

SUMMER HOMEWORK

COMBINED SCIENCE

YEAR 9 INTO YEAR 10 SUMMER TRANSITION WORK

OCR GATEWAY COMBINED SCIENCE A (J250)

STUDENT INSTRUCTIONS

1. Complete all Biology, Chemistry and Physics revision maps.
2. Complete the exam-question packs posted in the Year 9 Teams group.
3. Show full working for calculations and answer extended questions in full sentences.
4. Check and correct your answers using your Year 9 notes and class resources.
5. Bring all completed work to your first Science lesson in September.

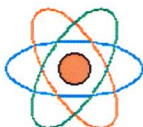
Name: _____

Class: _____



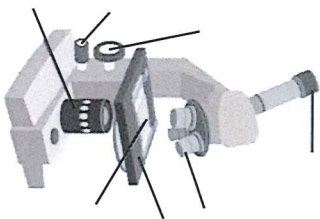
BEAL HIGH SCHOOL

SCIENCE DEPARTMENT



The light microscope, using the following:

Objective lens
eyepiece lens
fine focus
slide
coarse focus
light stage



What is the correct way to focus a light microscope on a new slide?

- Start with the highest magnification objective lens and move the stage away from it.
- Start with the highest magnification objective lens and move the stage towards it.
- Start with the lowest magnification objective lens and move the stage away from it.
- Start with the lowest magnification objective lens and move the stage towards it.

B1.1 – Cell Structures – Revision Sheet

Cells structures

There are two main types of cells:

Eukaryotic cells contain genetic material in a _____ cells. Their size is between _____ and _____.

Prokaryotic cells do not contain a _____. Their genetic material floats in the _____.

These are simple cells, an example of a Prokaryotic cell is a _____.

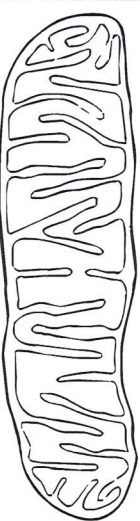
Their size is between _____ and _____.

Image size

Below is a drawing of a mitochondria seen with an electron microscope. Calculate the actual length of the organelle as shown along the line A-B. Write your answer to the nearest micrometer (µm).

A _____ B _____

$$\text{Image size (mm)} = \frac{\text{Actual size (mm)}}{\text{Magnification}}$$



× 20 000

Magnification

Write down the formula used to calculate magnification.

Total Magnification =

×

Wymondham High Academy

Comparing microscopes

What are the advantages and disadvantages of using a light and electron microscope?

Light Microscope	Electron microscope
Advantages	Advantages
Disadvantages	Disadvantages

Staining cells

Many cells are colourless. We stain cells to make them easier to observe.

Methylene Blue – used to see the nucleus of an _____ cell.

Iodine – used to see the nucleus of a _____ cell.

Crystal Violet – used to stain _____ of bacterial cells.

Cell components and their function

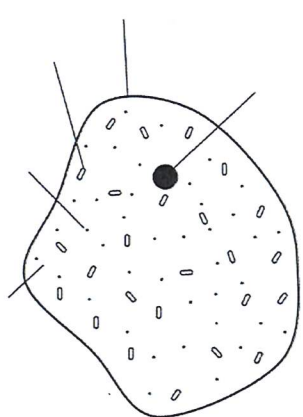
Match the cell components to their function

Mitochondria	Where photosynthesis takes place
Cell wall	Where protein synthesis takes place
Cell membrane	Where respiration takes place
Ribosomes	Controls which substance can move into and out of the cell
chloroplasts	Surrounds the cell, providing support

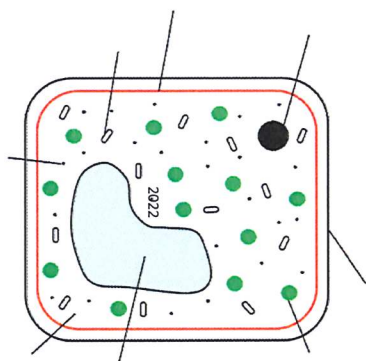
Subcellular structures

Label with the following cells diagrams using the appropriate name from this list:

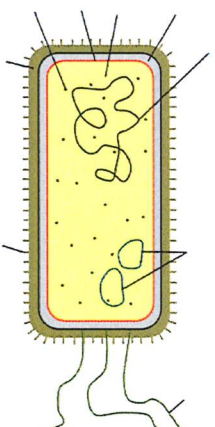
nucleus
plasmids
cell membrane
slime capsule
ribosomes
flagella
mitochondria
cell wall
pili
cytoplasm
vacuole
chloroplasts
genetic material



_____ cell



_____ cell



_____ cell

Arrange the following structures in order of size

nucleotides	helix	bases
100	3.4	10
200	6.8	20
300	10.2	30
400	13.6	40
500	17.0	50
600	20.4	60
700	23.8	70
800	27.2	80
900	30.6	90
1000	34.0	100

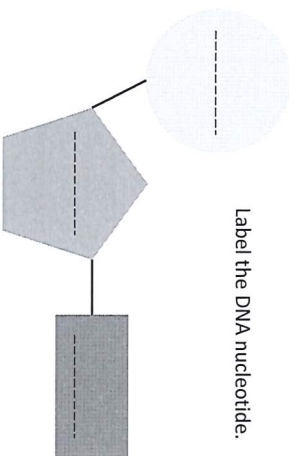
DNA is made of two strands joined together by

_____. The strands are then twisted together

to form a shape known as a double _____

DNA is made of lots of small units called _____

Each nucleotide is made of a sugar (deoxyribose), a phosphate group and a base.

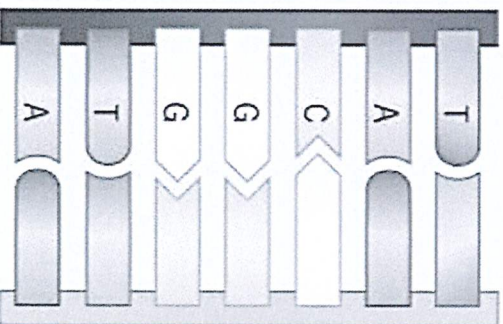


DNA is made up of four complimentary bases, known as

A _____ which bonds with T _____

C_____ which bonds with G_____

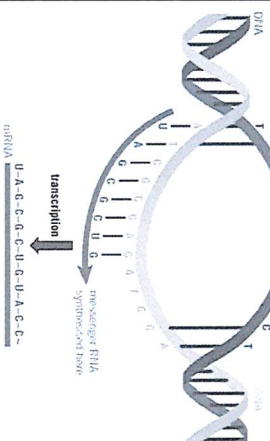
Complete the base sequence shown below:



Transcription and Translation

Match the following descriptions to the keyword.

Transcription	A copied DNA strand carrying genetic code out of the nucleus
Ribosome	To chemically make something new
Translation	Process by which an mRNA chain is made
mRNA	A subcellular structure where proteins are made
Synthesised	Process by which proteins are made



What order do these actions occur in transcription? Number them from 1 to 4.

When the copy is complete the mRNA strand detaches and the DNA zips back together.
One DNA strand acts as a template, nucleotide bases of mRNA complimentary pair with the DNA to create a copy.
DNA unzips so both strands are separated.
The mRNA copy is small enough to leave the nucleus and enters a ribosome.

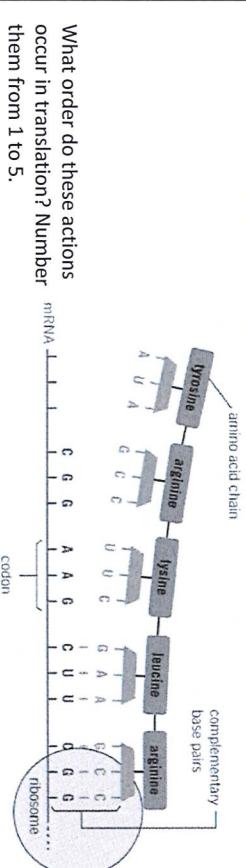
During protein synthesis the DNA that codes for a particular protein is copied. This copy is called mRNA. The diagram below shows the base sequence for a section of DNA.

G G T G C A T A T

What would be the complementary sequence of mRNA for this section of DNA? Tick your

answer.

C	C	A	C	G	T	A	T	A
C	C	A	C	G	U	A	U	A



What order do these actions occur in translation? Number them from 1 to 5.

The mRNA attaches to the ribosome in the cytoplasm.
Transfer RNA (tRNA) molecules bring the complimentary anticodon amino acid to the ribosome
The process is repeated along the whole mRNA chain until the complete protein is synthesised.
The ribosome reads the order of the nucleotides in triplet codons on the mRNA
The ribosome attaches the amino acid to the previous one to bind the chain together

Insulin is a protein made of 51 amino acids.

How many bases are in the length of DNA the monomer in DNA? Circle your answer.

coding for insulin? Circle your answer.

51 102 153 204

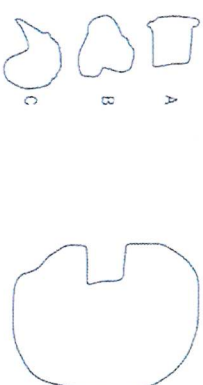
These are involved in many reactions in the body. They

build _____ molecules from small ones, such as protein synthesis.

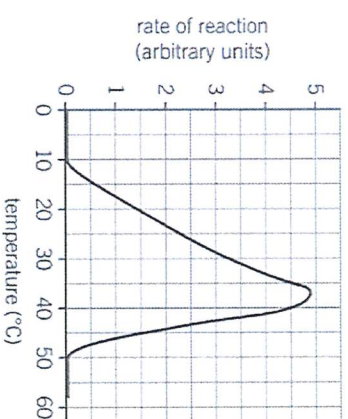
as protein synthesis.

They break down _____ molecules into smaller one, as in digestion.

Label the enzyme, substrate and the active site.



Which substrate fits the enzyme? _____



The graph shows the effect of temperature on an enzyme-catalysed reaction.

a. State the optimum temperature for this enzyme.

b. Describe how the rate of reaction varies with temperature _____

c. Explain what happens at 50°C

Carbohydrates, Proteins and Lipids

Carbohydrate	Used for growth and repair
Lipids	Required by the body to maintain good health
Proteins	Used as a store of energy, and for insulation
Vitamins and minerals	Provide the body with energy

State the enzyme that digests each of the following and the product of the process.

- Carbohydrates _____
- Proteins _____
- Lipids _____

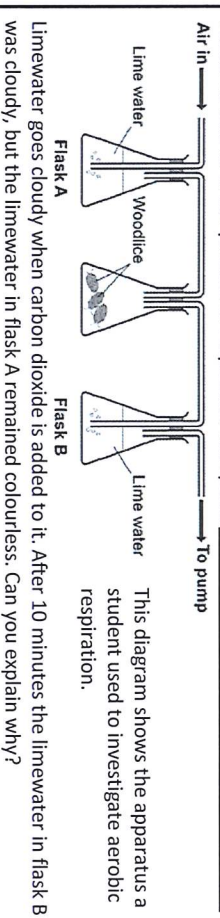
B1.3 – Respiration – Revision Sheet

Aerobic Respiration

Complete the word equation and the balanced symbol equation for aerobic respiration:



Where in cells does the process of respiration take place _____



ATP

What is the name of the chemical reaction in animal's bodies that produces the most ATP?

In which organelle in a cell does the above reaction happen?

What three functions is ATP used for in animals?

- _____
 - _____
 - _____
- Which row in the following table gives the correct comparison between aerobic and anaerobic respiration in animals? Circle the correct letter, A, B, C or D.

	Aerobic respiration	Anaerobic respiration
A	Produces more ATP	Produces less ATP
B	Produces lactic acid	Does not produce lactic acid
C	Does not use oxygen	Uses oxygen
D	Produces carbon dioxide	Produces carbon dioxide

Food Tests

Match the food molecule to the chemical used to test for its presence to the enzyme that breaks it down.

Food molecule	Chemical test	Enzyme
Starch	Iodine	Lipase
Sugar	Biuret	Protease
Protein	Ethanol	Amylase (a carbohydrase)
Lipids	Benedict's	Carbohydrase

Anaerobic Respiration

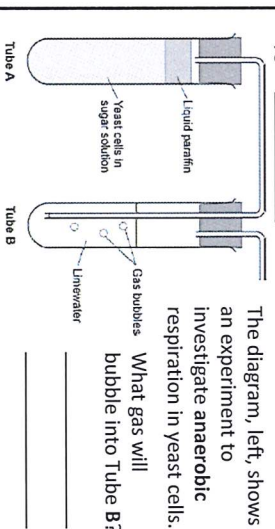
When there is not enough oxygen for aerobic respiration to take place the body transfers energy from its chemical store of glucose for short periods by anaerobic respiration. Complete the reaction:



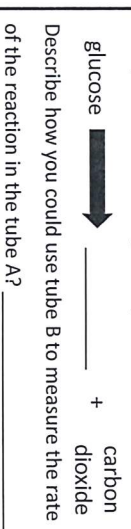
An athlete is training for a marathon. When she runs, her heart beats faster than it does when she is resting. When she is running, their muscle activity increases. To do this, her muscle cells _____ at a faster rate to give her more energy. Her muscles need to be supplied with _____ and _____ more quickly.

Her heart beats faster to increase the flow of _____ which carries the products _____ and _____

away from her muscles. When you have finished exercising you keep breathing heavily. The extra oxygen you breathe in reacts with the lactic acid, breaking it down. The oxygen needed for this process is called the oxygen _____

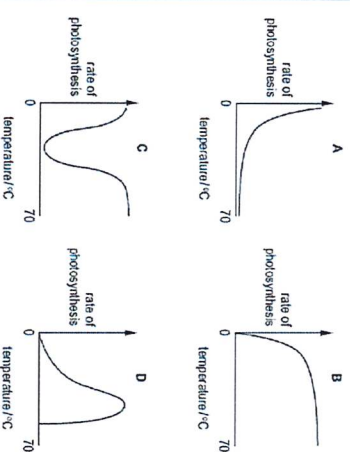


Complete the equation for anaerobic respiration in yeast cells (and other microorganisms).

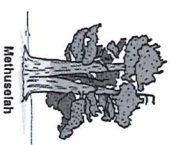


Anaerobic respiration in yeast is called fermentation. Give one use of fermentation in the food industry.

Factors affecting photosynthesis



Circle the graph which correctly shows the effect of increasing the temperature on the rate of photosynthesis.



Bristlecone pine trees are among the longest living things on Earth. One of them, called Methuselah, is in California and is over 4,800 years old. Bristlecone pine trees live high up in the mountains.

The Temperature, dry soils and strong winds make them grow very slowly.

Explain why these extreme conditions make the bristlecone pine tree grow very slowly. [6 marks]

Tick the following statements to show which one is correct.

Plants photosynthesise only when it is light. ☐

Plants respire only when it is light. ☐

Plants respire only when it is dark. ☐

Plants photosynthesise only when it is dark. ☐

B1.4 – Photosynthesis – Revision Sheet

Photosynthesis experiments

Number the following steps in order to show how you would carry out an experiment to prove light is necessary for photosynthesis. What does this experiment test for? _____

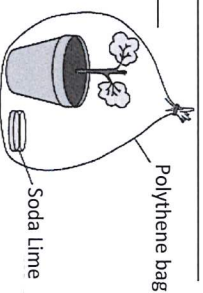
- ____. Cover part of a leaf with card.
- ____. Wash the leaf.
- ____. Remove card from leaf, and leaf from plant.
- ____. Boil the leaf in ethanol.

Which kind of leaf would you use in the above experiment to show that chlorophyll is needed for photosynthesis? _____.

Draw a diagram below to show the apparatus you could use to prove oxygen is given off during photosynthesis.

If I set up this experiment, what will the soda lime do? _____

If I test one of the leaves the following day, as described above, what will the iodine show? _____



Photosynthesis

Complete the word equation and the balanced symbol equation for photosynthesis:

carbon dioxide + water $\xrightarrow{\hspace{1cm}}$ _____ + oxygen

_____ + $6\text{H}_2\text{O}$ $\xrightarrow{\hspace{1cm}}$ $\text{C}_6\text{H}_{12}\text{O}_6$ + _____

What are the two main stages of photosynthesis? Which is light dependant, which is light independent.

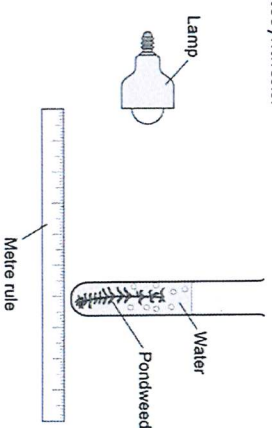
Stage No	Light dependant or independent	Actions
_____	_____	Carbon dioxide gas combines with the hydrogen ion to make glucose
_____	_____	Energy transferred from light splits water molecules into oxygen gas and hydrogen gas

How does the carbon dioxide used in photosynthesis enter a plant? _____

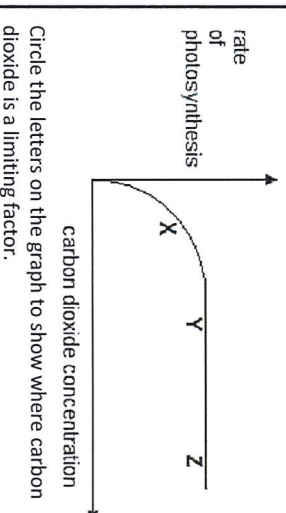
How does the water used in photosynthesis enter a plant? _____

Limiting factors

Explain how you could use the following equipment to investigate how light intensity limits the rate of photosynthesis.



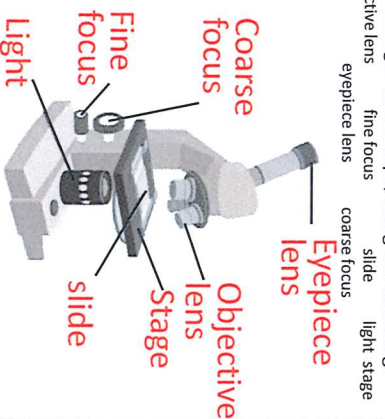
Explain why commercial growers increases the carbon dioxide concentration in a greenhouse.



Circle the letters on the graph to show where carbon dioxide is a limiting factor.

The light microscope

Label the light microscope, using the following:



What is the correct way to focus a light microscope on a new slide?

- Start with the highest magnification objective lens and move the stage away from it.
- Start with the highest magnification objective lens and move the stage towards it.
- Start with the lowest magnification objective lens and move the stage away from it.**
- Start with the lowest magnification objective lens and move the stage towards it.

B1.1 – Cell Structures – Revision Sheet

Cells structures

There are two main types of cells:

Eukaryotic cells contain genetic material in a **nucleus**. Example of a Eukaryotic cells are

plant cells and **animal** cells. Their size is between **10µm** and **100µm**

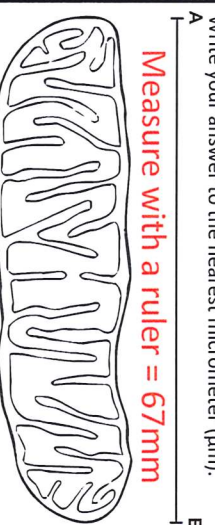
Prokaryotic cells do not contain a **nucleus**. Their genetic material floats in the

cytoplasm. These are simple cells, an example of a Prokaryotic cell is a

bacteria. Their size is between **1µm** and **10µm**.

Image size

Below is a drawing of a mitochondria seen with an electron microscope. Calculate the **actual** length of the organelle as shown along the line A-B. Write your answer to the nearest micrometer (µm).



Measure with a ruler = 67mm

Image size (mm) = Actual size (mm) x Magnification

Image ÷ Magnification
 $67 \div 20\,000 = 0.00335$
 $0.00335 \times 1000 = 3.35\mu\text{m}$

x 20 000

Magnification

Write down the formula used to calculate magnification.

Total Magnification = **Eyepiece lens**

x **Objective lens**

Comparing microscopes

What are the advantages and disadvantages of using a light and electron microscope?

Light Microscope	Electron microscope
Advantages	Advantages
Cheap, portable Simple to prepare slides Living or dead specimens Natural colour samples	Resolution to 0.1nm Maximum magnification about x100 000
Disadvantages	Disadvantages
Resolution to 0.2µm Maximum magnification x1500 (due to wavelength of light)	Expensive Difficult to move Complex to make slides Dead specimens only Black and white images only

Staining cells

Many cells are colourless. We stain cells to make them easier to observe.

Methylene Blue – used to see the nucleus of an **animal** cell.

Iodine – used to see the nucleus of a **plant** cell.

Crystal Violet – used to stain **cell wall** of bacterial cells.

Cell components and their function

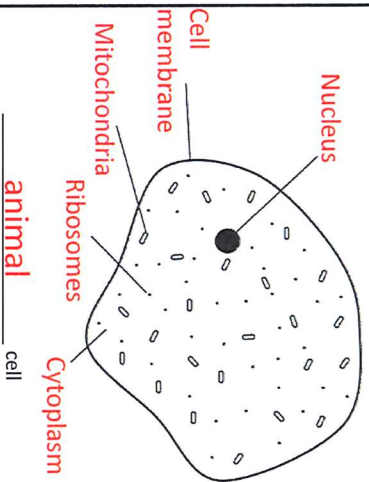
Match the cell components to their function

Cell components	Where they take place
Mitochondria	Where protein synthesis takes place
Cell wall	Where respiration takes place
Cell membrane	Controls which substance can move into and out of the cell
Ribosomes	Surrounds the cell, providing support
Chloroplasts	

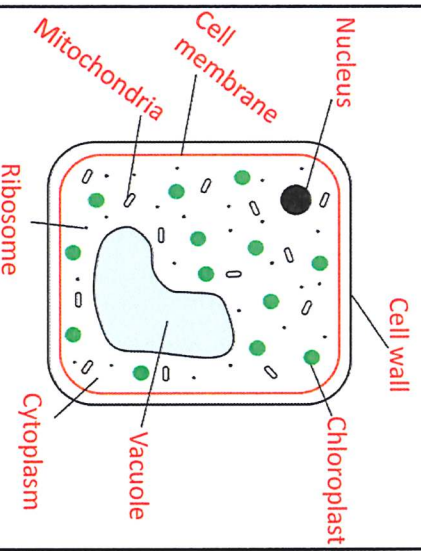
Subcellular structures

Label with the following cells diagrams using the appropriate name from this list:

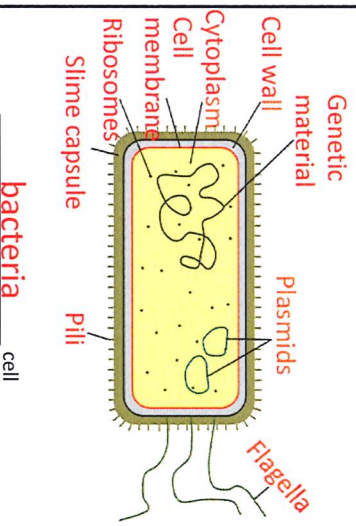
nucleus, plasmids, cell membrane, slime capsule, ribosomes, flagella, mitochondria, cell wall, pili, cytoplasm, vacuole, chloroplasts, genetic material



animal cell



plant cell



bacteria cell

Arrange the following structures in order of size

cell	nucleus	chromosome	gene	nucleotide
------	---------	------------	------	------------

nucleotides helix bases

DNA is made of two strands joined together by

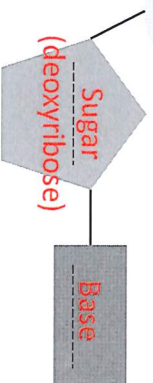
bases. The strands are then twisted together

to form a shape known as a double **helix**

DNA is made of lots of small units called nucleotides.

Each nucleotide is made of a sugar (deoxyribose), a phosphate group and a base.

Label the DNA nucleotide.

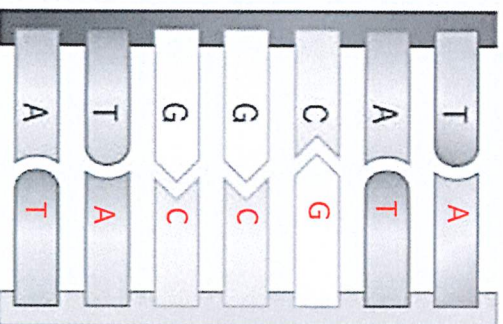


DNA is made up of four complimentary bases, known as

A adenine which bonds with T thymine

Cytosine which bonds with Guanine

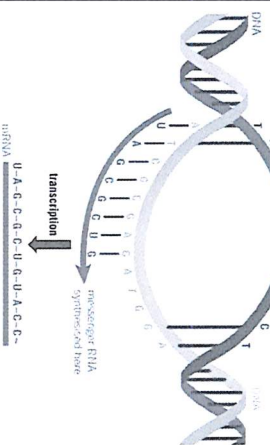
Complete the base sequence shown below:



Transcription and Translation

Match the following descriptions to the keyword.

Transcription	A copied DNA strand carrying genetic code out of the nucleus
Ribosome	To chemically make something new
Translation	Process by which an mRNA chain is made
mRNA	A subcellular structure where proteins are made
Synthesised	Process by which proteins are made



What order do these actions occur in transcription? Number them from 1 to 4

3	When the copy is complete the mRNA strand detaches and the DNA zips back together.
2	One DNA strand acts as a template, nucleotide bases of mRNA complementary pair with the DNA to create a copy.
1	DNA unzips so both strands are separated.
4	The mRNA copy is small enough to leave the nucleus and enters a ribosome.

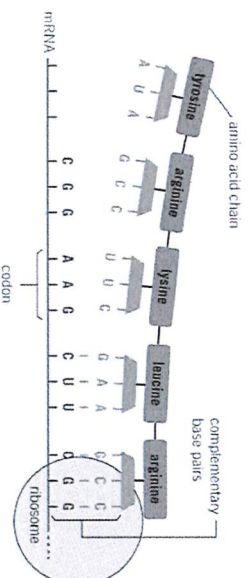
During protein synthesis the DNA that codes for a particular protein is copied. This copy is called mRNA. The diagram below shows the base sequence for a section of DNA.

GGTGGCTATT

What would be the complementary sequence of mRNA for this section of DNA? Tick your answer.

C	C	A	C	G	T	A	T	A
G	G	T	G	C	A	T	A	

	C C A C G T A T A		G G T G C A T A T
X	C C A C G U A U A		G G U G C A U A U



What order do these actions occur in translation? Number them from 1 to 5.

- 1 The mRNA attaches to the ribosome in the cytoplasm.
- 2 The ribosome reads the order of the nucleotides in triplet codons on the mRNA
- 3 Transfer RNA (tRNA) molecules bring the complementary anticodon amino acid to the ribosome
- 4 The process is repeated along the whole mRNA chain until the complete protein is synthesised.
- 5 The ribosome reads the order of the nucleotides in triplet codons on the mRNA
- 6 The ribosome attaches the amino acid to the previous one to bind the chain together

Insulin is a protein made of 51 amino acids.

How many bases are in the length of DNA the monomer in DNA? Circle your answer

coding for insulin? Circle your answer.

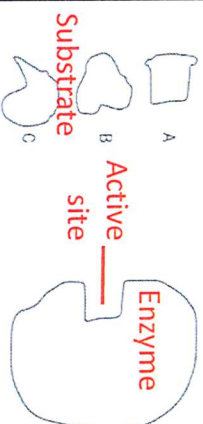
51 102 153 204

These are involved in many reactions in the body. They

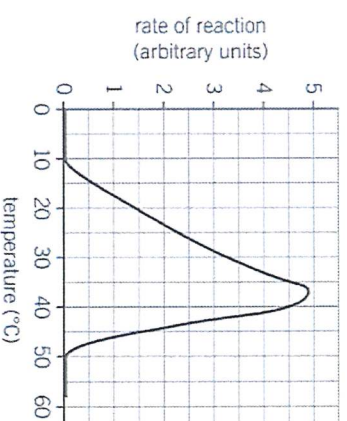
build larger molecules from small ones, such as protein synthesis.

They break down **larger** molecules into smaller one, as in digestion.

Label the enzyme, substrate and the active site.



Which substrate fits the enzyme? A



The graph shows the effect of temperature on an enzyme-catalysed reaction.

a. State the optimum temperature for this enzyme.

37°C

b. Describe how the rate of reaction varies with

temperature Below 10°C the enzyme can't catalyse the reaction. Between 10°C and 37°C the reaction rate increases to the optimum. Above 37°C the rate rapidly decreases until 50°C where the reaction stops.

c. Explain what happens at 50°C

Above 50°C the enzyme denatures, the active site changes shape, the substrate can no longer bind and reactions stop.

Carbohydrates, Proteins and Lipids

Carbohydrate	Used for growth and repair
Lipids	Required by the body to maintain good health
Proteins	Used as a store of energy, and for insulation
Vitamins and minerals	Provide the body with energy

State the enzyme that digests each of the following and the product of the process.

- Carbohydrates **Carbohydrase**
- Proteins **Protease**
- Lipids **Lipase**

B1.3 – Respiration – Revision Sheet

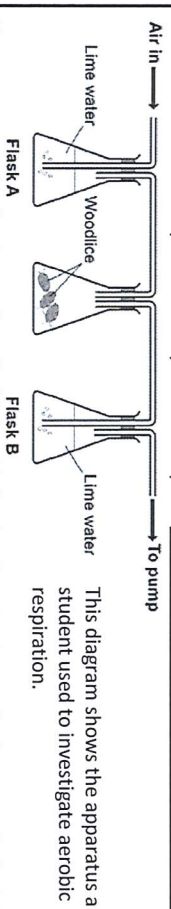
Aerobic Respiration

Complete the word equation and the balanced symbol equation for aerobic respiration:

Glucose + oxygen → carbon dioxide + water



Where in cells does the process of respiration take place **Mitochondria**



Lime water goes cloudy when carbon dioxide is added to it. After 10 minutes the lime water in flask B was cloudy, but the lime water in flask A remained colourless. Can you explain why? **Flask B goes more cloudy because carbon dioxide is produced in aerobic respiration by the woodlice. Flask A doesn't change colour because air doesn't contain enough carbon dioxide to react with the lime water.**

ATP

What is the name of the chemical reaction in animal's bodies that produces the most ATP?

Aerobic respiration

In which organelle in a cell does the above reaction happen?

Mitochondria

What three functions is ATP used for in animals?

- Enzymes – to make larger or smaller molecules**
 - For movement - to contract muscle cells**
 - To stay warm – respiration increases when the animal is cold**
- Which row in the following table gives the correct comparison between aerobic and anaerobic respiration in animals? Circle the correct letter, A, B, C or D.

	Aerobic respiration	Anaerobic respiration
A	Produces more ATP	Produces less ATP
B	Produces lactic acid	Does not produce lactic acid
C	Does not use oxygen	Uses oxygen
D	Produces carbon dioxide	Produces carbon dioxide

Food Tests

Match the food molecule to the chemical used to test for its presence to the enzyme that breaks it down.

Food molecule	Chemical test	Enzyme
Starch	Iodine	Lipase
Sugar	Biuret	Protease
Protein	Ethanol	Amylase (a carbohydrase)
Lipids	Benedict's	Carbohydrase

Anaerobic Respiration

When there is not enough oxygen for aerobic respiration to take place the body transfers energy from its chemical store of glucose for short periods by anaerobic respiration. Complete the reaction:

glucose → **Lactic Acid**

Complete the sentences, using the words in the box.

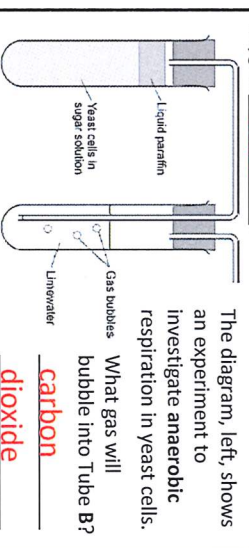
blood breathe carbon dioxide glucose
heat nitrogen oxygen respire debt

An athlete is training for a marathon. When she runs, her heart beats faster than it does when she is resting. When she is running, their muscle activity increases. To do this, her muscle cells **respire**

at a faster rate to give her more energy. Her muscles need to be supplied with **oxygen** and **glucose** more quickly.

Her heart beats faster to increase the flow of **blood** which carries the products **carbon dioxide** and **heat**

away from her muscles. When you have finished exercising you keep breathing heavily. The extra oxygen you breathe in reacts with the lactic acid, breaking it down. The oxygen needed for this process is called the oxygen **debt**

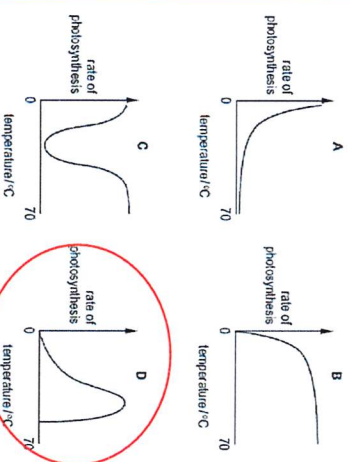


Complete the equation for anaerobic respiration in yeast cells (and other microorganisms).

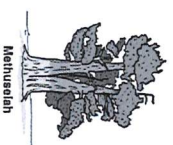
glucose → **ethanol** + carbon dioxide

Describe how you could use tube B to measure the rate of the reaction in the tube A? **Count the number of bubbles or measure the volume of gas in a given time.**
Anaerobic respiration in yeast is called fermentation. Give one use of fermentation in the food industry.
Brewing beer, baking bread

Factors affecting photosynthesis



Circle the graph which correctly shows the effect of increasing the temperature on the rate of photosynthesis.



Bristlecone pine trees are among the longest living things on Earth. One of them, called Methuselah, is in California and is over 4,800 years old. Bristlecone pine trees live high up in the mountains.

The Temperature, dry soils and strong winds make them grow very slowly.

Explain why these extreme conditions make the bristlecone pine tree grow very slowly. [6 marks]

Photosynthesis is reduced because dry, windy conditions mean stomata are often closed, so reduced CO_2 taken in. Reduced rain means less water in the tree to transport minerals and less water available for photosynthesis. Colder temperatures reduce the rate of photosynthesis, and affect the ability of enzymes to work at their optimum

Tick the following statements to show which one is correct.

- ☒ Plants photosynthesise only when it is light.
- ☐ Plants respire only when it is light.
- ☐ Plants respire only when it is dark.
- ☐ Plants photosynthesise only when it is dark.

B1.4 – Photosynthesis – Revision Sheet

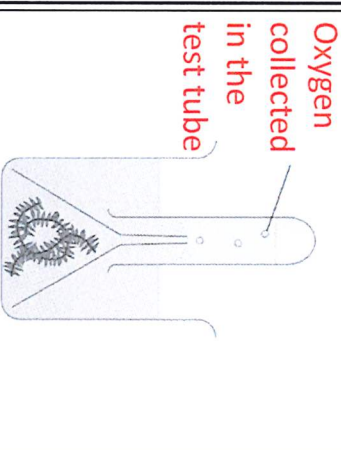
Photosynthesis experiments

Number the following steps in order to show how you would carry out an experiment to prove light is necessary for photosynthesis. What does this experiment test for? Starch

1. Cover part of a leaf with card.
2. Wash the leaf.
3. Remove card from leaf, and leaf from plant.
4. Boil the leaf in ethanol.
5. Add a few drops of iodine solution to the leaf.
6. Place the plant in the dark for 24 hours.
7. Place the plant in sunlight for a few hours.

Which kind of leaf would you use in the above experiment to show that chlorophyll is needed for photosynthesis? Variegated (stripey)

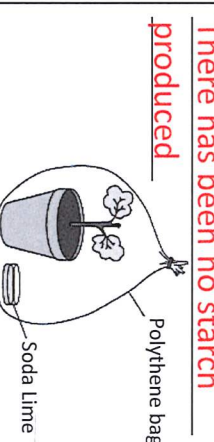
Draw a diagram below to show the apparatus you could use to prove oxygen is given off during photosynthesis.



Oxygen collected in the test tube

If I set up this experiment, what will the soda lime do? Removes the carbon dioxide from the air

If I test one of the leaves the following day, as described above, what will the iodine show? There has been no starch produced



Photosynthesis

Complete the word equation and the balanced symbol equation for photosynthesis:

carbon dioxide + water $\xrightarrow{\quad}$ Glucose + oxygen

6CO_2 + $6\text{H}_2\text{O}$ $\xrightarrow{\quad}$ $\text{C}_6\text{H}_{12}\text{O}_6$ + 6O_2

What are the two main stages of photosynthesis? Which is light dependant, which is light independent.

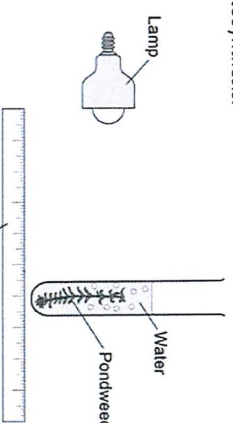
Stage No	Light dependant or independent	Actions
2	Light independent	Carbon dioxide gas combines with the hydrogen ion to make glucose
1	Light dependant	Energy transferred from light splits water molecules into oxygen gas and hydrogen gas

How does the carbon dioxide used in photosynthesis enter a plant? Through the open stomata on the underside of the leaf

How does the water used in photosynthesis enter a plant? Through the root hair cells and then up through the xylem in the veins

Limiting factors

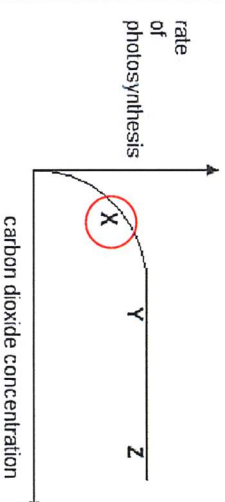
Explain how you could use the following equipment to investigate how light intensity limits the rate of photosynthesis.



Place the lamp close to the pondweed and count the number of bubbles released by the plant. Move the lamp at away from the weed in 10cm intervals counting the number of bubbles. Then plot a graph showing the distance of the light on the x axis and number of bubbles on the y axis.

Explain why commercial growers increases the carbon dioxide concentration in a greenhouse.

If you increase the concentration of the carbon dioxide the rate of photosynthesis will be increased. If photosynthesis increases you will increase the yield of the crop.



Circle the letters on the graph to show where carbon dioxide is a limiting factor.

Diffusion

Tick the box to answer the question.

	True	False
Increasing the surface area decreases the rate of diffusion		
Particles move randomly		
Net movement of particles is from higher to lower concentration		
Increasing the temperature will increase the rate of diffusion		
The steeper the concentration gradient the slower the rate of diffusion		
Particles move up a concentration gradient		
The shorter the distance the particle have to move, the faster the rate of diffusion		

Name one example of where diffusion is occurring in humans and plants.

Humans: _____

Plants: _____

B2.1 – Supplying the Cell – Revision Sheet

Osmosis

Read the table right.

Which row describe osmosis?

	Requires energy	Movement down a concentration gradient	Substance(s) moved
A	Yes	No	Water and glucose
B	No	No	Water only
C	Yes	Yes	Water and glucose
D	no	Yes	Water only

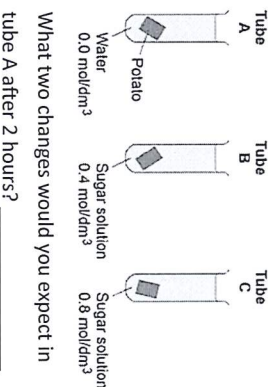
A student investigated the effect of sugar solution concentration on pieces of potato.

This is the method used.

1. Cut three pieces of potato to the same length.
2. Dry each piece on a paper towel.
3. Weigh each piece.
4. Place potato in different concentration sugar solutions.
5. Leave all three pieces for 2 hours.
6. Remove the three pieces of potato from the solutions.
7. Dry each piece on a paper towel.
8. Measure the length and mass of each piece of potato.

Why did they dry each piece of potato before weighing?

The potato in tube B did not change, give one conclusion from this observation? _____



Active Transport

This paragraph is about moving substances by active transport. Complete the paragraph using the words from the box.

low mitochondria energy high respiration ATP

Active transport allows movement of substances from areas of _____ concentration to areas of _____ concentration. It requires the breakdown of _____ to provide the _____ for active transport. This is provided during cell _____. Cells that carry out lots of active transport will usually have many _____.

Name one example of where active transport is used in humans and plants.

Humans: _____
Plants: _____

Stem Cells

This paragraph is about stem cells in animals. Use the words from the box to complete the paragraph.

mitosis any adult repair undifferentiated differentiation

Stem cells in animals are _____. They can undergo the process of _____ to become specialised to carry out a particular role. There are two main types of stem cell in animals; embryonic stem cells and _____ stem cells. Stem cells in mature animals are restricted in what type of cell they can become, embryonic stem cells can become _____ cell in the organism. Embryonic stem cells can divide through the process of _____ to make a whole organism. Fully developed animals contain stem cells for their entire lives to help them _____ damaged tissues.



Name one other location in a plant where stem cells can be found? _____

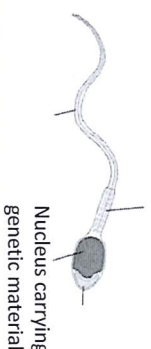
Cell Differentiation

During the development of a multicellular organism, cells differentiate. What does this mean?

Match the specialised cell with the correct adaptation and function.

Cell	Adaptation	Function
Ciliated cell	Can expand	More room for haemoglobin molecules
Palisade cell	Contains many chloroplasts	photosynthesis
Sperm cell	Hair like structures on the surface	Sweep mucus away
Fat cell	Contains enzymes in acrosome	Fat storage
Red blood cell	No nucleus	Breaks down outer layer of ovum

Label the sperm cell adaptations and explain the reason for each one.



Mitosis

Mitosis is the process by which body cells divide. Each cell divides to produce two daughter cells, which are genetically identical to each other.

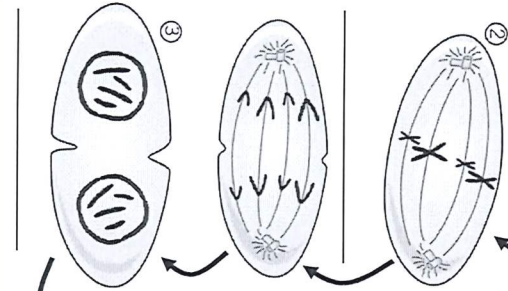


A cell cycle has four stages shown in the numbered images on the left. Label the images using the following names.

DNA replication
movement of chromosomes
cytokinesis
growth of daughter cells

Number the following sentences to describe the process of mitosis. The first one has been done for you:

Chromosomes align across the centre of the cell	1
Nuclear membranes form	
A cell grows in size and mass and chromosomes are replicated	
One copy of each chromosome moves to opposite ends of the cell	
The cell membrane and cytoplasm divide	
The nuclear membrane breaks down	



B2.2 – Challenges of Size – Revision Sheet

Exchange and Transport

Surface area and volume are important for the transport of substance in the circulatory system. Look at the diagram.



	1 mm cube	2 mm cube	4 mm cube
Surface area	6 sides x 1 mm ² = 6 mm ²	6 sides x 2 mm ² = 24 mm ²	6 sides x 4 mm ² = 96 mm ²
Volume	(1 mm) ³ = 1 mm ³	(2 mm) ³ = 8 mm ³	(4 mm) ³ = 64 mm ³
Surface area: volume ratio	6/1	3/1	

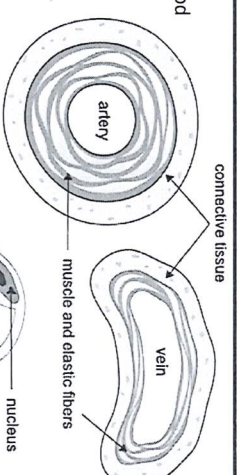
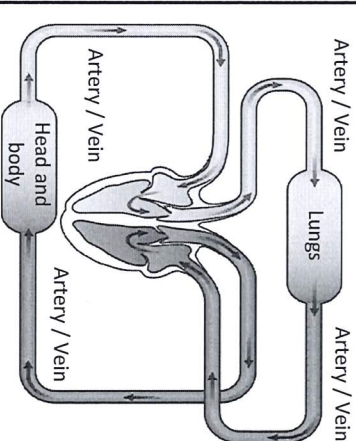
Complete the table above for the 4mm cube. Explain which blood vessel would you expect to have the largest surface area: volume ratio?

Circulatory System

The picture on the right shows three of the blood vessels found in humans (not drawn to scale).

What is the lumen? _____

Arteries carry blood away from the heart under high pressure.



On the diagram, left, select the correct vessel in each part of the circulatory system.

Capillary walls are one cell thick and are semipermeable enabling substances to pass through.

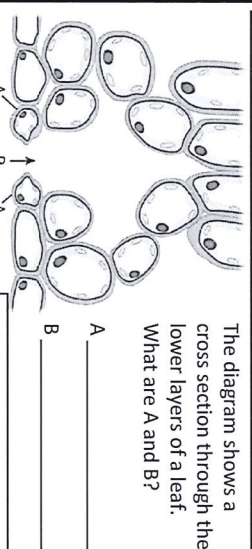
What types of blood vessels will be found inside the lungs? _____

Blood circulates through the human heart twice during each circuit of the body. It is called a _____ circulatory system.

Transpiration Stream

Number the following sentences to describe the movement of water through a plant. The first one has been done for you.

1	Water moves in the xylem up through the stem and into the leaves
	Water is lost from the leaves by evaporation through open stomata
	Water and minerals move from cell to cell through the root until they reach xylem vessels
	Water moved into the root from the soil by osmosis



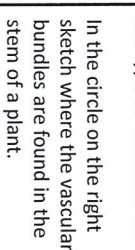
Cell A can lose or gain water. Complete the sentences, choosing words from the box.

active transport
condensation
osmosis
photosynthesis
transpiration

Cell A can gain water by _____.
Water vapour can escape from the leaf through hole B by _____.

Plant Transport Systems

The diagram, right, shows a cross-section of a plant root and the vascular bundle. Draw a line to match the correct name to the type of tissue shown.



Name two substances transported by xylem.

Name two substances transported by phloem.

Translocation is a process that occurs in plants. Which row in the table describe translocation?

Transport tissue	Substances transported	Direction of movement	Involves active transport
A Phloem	Sucrose	Two way flow	Yes
B Phloem	Mineral ions	One direction only	No
C Xylem	Mineral ions	One direction only	No
D Phloem	Sucrose	Two way flow	No

Factors Affecting Transpiration

Match the following factors to the explanations.

Factor	Description	Explanation
Light	Transpiration is faster in higher temperature	The stomata open wider to allowing CO ₂ into the leaf for photosynthesis
Temperature	Transpiration is faster in windy conditions	Water vapour quickly removed by air movement, speeds up diffusion out of the leaf
Wind	In bright light transpiration increases	Evaporation and diffusion are faster at higher temperatures
Humidity	Transpiration is slower in humid conditions.	

Look at the diagram of the potometer.

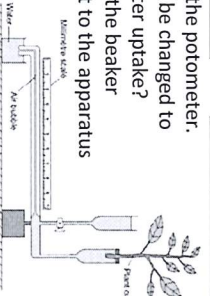
How can the apparatus be changed to increase the rate of water uptake?

A – Add more water to the beaker

B – Switch on a fan next to the apparatus

C – Place a plastic bag over the plant

D – Remove two leaves



Diffusion

Tick the box to answer the question.

	True	False
Increasing the surface area decreases the rate of diffusion	☒	☐
Particles move randomly	☒	☐
Net movement of particles is from higher to lower concentration	☒	☐
Increasing the temperature will increase the rate of diffusion	☒	☐
The steeper the concentration gradient the slower the rate of diffusion	☒	☐
Particles move up a concentration gradient	☒	☐
The shorter the distance the particle have to move, the faster the rate of diffusion	☒	☐

Name one example of where diffusion is occurring in humans and plants.

Humans: Oxygen diffuses into blood
Plants: CO₂ diffuses into leaf cells for photosynthesis

B2.1 – Supplying the Cell – Revision Sheet

Osmosis

Read the table right.

Which row describe osmosis?

	Requires energy	Movement down a concentration gradient	Substance(s) moved
A	Yes	No	Water and glucose
B	No	No	Water only
C	Yes	Yes	Water and glucose
D	no	Yes	Water only

A student investigated the effect of sugar solution concentration on pieces of potato.

This is the method used.

1. Cut three pieces of potato to the same length.
2. Dry each piece on a paper towel.
3. Weigh each piece.
4. Place potato in different concentration sugar solutions.
5. Leave all three pieces for 2 hours.
6. Remove the three pieces of potato from the solutions.
7. Dry each piece on a paper towel.
8. Measure the length and mass of each piece of potato.

Why did they dry each piece of potato before weighing?

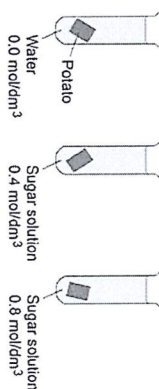
To remove excess

water/get mass of potato only

The potato in tube B did not change, give one conclusion from this observation? conc. of sugar in the cells is the same as the solution (0.4mol/dm³)

size/length and mass

What two changes would you expect in tube A after 2 hours? Increase in



Active Transport

This paragraph is about moving substances by active transport. Complete the paragraph using the words from the box.

low	mitochondria	energy	high
	respiration	ATP	

Active transport allows movement of substances from areas of low concentration to areas of high concentration.

high concentration.

It requires the breakdown of ATP to provide the energy for active transport.

This is provided during cell respiration.

Cells that carry out lots of active transport will usually have many mitochondria.

Name one example of where active transport is used in humans and plants.

Humans Small intestines/nerve cells

Plants Root hair cells

Stem Cells

This paragraph is about stem cells in animals. Use the words from the box to complete the paragraph.

mitosis	any	adult	repair
undifferentiated		differentiation	

Stem cells in animals are undifferentiated. They can undergo the process of differentiation to become specialised to carry out a particular role. There are two main types of stem cell in animals; embryonic stem cells and adult stem cells. Stem cells in mature animals are restricted in what type of cell they can become, embryonic stem cells can become any cell in the organism. Embryonic stem cells can divide through the process of mitosis to make a whole organism. Fully developed animals contain stem cells for their entire lives to help them repair damaged tissues.

The figure left shows one area where stem cells can be found in a plant. What is this called? meristem
Name one other location in a plant where stem cells can be found? Root tips, side shoots



Mitosis

Mitosis is the process by which body cells divide. Each cell divides to produce two daughter cells, which are genetically identical to each other.



A cell cycle has four stages shown in the numbered images on the left. Label the images using the following names.

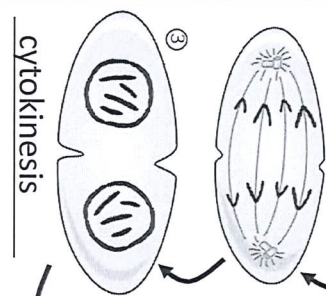
DNA replication

DNA replication movement of chromosomes cytokinesis growth of daughter cells

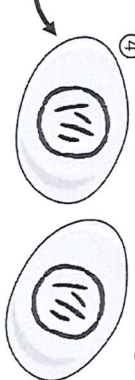
Number the following sentences to describe the process of mitosis. The first one has been done for you:

3	Chromosomes align across the centre of the cell
5	Nuclear membranes form
1	A cell grows in size and mass and chromosomes are replicated
4	One copy of each chromosome moves to opposite ends of the cell
6	The cell membrane and cytoplasm divide
2	The nuclear membrane breaks down

Movement of chromosomes



Growth of daughter cells



cytokinesis

Cell Differentiation

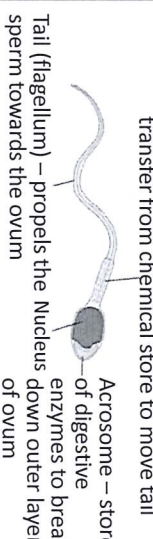
During the development of a multicellular organism, cells differentiate. What does this mean?

The cell becomes specialised to be able to complete a particular role

Match the specialised cell with the correct adaptation and function.

Cell	Adaptation	Function
Ciliated cell	Can expand	More room for haemoglobin molecules
Palisade cell	Contains many chloroplasts	photosynthesis
Sperm cell	Hair like structures on the surface	Sweep mucus away
Fat cell	Contains enzymes in acrosome	Fat storage
Red blood cell	No nucleus	Breaks down outer layer of ovum

Label the sperm cell adaptations and explain the reason for each one. Lots of mitochondria – high level of energy transfer from chemical store to move tail



B2.2 – Challenges of Size – Revision Sheet

Exchange and Transport

Surface area and volume are important for the transport of substance in the circulatory system. Look at the diagram.



	1 mm cube	2 mm cube	4 mm cube
Surface area	6 sides x 1 mm ² = 6 mm ²	6 sides x 2 mm ² = 24 mm ²	6 sides x 4 mm ² = 96 mm ²
Volume	(1 mm) ³ = 1 mm ³	(2 mm) ³ = 8 mm ³	(4 mm) ³ = 64 mm ³
Surface area: volume ratio	6/1	3/1	1.5/1

Complete the table above for the 4mm cube.

Explain which blood vessel would you expect to have the largest surface area: volume ratio?

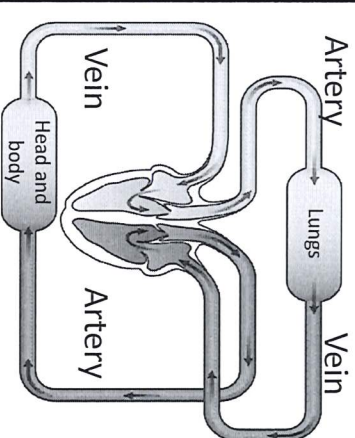
Capillaries because the huge network gives a large SA:V ratio

Circulatory System

The picture on the right shows three of the blood vessels found in humans (not drawn to scale).

What is the lumen? **The hollow cavity in the centre**

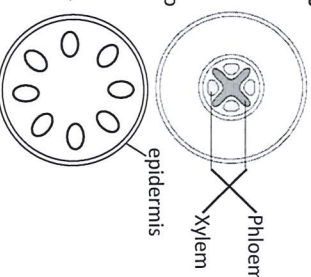
Arteries carry blood away from the heart under high pressure.



Plant Transport Systems

The diagram, right, shows a cross-section of a plant root and the vascular bundle. Draw a line to match the correct name to the type of tissue shown.

In the circle on the right sketch where the vascular bundles are found in the stem of a plant.



Name two substances transported by xylem.

1. **Water** 2. **minerals**

Name two substances transported by phloem.

1. **Water** 2. **sugar**

Translocation is a process that occurs in plants. Which row in the table describe translocation? **A**

Transport tissue	Substances transported	Direction of movement	Involves active transport
A Phloem	Sucrose	Two way flow	Yes
B Phloem	Mineral ions	One direction only	No
C Xylem	Mineral ions	One direction only	No
D Phloem	Sucrose	Two way flow	No

Factors Affecting Transpiration

Match the following factors to the explanations.

Factor	Description	Explanation
Light	Transpiration is faster in higher temperature	The stomata open wider to allowing CO ₂ into the leaf for photosynthesis
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Humidity	Transpiration is slower in humid conditions.	

Look at the diagram of the potometer.

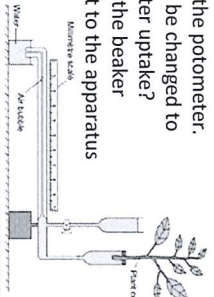
How can the apparatus be changed to increase the rate of water uptake?

A – Add more water to the beaker

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C – Place a plastic bag over the plant

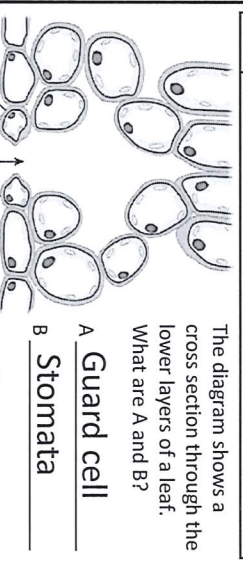
D – Remove two leaves



Transpiration Stream

Number the following sentences to describe the movement of water through a plant. The first one has been done for you.

3	Water moves in the xylem up through the stem and into the leaves
4	Water is lost from the leaves by evaporation through open stomata
2	Water and minerals move from cell to cell through the root until they reach xylem vessels
1	Water moved into the root from the soil by osmosis



The diagram shows a cross section through the lower layers of a leaf. What are A and B?

A **Guard cell**

B **Stomata**

active transport
condensation
osmosis
photosynthesis
transpiration

Cell A can lose or gain water.

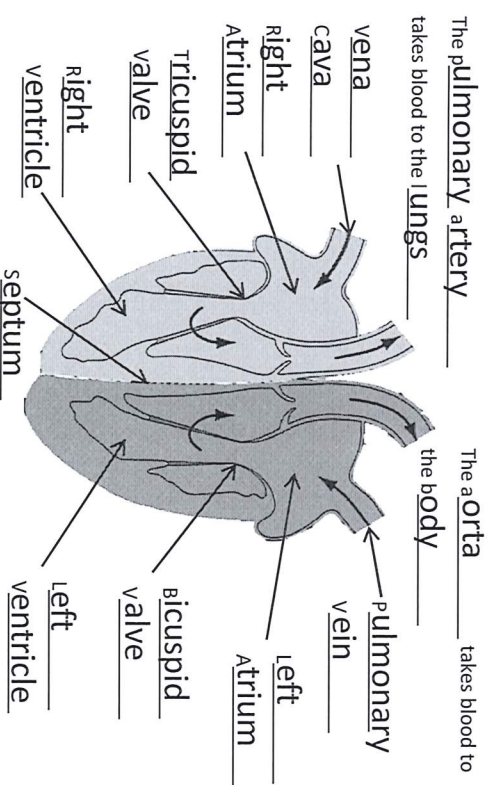
Complete the sentences, choosing words from the box.

Cell A can gain water by **osmosis**

Water vapour can escape from the leaf through hole B by **transpiration**

Heart and blood

The picture below shows a human heart. Colour the side pumping deoxygenated blood blue. Colour the side pumping oxygenated blood red. Complete the labels.



The **pulmonary artery** takes blood to the **lungs**

The **aorta** takes blood to the **body**

vena cava right **atrium** **tricuspid valve** **right ventricle** **septum** **left atrium** **bicuspid valve** **left ventricle** **pulmonary vein**

Transports food, waste and hormones

Helps blood to clot

Carries oxygen

Fight disease by making antibodies

Plasma

Platelets

Red blood cell

White blood cell

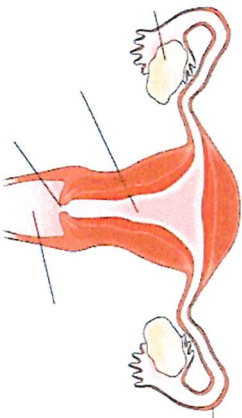
Menstrual Cycle

Label the diagram of the female reproductive system and its function.

B3 – Nervous System & Endocrine System – Biology Revision Sheet

Using Hormones to Treat Infertility

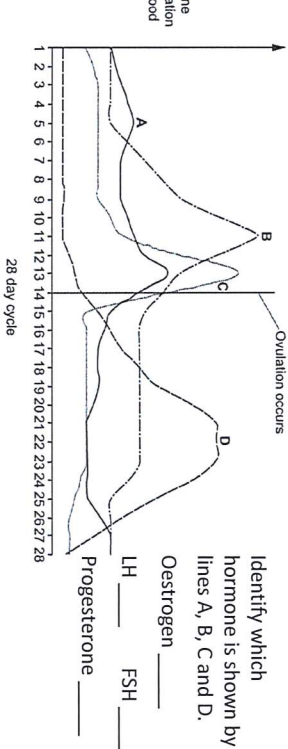
Being infertile means, someone cannot reproduce. Infertility can be caused by many reasons, some are problems with male reproductive organs and some female. List two causes of infertility for each:



Hormone concentration in the blood

Match the reproductive hormones with their correct functions

Hormone	Function of hormone
FSH	Triggers ovulation
LH	Maintains uterus and inhibits LH
Oestrogen	Causes lining of uterus to build up and inhibits FSH
Progesterone	Stimulates eggs to mature and ovaries to secrete oestrogen



The graph, below, shows the changes that occur to female hormone concentrations in the blood during the menstrual cycle.

What is the full name of FSH?

What is the full name of LH?

What is ovulation?

State the time period during which ovulation will occur

State how long the period lasts?

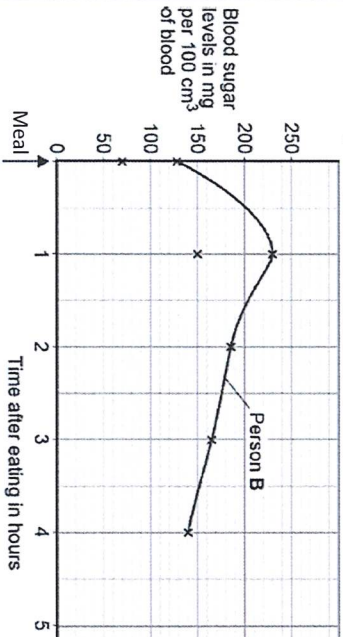
How long does it take for the uterus lining to reach maximum thickness?

Controlling Blood Sugar

This paragraph explains how the body controls blood sugar levels. Complete the paragraph using the words from the box once.

Your cells need a constant supply of _____ for respiration. Too much or too little will cause serious problems. If the blood glucose level gets too high, cells in the _____ produce the hormone _____ which causes glucose to be converted into _____ for storage in the liver. If the blood glucose level gets too low, the hormone _____ is released by the _____, converting glycogen back into glucose. A balance is kept,

this is an example of _____.



	Glycogen is stored in the liver	Add numbers to the table below to show the correct order for how the body normally responds to eating a sugary meal.
1	Glucose is converted to glycogen	
	Blood glucose concentration decreases	
	Blood glucose concentration increases	
	The pancreas releases insulin	
	The liver is stimulated	

Diabetes is a condition where the body can no longer control blood sugar normally. There are two types of diabetes, type 1 and type 2. Colour the boxes as follows to identify the statements.

Type 1	Cells don't respond to insulin properly	Can't produce insulin	Normally begins in childhood
Type 2	Controlled by insulin injections	Obesity is a risk factor	Controlled by diet
			Pancreatic cells destroyed

glucagon pancreas homeostasis glucose insulin glycogen pancreas

Controlling Reproduction

There are two methods of contraception used to prevent pregnancy, hormonal and non-hormonal. Explain them:

Hormonal: _____

Non-hormonal: _____

Write the following forms of contraception in the correct box:

Hormonal	Non-hormonal
Condom	
Diaphragm	
Intrauterine device (IUD)	
Intrauterine system (IUS)	
Combined pill	
Progesterone pill	

HIV is a virus that causes AIDS. HIV can be transmitted during unprotected sexual intercourse. Name one method of contraception that prevents the transmission of HIV and how?

Method	Pregnancies per 100 couples each year.
The pill	8
Condom	18
Diaphragm	16
IUD	1
Withdrawal	27

Look at the table of data, right. It shows the effectiveness of different types of contraception.

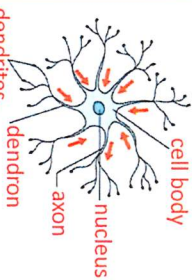
- Using the data from the table,
- Withdrawal is the least effective method of birth control from the table.
 - The condom is 10% more effective than the pill
 - A diaphragm gives a 16% chance of pregnancy each year.
 - The IUD is 100% effective in birth control.

Nervous System

What are the two parts of the body that make up the central nervous system?

brain and **spinal cord**

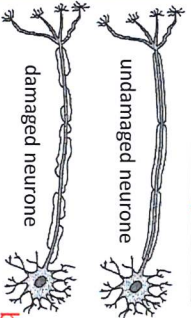
The nervous system sends nerve impulses around the body. Nerve impulses are **electrical** signals sent along neurones.



1. **motor** neurones

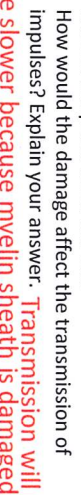
2. **relay** neurones

What does the red arrow indicate in each neurone?



Direction of impulse

Sometimes motor neurones can be damaged. Look at the pictures on the left.

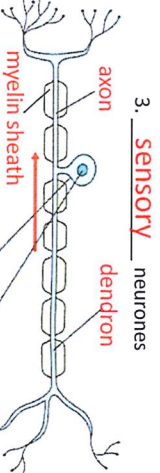
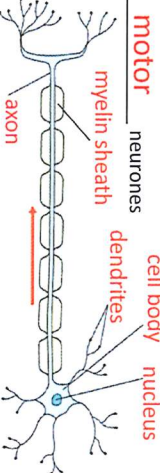


How would the damage affect the transmission of impulses? Explain your answer. **Transmission will be slower because myelin sheath is damaged**

B3 – Nervous System & Endocrine System – Biology Revision Sheet

There are three types of neurones, they are shown in the diagrams below, name them correctly.

Label the parts of each neuron.



Reflexes

What are the features of a reflex action? Select the correct answers:

- Does not require conscious thought ☒
- Usually protective ☒
- Brain is always involved ☐
- Response is involuntary ☒
- Response is voluntary ☐

From the list below circle the reflex actions:

- Heart beating ☒
- Coughing ☒
- Running ☐
- Thinking ☐
- Reading ☐
- Eating ☐
- Blinking ☒
- Sneezing ☒

Add numbers to the table below to show the correct order of the pathway in a nervous reaction from stimulus (1) to response (9).

1	Stimulus
3	Sensory neurone
2	Receptor cells
8	Effector
5	Brain
4/6	Spinal cord
7	Motor neurone
4/6	Spinal cord
9	Response

The nerve pathway the impulse follows is called a **Reflex arc**.

Negative Feedback

Negative feedback is an important type of control used in homeostasis. It allows the body to keep internal conditions constant.

Add numbers to the table below to show the correct order to describe how negative feedback works. One has been done for you.

5	Corrective mechanisms switched off
2	Change detected by receptor
1	Conditions in the body change from set point
4	Conditions returned to set point
3	Corrective mechanism activated by an effector

Two important hormones in the body controlled by negative feedback are thyroxine and adrenaline. What are the roles of these hormones in the body?

Thyroxine: **Regulates the body's metabolic rate**

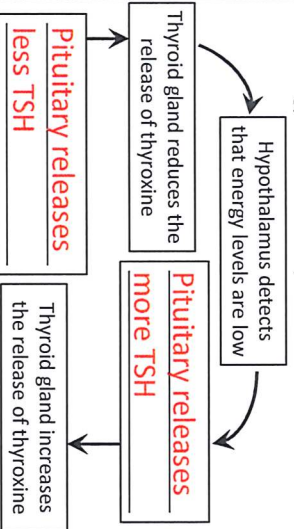
Adrenaline: **Prepares the body in times of stress for the fight or flight reaction**

Suggest a situation that could trigger the release of adrenaline.

An exam, a scary film, rollercoaster

If adrenaline is released in the body what changes would be observed? **Respire quicker to increase ATP production, breathing increases, heart rate rises, blood diverts towards muscles**

The hormone thyroxine helps to control the amount of energy available to cells. Complete the diagram to show how energy levels in the body are controlled.



Explain why controlling energy levels is an example of negative feedback.

High levels of thyroxine inhibit release of TSH. Low levels of TSH inhibits the release of thyroxine. Any change in energy levels is detected. Changes in thyroxine levels bring energy levels back to normal

Hormones

This paragraph is about the endocrine system. Complete the paragraph using the words from the box once.

hormones pituitary hormones blood glands long-term nervous glands endocrine hormones

The **endocrine** system consists of a number of **glands**. These secrete **hormones**

which are chemical messengers that affect the

coordination and control of our bodies. They travel in the **blood** throughout the body and have their

effect at target organs. Although some hormones can act very quickly, most act more slowly than the effects of the **nervous** system, and their effects are more

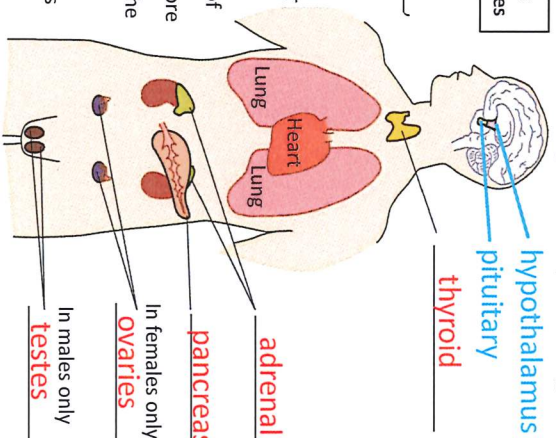
long-term. The **pituitary** gland is the

master gland. Some of the hormones it produces can directly affect the body. The pituitary gland also secretes

hormones that indirectly affect the body. They travel to other **glands** which in turn secrete their own

hormones to bring about specific effects.

On the diagram below, name the major glands of the endocrine system (Heart and lungs shown for position only).



hypothalamus

pituitary

thyroid

adrenal

pancreas

ovaries

testes

Match the hormone to the gland that produces it.

Hormone	Where is hormone produced?
Oestrogen	Adrenal glands
Insulin	Testes
Adrenaline	Ovary
Testosterone	Pancreas
Thyroxine	Thyroid gland
Progesterone	

Hormones are involved in an important process called homeostasis. What is homeostasis?

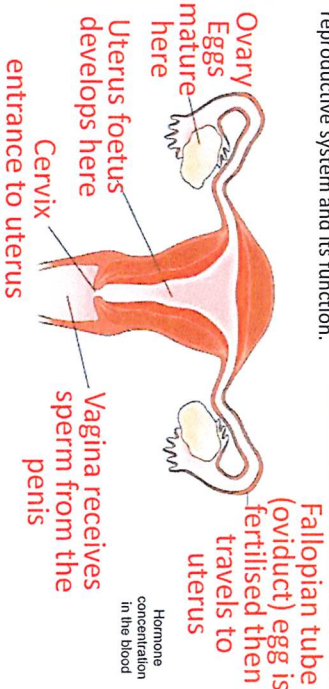
Keeping the conditions in your body constant

Which two of these processes are regulated by homeostasis?

- Controlling water output in urine. ☒
- Defending the body against pathogens. ☐
- How quickly you walk. ☐
- Keeping cool on a hot day. ☒
- Waking up in the morning. ☐

Menstrual Cycle

Label the diagram of the female reproductive system and its function.



B3 – Nervous System & Endocrine System – Biology Revision Sheet

Using Hormones to Treat Infertility

Being infertile means, someone cannot reproduce. Infertility can be caused by many reasons; some are problems with male reproductive organs and some female. List two causes of infertility for each:

Male 1: **Blocked sperm ducts**

2: **Not enough sperm produced**

Female 1: **Lack of mature eggs**

2: **Ovaries don't release any eggs**

Hormones can be given to women to treat some of these problems. Suggest two hormones which could be used to help someone become fertile and why?

FSH because **matures the egg**

LH because **triggers ovulation**

Write an A for advantage or D for disadvantage next to the following statements about IVF.

D It is an expensive procedure

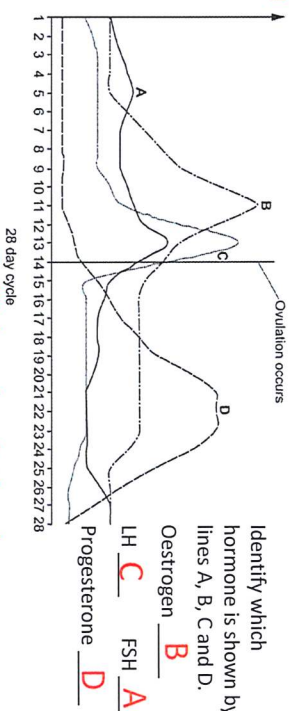
D It is often unsuccessful

A Pregnancy is natural once a fertilised egg is implanted

A It allows people to have children

D It can result in multiple pregnancies

The graph, below, shows the changes that occur to female hormone concentrations in the blood during the menstrual cycle.



What is the full name of FSH? **Follicle-stimulating hormone**

What is the full name of LH? **Luteinising hormone**

What is ovulation? **A mature egg is released from the ovary**

State the time period during which ovulation will occur **12-16 days**

State how long the period lasts? **5 days**

How long does it take for the uterus lining to reach maximum thickness? **7 days**

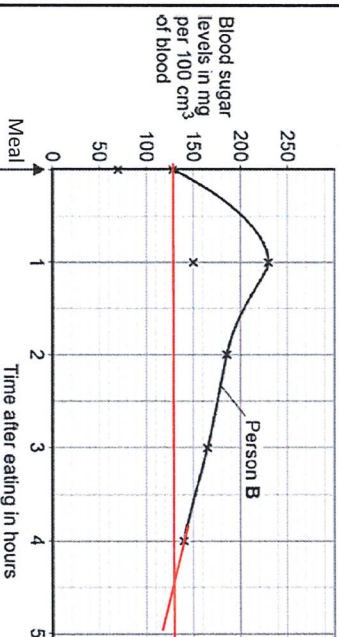
Controlling Blood Sugar

This paragraph explains how the body controls blood sugar levels. Complete the paragraph using the words from the box once.

Your cells need a constant supply of **glucose** for respiration. Too much or too little will cause serious problems. If the blood glucose level gets too high, cells in the **pancreas** produce the hormone **insulin** which causes

glucose to be converted into **glycogen** for storage in the liver. If the blood glucose level gets too low, the hormone **glucagon** is released by the **pancreas** converting glycogen back into glucose. A balance is kept,

this is an example of **homeostasis**.



How long after the meal is person B's insulin production at its peak? **1 hour**

What is the greatest decrease in the blood sugar level of person B in an hour? **230 - 185 = 45mg/100cm³**

Estimate how long after eating the meal will take for person B's blood sugar level to return to the level before the meal? **4.5 (to 5) hours**

6	Glycogen is stored in the liver	Add numbers to the table below to show the correct order for how the body responds to eating a sugary meal.
3	Insulin travels in the blood	
5	Glucose is converted to glycogen	
7	Blood glucose concentration decreases	
1	Blood glucose concentration increases	
2	The pancreas releases insulin	
4	The liver is stimulated	

Diabetes is a condition where the body can no longer control blood sugar normally. There are two types of diabetes, type 1 and type 2. Colour the boxes as follows to identify the statements.

Type 1	Cells don't respond to insulin properly	Can't produce insulin	Normally begins in childhood
Type 2	Controlled by insulin injections	Obesity is a risk factor	Controlled by diet
			Pancreatic cells destroyed

glucagon	pancreas	homeostasis	glucose	insulin	glycogen	pancreas
----------	----------	-------------	---------	---------	----------	----------

Controlling Reproduction

There are two methods of contraception used to prevent pregnancy, hormonal and non-hormonal. Explain them:

Hormonal: **Uses hormones to disrupt the normal female reproductive cycle**

Non-hormonal: **Barrier methods that stop the sperm and egg coming together, chemicals to kill sperm**

Write the following forms of contraception in the correct box:

Hormonal	Non-hormonal
Condom	Progesterone pill
Diaphragm	Condom
Intrauterine device (IUD)	Diaphragm
Intrauterine system (IUS)	
Combined pill	
Progesterone pill	

HIV is a virus that causes AIDS. HIV can be transmitted during unprotected sexual intercourse. Name one method of contraception that prevents the transmission of HIV and how?

Condom – a barrier that stops transfer of fluids

Look at the table of data, right. It shows the effectiveness of different types of contraception.

Method	Pregnancies per 100 couples each year.
The pill	8
Condom	18
Diaphragm	16
IUD	1
Withdrawal	27

Using the data from the table, **A** Withdrawal is the least effective method of birth control from the table, **B** The condom is 10% more effective than the pill circle two correct **C** A diaphragm gives a 16% chance of pregnancy each year. statements? **D** The IUD is 100% effective in birth control.

C1 – C2 – C3

Revision mind map pack

OCR Gateway

Name these changes of state: Solid → liquid Liquid → gas Gas → liquid Gas → solid Liquid → solid		Describe how the density of particles changes when wax melts	
Sketch a graph to show the temperature change when ice is heated from -50°C to 150°C. Label where ice melts and the water boils		Sketch a graph to show the temperature change when steam is cooled from 150°C to -50°C. Label where steam condenses and the water freezes	
Similarities		Differences	
Explain the shape of this curve		Explain the shape of this curve	
C1 Particles		Links	
C1.1 The Particle Model		→ 1.2 Atomic Structure 2.1 Purity and Separating Substances 5.2 Controlling Reactions	
Describe how the movement of particles changes when ice melts		Describe how the movement of particles changes when water boils	
Draw a particle diagram for a solid		Draw a particle diagram for a liquid	
Draw a particle diagram for a liquid		Draw a particle diagram for a gas	
Describe how the forces of attraction are different in: Water and ice Water and steam		Describe how the density of particles changes when water evaporates	

Write C next to the chemical changes and P next to the physical changes below:

Frying an egg
Dissolving salt in water
Baking a cake
Respiration

Melting an ice cube
Making a cup of tea
Plants growing
Cutting the grass

What might you observe if a chemical reaction was occurring?

- 1.
- 2.
- 3.

Draw a particle diagram showing water evaporating

Draw a particle diagram showing hydrogen gas reacting with oxygen gas to produce liquid water

Similarities

Differences

C1 Particles

Links



C1 The Particle Model

1.2 Atomic Structure
2.1 Purity and Separating Substances
5.2 Controlling Reactions

Why is it easier to separate a mixture of hydrogen molecules and oxygen molecules than to separate the oxygen and hydrogen atoms in water?

Draw a particle diagram for an element

Draw a particle diagram for a compound

Draw a particle diagram for a mixture

When metals and non-metals react with oxygen, how are the oxides that form different?

What are the typical properties of metals?

What are the typical properties of non-metals?

Keywords

Draw a labelled diagram of an atom showing the electrons, neutrons and protons

What is an isotope?

How do the physical and properties of isotopes compare?

C1 Particles

C1.2 Atomic Structure

What is an ion?

How is a positive ion formed?

How is a negative ion formed?

Links



1.1 The Particle Model

2.2 Bonding

3.1 Introducing Chemical Reactions

C3.4 Electrolysis



Using a diagram, explain the contribution of the Greeks and Dalton to the atomic model

Which subatomic particle did Chadwick discover?

Using a diagram, explain the contribution of Rutherford to the atomic model

Using a diagram, explain the contribution of Bohr to the atomic model

	Electron	Neutron	Proton
Mass			
Charge			

	Number of electrons	Number of neutrons	Number of protons
^{31}P			
^{14}C			

Keywords

What is the definition of relative formula mass?

Use the periodic table to calculate the relative formula mass of the following chemicals:

Methane:
Water:
Sodium chloride:
Magnesium chloride:

Define empirical formula

Work out the empirical formula of the following:

CH_4
 C_2H_6
 $\text{C}_6\text{H}_{12}\text{O}_2$

What does 'pure' mean...

...in everyday life?

...in chemistry?

C2 Elements, Compounds and Mixtures

C2.1 Purity and Separating Mixtures

How can we tell from observing a solid melting whether it is pure or impure?

- 1.
- 2.

What is an Rf value and how do we calculate it?

Links

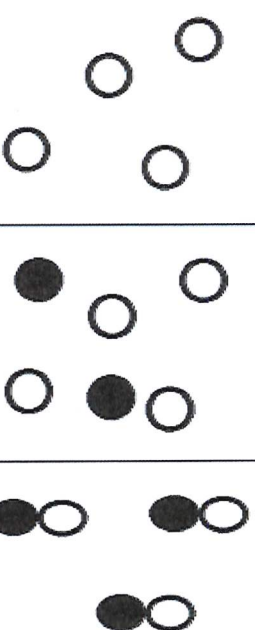


1.1 The Particle Model



2.3.2 Changing State

Pure or impure?



How would you separate these mixtures? - Name the technique and draw a labelled diagram

Two soluble solids	An insoluble solid from a liquid	A soluble solid from a liquid	Two miscible liquids	Two immiscible liquids

Keywords

	Electronic configuration shorthand e.g.2,8,8,1	Full drawing of electronic configuration
N		
Ca		
Ca^{2+}		

Diagram of the chains in a thermosetting polymer	Diagram of the chains in a thermoplastic polymer
Similarities	
Differences	

C2 Elements, Compounds and Mixtures
C2.2 Bonding

Links	
← 1.2 Atomic Structure	2.3 Properties of Materials 3.1 Introducing Chemical Reactions 3.4 Electrolysis 4.1 Predicting Chemical Reactions →

Type of bonding	Diagram of bonding	Typical properties	Link between bonding and properties
Metallic			
Simple covalent			
Giant covalent			
Ionic			

When metals and non-metals react with oxygen, how are the oxides that form different?	What are the typical properties of metals? What are the typical properties of non-metals?
---	--

Keywords

What is a nanoparticle?

Why do nanoparticles have special properties?

Sketch a cooling curve for steam. Label the changes of state



How would this be different if the steam was impure?

What is an allotrope?

Explain why ionic compounds conduct electricity when molten or dissolved, but not when they are solids.

C2 Elements, Compounds and Mixtures

2.3 Properties of Materials

Links



2.1 Separating Mixtures

2.2 Bonding

Allotrope	Uses / potential uses	Useful properties	Link between bonding and properties
Buckyballs			
Diamond			
Graphite			
Nanotubes			
Graphene			

What are the risks of using nanoparticles?

What are the benefits of using nanoparticles?

Keywords

Write the chemical formulae of the following substances:

Methane
Water
Sodium chloride
Magnesium chloride

Explain what conservation of mass is

Write word and symbol equations for the following reactions:

Combustion of hydrogen

Combustion of methane

Draw a flow chart with instructions for how to write an ionic equation

C3 Chemical Reactions

C3.1 Introducing Chemical Reactions

Use conservation of mass to calculate how much water is produced when 5g of hydrogen burns in oxygen.

Draw a formula triangle connecting moles, mass and relative formula mass

Links

←

1.2 Atomic Structure
2.2 Bonding

→

This is such a fundamental topic that it links to every other topic

In a half equation showing oxidation, which side of the equation will the electrons be on?

In a half equation showing reduction, which side of the equation will the electrons be on?

What is the definition of a mole?

Use this to calculate:

The mass of 0.25 moles of methane

The relative formula mass of a compound if 4 moles weigh 360g

The number of moles of sodium chloride in 1g

Keywords

Define activation energy

Describe an experiment to find out if a reaction is exothermic or endothermic

C3 Chemical Reactions

3.2 Energetics

Links



3.1 Introducing Chemical Reactions



C5.2 Controlling Reactions

Define an exothermic reaction

Describe in terms of bond making and breaking why a reaction is exothermic

Draw a labelled reaction profile for an exothermic reaction

Similarities

Differences

Define an endothermic reaction

Describe in terms of bond making and breaking why a reaction is endothermic

Draw a labelled reaction profile for an endothermic reaction

Draw a flow chart to show how to calculate the energy change in a reaction when given the bond energies

Keywords

What do the following letters stand for?
O
I
L
R
I
G

Are these reduction of oxidation?
Iron rusting
 $\text{Cl}_2 + 2\text{e}^- \rightarrow 2\text{Cl}^-$
 $\text{Mg}^{2+} + 2\text{e}^- \rightarrow \text{Mg}$
 $2\text{O}^{2-} \rightarrow \text{O}_2 + 4\text{e}^-$

Label this rectangle as a pH scale from 0-14. Identify where strong acids, weak acids, neutral substances, weak alkalis and strong alkalis are found

What do we mean by strength of an acid?

What do we mean by the concentration of an acid?

Similarities

Differences

Chemical Reactions

C3.3 Types of Chemical Reactions

←
2.2 Bonding
3.1 Introduction to Chemical Reactions

→
3.4 Electrolysis
4.1 Predicting Chemical Reactions
6.1 Improving Processes and Products

Links

What happens when marble chips react with hydrochloric acid?

What happens when marble chips react with ethanoic acid?

Similarities

Differences

Keywords

What do the following letters stand for?

P
A
N
I
C

Write the half equations for the electrolysis of NaCl solution

C3 Chemical reactions

C3.4 Electrolysis

links



1.2 Atomic Structure
2.2 Bonding
3.1 Introduction to Chemical Reactions
3.3 Types of Chemical Reaction



6.1 Improving Processes and Product

Write the half equations for the electrolysis of CaCl_2 solution

Metals go to the...

The exception is...

Non-metals go to the...

Electrolysis of molten ionic compounds

Electrolysis of solutions of ionic compounds

Oxidation occurs at the...

Reduction occurs at the...

Write the half equations for the electrolysis of molten CaCl_2

Draw a labelled diagram for purifying copper

Draw a labelled diagram for electroplating a spoon

Similarities

Differences

Similarities

Differences

Keywords

How did Democritus and Leucippus come up with the idea of the atom?

Why did people not believe their idea about the atom?

Draw Democritus and Leucippus model of the atom

What is the difference between an atom, an element and a compound?

The diameter of an atom is 0.000 000 0001m.
Write this number in standard form.

A molecule contains 50 atoms.
Estimate the length of the molecule.

1.1 The particle model

What subatomic particle did Thompson find Cathode rays were made from?

Why did Thompson conclude their must be a positive part to the atom as well?

Give the masses of a proton, neutron and electron

According to the Bohr model of the atom, where do you find electrons in an atom?

Give the Charges of a proton, neutron and electron

In Rutherford's scatter experiment, what 3 different things happened to the alpha particles?

What did this tell Rutherford about the structure of the atom?

Draw the atomic model of the atom labelling the 4 parts

Draw how particles are arranged in a solid, liquid and a gas.

Explain why can we squash one state of matter but not the other two?

What happens to the temperature of a material when it changes state?

When ice melts, where does the energy go?

What is the equation for density?

Find the density of a wooden cube with a volume of 512cm^3 and a mass of 307.2 grams.

What is the difference between heat and temperature?

1.2 Changes of state

What is the formula for specific heat capacity?

What is the equation for specific latent heat?

What is the internal energy of an object?

Water has a high specific heat capacity. What does this tell you?

Calculate the energy needed to heat 1.5 kg water from 20°C to 60°C . The specific heat capacity of water is $4200\text{J/kg}^\circ\text{C}$

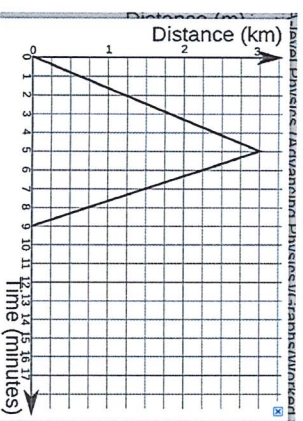
How much energy is required to evaporate 0.25 kg of water? (Water Specific latent heat of fusion $2,260\text{ kJ/Kg}$)

Describe how gas particles exert a pressure.

What is the difference between a physical and chemical reaction?

How does changing the temperature or volume affect the pressure of a gas?

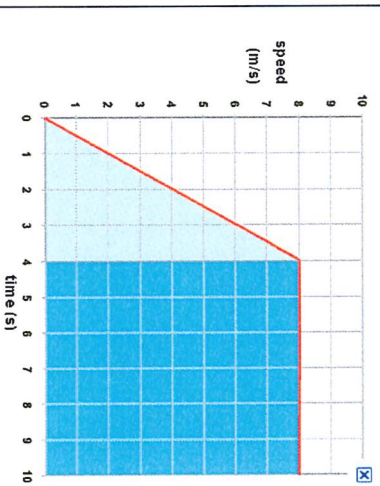
Describe the motion of this graph:



How can you work out the speed value on a distance-time graph?

How is Velocity different to speed?

Describe the motion of this graph:



What units can you measure speed in?

How can you calculate distance from a speed time graph?

2.1 Motion

What is the equation to calculate speed?

What is the equation to calculate acceleration?

A bike travels 20km in 45 mins
what is it's speed in m/s?

A car is travelling at 60m/s,
and brakes to a speed of
14m/s, in 2.7seconds. What
is the deceleration?

What is kinetic energy? What is it
measured in?

What is the equation of motion that links initial
and final velocities, acceleration, and distance?

How far would a person go in
the 0.2 s travelling at 50 km/h

What is the equation for
kinetic energy?

What is the KE of a bird, mass 40g flying
at 23m/s?

If a ball is dropped from rest and falls 8m to the
ground, what is the speed just before it hits the
ground? (Take acceleration due to gravity to be
10m/s²)

Give an example of a contact force.

Give an example of a non-contact force.

Draw a free body diagram for a car moving forward with a force of 3000N and a drag force of 1000N.

What would the result force be and in which direction?

What is Newton's 1st law?

What is the equation to calculate force, using Newton's 2nd law?

An aircraft accelerates from 20m/s to 60 m/s in 20 seconds. Calculate the acceleration

What is terminal velocity?

How does air resistance affect speed?

2.2 Newton's laws

What is Newton's 3rd law?

What is Work done?

Explain how a rocket takes off using Newton's 3rd law.

What is power and what is it measured in?

What is the equation for work done?

What is the equation for power?

If an object has a 200 N force acting on it over a distance of 2 m, how much work is done?

If the work above is done in 4 seconds, what is the power?

(H) A car of mass 1000kg heading up the M1 at 50m/s collides with a stationary truck of mass 8000kg and sticks to it. What velocity does the wreckage move forward at?

Explain using Forces how a parachute slows a skydiver down.

(H) What is the equation for momentum?

(H) Calculate the momentum of a boy who's mass is 55 kg if he travels at a velocity of 6 m/s.

What is Hooke's law?

What do we call a material that when stretched returns to its original shape?

What do we call a material that when stretched does not return to its original shape?

What is the difference between Mass and Weight?

What is acceleration due to gravity also known as?

Why does an elastic band not obey Hooke's law?

What is the equation to find the force applied to a spring?

If a bungee rope has a spring constant of 5 N/m . How much must a person weigh in N if we want it to extend (stretch) 60 m ?

What is the equation to find the potential energy stored in a spring?

A spring compresses by 2 cm when a force of 50 N is applied. What is its spring constant?

2.3 Forces in action

What is the equation for Gravitational potential energy?

A spring, which has a spring constant $k = 7.50 \text{ N/m}$, and has been stretched 0.40 m , what is the potential energy now stored in the spring?

What is the gravitational field strength on Earth?

A spring with a spring constant $k = 800 \text{ N/m}$ has been stretched 70 cm . What is the potential energy now stored in the spring?

What energy does a 120 g clock have on a 1.3 m high shelf?

A 500 kg roller coaster carriage is pulled up to a height of 20 m . Calculate the weight on the 500 kg mass on Earth.
How much gravitational potential energy does the carriage gain?