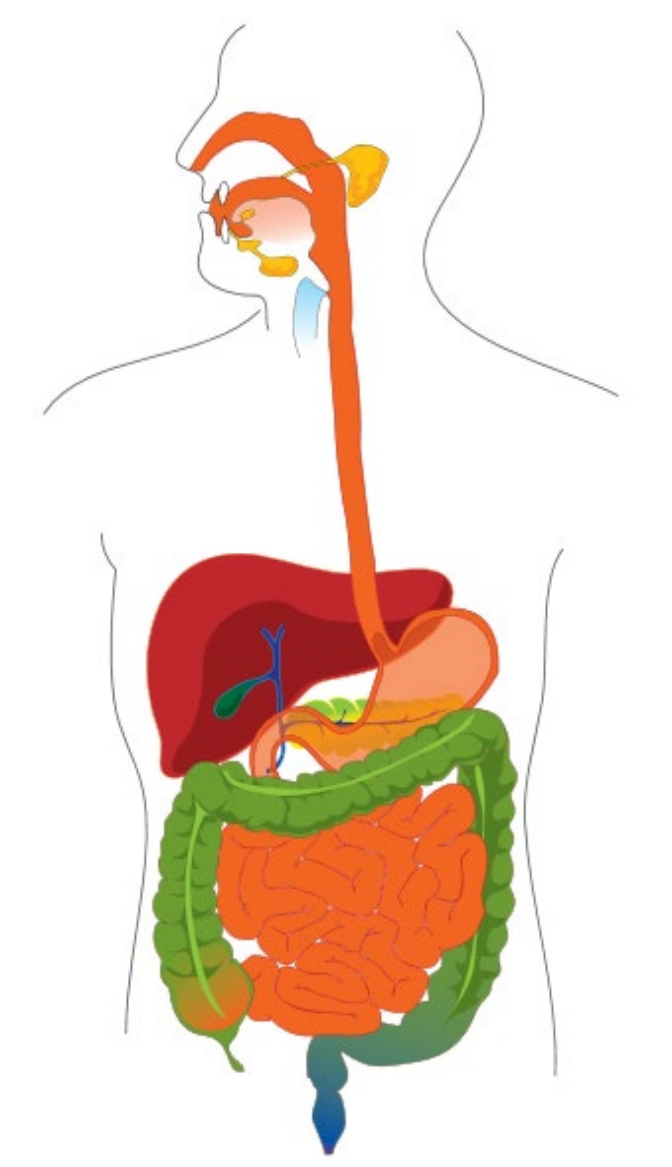
In the digestive system **enzymes** break down large, **insoluble**, molecules into smaller soluble ones which can be **absorbed** into the bloodstream.



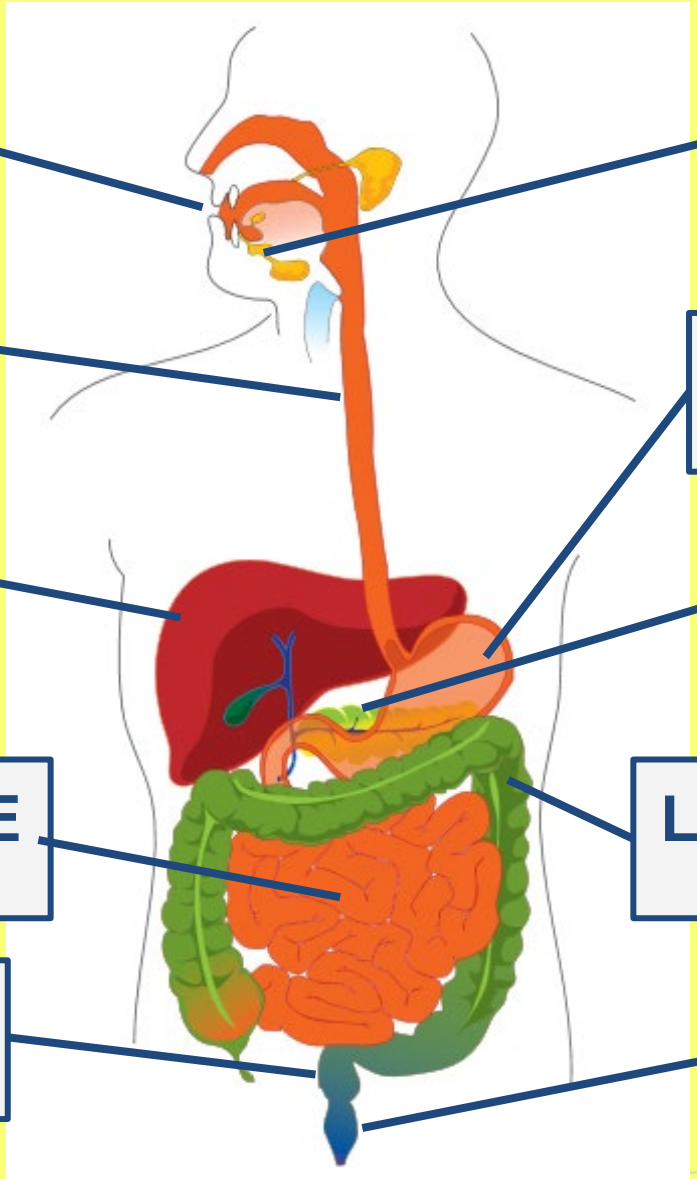
The Digestive System (page 21)

Add these labels to your diagram:

- Pancreas
- Salivary glands
- Liver
- Small intestine
- Oesophagus
- Large intestine
- Mouth
- Rectum
- Anus
- Stomach



The Digestive System (page 21)



MOUTH

SALIVARY GLANDS

OESOPHAGUS

STOMACH

LIVER

PANCREAS

SMALL INTESTINE

LARGE INTESTINE

RECTUM

ANUS

Functions of Key Parts (page 21)

Part of System	Function
salivary glands	**Produce the amylase enzyme to start digestion**
stomach	**Produce the protease enzyme to digest food**
liver	**Produces bile to neutralise stomach acid and emulsify fats**
pancreas	**Produces digestive enzymes**
small intestine	**Where digested, small soluble molecules are absorbed into bloodstream**
large intestine	**Water from undigested food is absorbed**

Enzymes - Lock and Key (page 22)

Our body has many chemical reactions going on.

Enzymes are protein molecules which can speed up reactions.

We say they are **biological catalysts.**

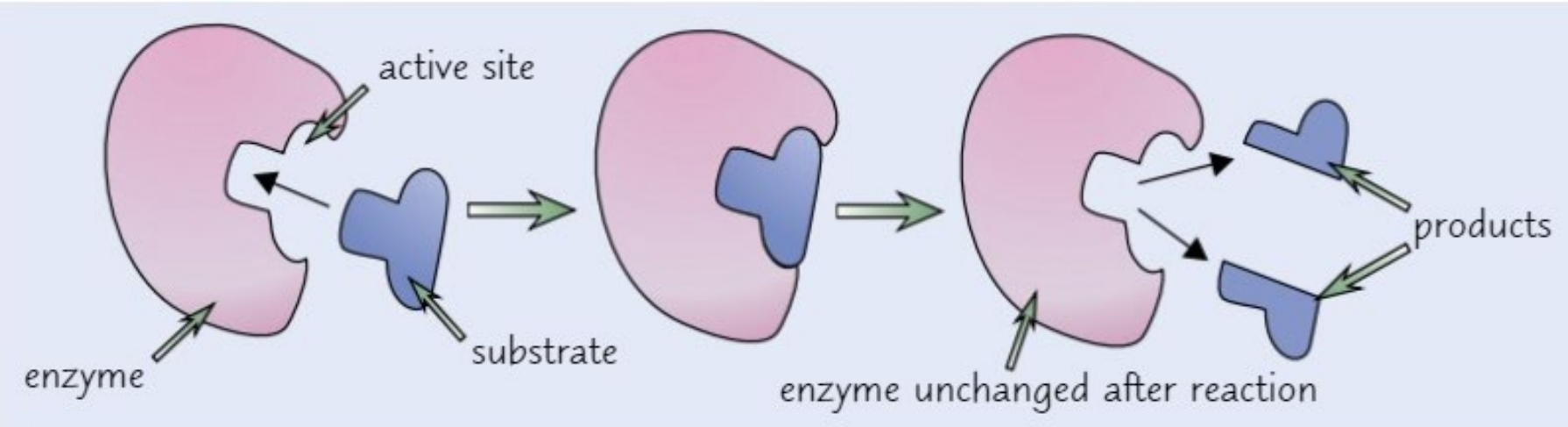
A CATALYST is a substance which INCREASES the speed of a reaction, without being CHANGED or USED UP in the reaction.

Enzymes - Lock and Key (page 22)

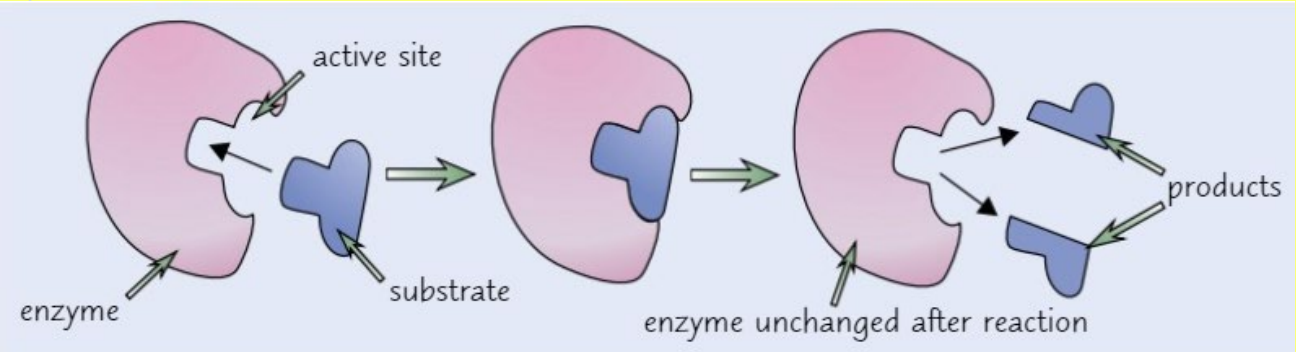
Describe what is meant by lock and key theory, using the key words from the diagram.

Why do we say that enzymes are **specific**?

What do we mean when we say an enzyme has **denatured**?



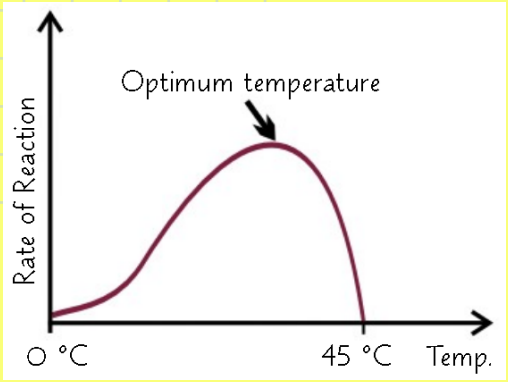
Enzymes - Lock and Key (page 22)



- The **substrate** fits into the **active site** of the enzyme.
- The enzyme then breaks the substrate into the **products** which are released from the active site.
- The enzyme is **not used up** in the reaction and will be able to break down another substrate molecule.
- Enzymes are **specific** because the active site is a **particular shape** and only one type of substrate can **fit**.
- If an enzyme is in the wrong conditions it can **denature**. This is where the active site **changes shape** so the substrate **won't fit** anymore

Denaturing Enzymes (page 23)

1



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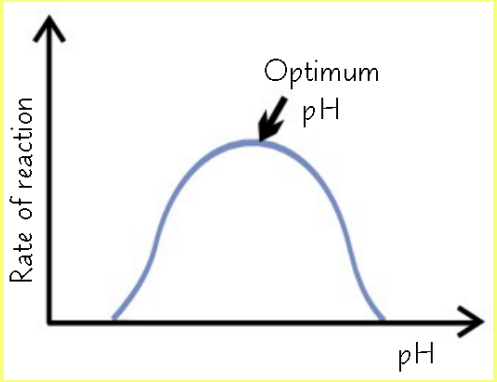
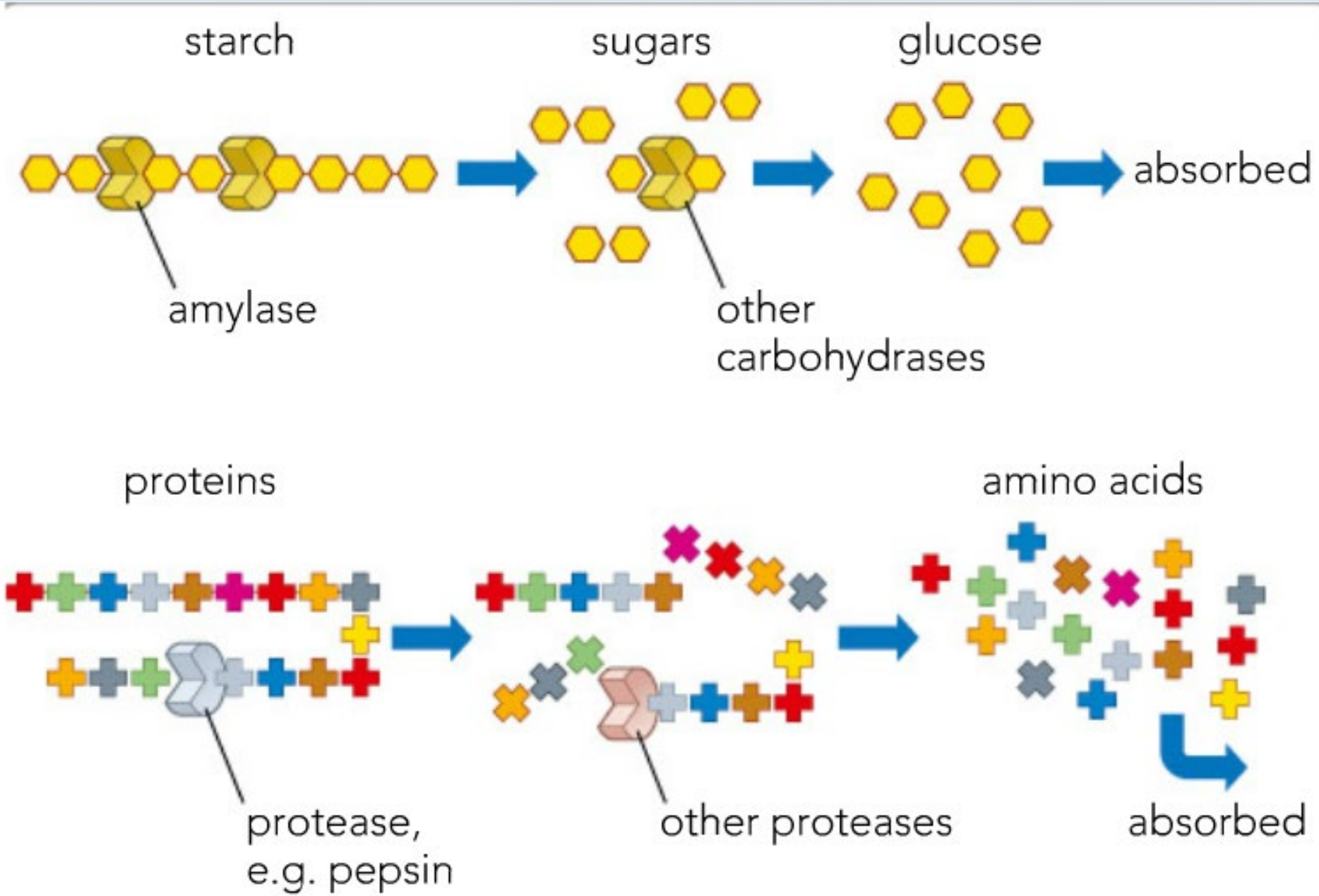


We need to be able to explain the shape of each graph.

Graph 1: At first, the increase in temperature makes the rate of reaction **increase** up to the **optimum** temperature. After this, the active site of the enzyme starts to change **shape**, the **substrate** won't fit and the enzyme is **denatured**.

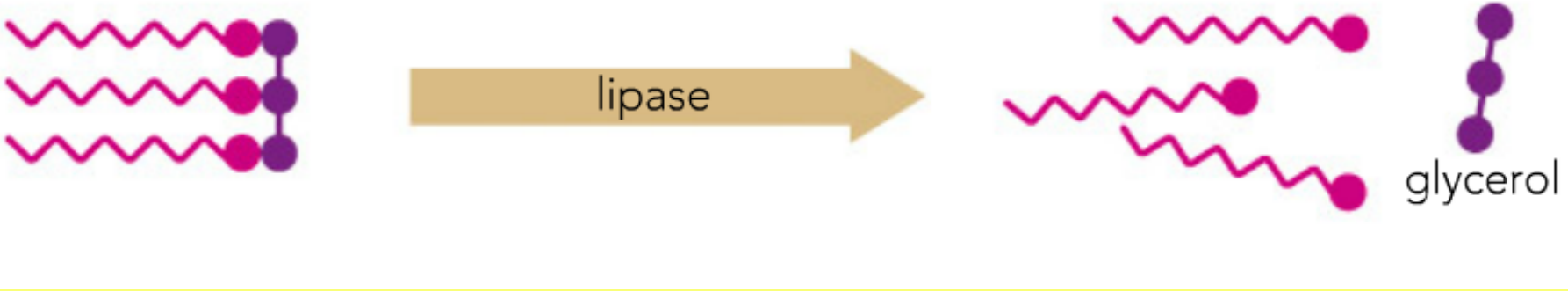
Graph 2: If the pH is too low or too high the **active site** of the enzyme starts to change shape, the substrate won't fit and the enzyme is **denatured**. The pH the enzyme works best at is called the **optimum** pH.



B *The action of carbohydrases and proteases.*

Breaking down lipids

a fat molecule is made up of fatty acid and glycerol molecules

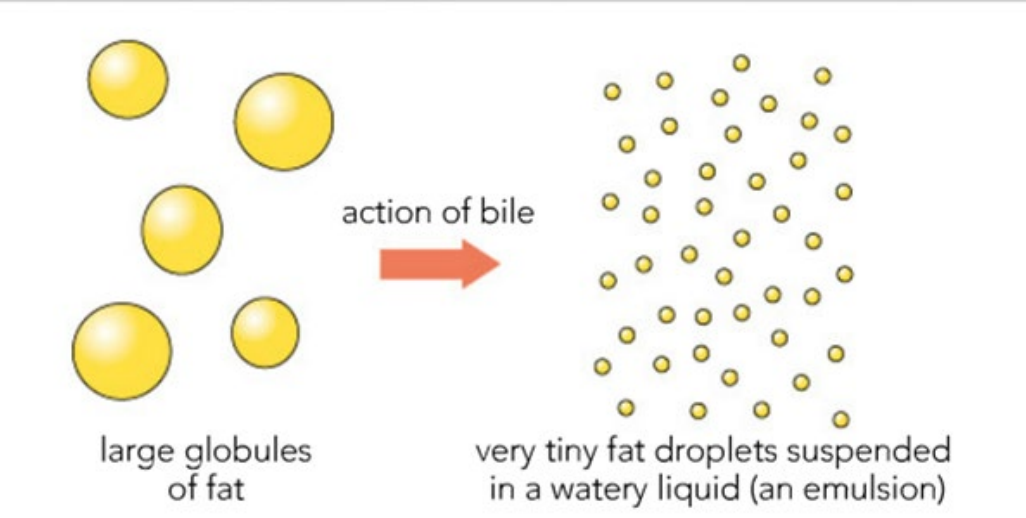


Enzymes in Digestion (page 23)

Complete the table.....

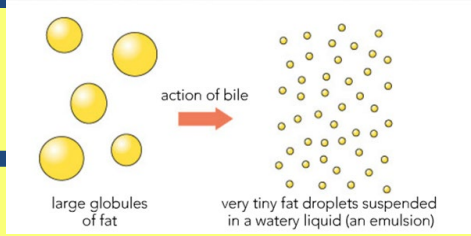
Enzyme	Breaks down...	into...	Made in the...
Carbohydrase (e.g. amylase)	**starch**	**sugar**	**Salivary gland and pancreas**
Protease (e.g. pepsin)	**protein**	**amino acids**	**stomach and pancreas**
Lipase	**Fats (lipids)**	**Fatty acid and glycerol**	**pancreas**

The action of bile..... (page 24)



1. Which molecule does bile help to digest?
2. What is a globule?
3. What does bile do to the globules and why does this help digestion?
4. Compare the pH of the food being digested before and after the bile is added. Explain why this happens.

The action of bile…. (page 24)



1. Which molecule does bile help to digest?
   Fats (lipids)
2. What is a globule?
   A large blob of fat
3. What does bile do to the globules and why does this help digestion?
   It emulsifies the fat (breaks it into small droplets) which increases the surface area so the enzymes can work at a faster rate.
4. Compare the pH of the food being digested before and after the bile is added. Explain why this happens.
   The stomach is acidic (pH 1). The bile is alkali so it neutralises the stomach acid.

Summary Task (page 25)

Use your knowledge of the digestive system to describe the journey of a cheese sandwich from mouth to anus.

You will need to:

- Ensure that your journey follows the correct order of organs in the digestive system
- Describe what is happening to the food at each stage in the digestive system
- Describe what the pancreas and liver do, making sure you name the chemical and enzymes involved

Self Assess (page 25)

- Mouth - teeth grind the food into smaller chunks
- Salivary glands - produce amylase that helps breakdown starch
- Oesophagus - connects to the stomach
- Stomach - acid to help kill any pathogens. Pepsin (protease) to breakdown proteins
- Small intestine - mixes with amylase, protease, lipase.
- Pancreas - produces enzymes to help breakdown foods
- Liver - produces bile to neutralise stomach acid and breakdown fats
- Small intestine - nutrients absorbed through villi
- (food does not pass through pancreas and liver)
- Large intestine - water absorption
- Rectum and Anus - faeces stored and excreted

Enzymes Required Practical (page 26)

1. Why is it a good idea to measure the temperature inside the test tube and not just outside?
2. What is the sign for a positive test for starch?
3. What does it mean when there is no colour change with the iodine?
4. How can we use a graph of our results to determine the optimum pH?
5. How can we improve the investigation to improve the accuracy of our optimum temperature reading?

Enzymes Required Practical (page 26)

1. Why is it a good idea to measure the temperature inside the test tube and not just outside?

   To measure the solution temperature not just the glass.

2. What is the sign for a positive test for starch?

   blue black colour change

3. What does it mean when there is no colour change with the iodine?

   Starch fully broken down (no starch left)

4. How can we use a graph of our results to determine the optimum pH?

   Smallest time is the optimum

5. How can we improve the investigation to improve the accuracy of our optimum temperature reading?

   more intervals/readings between 6 and 8

B2 - Organisation

Complete the exam questions on pages 24-35 of the exam question booklet

Food Tests Required Practical (page 27)

1. Why do we mix the crushed food with water and then filter the mixture?
2. What is the chemical test for sugars?
3. What is the chemical used to test for starch?
4. How do we test for fats?
5. What is the chemical used to test for proteins?
6. What would you see if sugar was present?
7. What would you see if starch is present?
8. What would you see if fat is present?
9. What would you see if protein is present?

Food Tests Required Practical (page 27)

1. Separate the molecules into the water to make it easier to see the colour change
2. Benedict's and heated
3. iodine
4. Ethanol and shake
5. biuret
6. Blue to brick red (green, yellow then brick-red)
7. Brown to Blue black colour
8. Clear to cloudy/milky white
9. Blue to purple/pink

Food Tests - Summary Table (page 28)

Food Molecule	Chemical Test	If it is present	If it is absent
Sugar	Benedict's solution (heated)	Turns from blue to green, yellow, orange and then brick red	stays blue
Starch	iodine	Iodine turns from orange to blue-black	stays orange

Food Tests - Summary Table (page 28)

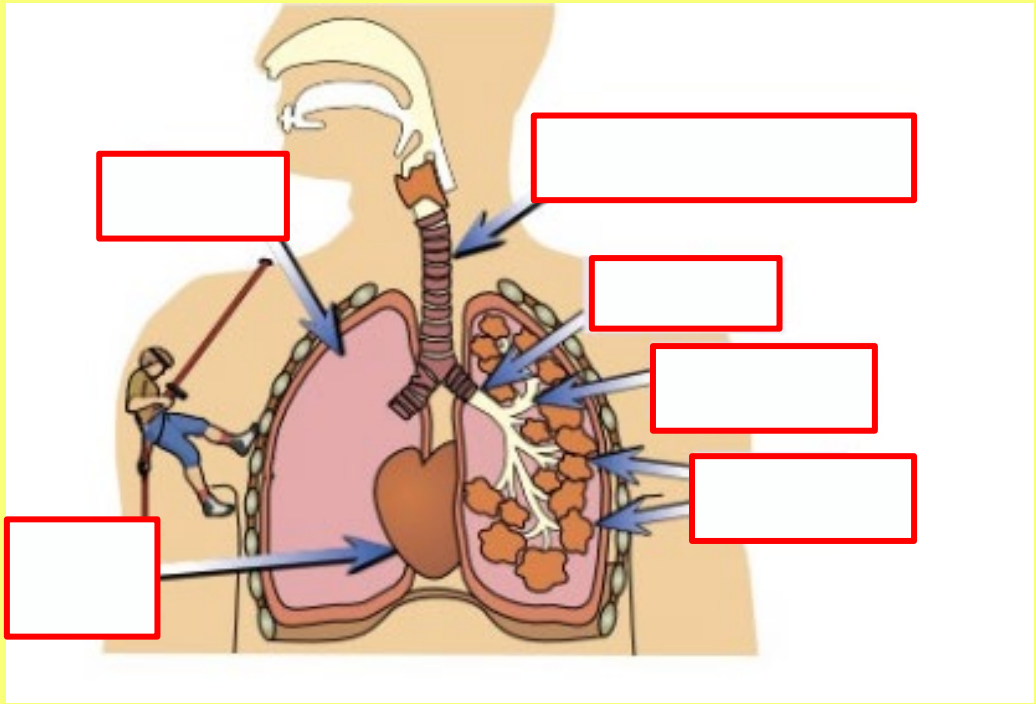
Food Molecule	Chemical Test	If it is present	If it is absent
Protein	**Biuret reagent**	**Turns from blue to purple**	**Stays blue**
Fats	**Add ethanol**	**Turns cloudy-white**	**Stays clear**

B2 - Organisation

Complete the exam questions on pages 36-39 of the exam question booklet

Lungs and Gas Exchange (page 29)

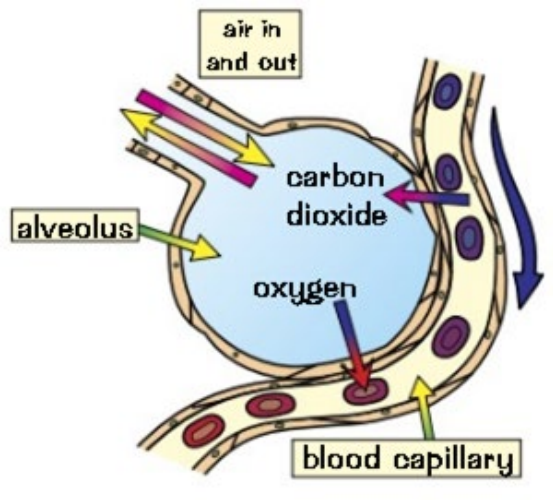
Label the breathing system



Alveoli and Breathing Rate (page 29)

The alveoli is where oxygen enters our body.

1. Describe how oxygen travels from our **lungs** to our **cells**.
2. How does the carbon dioxide get from the cells back to the lungs?
3. If a person takes 91 breaths in 7 minutes, what is there breathing rate?



breaths per minute = number of breaths ÷ number of minutes

Alveoli and Breathing Rate (page 29)

1. Describe how oxygen travels from our lungs to our cells.
   Oxygen diffuses from a high concentration in the alveoli to a low concentration in the blood. The oxygenated blood now goes to the cells where the oxygen diffuses into the cell (because oxygen is at a low concentration in the cell)
2. How does the carbon dioxide get from the cells back to the lungs?
   It diffuses from the cell to the blood plasma and is carried back to the lungs. It then diffuses into the alveoli and is exhaled
3. If a person takes 91 breaths in 7 minutes, what is their breathing rate?
   91÷7 = 13

B2 - Organisation

Complete the exam questions on pages 40-43 of the exam question booklet

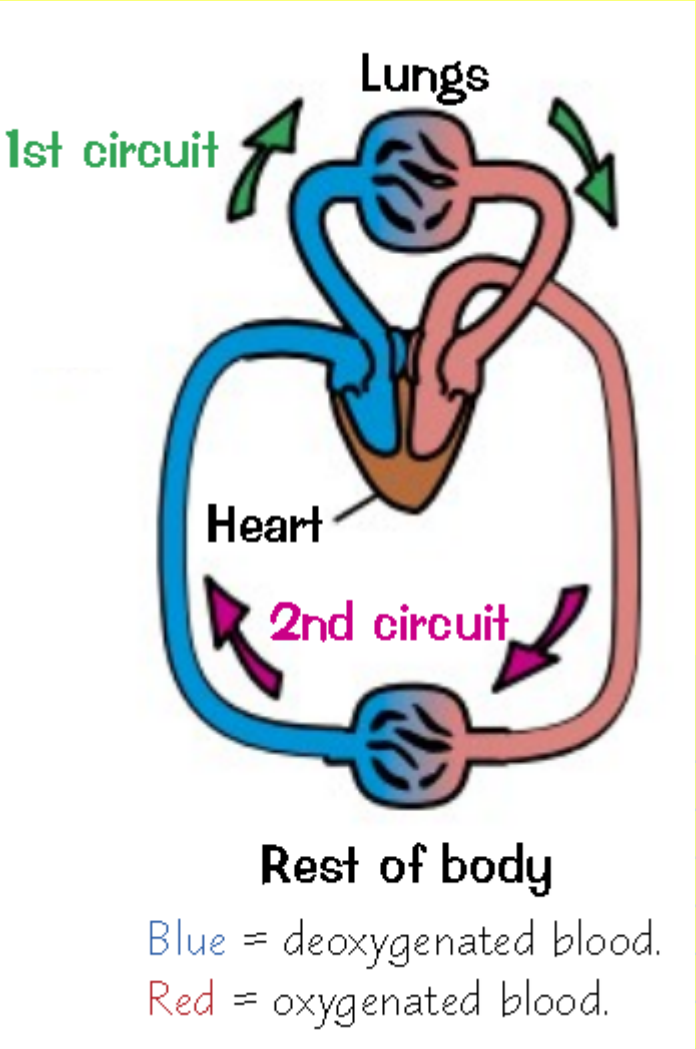
Structure of the Heart (page 30)

Key Facts

The heart is an organ that pumps blood around the body in a double circulatory system.

The right ventricle pumps blood to the lungs where gas exchange takes place.

The left ventricle pumps blood around the rest of the body.



Structure of the Heart (page 30)

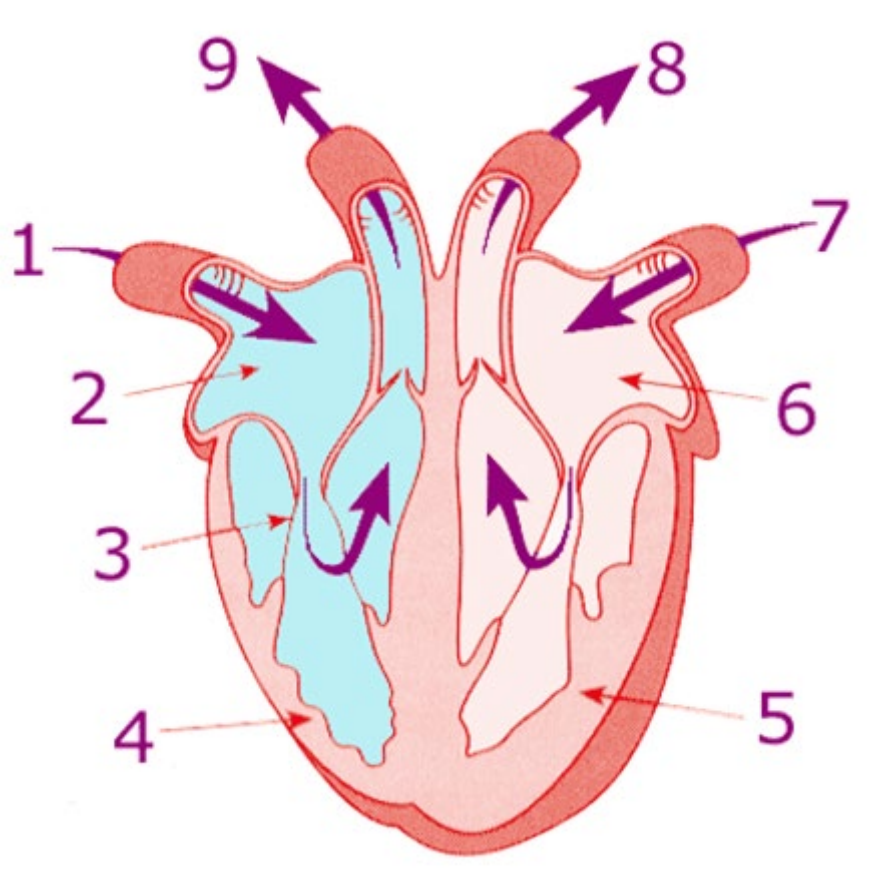
http://www.bbc.co.uk/education/clips/zx7qn39

1. What are pacemaker cells?
2. Why does the left ventricle have to work harder than the rest of the heart?
3. Why do we need valves in our heart?
4. What is the coronary artery?

Structure of the Heart (page 30)

1. What are pacemaker cells?
   A group of cells that control the natural resting heart rate
2. Why does the left ventricle have to work harder than the rest of the heart?
   It has to pump blood around the whole body
3. Why do we need valves in our heart?
   To stop the blood flowing backwards
4. What is the coronary artery?
   An artery on the outside of the heart which supplies it with oxygenated blood

The Heart (page 31)



Task: label your diagram of the heart

Extension: which side pumps the **oxygenated** blood around the body?

The Heart (page 31)

Pulmonary artery

Aorta

Vena cava

Pulmonary vein

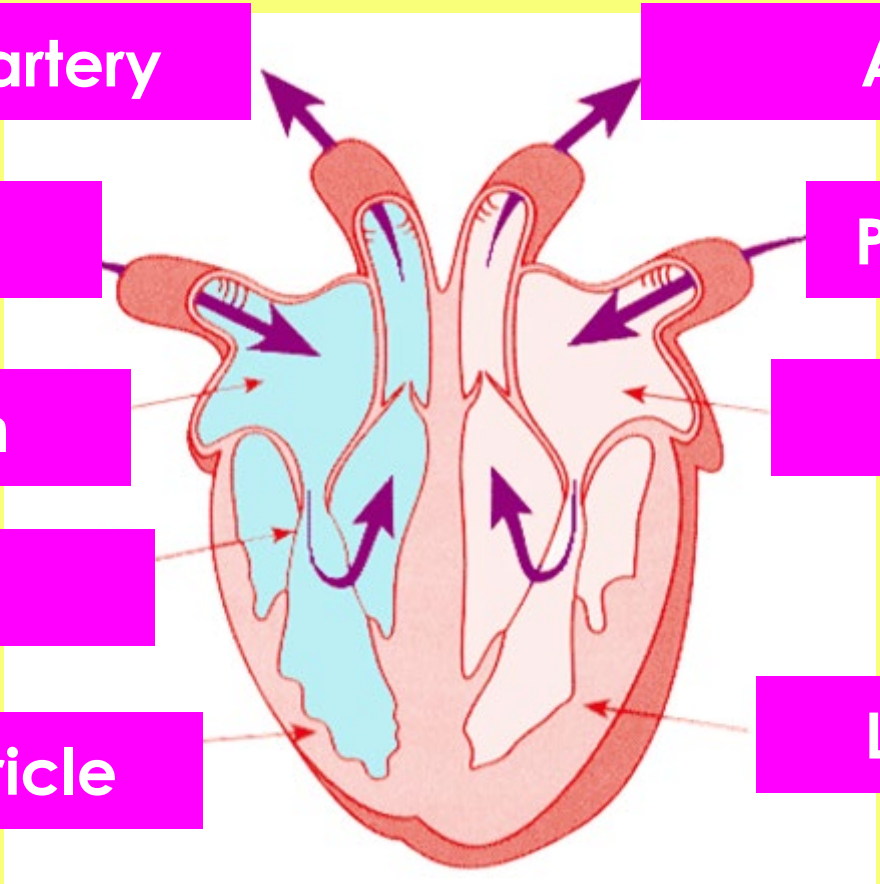
Right atrium

Left atrium

valve

Left ventricle

Right ventricle



Task: label your diagram of the heart

Extension: which side pumps the **oxygenated** blood around the body?

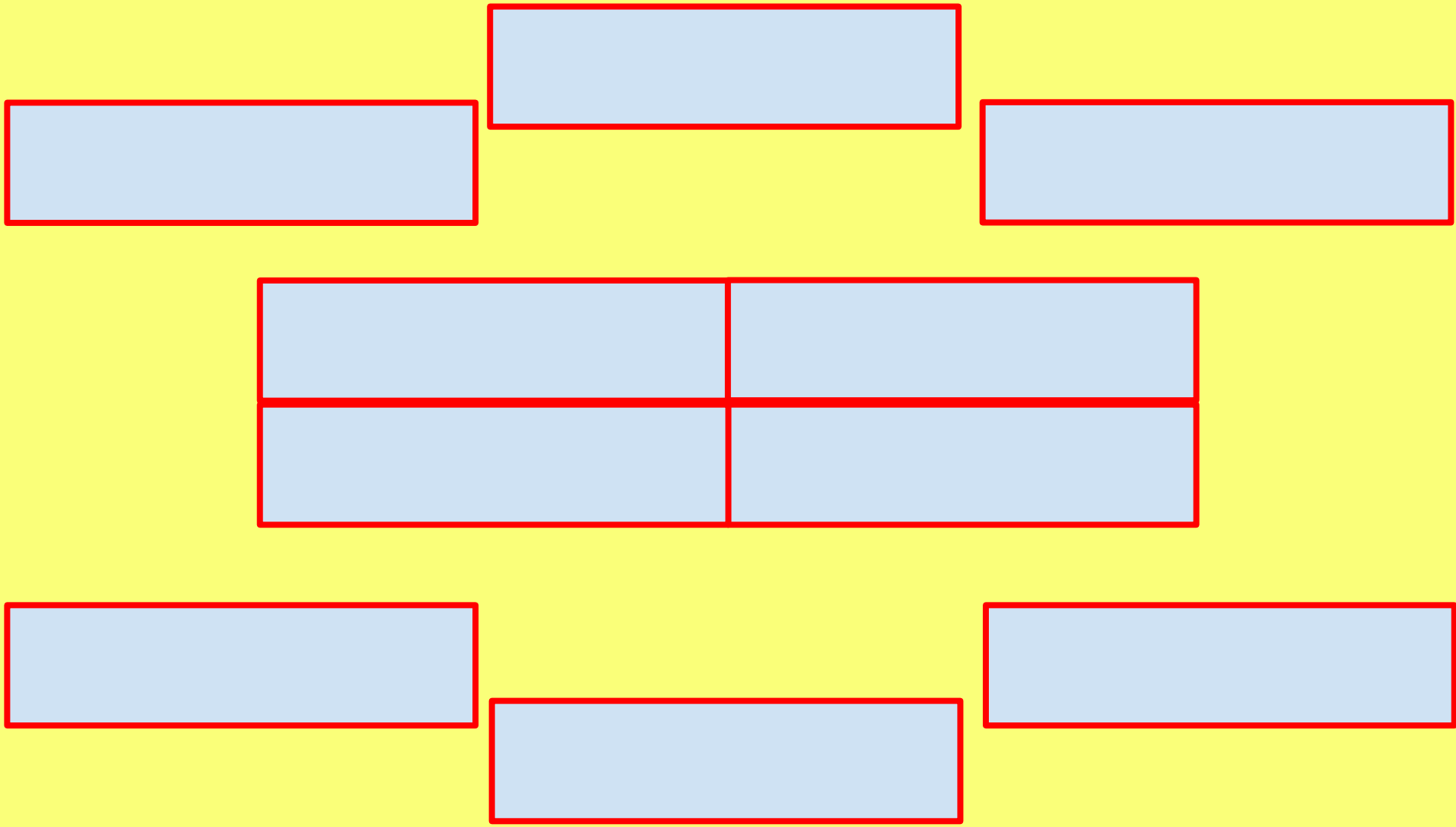
The Heart (page 31)

Put the parts of the heart in the order they would be in on the diagram.

Extension: Add arrows to the diagram to show the blood flow

Left atrium	Right ventricle	Pulmonary vein
Right atrium	aorta	Vena cava
Pulmonary artery	Left ventricle	lungs
	Body cells	

The Heart (page 31)



The Heart (page 31)

lungs

Pulmonary artery

Pulmonary vein

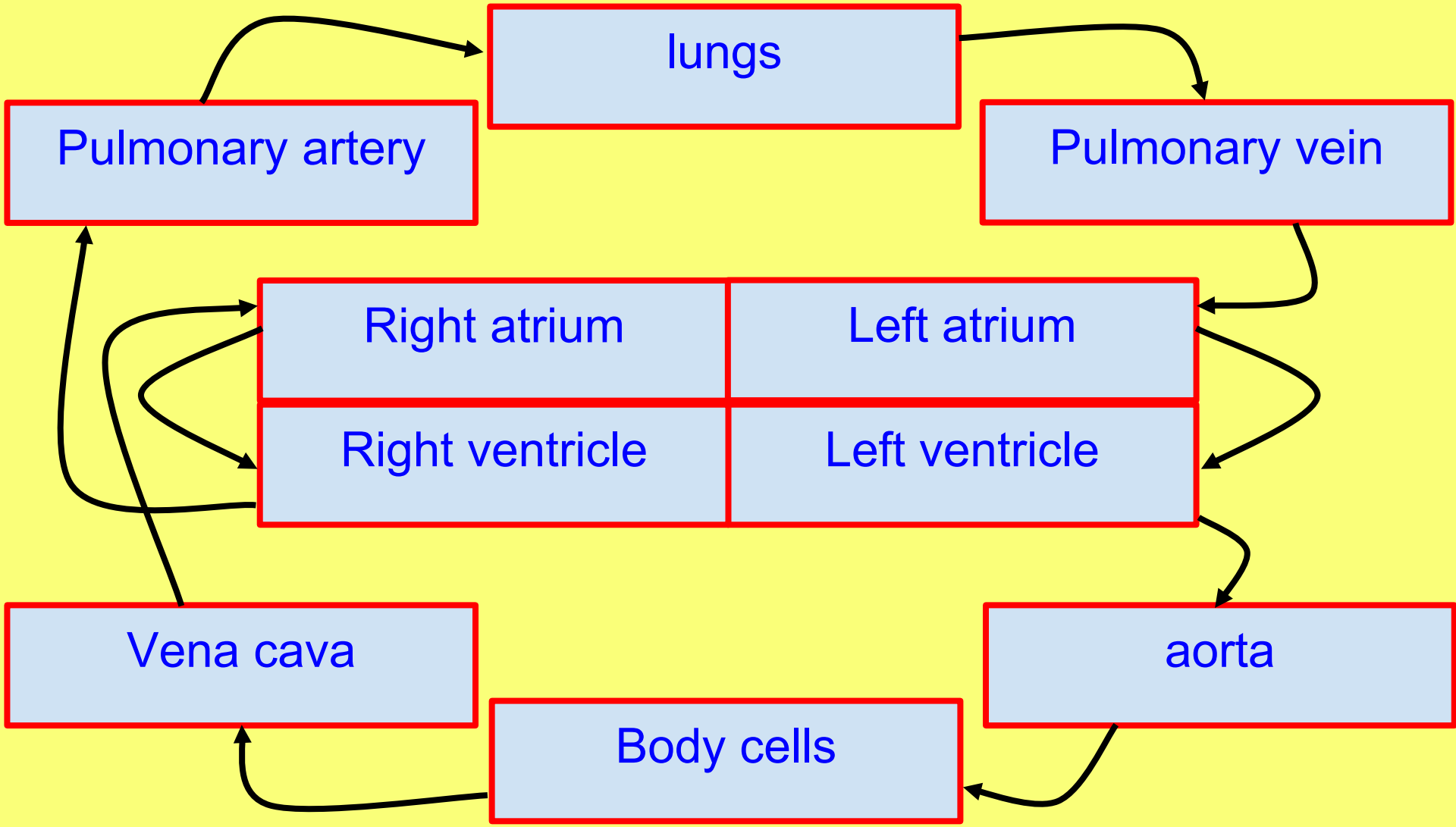
Right atrium	Left atrium
Right ventricle	Left ventricle

Vena cava

aorta

Body cells

The Heart (page 31)



The Heart (page 32)

Put the statements into the correct order.

- Deoxygenated blood passes through pulmonary artery towards the lungs
- Blood emptied into the left ventricle
- Oxygenated blood pumped through aorta to the rest of the body (inc. heart)
- Deoxygenated blood from the body enters the right atrium through the vena cava
- The blood then emptied into right ventricle
- Oxygenated blood from the lungs enters the left atrium through the pulmonary vein

The Heart (page 32)

Put the statements into the correct order.

Check your answers

Deoxygenated blood from the body enters the right atrium through the vena cava

The blood then emptied into right ventricle

Deoxygenated blood passes through pulmonary artery towards the lungs

Oxygenated blood from the lungs enters the left atrium through the pulmonary vein

Blood emptied into the left ventricle

Oxygenated blood pumped through aorta to the rest of the body (inc. heart)

Extension (page 32)

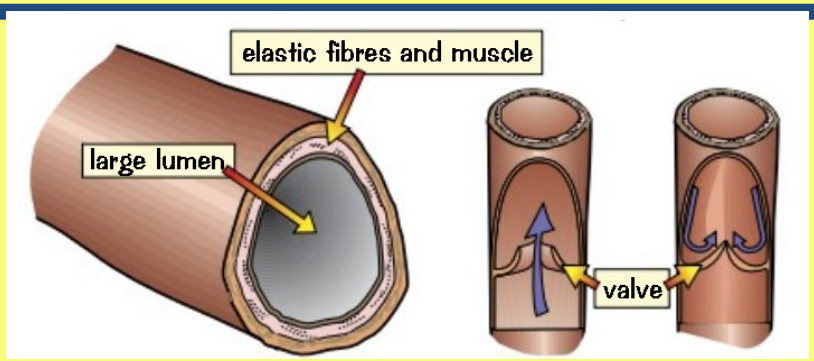
Write a description of the journey of a red blood cell around the body. Include:

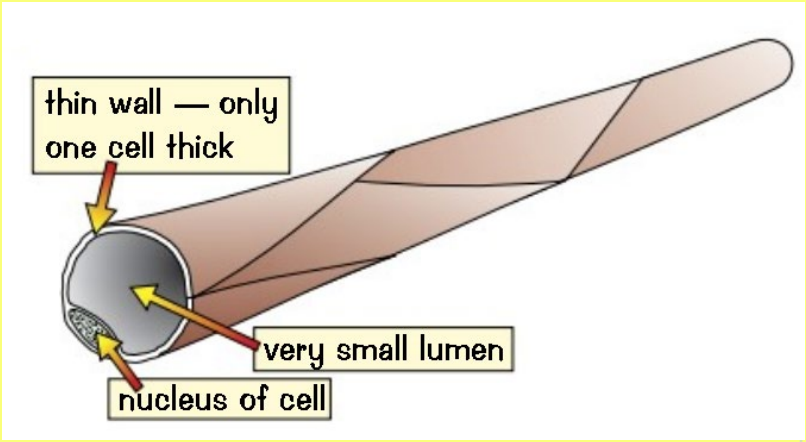
- The movement of blood through the heart and the 4 main blood vessels.
- The role of the valves
- When the blood is oxygenated or not

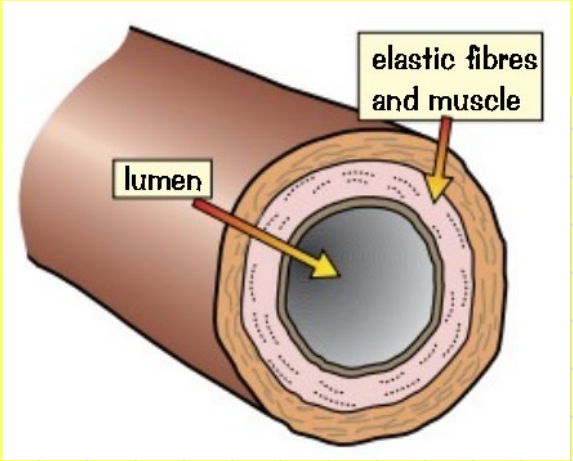
Keywords: aorta, pulmonary artery, pulmonary vein, vena cava, atrium, ventricle, oxygenated

Blood Vessels (page 33)

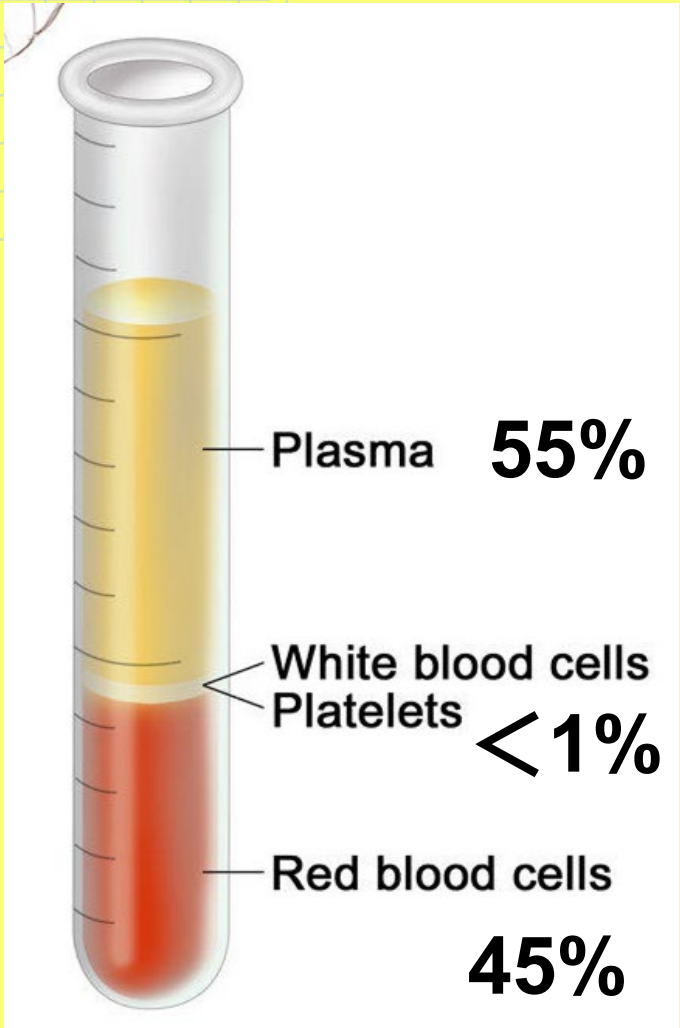
1. Label each diagram: artery, vein and capillary
2. Explain how the structure of the artery is adapted to its function
3. Explain how the structure of the vein is adapted to its function
4. Explain how the structure of the capillary is adapted to its function







Components of Blood (page 34)

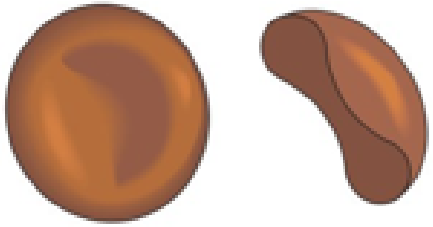
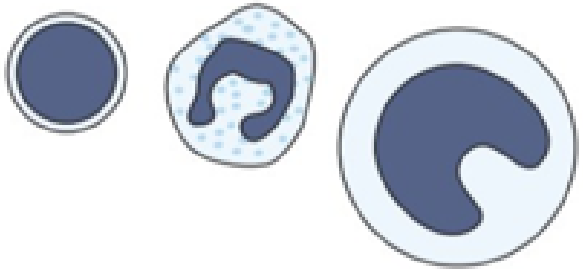


Blood is a tissue made of plasma, in which the red blood cells, white blood cells and platelets are suspended.

What is the percentage of each of the 4 components of blood?

Can you remember what each part of the blood does?

Components of Blood (page 34)

Blood Component	% Composition	Function (job)
Red Blood Cell 	45%	To transport oxygen around the body.
White Blood Cell 	<1%	To engulf and digest pathogens. To make antibodies and antitoxins.

Components of Blood (page 34)

Blood Component	% Composition	Function (job)
Platelets 	<1%	Clot blood to stop the animal bleeding to death
Plasma 	55%	Liquid part of the blood. Carries blood cells, carbon dioxide, urea, glucose, amino acids and hormones around the body.

Adaptation of Red Blood Cell (page 35)

Red Blood Cells Carry Oxygen

1) The job of red blood cells is to carry oxygen from the lungs to all the cells in the body.
2) Their shape gives them a large surface area for absorbing oxygen.
3) They contain a red substance called haemoglobin.
4) Haemoglobin is the stuff that allows red blood cells to carry oxygen.
5) Red blood cells don't have a nucleus — this leaves more space for carrying oxygen.

Quick Questions

1. Haemoglobin is a chemical found in red blood cells. What is its function?
2. State two adaptations of a red blood cell. For each one, state how the adaptation helps the blood cell to carry out its function

Adaptation of Red Blood Cell (page 35)

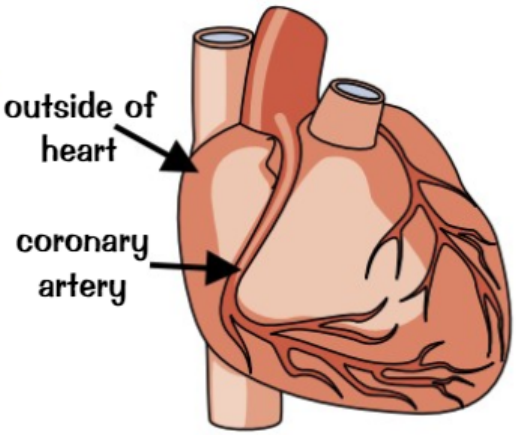
1. Haemoglobin is a chemical found in red blood cells. What is its function?
   Haemoglobin attaches to oxygen molecules and carries them around the body
2. State two adaptations of a red blood cell. For each one, state how the adaptation helps the blood cell to carry out its function
   No nucleus - more space to carry oxygen
   Dimple on the cell (biconcave disc) - increased surface are so more oxygen can be absorbed.

Coronary Heart Disease (page 36)

Cardiovascular diseases are diseases of the heart or blood vessels. One example is coronary heart disease.

Coronary Heart Disease is a Disease of the Coronary Arteries

1) The coronary arteries supply the heart muscle with blood.
2) Coronary heart disease is when layers of fatty material (called fatty deposits) build up in the coronary arteries. This causes the arteries to become narrow.
3) This reduces the blood flow to the heart muscle.
4) This means less oxygen can get to the heart muscle. This can result in a heart attack.



1. What is the function of the coronary artery
2. Where is it found?
3. What happens in coronary heart disease?
4. What effect can this have on the heart muscle?

Coronary Heart Disease (page 36)

1. What is the function of the coronary artery
   To supply the heart muscle with blood
2. Where is it found?
   On the outside of the heart
3. What happens in coronary heart disease?
   Fatty deposits build up inside the coronary artery which makes it narrow
4. What effect can this have on the heart muscle?
   Less blood gets to the heart, so less oxygen. This can cause a heart attack.

Coronary Heart Disease: Treatment (pg 37)

Treatment	How it Works	Advantages	Disadvantages
Stents	Used to open up and keep open coronary arteries	Works instantly. Effective for a long time. Recovery time is quick.	Risk of heart attack after the operation. Risk of infection after surgery. Blood clots can form near stent.
Statins	Used to reduce blood cholesterol levels less fatty material deposited	Reduce risk of stroke, coronary heart disease, heart attacks and other diseases	May forget to take them. Unwanted side effects (headaches) Takes time to work

Coronary Heart Disease: Treatment (pg 37)

Treatment	How it Works	Advantages	Disadvantages
Artificial Hearts	Keep a person alive until donor heart is available or while heart recovers	Made from metal or plastic, less likely to be rejected	Bleeding during surgery. May lead to blood clots or strokes. Drugs needed to thin blood.
Valve Replacement	Replacing damaged valves with biological (from animals) or mechanical (man-made) valves	Less risky than heart transplant.	Blood clots. Possible rejection.

B2 - Organisation

Complete the exam questions on pages 44-55 of the exam question booklet

Health Issues (page 38)

Diseases are a *Major Cause* of *Ill Health*

1) Health is the state of physical and mental wellbeing.
2) This means that both the body and mind are well.
3) Diseases are often responsible for causing ill health.
4) Diseases can be communicable or non-communicable:

Communicable diseases are sometimes called infectious diseases.

Communicable diseases

1) These are diseases that can spread from person to person or between animals and people.
2) Communicable diseases can be caused by bacteria, viruses, parasites or fungi.
3) Measles and malaria are examples of communicable diseases. See pages 43-45 for more.

Non-communicable diseases

1) These are diseases that cannot spread between people or between animals and people.
2) Coronary heart disease (see page 33) is an example of a non-communicable disease.

Health Issues (page 38)

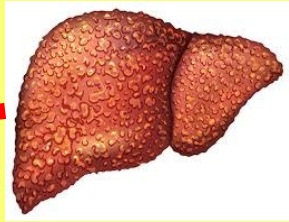
1. What is meant by ‘health’?
2. What is meant by a ‘communicable disease’?
3. What causes communicable diseases?
4. What is meant by a ‘non-communicable disease’?
5. Give an example of a non-communicable disease?

Health Issues (page 38)

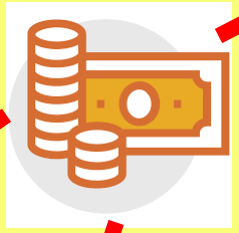
1. What is meant by 'health'?
   The state of physical and mental well-being
2. What is meant by a 'communicable disease'?
   A disease which can be spread
3. What causes communicable diseases?
   Pathogens: bacteria, viruses, fungi and parasites
4. What is meant by a 'non-communicable disease'?
   A disease which cannot spread
5. Give an example of a non-communicable disease?
   Coronary heart disease

Health Risk Factors (page 39)

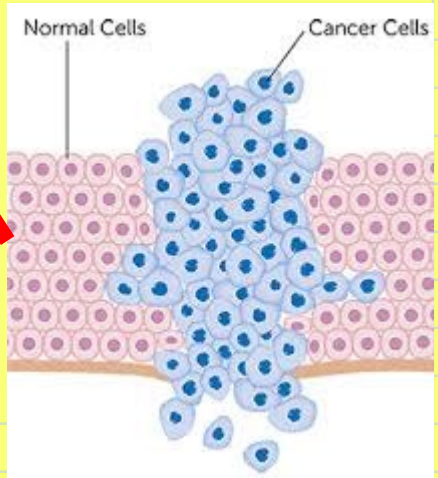
HEALTH RISK



Total NHS expenditure on services £91.5bn



Ionising Radiation

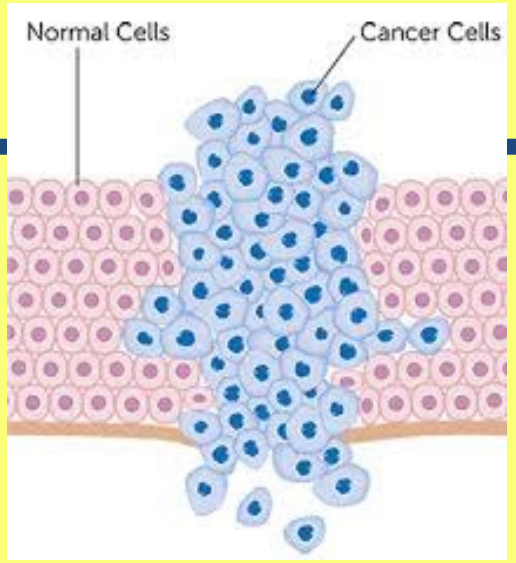


Health Risk Factors (page 39)

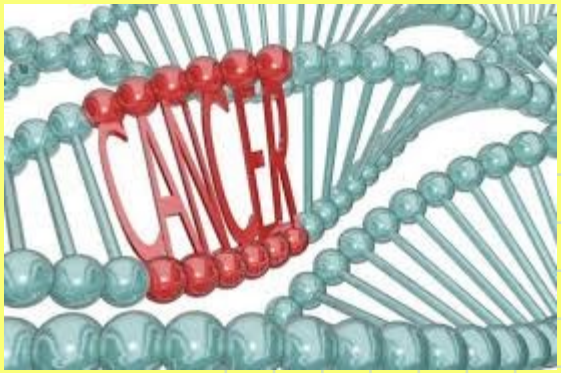
Write a paragraph where you:

- Explain what is meant by a risk factor
- Describe a range of risk factors and link them to specific diseases
- Discuss the cost implications of poor health

Cancer (page 40)



1. What causes cancer?
2. What is a benign tumor?
3. What is a malignant tumour?
4. How do cancers spread?
5. Name 5 risk-factors for cancer (be clear if the risk factor causes a particular type of cancer)
6. Why have cancer survival rates improved?



Cancer (page 40)

1. Uncontrolled cell division and growth, leading to a tumour
2. A tumour which does not spread and is not normally dangerous
3. Tumours which spread to other parts of the body and form secondary tumours. More dangerous
4. Some of the tumour breaks off and travels in the bloodstream to another part of the body
5. Smoking, obesity, viral infections, UV exposure (linked to skin cancer) and genetic inheritance
6. Better treatments, earlier diagnosis, more screening, public awareness of risk factors.

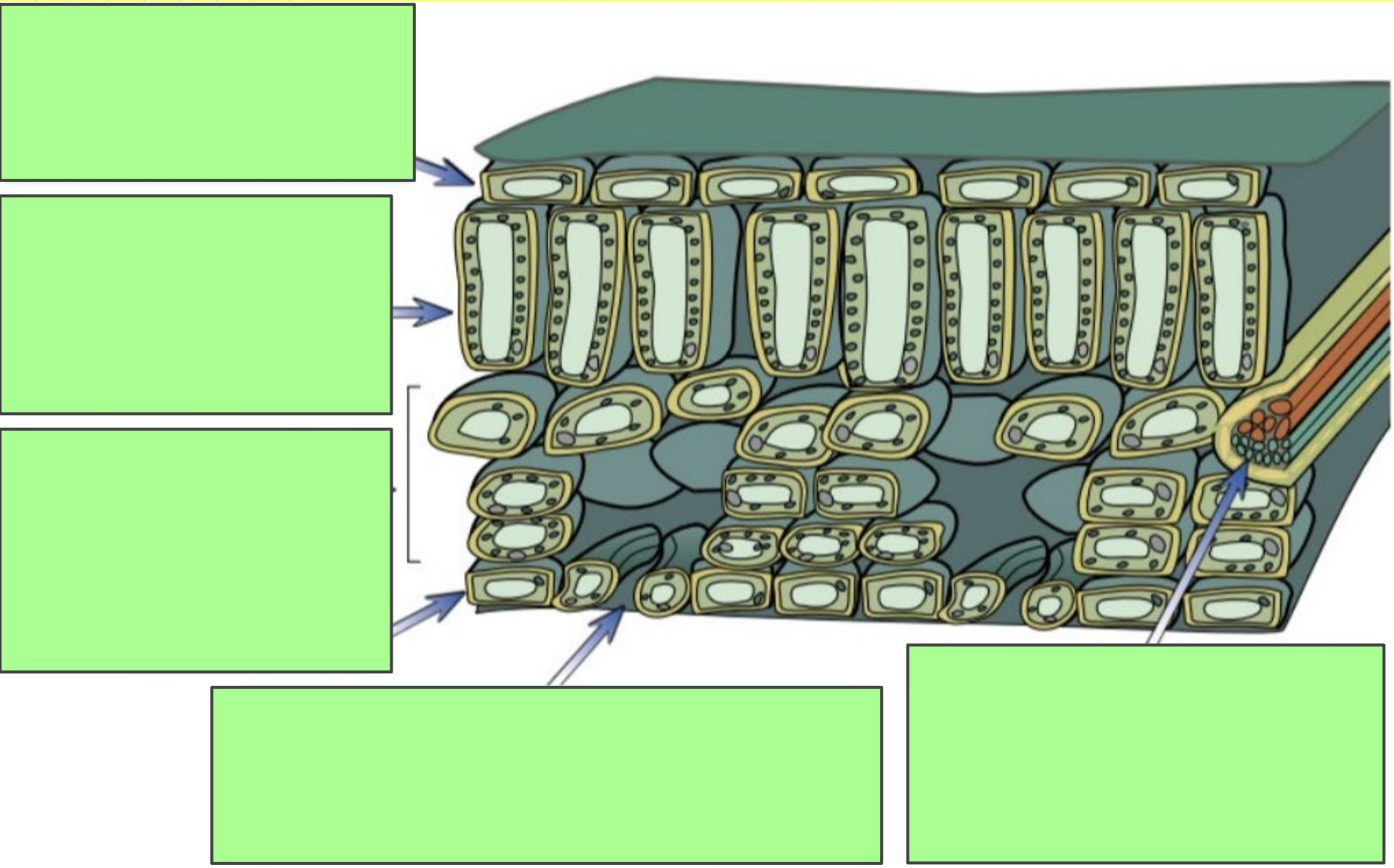
B2 - Organisation

Complete the exam questions on pages 56-62 of the exam question booklet

Plant Tissues and Organs (page 41)

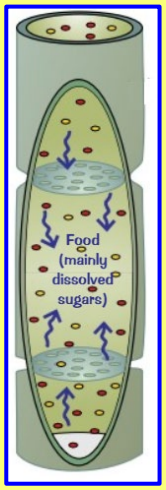
Plants are made from a range of different cells, tissues and organs. Label the leaf diagram with the name of the tissue and how it is adapted to its function.

Plant Tissues and Organs (page 41)



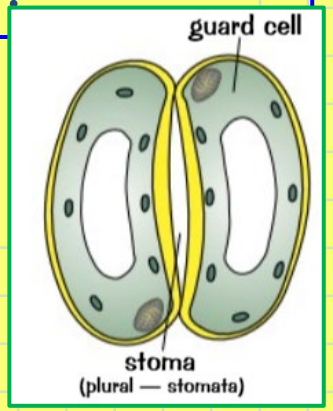
Specialised Plant Cells (page 42)

Xylem tubes are made of **dead cells** . They are hollow tubes, strengthened by **lignin** and travel from the **roots** to the **leaves**. They carry **water** and **mineral ions**. This process of moving water is called **transpiration**



Phloem tubes are made of **elongated cells** . They carry **food** from the **leaves** all around the plant to be used or **stored**. This process of moving food is called **translocation** .

The guard cells change **shape** to control the size of the **stoma**. This controls the rate of **gas exchange** and water loss.

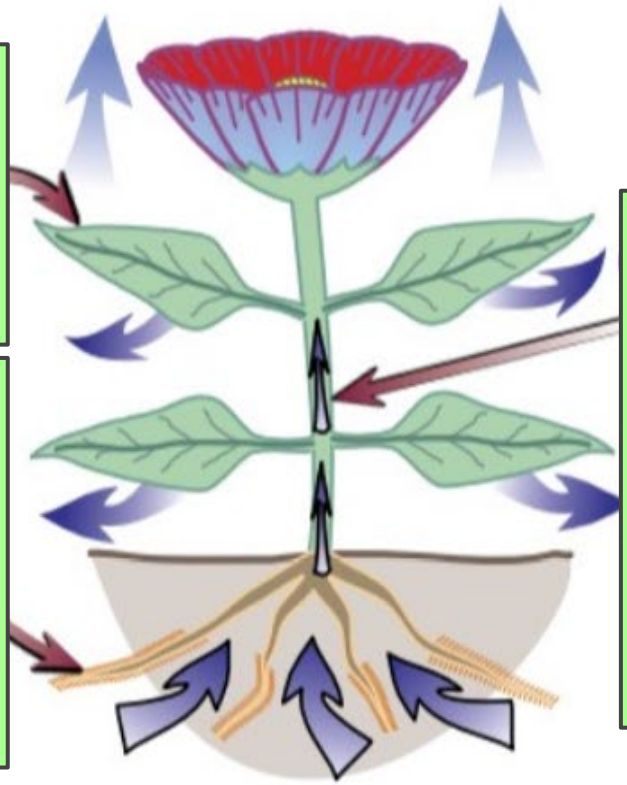


Transpiration (page 42)

Transpiration is the Loss of Water from the Plant

1) Transpiration is caused by evaporation and diffusion of water from a plant's surface (mainly the leaves).
2) Here's how it happens:

1



2

3

3) There's a constant stream of water through the plant. This is called the transpiration stream.

Transpiration (page 43)

Transpiration Factors	How it affects transpiration
Air Flow	More wind means faster transpiration. The water vapour around the leaf is swept away which means there is a high concentration of water vapour inside the leaf and a low concentration outside. This means diffusion happens faster
Temperature	Warmer temperature means faster transpiration. If the water particles have more energy they will evaporate and diffuse out of the leaf faster

Transpiration (page 43)

Transpiration Factors	How it affects transpiration
Humidity	Humid air has more water vapour in it already so there is not much difference between the concentration of water vapour inside and outside the leaf. This means that diffusion is slow so transpiration will not happen very quickly
Light Intensity	Bright light mean faster transpiration. When it is light, the stomata have to open so gas exchange can take place for photosynthesis. The open stomata mean that more water vapour can diffuse out

B2 - Organisation

Complete the exam questions on pages 63-70 of the exam question booklet

B3 - Infection and Response

Topic	Slide number	Booklet page number	Revision guide page
Communicable diseases	120-126	44-45	42-45
Natural defence systems	127-136	46-49	46-47
Drugs	137-143	50-52	48-49

Communicable Diseases (page 44)

1. What is a pathogen?
2. What is a communicable disease?
3. Name the 4 types of pathogen
4. Why do bacteria make us feel ill?
5. Where are viruses found in the body?
6. How do viruses make us feel ill?

Communicable Diseases (page 44)

1. What is a pathogen?

   A microorganism which causes disease
2. What is a communicable disease?

   A disease which can be spread
3. Name the 4 types of pathogen

   Bacteria, virus, fungus, protist
4. Why do bacteria make us feel ill?

   They reproduce rapidly and release toxins which damage cells and tissues
5. Where are viruses found in the body?

   Inside cells
6. How do viruses make us feel ill?

   They replicate inside cells which burst open to release the viruses. This cell damage makes us feel ill

Spread of Disease (page 44)

Spread of disease

Examples of Communicable Diseases (pg 45)

Disease	Pathogen	How it is spread	Symptoms (effect on the body)	Treatment and Prevention
Salmonella	bacteria	Bacteria ingested in food, or on food prepared in unhygienic conditions	Fever, abdominal cramps, vomiting and diarrhoea	Hydrate the body and wait for the infection to pass
Gonorrhoea	bacteria	Sexual Contact	thick yellow or green discharge from the vagina or penis and pain on urinating.	antibiotic penicillin (although some bacteria are resistant) Prevent by using a condom

Examples of Communicable Diseases (pg 45)

Disease	Pathogen	How it is spread	Symptoms (effect on the body)	Treatment and Prevention
Measles	virus	inhalation of droplets from sneezes and coughs.	fever and a red skin rash Can be fatal.	No treatment available. Prevent with vaccination
HIV	virus	sexual contact or exchange of body fluids such as blood when drug users share needles.	virus attacks the body's immune system. Body unable to deal with other infections or cancers.	Antiretroviral drugs

Examples of Communicable Diseases (pg 45)

Disease	Pathogen	How it is spread	Symptoms (effect on the body)	Treatment and Prevention
Tobacco Mosaic Virus (TMV)	virus	Soil and direct contact between leaves	Discolouration on the leaves. Affects growth of the plant due to lack of photosynthesis	No chemicals available. Remove diseased leaves.
Rose Black Spot	fungus	water or wind	Spots on leaves. Leaves turn yellow and drop early. Affects growth of the plant - photosynthesis is reduced.	Fungicides and/or removing and destroying the affected leaves

Examples of Communicable Diseases (pg 45)

Disease	Pathogen	How it is spread	Symptoms (effect on the body)	Treatment and Prevention
Malaria	protist	The protist is spread by mosquitoes biting infected people and transferring the pathogen to healthy people	Recurring episodes of fever and can be fatal.	Stop mosquitoes, from breeding and use mosquito nets to avoid being bitten

Human Defence Systems (page 46)

The human body has got features that stop a lot of nasties getting inside. For example:

1) The skin — It stops pathogens getting inside you. It also releases substances that kill pathogens.
2) Nose hairs — They trap particles that could contain pathogens.
3) Mucus (snot) — The trachea and bronchi (airways — see page 29) release mucus to trap pathogens.
4) Cilia (hair-like structures) — The trachea and bronchi are lined with cilia. They move the mucus up to the back of the throat where it can be swallowed.
5) Stomach acid — The stomach makes hydrochloric acid. This kills pathogens in the stomach.

What is the role of the following parts of the defence system?:

- The skin
- Nose hair
- Mucus
- Cilia
- Stomach acid

Human Defence Systems (page 46)

- The skin
  Stops pathogens entering the body. Released chemicals to kill pathogens
- Nose hair
  Traps particles containing pathogens s before they enter the body
- Mucus
  Released in the trachea to trap pathogens
- Cilia
  Line the trachea and move mucus (with trapped pathogens) up to the back of the throat to be swallowed
- Stomach acid
  Has hydrochloric acid which kills pathogens

Defence Systems - White Blood Cells (pg 47)

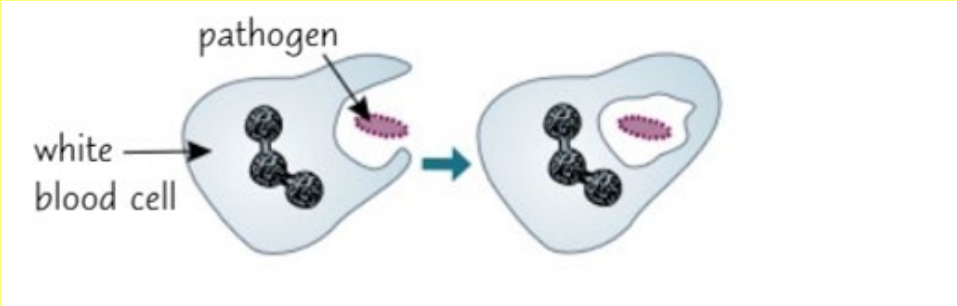
There are 3 functions of white blood cells:

1. Phagocytosis
2. Producing antibodies
3. Producing antitoxins

Defence Systems - White Blood Cells (pg 47)

Describe what happens using the diagram:

1. Phagocytosis



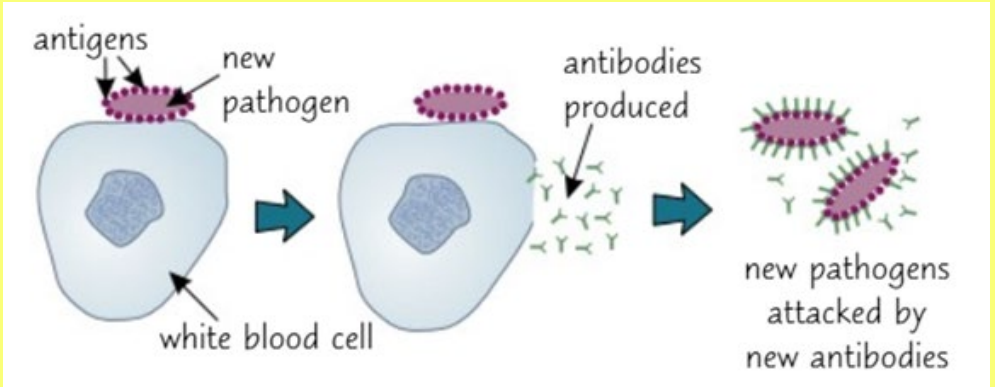
White blood cells engulf and digest the pathogen.

DO NOT say 'gobble' - even though it says this in the revision guide!!

Defence Systems - White Blood Cells (pg 47)

Describe what happens using the diagram:

2. Making Antibodies



- **Pathogens have unique antigens (chemical markers) on the outside.**
- **White blood cells make antibodies which attach to the foreign antigens. The antibodies are specific to the antigen for that pathogen.**
- **The antibodies let other white blood cells find the pathogen to engulf and digest it.**
- **The person is now naturally immune to a disease. If that pathogen enters the body again, the white blood cells can quickly make the antibodies before the person gets ill.**

Defence Systems - White Blood Cells (pg 47)

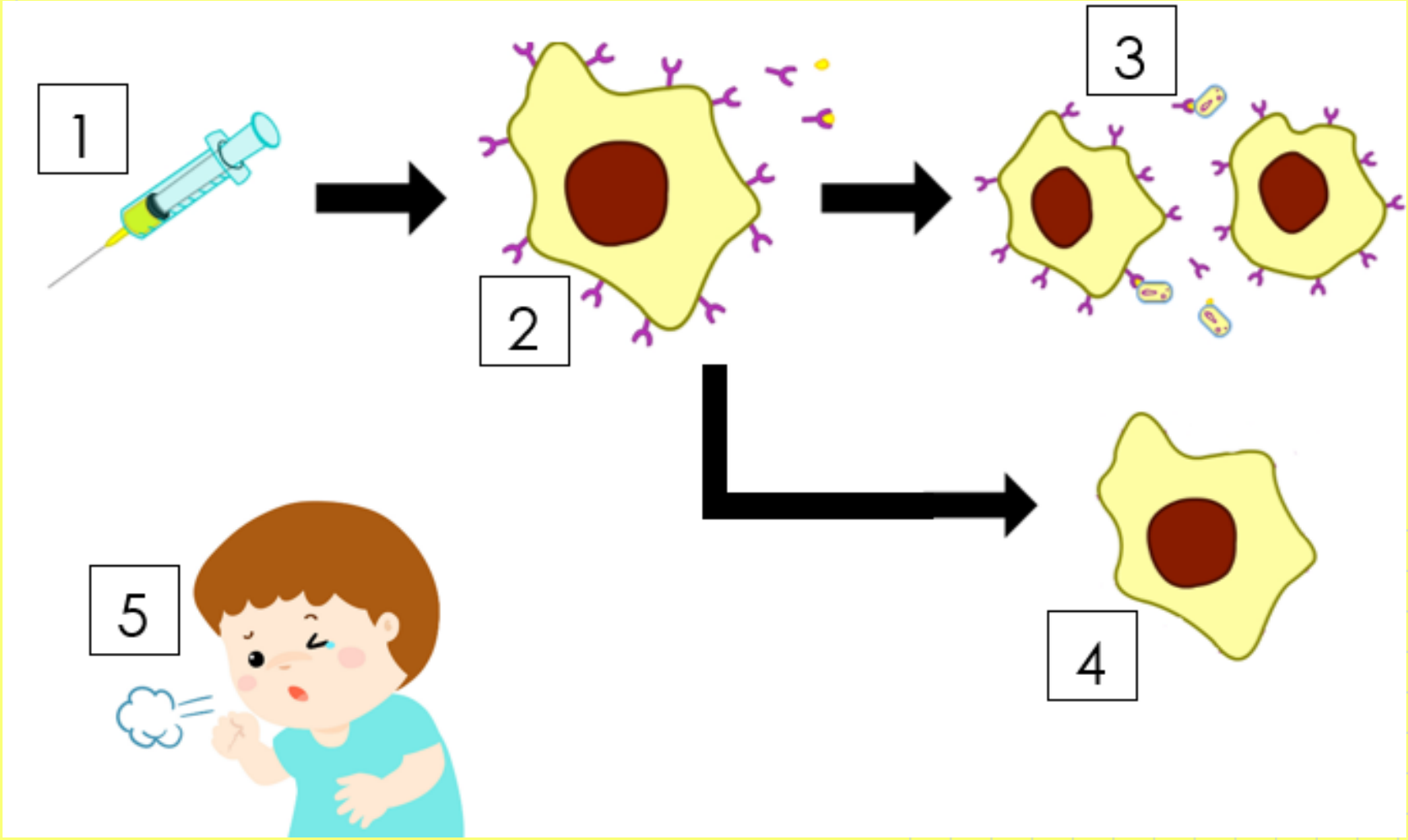
Describe what happens using the diagram:

3. Producing Antitoxins

Antitoxins are chemicals which stop the toxins from the bacteria affecting the body.

Vaccination (page 48)

Describe how vaccines help to protect against future infections.



Vaccination (page 48)

1. Vaccination given
   Injected with a small amount of dead or inactive pathogen
2. Antibodies produced
   White blood cells produce antibodies to attack antigens
3. Attract more white blood cells
   More white blood cells produce antibodies
4. Memory cells
   These cells stay in the blood in case we are infected in the future
5. Infection with same pathogen later on
   White blood cells can quickly respond and produce antibodies to kill pathogens

Vaccination - advantages and disadvantages (pg 49)

Advantages

Vaccinations have helped to control diseases which used to be common. E.g. polio

When a large disease outbreak happens, we call this an epidemic. This is stopped from happening if many people have been vaccinated. This is because the disease cannot easily spread

Disadvantages:

Sometimes they do not work. We say the person has not got immunity.

Cannot be used on people with a weakened immune system

Sometimes you can have a bad reaction to the vaccine. E.g. swelling or a fever.

B3 - Infection and Response

Complete the exam questions on pages 71-78 of the exam question booklet

Antibiotics and Painkillers (page 50)

1. What is an antibiotic?
2. What is a pain killer?
3. Why is it pointless to give antibiotics to someone suffering from measles?
4. Some bacteria can no longer be treated by antibiotics. Explain why.
5. What is the source of most drugs?

Antibiotics and Painkillers (page 50)

1. What is an antibiotic?

   A chemical which kills bacteria
2. What is a pain killer?

   A drug which reduces pain and treats the symptoms of a disease (but does not kill the pathogen)
3. Why is it pointless to give antibiotics to someone suffering from measles?

   Measles is a virus and antibiotics only work on bacteria, not viruses
4. Some bacteria can no longer be treated by antibiotics. Explain why.

   They have mutated and become resistant to antibiotics, so they are no longer killed
5. What is the source of most drugs?

   Plants

Antibiotics and Painkillers (page 51)

Name of Drug	Where its produced	What its used for
Aspirin	**Willow trees** 	**Painkiller**
Digitalis	**Foxglove plants** 	**Treat heart conditions**
Penicillin	***Penicillium* mould** 	**Antibiotic - kills bacteria ONLY**

Developing Drugs (pages 51-52)

1. New drugs are tested for toxicity, efficacy and dose. What do these words mean?
2. What is pre-clinical testing?
3. Who takes part in clinical trials?
4. Why are healthy people used at the start of clinical trials?
5. What precautions are taken at the start of clinical trials?
6. What does the 'optimum dose' mean?
7. When the drug is tested on patients, some are given a placebo. What is this and why is it given?
8. What is a double blind trial?

Developing Drugs (pages 51-52)

1. New drugs are tested for toxicity, efficacy and dose. What do these words mean?
   Toxicity - if it is harmful and has any side effects
   Efficacy - if the drug works
   Dose - the concentration of drug which works best and how often it needs to be taken
2. What is pre-clinical testing?
   Testing first on human cells and tissues, followed by live animals
3. Who takes part in clinical trials?
   Both healthy volunteers and patients
4. Why are healthy people used at the start of clinical trials?
   To make sure the drug has no harmful side effects which may be masked by other symptoms

Developing Drugs (pages 51-52)

5. What precautions are taken at the start of clinical trials?
   Only healthy people are used and the dose starts off very low
6. What does the 'optimum dose' mean?
   The amount which is most effective and has fewest side effects
7. When the drug is tested on patients, some are given a placebo. What is this and why is it given?
   A placebo is a fake drug. It is given to check that any improvements are down to the drug and not caused by any psychological effects
8. What is a double blind trial?
   When neither the doctor nor the patients know who is getting the real drug and who is getting the placebo.

B3 - Infection and Response

Complete the exam questions on pages 79-83 of the exam question booklet

B4 - Bioenergetics

Topic	Slide number	Booklet page number	Revision guide page
Photosynthesis (inc. RP)	145-157	53-56	50-52
Respiration and Exercise	158-177	57-61	53-55

Photosynthesis (page 53)

Photosynthesis Produces Glucose Using Light

1) Photosynthesis uses energy to change carbon dioxide and water into glucose and oxygen.
2) It takes place in chloroplasts in plant cells.
3) Chloroplasts contain chlorophyll that absorbs light.
4) Energy is transferred to the chloroplasts from the environment by light.
5) Photosynthesis is an endothermic reaction.
   This means that energy is transferred from the environment during the reaction.
6) You need to learn the word equation for photosynthesis:

$$\text{carbon dioxide} + \text{water} \xrightarrow{\text{light}} \text{glucose} + \text{oxygen}$$

7) You also need to know the chemical symbols for the substances involved in photosynthesis:

carbon dioxide: CO_2 water: H_2O glucose: $C_6H_{12}O_6$ oxygen: O_2

Photosynthesis (page 53)

1. What is photosynthesis?
2. Where in the plant does it take place?
3. What type of reaction is photosynthesis?
4. Write the word equation for photosynthesis.
5. Write the chemical symbols for the reactants of photosynthesis.
6. Write the chemical symbols for the products of photosynthesis.

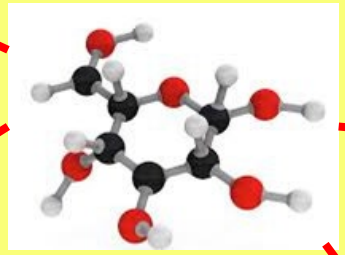
Photosynthesis (page 53)

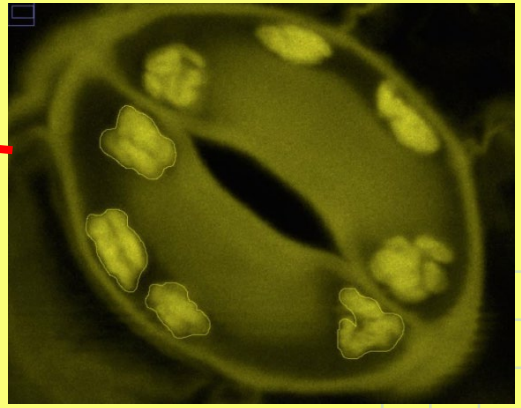
1. What is photosynthesis?
   A chemical reaction which takes place in plants where glucose is made using energy from the sun.
2. Where in the plant does it take place?
   In chlorophyll (a chemical found in chloroplasts)
3. What type of reaction is photosynthesis?
   endothermic
4. Write the word equation for photosynthesis.
   Carbon dioxide + water → glucose + oxygen
5. Write the chemical symbols for the reactants of photosynthesis.
   CO_2 - carbon dioxide and $C_6H_{12}O_6$ - glucose
6. Write the chemical symbols for the products of photosynthesis.
   O_2 - oxygen and H_2O - water

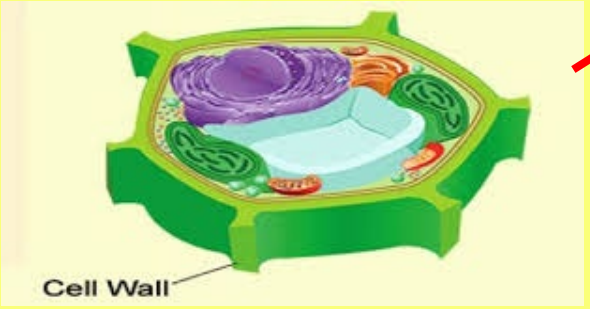
Uses of Glucose (page 54)

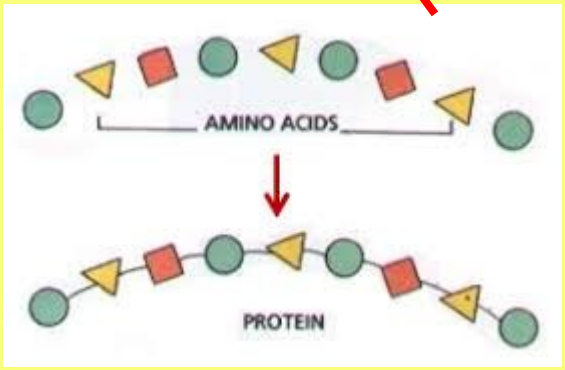
Use the mindmap to write a list of the uses of the glucose which the plant makes in photosynthesis.

glucose + oxygen → carbon dioxide + water (+ energy)







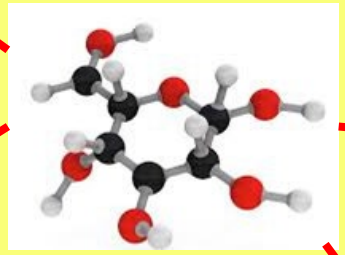


Uses of Glucose (page 54)

Use the mindmap to write a list of the uses of the glucose which the plant makes in photosynthesis.

Stored as fats or oils

For respiration



To store as insoluble starch granules

To make cell walls

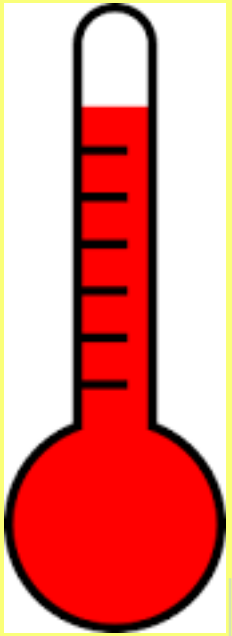
To make amino acids

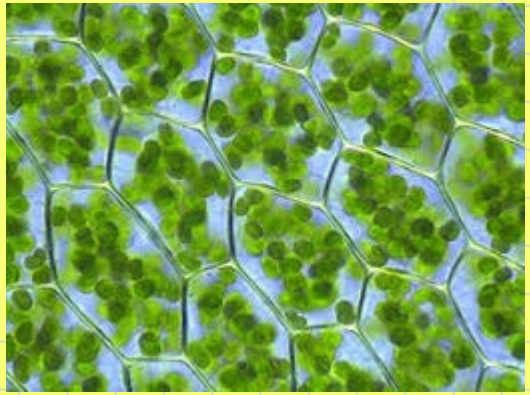
Affecting the Rate of Photosynthesis (pgs 54-55)

The rate of photosynthesis can be affected by 4 main factors:

- The light intensity
- The concentration of CO_2
- The temperature
- The amount of chlorophyll a plant has.

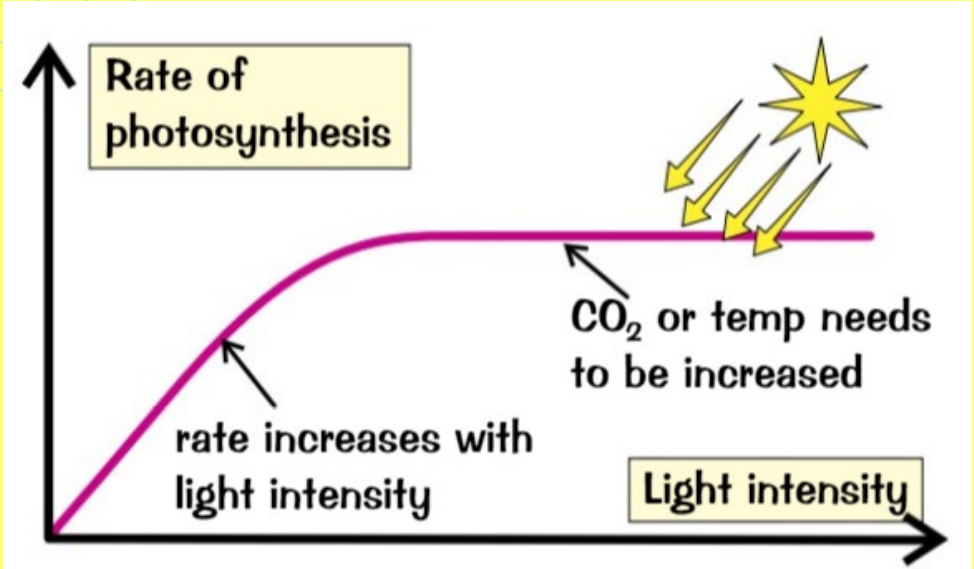
We call these **limiting factors**. A limiting factor is something which can stop photosynthesis happening any faster.





Limiting Factor - Light intensity (pg 54)

Explain the shape of the graph.



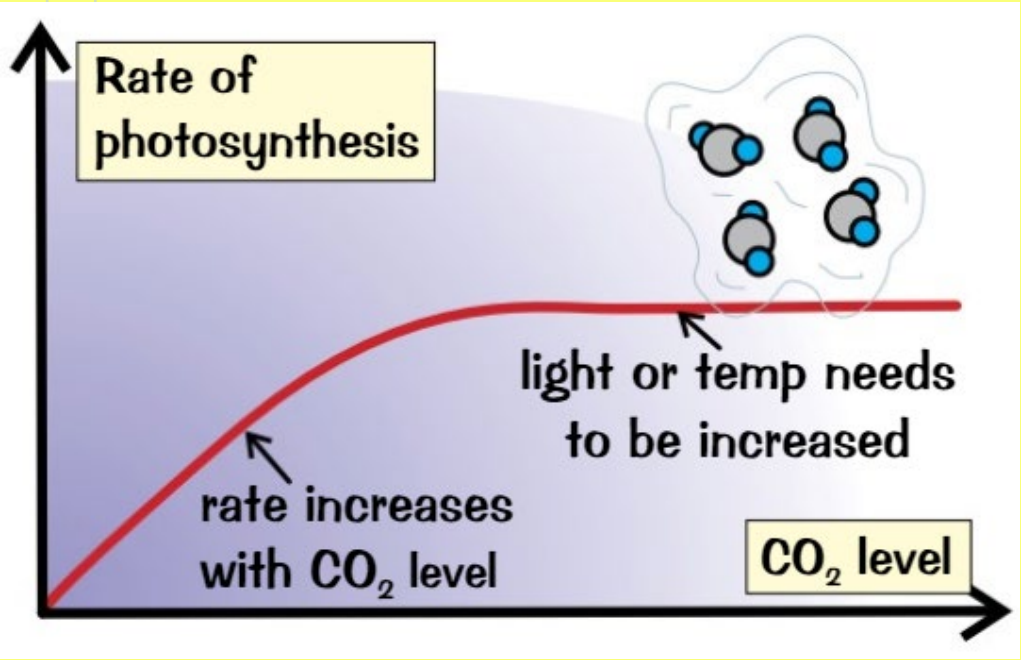
At first, as you increase the **Light intensity**, the rate of photosynthesis **increases**. Light is the **limiting** factor.

At a certain point, the graph goes **flat** and no matter how bright the light is, photosynthesis will not go any faster.

This is because **Light intensity** is no longer the limiting factor. The **concentration** of CO_2 or the **temperature** is now the limiting factor.

Limiting Factor - CO_2 Concentration (pg 55)

Explain the shape of the graph.

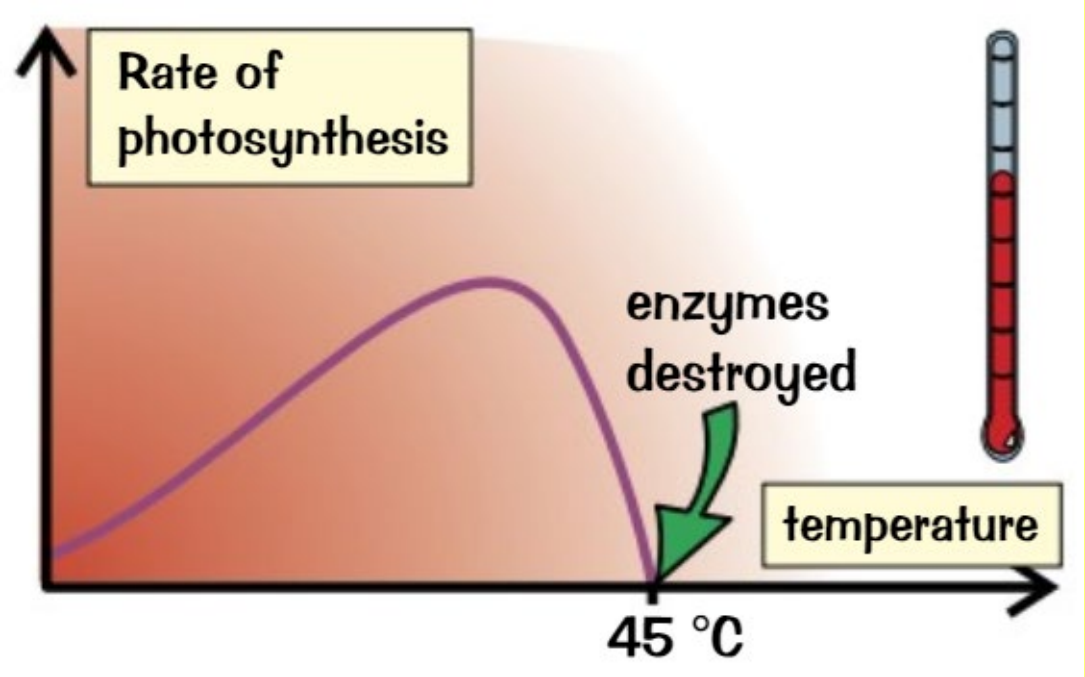


At first, as you increase the CO_2 concentration, the rate of photosynthesis increases. CO_2 concentration is the limiting factor.
At a certain point, the graph goes flat and no matter how much CO_2 there is, photosynthesis will not go any faster.

This is because concentration of CO_2 is no longer the limiting factor. The light intensity or the temperature is now the limiting factor.

Limiting Factor - Temperature (pg 55)

Explain the shape of the graph.



At first, as you increase the temperature, the rate of photosynthesis increases. Temperature is the limiting factor. The enzymes needed for photosynthesis work best at the temperature shown by the peak of the graph.

After this point, the rate of photosynthesis will slow down as the temperature is too high and the enzymes will start to denature

Photosynthesis - Required Practical (pg 56)

1. What are you investigating in the experiment
2. Why was sodium hydrogen carbonate added to the boiling tube?
3. What will we be measuring/counting
4. How will we be changing the light intensity?
5. Why is it better to use an LED light source
6. What repeats will be done?
7. What error has been introduced in the experiment?
8. In the second style of experiment, what is done differently?

Photosynthesis - Required Practical (pg 56)

1. What are you investigating in the experiment
   How light intensity affects the rate of photosynthesis
2. Why was sodium hydrogen carbonate added to the boiling tube?
   To encourage the plant to carry out photosynthesis
3. What will we be measuring/counting
   The number of oxygen bubbles produced by the plant in 1 minute
4. How will we be changing the light intensity?
   We will change the distance between the light source and the pond weed.

Photosynthesis - Required Practical (pg 56)

5. Why is it better to use an LED light source
   So the heat from the lamp does not affect the results. If the temperature increases, this will increase the rate of photosynthesis, so two variables would be changing.
6. What repeats will be done?
   5 in total (10cm, 20cm, 30cm, 40cm and 50cm)
7. What error has been introduced in the experiment?
   We have assumed that all the oxygen bubbles are the same volume
8. In the second style of experiment, what is done differently?
   The oxygen gas is collected instead of letting it escape, so that the volume can be measured.

B4 - Bioenergetics

Complete the exam questions on pages 84-88 of the exam question booklet

Respiration (page 57)

Respiration is NOT "Breathing In and Out"

1) All living things respire.
2) Respiration is the process of transferring energy from the breakdown of glucose
3) Respiration goes on in every cell in your body all the time.
4) The energy transferred from respiration is used for all living processes

RESPIRATION is the process of TRANSFERRING ENERGY FROM GLUCOSE, which goes on IN EVERY CELL.

5) Respiration is exothermic. This means it transfers energy to the environment.

Respiration Transfers Energy for All Kinds of Things

Here are three examples of how organisms use the energy transferred by respiration:

1) To build up larger molecules from smaller ones
2) In animals, to move about.
3) In mammals and birds, to keep warm.

Respiration (page 57)

1. What is respiration?
2. What type of reaction is respiration?
3. Where does respiration take place?
4. Give 3 ways the organisms use the energy transferred by respiration

Respiration (page 57)

1. What is respiration?

   A chemical reaction which releases energy from glucose in all cells
2. What type of reaction is respiration?

   Exothermic
3. Where does respiration take place?

   In the mitochondria of cells
4. Give 3 ways the organisms use the energy transferred by respiration

- **To build large molecules from smaller ones**
- **To move**
- **To keep warm**

Metabolism (page 58)

Metabolism is ALL the Chemical Reactions in an Organism

1) In a cell there are lots of chemical reactions happening all the time.
2) These reactions are controlled by enzymes.
3) In some of these reactions, larger molecules are made from smaller ones. For example:

- Lots of small glucose (sugar) molecules are joined together in reactions to form:
  - starch (a storage molecule in plant cells),
  - glycogen (a storage molecule in animal cells),
  - cellulose (a component of plant cell walls).
- Lipid molecules are each made from one molecule of glycerol and three fatty acids.
- Glucose is combined with nitrate ions to make amino acids. These are then made into proteins.

4) In other reactions, larger molecules are broken down into smaller ones. For example:

- Glucose is broken down in respiration.
  Respiration transfers energy to power all the reactions in the body that make molecules.
- Excess protein is broken down in a reaction to produce urea. Urea is then excreted in urine.

5) The sum (total) of all of the reactions that happen in a cell or the body is called its metabolism.

Excreted is just a fancy word for 'released from the body'.

Metabolism (page 58)

1. What is metabolism?
2. What controls the rate of chemical reactions in the body?
3. Give examples of 5 large molecules which are made in the body (say what each is made from)
4. Give 2 examples of reactions in the body where large molecules are broken down into smaller ones.

Metabolism (page 58)

1. What is metabolism?
   The total of all the reactions taking place in a cell or body
2. What controls the rate of chemical reactions in the body?
   enzymes
3. Give examples of 5 large molecules which are made in the body (say what each is made from)

- **Starch - made from glucose**
- **Glycogen - made from glucose**
- **Cellulose - made from glucose**
- **Lipids (fats) - made from glycerol and 3 fatty acids**
- **Proteins - made from amino acids**

Metabolism (page 58)

4. Give 2 examples of reactions in the body where large molecules are broken down into smaller ones.

- **Respiration - the breakdown of glucose**
- **Excess protein - broken down to make urea**

Different types of respiration (page 59)

You need to know about 3 different types of respiration.

1. Aerobic respiration - already revised
2. Anaerobic respiration in muscle cells
3. Anaerobic respiration in plant and yeast cells

Anaerobic Respiration in Muscles (pg 59)

1. When does anaerobic respiration take place in muscle cells?
2. What is the word equation for anaerobic respiration in muscle cells?
3. Compare the amount of energy released by this type of respiration with aerobic respiration.

Anaerobic Respiration in Muscles (pg 59)

1. When does anaerobic respiration take place in muscle cells?
   When not enough oxygen is available
2. What is the word equation for anaerobic respiration in muscle cells?
   Glucose → lactic acid
3. Compare the amount of energy released by this type of respiration with aerobic respiration.
   Much less energy is released in anaerobic respiration

Aerobic Respiration in Plants and Yeast (pg 59)

1. Write the word equation for anaerobic respiration in plants and yeast cells
2. What is another name for anaerobic respiration in yeast cells?
3. How do we use this type of respiration in the food and drink industry (2 ways)

Aerobic Respiration in Plants and Yeast (pg 59)

1. Write the word equation for anaerobic respiration in plants and yeast cells

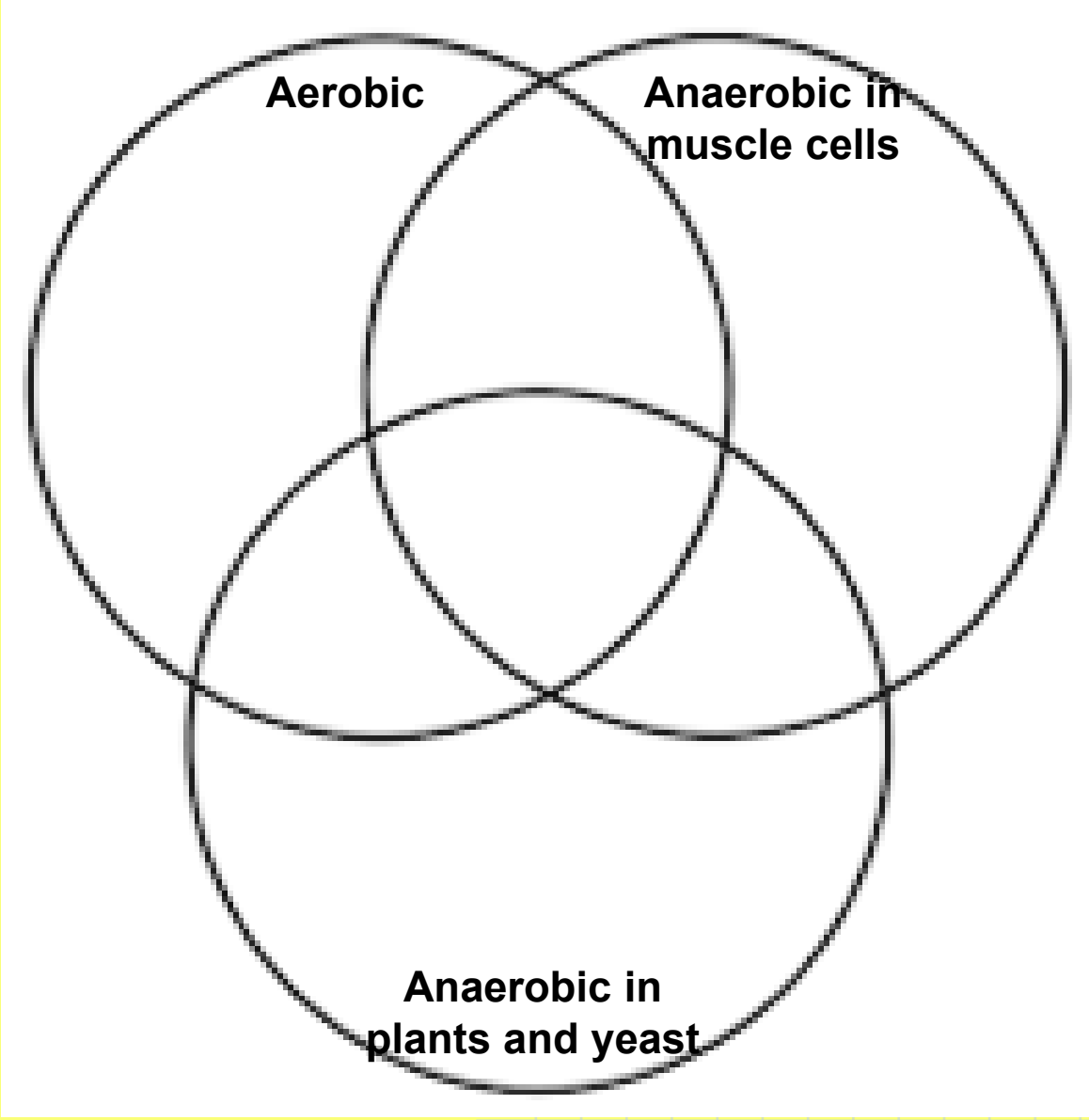
   Glucose → ethanol + carbon dioxide
2. What is another name for anaerobic respiration in yeast cells?

   fermentation
3. How do we use this type of respiration in the food and drink industry (2 ways)

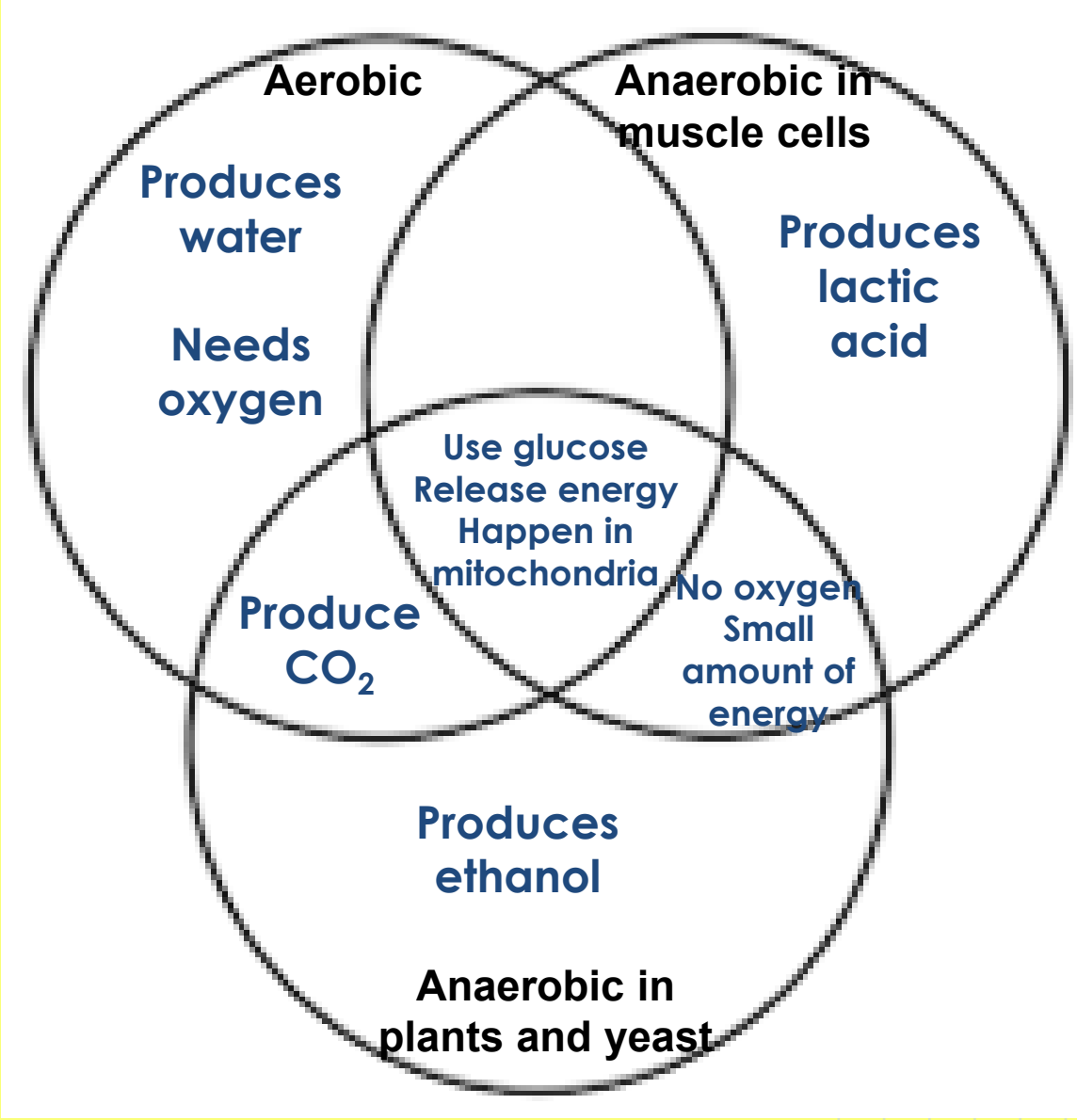
- **Baking bread - the carbon dioxide bubbles make bread rise**
- **Making beer/wine - the fermentation makes ethanol which is the alcohol in the drinks**

Comparing Respiration (page 60)

- Produces water
- Produces lactic acid
- Needs oxygen
- Uses glucose
- Produces CO_2
- Releases energy
- Small amount of energy
- Happens in mitochondria
- Produces ethanol
- Uses glucose



Comparing Respiration (page 60)



Comparing Respiration (page 60)

1. Use your diagram to **compare** aerobic respiration and anaerobic respiration in muscle cells
2. Use your diagram to **compare** anaerobic respiration in plant and yeast with anaerobic respiration in muscle cells

Comparing Respiration (page 60)

1. Use your diagram to **compare** aerobic respiration and anaerobic respiration in muscle cells.

Similarities: both happen in mitochondria, use glucose and release energy

Differences: In aerobic respiration water and CO_2 are produced and it needs oxygen whereas in anaerobic respiration, lactic acid is made and no oxygen is needed. In addition, the amount of energy released by anaerobic respiration is much less than aerobic respiration.

Comparing Respiration (page 60)

2. Use your diagram to **compare** anaerobic respiration in plant and yeast with anaerobic respiration in muscle cells

Similarities: both happen in mitochondria, use glucose, release a small amount of energy and do not need oxygen

Differences: In anaerobic respiration in muscle cells, the product is lactic acid whereas in anaerobic respiration in yeast cells, the product is ethanol.

Responding to Exercise (page 61)

When we exercise we need more **energy** so muscles can **contract** more.

We need to do more **respiration** so our breathing rate **increases** and we take **deeper** breaths to get more **oxygen** into our body.

Our heart rate **increases** to pump more **oxygenated** blood to our **muscle** cells.

Responding to Exercise (page 61)

Unfortunately, we cannot always get enough **oxygen** to our muscles. This means our muscles respire **anaerobically**. This releases **less** energy than aerobic respiration. Another problem is that **lactic acid** builds up in muscles, which can cause **muscle fatigue**.

After you stop exercising you have an **oxygen debt**. This is the amount of extra **oxygen** your body needs to break down the **lactic** acid. This is why you continue to **breathe** heavily after exercise.

B4 - Bioenergetics

Complete the exam questions on pages 89-96 of the exam question booklet