SUCCESSFUL SCIENTISTS!

Year 11 Information evening

HELPING YOUR CHILD IN SCIENCE

1. Check your daughter/son's science class
   - If they are in 11A1 or 11C1 they are completing AQA separate sciences
   - If they are in 11S1, 11S2, 11S3, 11T1, 11T2, 11T3, 11T4, 11M1 or 11M2 they are completing AQA **Trilogy** combined science
   - Please follow the links to see more information about the course and content https://www.aqa.org.uk/subjects/science/gcse

HELPING YOUR CHILD IN SCIENCE

2. What will they be examined on?

Biology	Chemistry	Physics
Paper 1 (topics 1-4)	Paper 1 (topics 1-5)	Paper 1 topics 1-4)
Paper 2 (topics 5-7)	Paper 2 (topics 6-10)	Paper 2 (topics 5-7)

- For separate science, each paper is 100 marks and 1 hour 45 minutes long
- For trilogy combined science, each paper is 70 marks and 1 hour 15 minutes long

HELPING YOUR CHILD IN SCIENCE

3. 5 top tips for great revision . . .

1. LEARNING FACTS AND EQUATIONS MADE EASY!

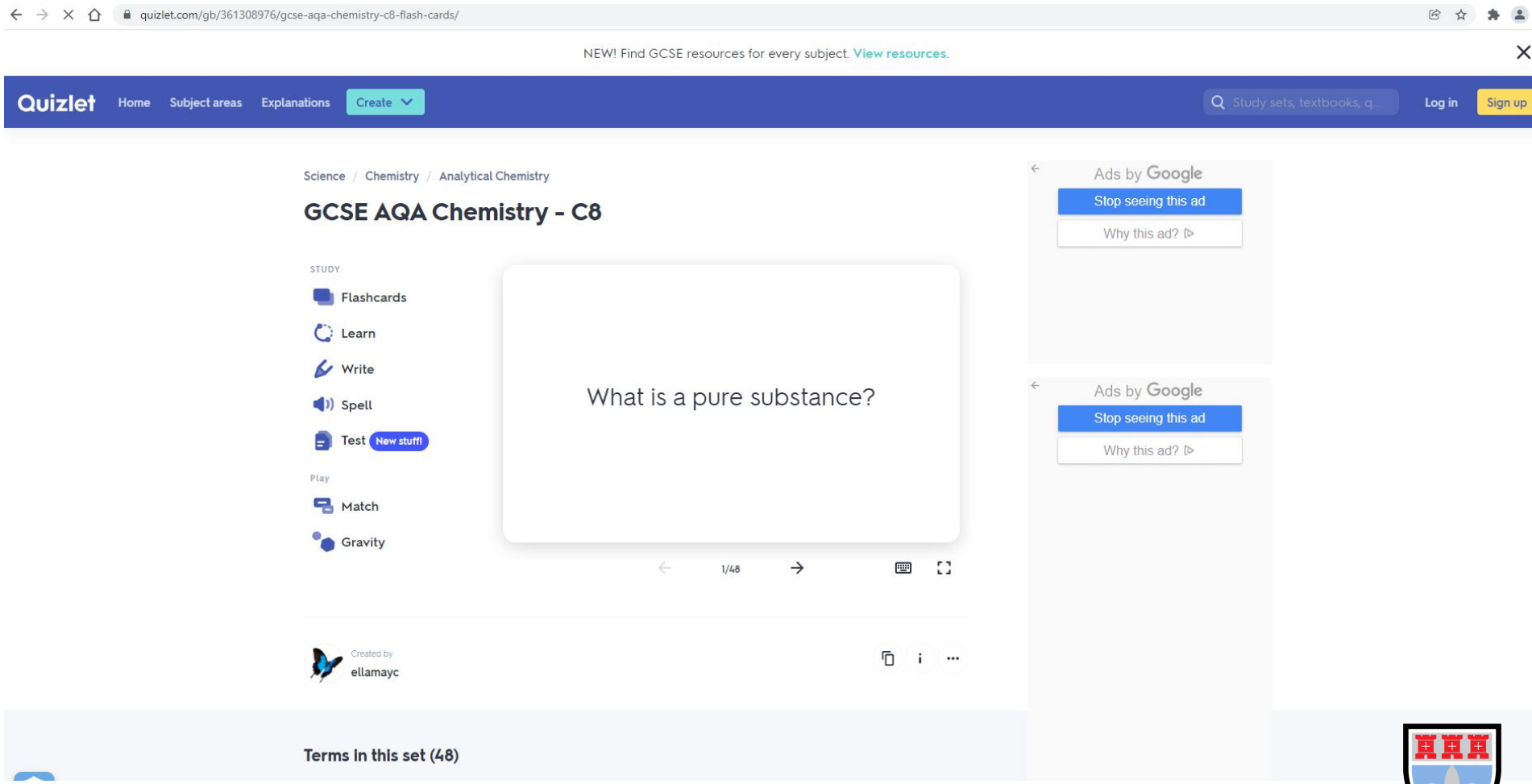
- Our students need to memorise equations for the science exams
- And be able to rearrange them!
- Normally it would be all the Physics equations, however this year they will be getting a full equation list!
- But there are lots of key facts and some equations to learn for Biology and Chemistry

1. LEARNING FACTS AND EQUATIONS MADE EASY!

- Try Quizlet!
- Quizlet is free to sign up for
- It has lots of ready made sets of flashcards
- You can print them off or play an online game with them

Make sure you search for either AQA Trilogy: Combined science **or** AQA Biology/Chemistry/Physics GCSE

1. LEARNING FACTS AND EQUATIONS MADE EASY!



Cell structure: Cell biology: Biology: GCSE (9:1)

STUDY

- Flashcards
- Learn
- Write
- Spell
- Test New stuff!

Play

- Match
- Gravity

Eukaryotic cell

1/16

Cell structure: Cell biology: Biology: GCSE (9:1)

STUDY

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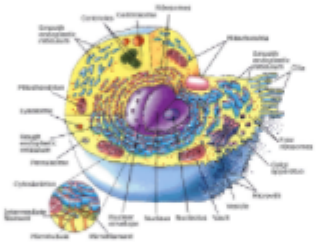


A cell type where the genetic material is enclosed within a nucleus

Quizlet Home Subject areas Explanations Create Study sets, textbooks, q... Log in Sign up

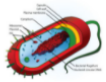
Back

Match

TIME
3.4

DNA loop

A type of eukaryotic cell with a cell membrane, mitochondria, chloroplasts and a cell wall

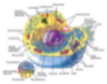


A cell type where the genetic material is free within the cytoplasm and sometimes within plasmids

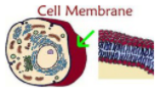
Prokaryotic cell

Ribosomes

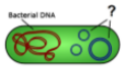
Eukaryotic cell



A cell type where the genetic material is enclosed within a nucleus



Controls the entry of substances into and outside of the cell



A single molecule of DNA that is found free in the cytoplasm of prokaryotes

Where protein synthesis takes place

Plant cell

Cell membrane

2. USING EQUATIONS MADE EASY

(e) Write the equation which links current, potential difference and resistance.

_____

(1)

(f) The current in the resistor was 0.12 A when the potential difference across the resistor was 3.0 V

Calculate the resistance of the resistor.

_____

$V = I \times R$

$R = V/I$

$R = 3 \times 0.12$

$R = 25$

Resistance = _____ Ω

(3)

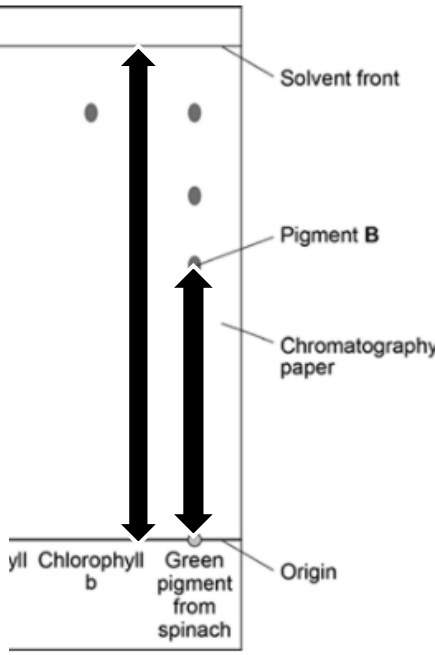
2. USING EQUATIONS MADE EASY

A student used paper chromatography to identify the pigments in spinach leaves.

She used propanone as a solvent.

Figure 1 shows the student's results.

Figure 1



(c) Write the equation that links distance moved by solvent, distance moved by solute and R_f value.

_____

(1)

(d) Use **Figure 1** to calculate the R_f value for pigment B.

Correctly measured the distance travelled by the pigment: 5cm and the distance travelled by the solvent: 9cm

Rf = 5/9

Rf of pigment B = 0.56

_____

R_f value = _____

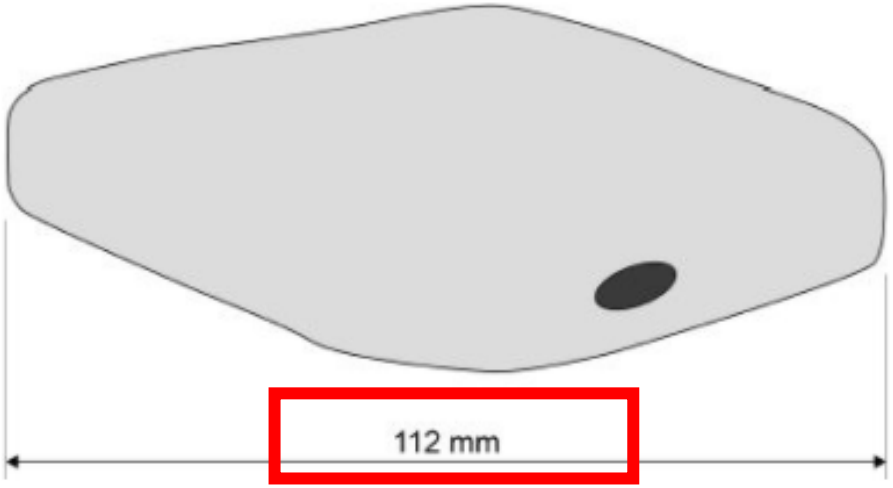
(3)

2. USING EQUATIONS MADE EASY

The student made the necessary adjustments to get a clear image.

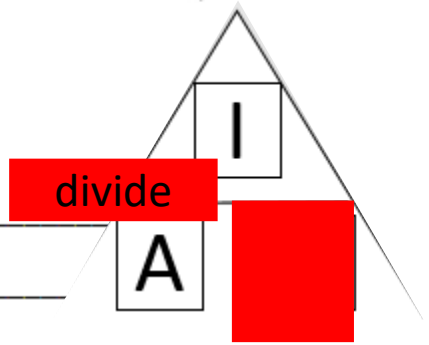
Figure 3 shows the student's drawing of one of the cells.

Figure 3



The real length of the cell was 280 micrometres (μm).

Calculate the magnification of the drawing.



Equation is: image = actual x magnification	
Rearranged equation is: M = I/A	
M = I/A = 112mm / 280micrometres = 0.4	1mm = 1000micrometres 0.4 x 1000 = 400

Magnification = × _____

(3)

3. PLANNING EXPERIMENTS

- These can often by 6 mark questions in ALL three sciences
- They involve the variables and describing how to use the equipment
- As well as how you collect your results and what to do with them

3. PLANNING EXPERIMENTS

- Review the required practicals for each science
- Use your revision guide or BBC bitesize to make a summary card for each one
- Then try and recall each method for each one and try the exam practice

A student wanted to determine the density of the irregular shaped object shown in **Figure 1**

Figure 1

(a) Plan an experiment that would allow the student to determine the density of the object.

Physics required practical: Working out the density of Irregular objects

Variables

Independent = the irregular objects

Dependent = the mass and volume

Control = same amount of water in the eureka can, just below the spout

Equipment:

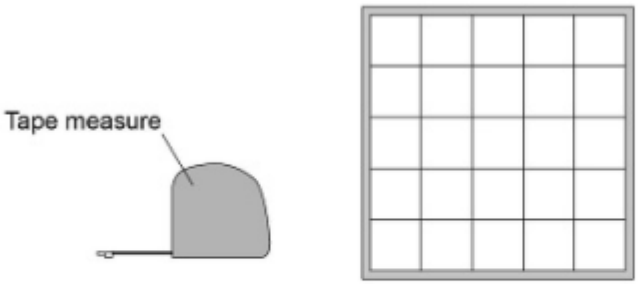
Eureka can
Mass balance
Measuring cylinder
Beaker
Irregular object(s)

Method:

Fill the eureka can up to the hole below the spout. Then place a small beaker under the spout. Place your object on the mass balance and record the mass in kg. Then lower the object into the eureka can. Measure the collected water in the beaker using a measuring cylinder. Then work out the density by calculating the mass divided by the volume.

Getting accurate results:

You could repeat the experiment 3 times, this allows identification of anomalies and then you can remove them. Then you can calculate a mean.



Not to scale

Describe a method to investigate the distribution of plants on the school field at different distances from the school building.

Biology required practical: sampling plants in a population

Variables

Independent = the location

Dependent = % coverage of plants/number of plants

Control = same sixe quadrat, same interval on tape measure

Getting accurate results:

You could repeat the experiment 3 times, this allows identification of anomalies and then you can remove them. Then you can calculate a mean.

Equipment:

Quadrat
Tape measure
Identification chart for plants

Method:

Lay out your tape measure, decide on intervals, for example intervals over 100m of every 5m. Every 5m place your quadrat down and record the % coverage of plants or the number of a plant species, identified using your plant identification chart. Repeat for the whole length of the tape measure. And then set up another transect line with your tape measure and repeat. You could then calculate an average of the number of plant species.

Describe a method to investigate how the temperature changes when different masses of ammonium nitrate are dissolved in water.

You do **not** need to write about safety precautions.

Chemistry required practical: measuring the temperature change	
Variables Independent = the amount of ammonium nitrate Dependent = the temperature change Control = same volume of water, amount of insulation Getting accurate results: You could repeat the experiment 3 times, this allows identification of anomalies and then you can remove them. Then you can calculate a mean.	Equipment: Test tube Thermometer Insulation Ammonium nitrate Measuring cylinder Water Mass balance Method: Place 10ml of water in a test tube, surround it with insulation. Measure the start temperature of the water using the thermometer and record this. Then add 1g of ammonium nitrate and measure the temperature at the end if the reaction, stirring. Then take the start away from the end temperature and record the change in temperature. Repeat for 2g, 3, 4g, 5g of ammonium nitrate, keep 10ml of water.

4. GRAPHS

- Students can get up to 5 marks for drawing tables and graphs in exam questions!

- It is an important skill in all three sciences!

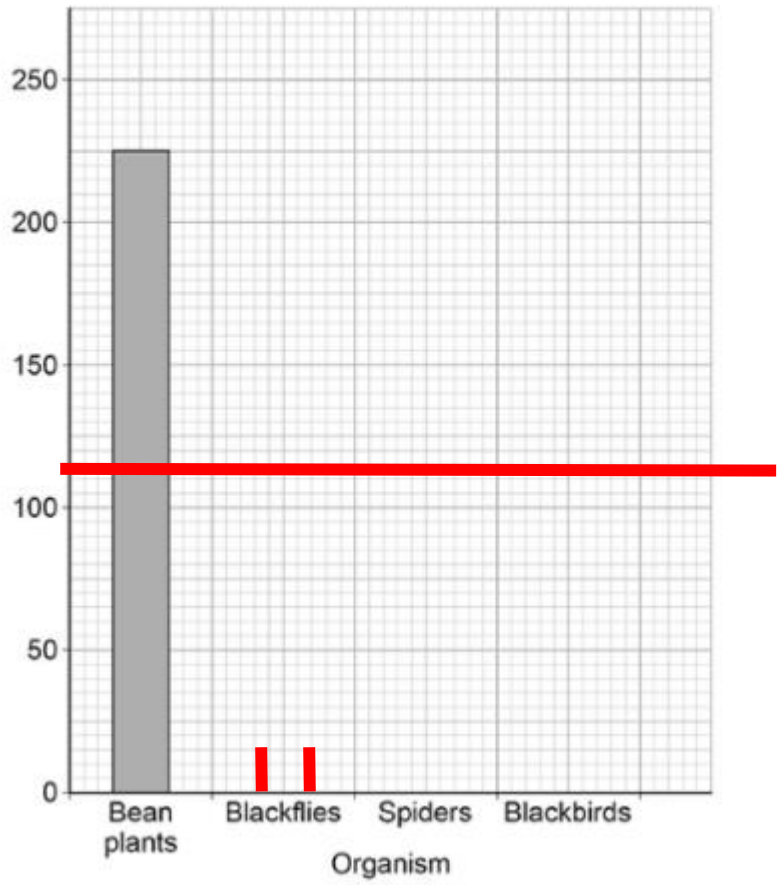
(e) Complete **Figure 2**.

You should:

- label the y-axis
- plot the data from the table above.

Organism	Biomass in g
Bean plants	225
Blackflies	115
Spiders	65
Blackbirds	10

Figure 2



(3)

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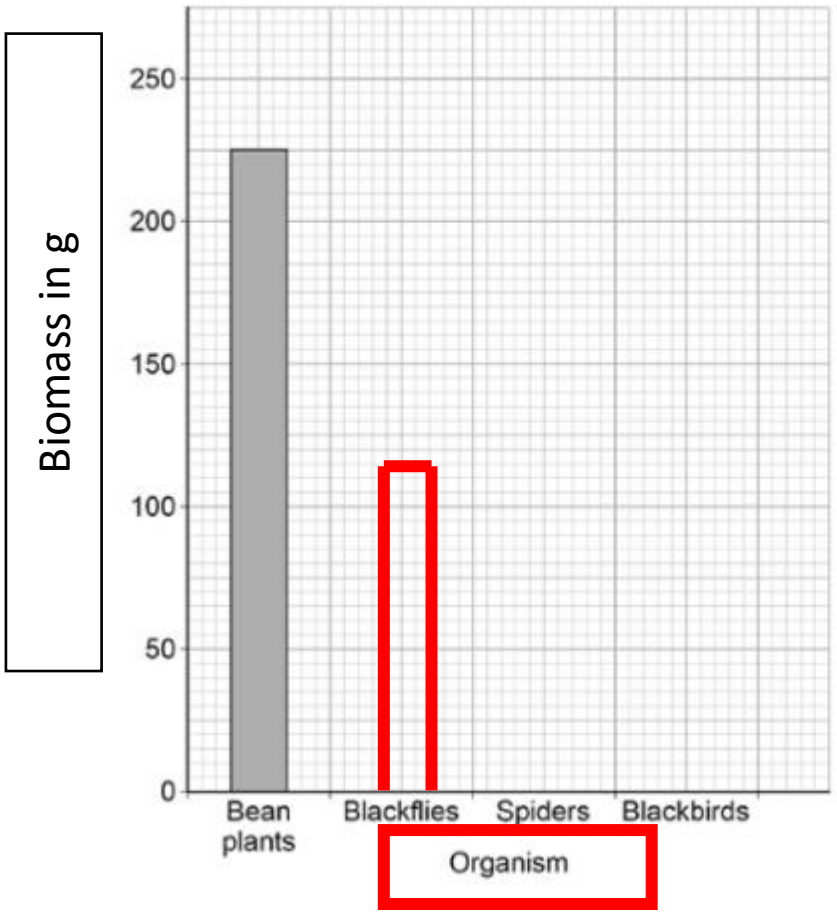
Figure 2



(3)

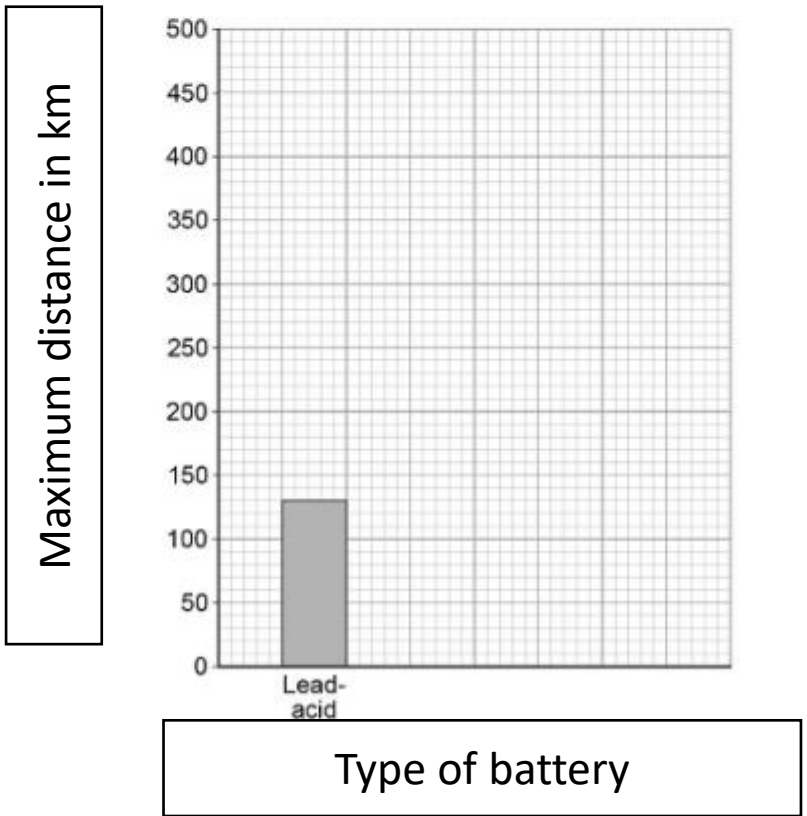
Type of battery	Maximum distance in km
Lead-acid	130
Lithium-ion	480
Nickel-metal hydride	200

(b) Complete **Figure 1**.

You should:

- label the x-axis
- label the y-axis
- plot the data from the table above.

Figure 1



(4)

Another student investigated a different hydrocarbon.

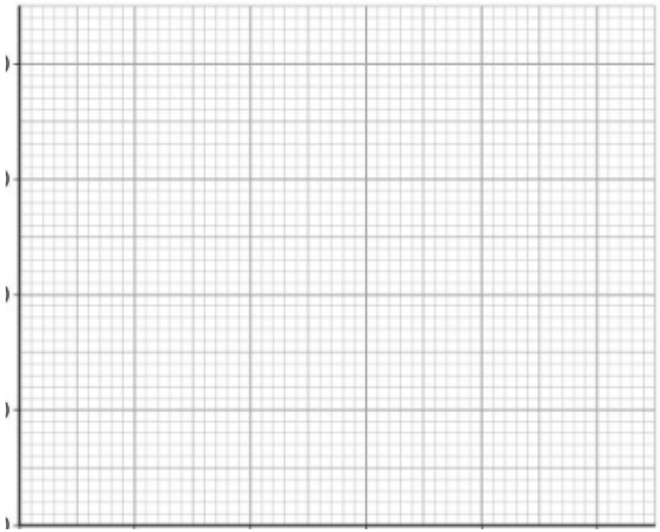
Table 2 shows the results.

Table 2

Temperature in °C	Time to flow through the viscometer in s
20	66
25	50
30	40
40	30
50	25

(e) Complete **Figure 3**.

Figure 3



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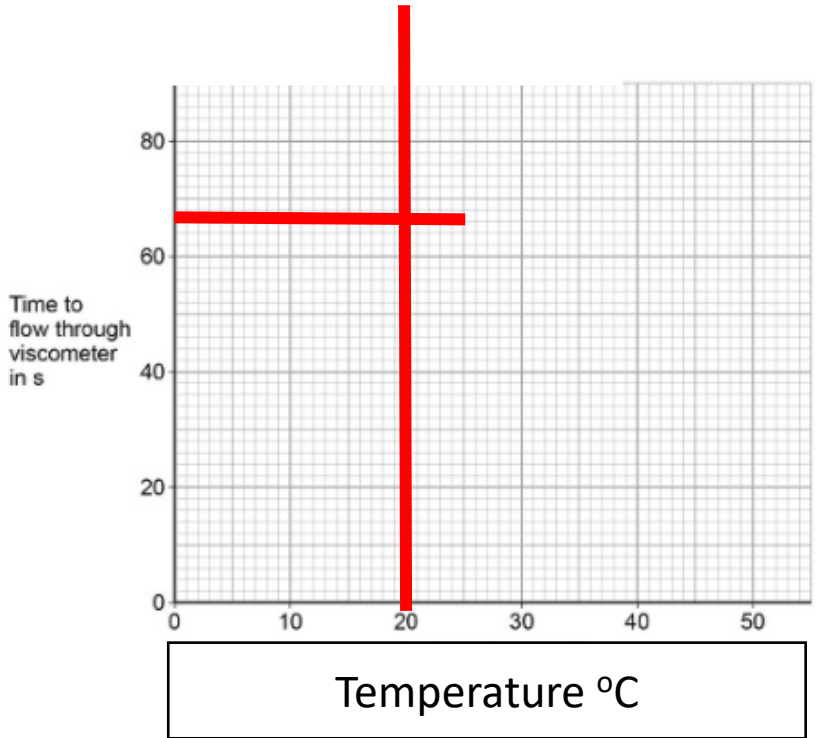
(e) Complete **Figure 3**.

You should:



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20	66
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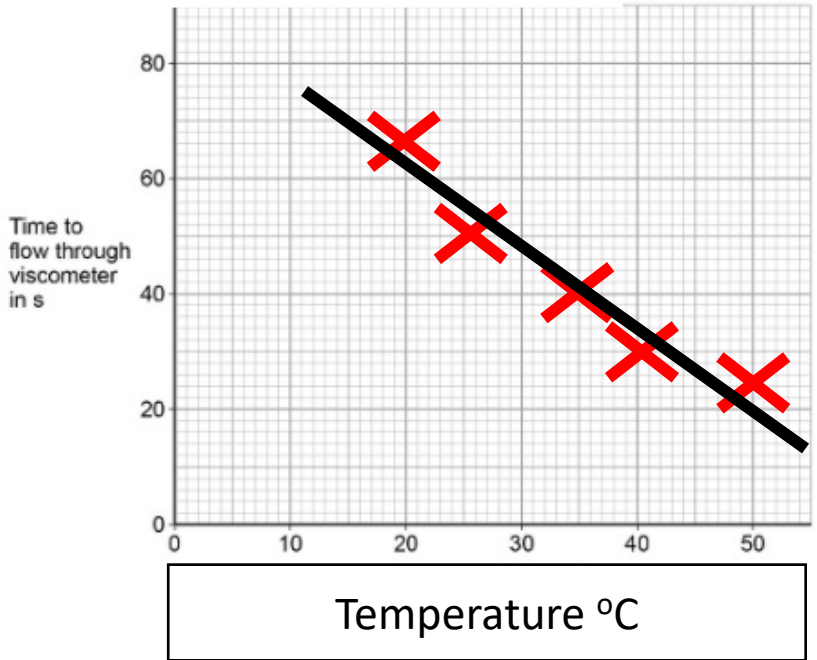
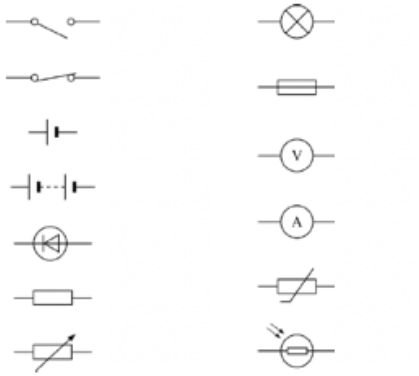
You should:



5. TESTING YOUR KNOWLEDGE AND FACTS

GCSE ELECTRICITY KNOWLEDGE ORGANISER

SECTION 1: Circuit Symbols



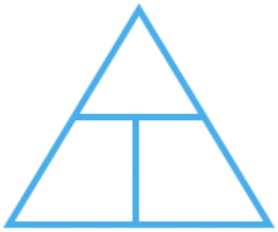
SECTION 2: Equations

2	
3	
4	
5	
6	
7	

SECTION 3: Units

8	Charge
9	Current
10	Time
11	Energy
12	Resistance
13	Power
14	Potential

2



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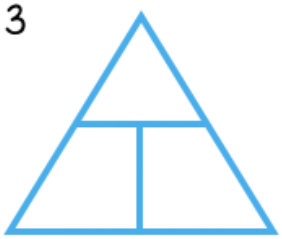

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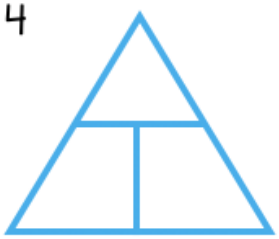

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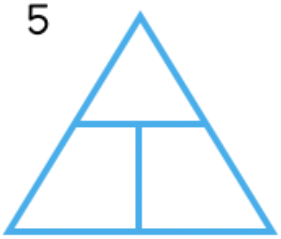

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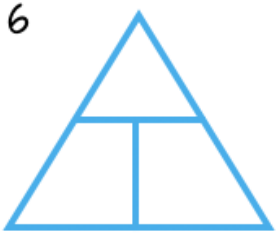

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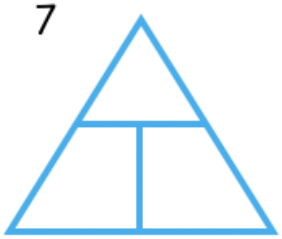


SECTION 4: Keywords

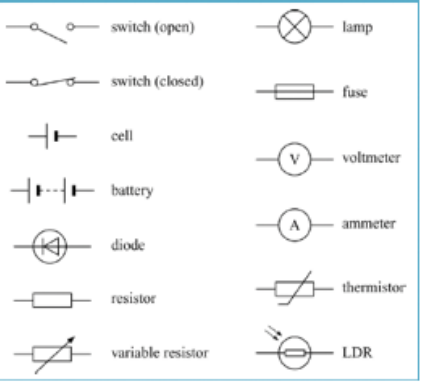
15	Charge
16	Current
17	Voltage Potential Difference
18	Resistance
19	Series circuit
20	Parallel circuit
21	Ohms Law
22	Power

SECTION 5: Circuit Rules

	Current	Voltage	Resistance
23 Series			
24 Parallel			

GCSE ELECTRICITY KNOWLEDGE ORGANISER

SECTION 1: Circuit Symbols



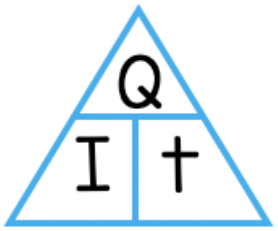
SECTION 2: Equations

2	charge flow = current × time	$Q = I t$
3	potential difference = current × resistance	$V = I R$
4	power = potential difference × current	$P = V I$
5	power = current ^{2} × resistance	$P = I^2 R$
6	energy transferred = power × time	$E = P t$
7	energy transferred = charge flow × potential difference	$E = Q V$

SECTION 3: Units

8	Charge = coulomb = C
9	Current = amps = A
10	Time = seconds = s
11	Energy = joules = J
12	Resistance = ohms = Ω
13	Power = watts = W
14	Potential = volts = V difference

2



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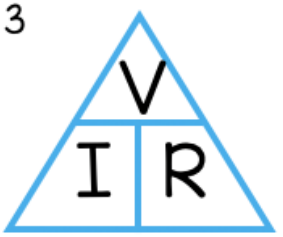

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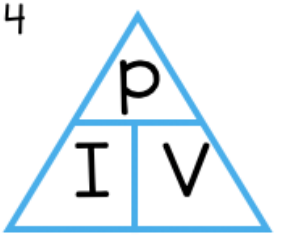

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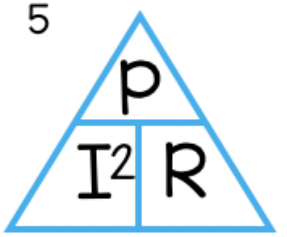

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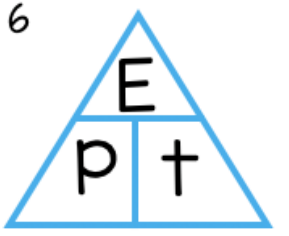

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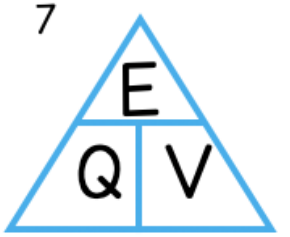


SECTION 4: Keywords

15	Charge	Electrons flowing in a circuit
16	Current	Rate of flow of electrons
17	Voltage Potential Difference	Voltage causes charge to flow Work done (energy transferred) when a coulomb of charge passes between 2 points in a circuit
18	Resistance	Opposition to the flow of electric charge
19	Series circuit	Charges can only take one route
20	Parallel circuit	Charges can take more than one route
21	Ohms Law	Current is directly proportional to voltage at constant resistance and constant temperature
22	Power	Rate of energy transfer Work done per unit time

SECTION 5: Circuit Rules

		Current	Voltage	Resistance
23	**Series**	Current is the same at every point in the circuit and in every component	The total voltage provided by the power supply is shared between each component	As more resistors are added the total resistance increases. The total resistance is the sum of the resistance of each component
24	**Parallel**	The total current through the whole circuit is the sum of the current though each separate component	The voltage is same on each branch and is equal to the voltage provided by the power pack	Adding more resistors in parallel decreases the total resistance as the current has more pathways. Total resistance will be less than the smallest resistor

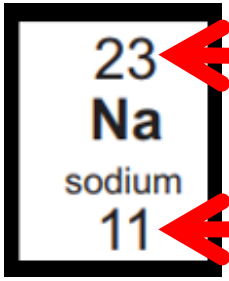
GCSE Combined Science: Trilogy Chemistry Topic 1: Atomic Structure and the periodic table

	A substance made of one type of atom only.
	Two are more different types of atoms chemically bonded together
	Elements and/or compounds combined together but not bonded. Can easily be separated

Particle	Mass
Proton	
Neutron	
Electron	

Particle	Relative charge
Proton	
Neutron	
Electron	

H tier



_____ = _____ + _____

_____ = _____

1. Atoms have the same number of _____ and _____

2. Atoms of the same element can have different numbers of _____; these atoms are called _____ of that element.

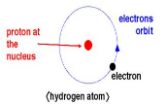
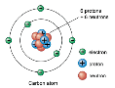
3. Isotopes of the same element have the same number of _____ and _____

4. To calculate the _____ _____ _____ of an element taking into consideration isotopes then you need the following equation:

$$\frac{(\text{percentage of isotope 1} \times \text{mass of isotope 1}) + (\text{percentage of isotope 2} \times \text{mass of isotope 2})}{100}$$

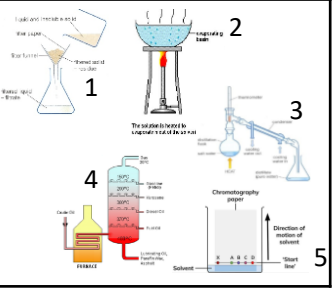
Steps in the development of the periodic table
Before the discovery of protons, neutrons and electrons, scientists attempted to classify the elements by arranging them in order of their _____ _____.
The early periodic tables were _____ and some _____ were placed in inappropriate groups if the strict order of atomic weights was followed.
Mendeleev overcame some of the problems by _____ _____ for elements that he thought had not been _____ and in some places changed the _____ based on atomic weights.
Elements with _____ predicted by Mendeleev were _____ and filled the gaps. Knowledge of _____ made it possible to explain why the order based on atomic weights was not always correct.

Development of the atomic model

					
	JJ Thomson	Ernest Rutherford	Niels Bohr		James Chadwick

Separation techniques

1. _____
2. _____
3. _____
4. _____
5. _____



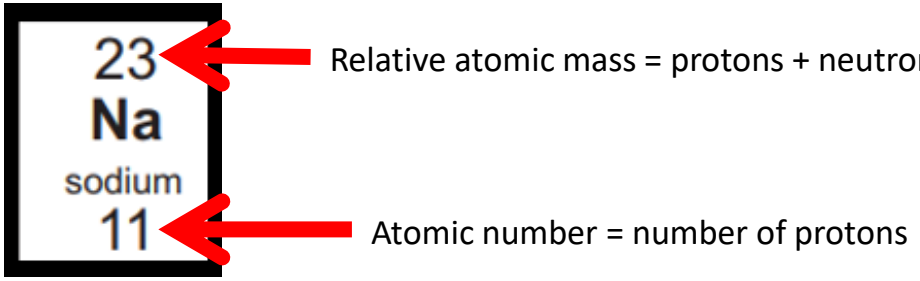
GCSE Combined Science: Trilogy Chemistry Topic 1: Atomic Structure and the periodic table

Element	A substance made of one type of atom only.
Compound	Two are more different types of atoms chemically bonded together
Mixture	Elements and/or compounds combined together but not bonded. Can easily be separated

Particle	Mass
Proton	1
Neutron	1
Electron	Very small

Particle	Relative charge
Proton	+1
Neutron	0
Electron	-1

H tier



1. Atoms have the same number of protons and electrons

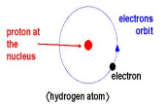
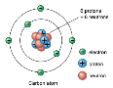
2. Atoms of the same element can have different numbers of neutrons; these atoms are called isotopes of that element.

3. Isotopes of the same element have the same number of protons and electrons

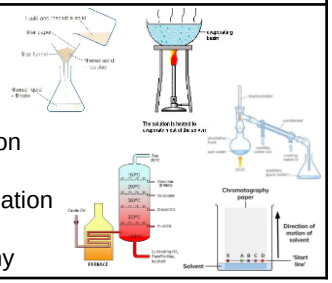
4. To calculate the relative atomic mass of an element taking into consideration isotopes then you need the following equation:

$$\frac{(\text{percentage of isotope 1} \times \text{mass of isotope 1}) + (\text{percentage of isotope 2} \times \text{mass of isotope 2})}{100}$$

Steps in the development of the periodic table
Before the discovery of protons, neutrons and electrons, scientists attempted to classify the elements by arranging them in order of their atomic weights.
The early periodic tables were incomplete and some elements were placed in inappropriate groups if the strict order of atomic weights was followed.
Mendeleev overcame some of the problems by leaving gaps for elements that he thought had not been discovered and in some places changed the order based on atomic weights.
Elements with properties predicted by Mendeleev were discovered and filled the gaps. Knowledge of isotopes made it possible to explain why the order based on atomic weights was not always correct.

Development of the atomic model					
					
	JJ Thomson	Ernest Rutherford	Niels Bohr		James Chadwick
Solid spheres	Plum pudding model	Nuclear model	Electrons in shells	Protons	Neutrons

Separation techniques
1. Filtration
2. Crystallisation
3. Simple distillation
4. Fractional distillation
5. Chromatography



AQA TRILOGY GCSE BIOLOGY: 4.2.1 ORGANISATION IN ANIMALS

Levels of organisation

Organelle ->

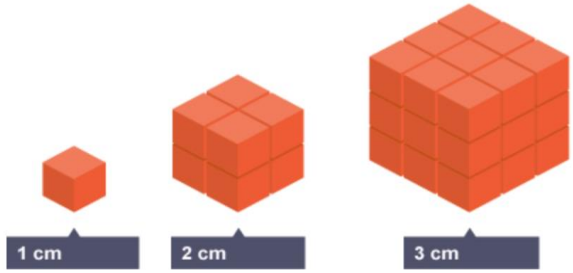
Organisms must take in

The size of their surface, or surface area, defines

Gas Exchange

Surface area to volume ratio

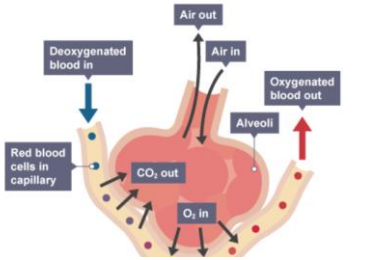
This is what happens when the cube increases in size:

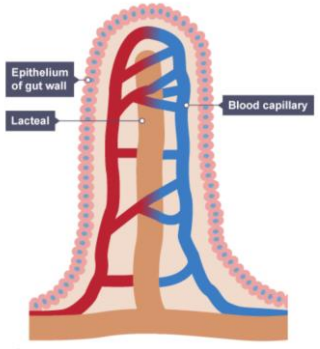


A large surface area:

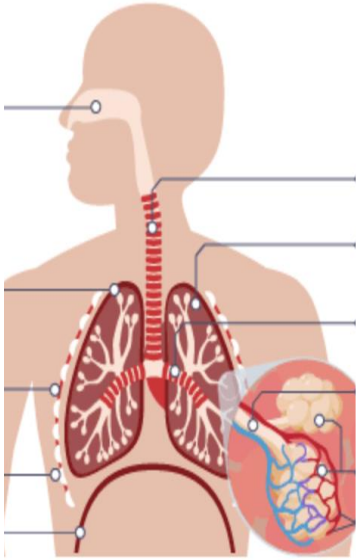
A short distance required for diffusion:

Exchange Surfaces





Respiratory System



Respiratory Adaptations

The human lungs provide an **exchange surface** adapted for:

The alveoli are adapted to provide a very large surface area for gaseous exchange:

AQA TRILOGY GCSE BIOLOGY: 4.2.1 ORGANISATION IN ANIMALS

Levels of organisation

Organelle -> Cell -> Tissue -> Organ -> Organism

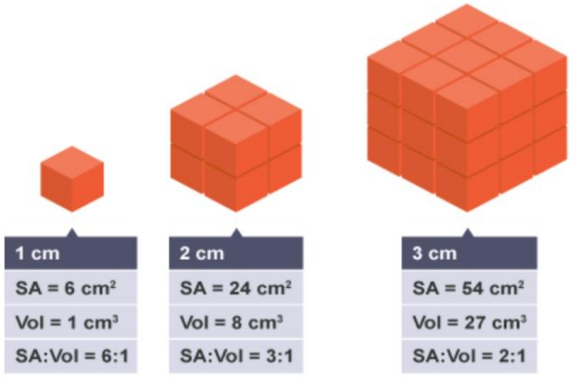
Organisms must take in food, oxygen and water, and other essential substances, from the environment. Organisms also need to remove waste substances.

The size of their surface, or surface area, defines how quickly they can absorb substances. The size of their volume defines how much of these substances they need.

Gas Exchange

Surface area to volume ratio

This is what happens when the cube increases in size:



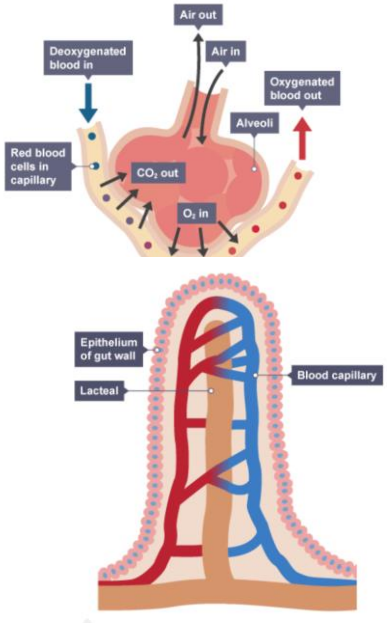
A large surface area:

- the flattened shape of structures such as leaves
- the **alveoli** in the respiratory system
- the **villi** in the digestive system

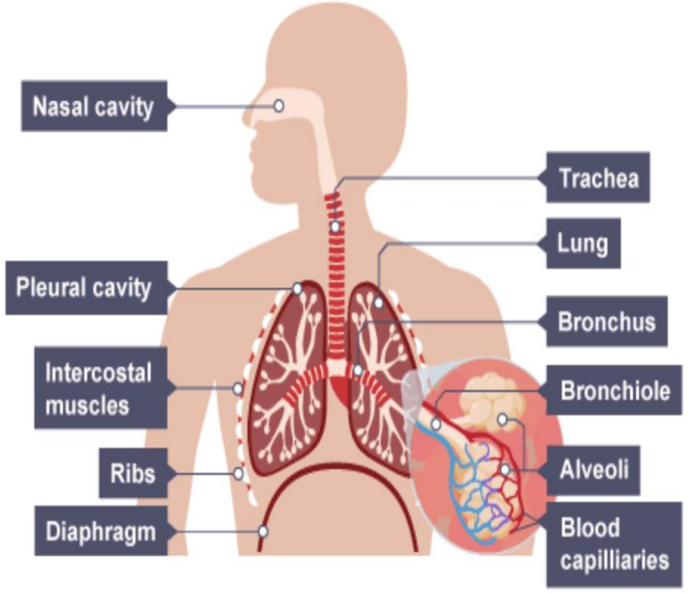
A short distance required for diffusion:

- the membranes of cells
- the flattened shape of structures such as leaves
- the walls of blood **capillaries** are one cell thick
- the **epithelia** of alveoli in the respiratory system and the villi in the small intestine are only one cell thick

Exchange Surfaces



Respiratory System



Respiratory Adaptations

The human lungs provide an **exchange surface** adapted for:
absorbing **oxygen** – needed for respiration – into the blood from the air
transferring **carbon dioxide** – produced by respiration – from the blood into the lungs then the air

The alveoli are adapted to provide a very large surface area for gaseous exchange:

- **small size** - each alveolus is a small sphere about 300 µm in diameter
- **number** - there are around 700 million alveoli
- There is also a short **diffusion** path - the walls of blood capillaries and alveoli are just one cell thick.

THANK YOU FOR LISTENING

- There will be an information leaflet available and some resources in the atrium
- All resources are on your daughter/son's class Microsoft team tile for science
- Please send them to speak to their class teacher or myself if they have any questions