

Student name: \_\_\_\_\_

# Cambridge Technical (Double Award)

## L3 Applied Science

### Getting Ready For Pack

### Summer 2023

Worksheet	Topic	Complete?
1	The Periodic table	
2	Atoms and ions	
3	Electron arrangement	
4	Structure types	
5	Writing chemical formula	
6	Balancing equations	

Target Grade	Type of task	Task and subject specific skill reference	Deadline
All	Workbook complete	<b>Workbook</b> Work through this workbook if you have any issues with it or need assistance contact us @ <a href="mailto:chinkitt@haywardsheath.ac.uk">chinkitt@haywardsheath.ac.uk</a> or <a href="mailto:info@haywardsheath.ac.uk">info@haywardsheath.ac.uk</a>	<b>11th September 2023</b>
All	Review GCSE work	<b>Worksheet 1: The Periodic Table</b> An understanding of the Periodic Table is important for any science course. This worksheet reviews what you should have learnt in GCSE Science. If you need help completing this activity, GCSE bitesize revision is helpful: <a href="https://www.bbc.com/bitesize/topics/zxnftv4">https://www.bbc.com/bitesize/topics/zxnftv4</a>	<b>from 11<sup>th</sup> September 2023</b>
All	Reviewing GCSE work	<b>Worksheet 2 and 3: Atoms, ions and electron arrangement</b> This activity reviews atomic structure and ions. You will need a scientific calculator for this activity – this is an essential requirement for this course. For help in converting pm (picometres) to metres, click on this link <a href="https://physics.nist.gov/cuu/Units/prefixes.html">https://physics.nist.gov/cuu/Units/prefixes.html</a>	<b>from 11<sup>th</sup> September 2023</b>
All	Worksheet questions	<b>Worksheet 4: Structure types</b> You should have covered the different types of substances – metallic, ionic, simple covalent, giant covalent and monatomic in GCSE Science. These are some bbc bitesize notes to help you answer the questions: <a href="https://www.bbc.com/bitesize/guides/zjfkw6f/revision/1">https://www.bbc.com/bitesize/guides/zjfkw6f/revision/1</a>	<b>from 11<sup>th</sup> September 2023</b>
All	Understanding chemical formulas	<b>Worksheet 5: Writing chemical formula</b> Understanding how to write chemical formula is vital for success in chemistry. You may find this video helpful: <a href="https://www.youtube.com/watch?v=URc75HoKGLY">https://www.youtube.com/watch?v=URc75HoKGLY</a>	<b>from 11<sup>th</sup> September 2023</b>
All	Balancing equations	<b>Worksheet 6: Balancing equations</b> You should have learned how to write balanced equations in your GCSE course. Attempt as many as you can. You may find this video helpful: <a href="https://www.youtube.com/watch?v=2Juem0lcifE">https://www.youtube.com/watch?v=2Juem0lcifE</a>	<b>from 11<sup>th</sup> September 2023</b>

Notes:

Hand-in date for getting ready for pack for Double award = 11<sup>th</sup>  
September

# Getting Ready For *Applied Science*

Your Name		
CAMTEC L3 Applied Science	Transition from GCSE to Level 3 Applied Science	Summer 2023

**We are delighted you have chosen to study Applied Science at Haywards Heath College.**

**Instructions:** This pack will help you make the best possible start to studying this subject.

The tasks in this pack:

- should take you **about 8 hours to complete**.
- should be handed into your teacher when teaching starts **from 11<sup>th</sup> September 2023** with your name on it for assessment.
- are also available on the internet – follow the links in the document.

**If you need help:** The tasks are designed to get a bit more difficult as you work through them as they are preparing you for studying at a higher level and to become an effective independent learner. You should try to get as far as you can working on your own but if you do need help, please email us at [info@haywardsheath.ac.uk](mailto:info@haywardsheath.ac.uk) telling us which Getting Ready For pack you are working on and what help you need. Help is available throughout the summer holidays.

## Skills Focus for this Getting Ready for Pack

<p>Maths skills:</p> <ul style="list-style-type: none"> <li>Converting to SI units</li> <li>Calculating sizes of atoms</li> <li>Balancing chemical symbol equations</li> <li>Working out formula of ionic compounds</li> </ul>	<p>GCSE science knowledge, including:</p> <ul style="list-style-type: none"> <li>Periodic table</li> <li>Atomic structure</li> <li>Structure types</li> <li>Chemical symbol equations</li> </ul>
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1 a In what order are the elements arranged in the Periodic Table? .....

.....

.....

b How many electrons are in the outer shell of atoms of the following elements?  
aluminium ..... fluorine ..... silicon .....

c Give the group and period number of the element with electron structure 2,8,5.  
group ..... period.....

d Which group are the following elements in? The electron structure of these elements is given.  
2,8,8,1 ..... 2,6 ..... 2,8,18,5 .....

2 a Explain why elements that are in the same group in the Periodic Table have similar properties.

.....

.....

.....

b Explain why the elements in Group 0 are unreactive.

.....

.....

.....

c Explain why the elements in Group 1 are very reactive.

.....

.....

.....



# GCSE REVISION

## Atoms, ions, equations, Periodic Table

**1** a) Complete the following table about protons, neutrons and electrons.

	neutron	proton	electron
relative charge			
relative mass			

b) Define the term **mass number**. .....

.....

c) Define the term **atomic number**. .....

.....

**2** Complete the following table about some atoms and ions. The first row has been done for you.

Particle	Atom or ion	Atomic number	Mass number	Number of protons	Number of neutrons	Number of electrons	Electron structure
${}^{19}_{9}\text{F}^{-}$	ion	9	19	9	10	10	2,8
${}^{40}_{18}\text{Ar}$							
${}^{27}_{13}\text{Al}^{3+}$							
				16	18	18	
				19	20	18	
				15	16	15	

**3** The diameter of an indium atom is 310 pm.

a) What is the diameter of an indium atom in metres? Give your answer in standard form.

.....

b) How many indium atoms would fit in a line 20 cm long? Give your answer to 3 significant figures.

.....

.....

.....

**4** This question is about the Periodic Table

a) Name each of the following groups.

Group 1 .....

Group 7 .....

Group 0 .....

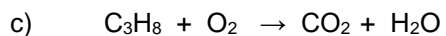
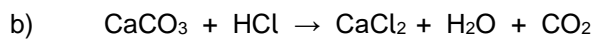
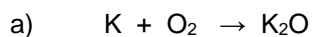
b) Which group would the following elements be in?

element with electron structure 2,8,6 .....

element with electron structure 2,8,8 .....

element with electron structure 2,8,18,3 .....

**5** Balance each of the following equations.



# Worksheet 3: Electron arrangement

**Group 1**

**Group 2**

hydrogen H  
Atomic number = 1

structure = .....

**Group 3**

**Group 4**

**Group 5**

**Group 6**

**Group 7**

**Group 0**

helium He  
Atomic number = 2

structure = .....

<p>lithium Li Atomic number = 3</p> <p>structure = 2,1</p>	<p>beryllium Be Atomic number = .....</p> <p>structure = .....</p>
<p>sodium Na Atomic number = .....</p> <p>structure = .....</p>	<p>magnesium Mg Atomic number = .....</p> <p>structure = .....</p>
<p>potassium K Atomic number = .....</p> <p>structure = .....</p>	<p>calcium Ca Atomic number = .....</p> <p>structure = .....</p>

<p>boron B Atomic number = .....</p> <p>structure = .....</p>	<p>carbon C Atomic number = .....</p> <p>structure = .....</p>	<p>nitrogen N Atomic number = .....</p> <p>structure = .....</p>	<p>oxygen O Atomic number = .....</p> <p>structure = .....</p>	<p>fluorine F Atomic number = .....</p> <p>structure = .....</p>	<p>neon Ne Atomic number = .....</p> <p>structure = .....</p>
<p>aluminium Al Atomic number = .....</p> <p>structure = .....</p>	<p>silicon Si Atomic number = .....</p> <p>structure = .....</p>	<p>phosphorus P Atomic number = .....</p> <p>structure = .....</p>	<p>sulfur S Atomic number = .....</p> <p>structure = .....</p>	<p>chlorine Cl Atomic number = .....</p> <p>structure = .....</p>	<p>argon Ar Atomic number = .....</p> <p>structure = .....</p>

1) The first 20 elements in the Periodic Table are shown below. The elements are arranged in order of increasing atomic number. Fill in the atomic number for each element. The first three have been done for you.

2) Complete the boxes to show the electronic structure of the first 20 elements. The box for lithium has been done for you.

3) What is the link between the Group number and the electronic structure? .....

.....

## Worksheet 4: Structure types



# STRUCTURE TYPES

1) Which type of structure do the following substances have?

	K <sub>2</sub> O	K	O <sub>2</sub>	CH <sub>2</sub> O	Ar	S <sub>8</sub>	Br <sub>2</sub>	Cr	Fel <sub>3</sub>	MgSO <sub>4</sub>	N <sub>2</sub> H <sub>4</sub>
ionic											
simple molecular											
metallic											
monatomic											
giant covalent											

2) Look at the properties of the following substances.

Substance	Melting point (°C)	Boiling point (°C)	Electrical conductivity as	
			solid	liquid
A	587	843	does not conduct	conducts
B	28	201	does not conduct	does not conduct
C	-39	357	conducts	conducts
D	-189	-101	does not conduct	does not conduct
E	2157	2895	does not conduct	does not conduct
F	1024	1598	does not conduct	conducts

a) Which of these compounds could have an ionic structure? .....

b) Which of these compounds could have a simple molecular structure? .....

c) Which of these compounds could have a metallic structure? .....

d) Which of these compounds could have a giant covalent structure? .....

3) Write the formula of the following ionic compounds.

a) potassium oxide ..... d) copper carbonate .....

b) magnesium nitrate ..... e) ammonium hydroxide .....



c) aluminium hydroxide ..... f) iron (III) oxide .....

4) a) **Aluminium oxide** is an ionic substance with formula **Al<sub>2</sub>O<sub>3</sub>**. Explain what this formula means.

.....  
.....  
.....  
.....

b) Explain why aluminium oxide has a high melting point. ....

.....  
.....

c) Explain why aluminium oxide does not conduct electricity as a solid but does when melted.

.....  
.....  
.....  
.....

5) a) **Aluminium** is a metal. Explain why it has a high melting point. ....

.....  
.....

b) Explain why aluminium conducts electricity. ....

.....  
.....

6) a) **Ammonia** is a simple molecular substance with formula **NH<sub>3</sub>**. Explain what this formula means.

.....  
.....

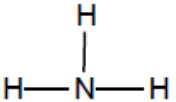
.....  
.....  
b) Explain why ammonia has a low melting point. ....

.....  
.....  
c) Explain why ammonia does not conduct electricity in any state. ....

.....  
.....  
7) a) Explain why **diamond** is hard but **graphite** is soft. ....

.....  
.....  
b) Explain why graphite conducts electricity but diamond does not. ....

8) Complete the table to draw any missing stick or dot-cross diagrams for the molecules shown below.

Substance		oxygen O <sub>2</sub>	oxygen fluoride OF <sub>2</sub>
Stick diagram			
Dot-cross diagram			

**Worksheet 5: Writing chemical formula**

Complete the table with the formula of the ions (e.g. magnesium ion is  $\text{Mg}^{2+}$ ) and the ionic compounds.

	Name	Formula
1	sodium ion	
2	chloride ion	
3	sulfate ion	
4	cobalt(II) ion	
5	potassium oxide	
6	calcium hydroxide	
7	iron(III) oxide	
8	aluminium bromide	
9	magnesium nitrate	
10	lithium carbonate	

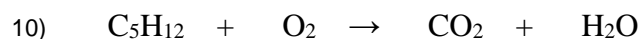
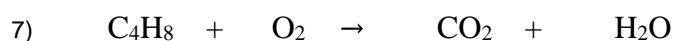
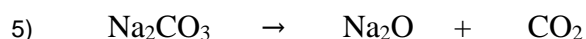
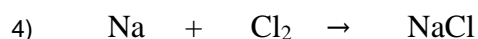
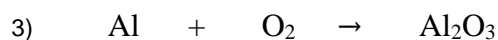
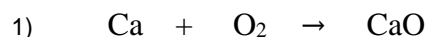
## Worksheet 6: Balancing equations

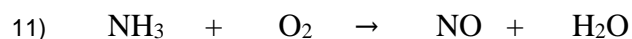
- An equation is balanced when there are the same number of atoms of each type on both sides of the equation.
- An equation can only be balanced by putting numbers in front of formulas – you cannot change the formula itself.
- Equations can be written with state symbols: (s) = solid, (l) = liquid, (g) = gas, (aq) = aqueous (dissolved in water).

### How to balance an equation:

- a) Calculate how many atoms of each type are on each side of the equation.
- b) If the numbers are the same then the equation is balanced.
- c) If the numbers are not the same, then numbers are put in front of the formulas (this adds more of that substance). You cannot change the formulas (this would make a different substance). Hint – start with unbalanced elements that only appear in one substance on each side of the equation.
- d) Keep doing this until the equation is balanced.



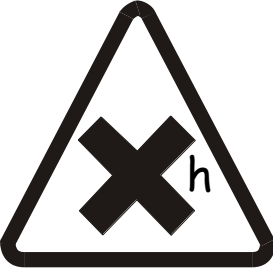
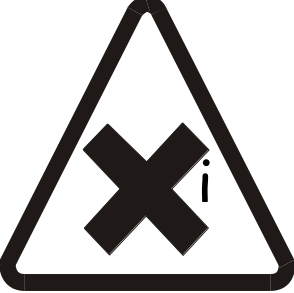
### Questions






SECTION 2: Includes a range of tasks which gets progressively more difficult. Being able to identify the difference between a risk and a hazard is an essential skill.

Acids & Bases - Throughout the Double award segment of the qualification you will perform a range of titrations, so you need to be familiar (comfortable) with the difference between an Acid or Base. Being able to REFERENCE is an essential skill, learning Harvard referencing style rather than just sticking in a website link is expected of all students!

Symbol	Name	Danger and how to minimise	Examples of chemicals that have it
			
			
			
			

			
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## Acid or Base

Label the following as Acid or Base and give the full name of each compound.

$\text{CH}_3\text{COOH}$ =

$\text{H}_2\text{SO}_4$ -

$\text{LiOH}$

$\text{HCl}$ -

$\text{NH}_3$ -

$\text{NaOH}$ -

$\text{H}_3\text{PO}_4$ -

Now name one further example of an acid and a base

Acid example=

Acid Colour in universal indicator=

Acid Colour in Phenolphthalein=

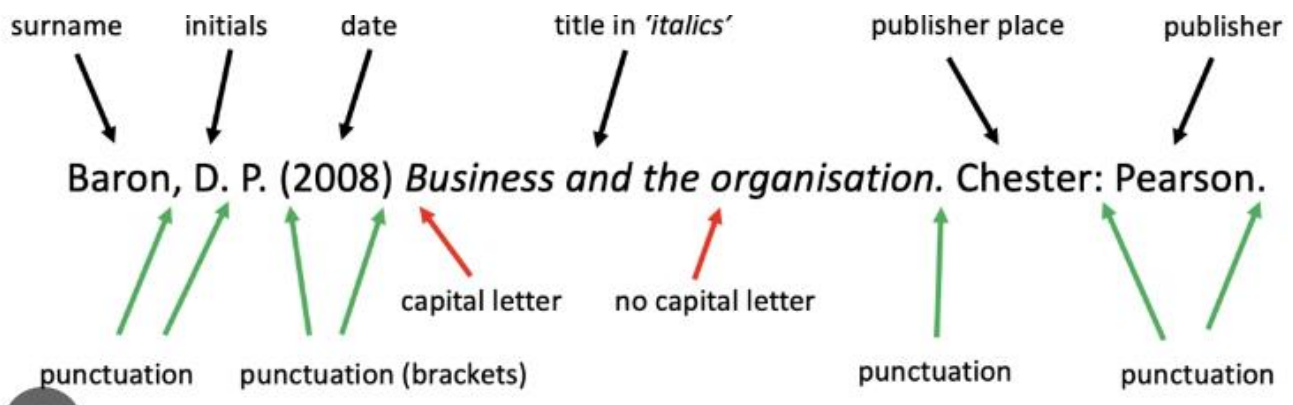
Base example=

Base colour in universal indicator=

Base colour in Phenolphthalein=

## How to reference like a professional in your written coursework

Those of you who have registered to do double awards will be required to reference contact using the Harvard referencing format. We take plagiarism very seriously and it is important that you know how to show that you have used someone else's idea.



Spend time watching the following link which shows you how to use the latest completely free software to make Harvard referencing easy ([15\) How To Use Zotero For Referencing In 2023 \(NEW Tutorial\) - YouTube](#))

Have a go at inputting an In-text citation and forming a reference list which comes at the end of the document. Use programs like Zotero to do this for you! GET COMFORTABLE WITH THIS Zotero does both of these at the click of a button

### **In-text Citations**

*You use only a few basic details*

The researcher describes a virtuous person as one "who acts and feels as he or she should, for the right reason considering the circumstances" (Alvaro, 2017, p.770).

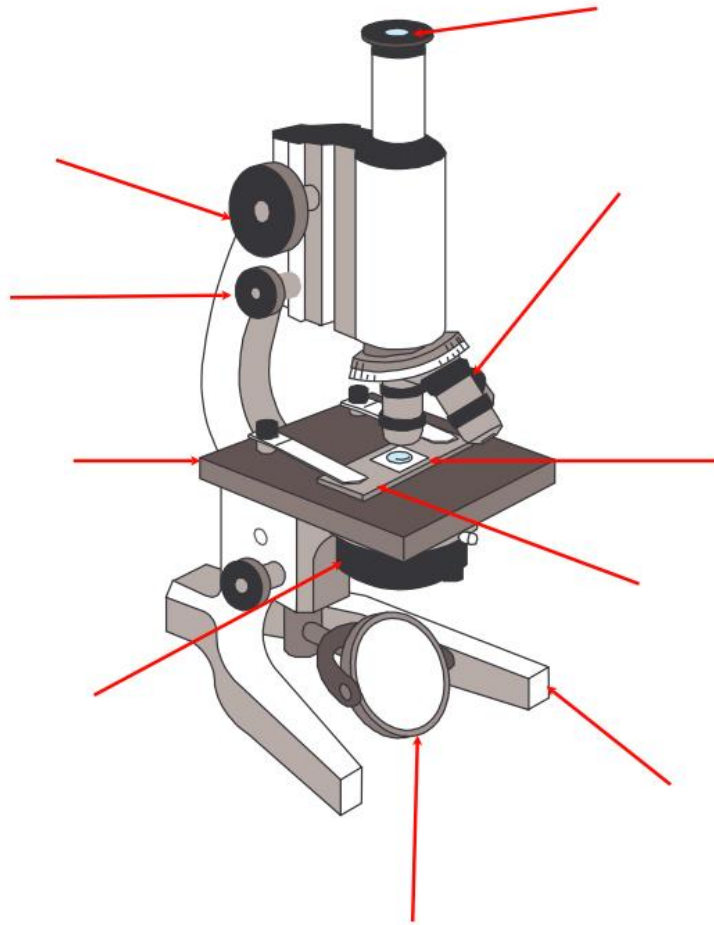
### **Reference List**

*You use ALL of the details*

Alvaro, C. (2017). Ethical veganism, virtue and greatness of the soul. *Journal of Agricultural and Environmental Ethics*, 30(6), 765-781. <https://doi.org/10.1007/s10806-017-9698-z>



## MICROSCOPE: LABEL IT



cover slip	slide	stage	objective lens	eyepiece
fine focus	mirror	stand	iris	coarse focus

Can you name the different parts of a microscope?

- 1 a Complete **Table 1** to give **two** ways in which the structure of a plant cell differs from that of an animal cell. (2 marks)

**Table 1**

Plant cell	Animal cell
1.	
2.	

- b **Table 2** shows the amounts of three different substances in the seeds of various plants.

**Table 2**

Plant	Percentage of total mass of three different substances in the seeds of various plants		
	Proteins	Polysaccharides	Lipids
buckwheat	15	84	1
brazil nut	14	8	78
mung bean	29	69	2
sesame	25	16	59

Name the plant seed which has the greatest percentages of

- i polymers in its seeds

..... (1 mark)

- ii nitrogen-containing substances in its seeds.

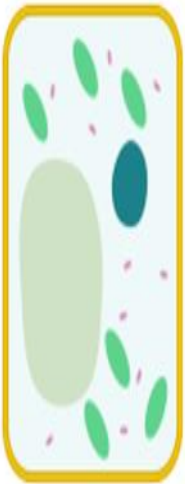
..... (1 mark)

- c One of the polysaccharides found in plant seeds is starch. A student decided to find out which of the seeds had cells with the most starch. The student used a microscope and a suitable stain.

Outline the method the student used.

.....  
 .....  
 ..... (3 marks)

Write down the names of the specialised cells you see below



P \_\_\_\_\_  
c \_\_\_\_\_



S \_\_\_\_\_ c \_\_\_\_\_



N \_\_\_\_\_  
c \_\_\_\_\_



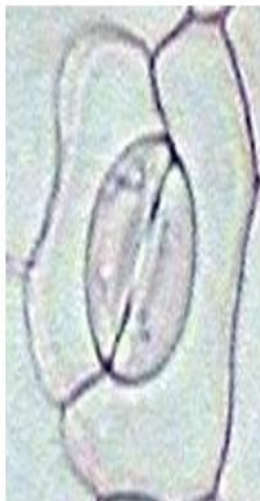
R \_\_\_\_\_ B \_\_\_\_\_  
c \_\_\_\_\_



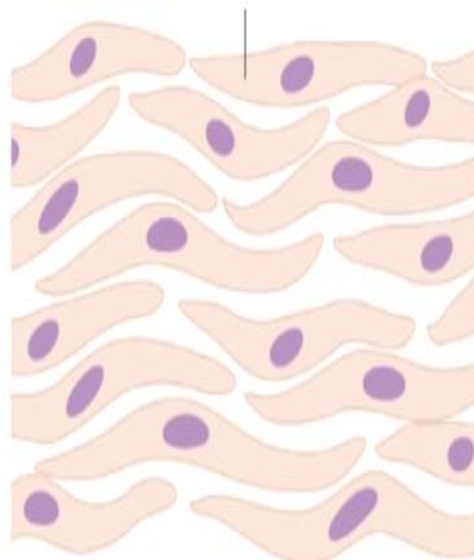
S \_\_\_\_\_  
c \_\_\_\_\_



R \_\_\_\_\_  
h \_\_\_\_\_ c \_\_\_\_\_



G \_\_\_\_\_  
c \_\_\_\_\_

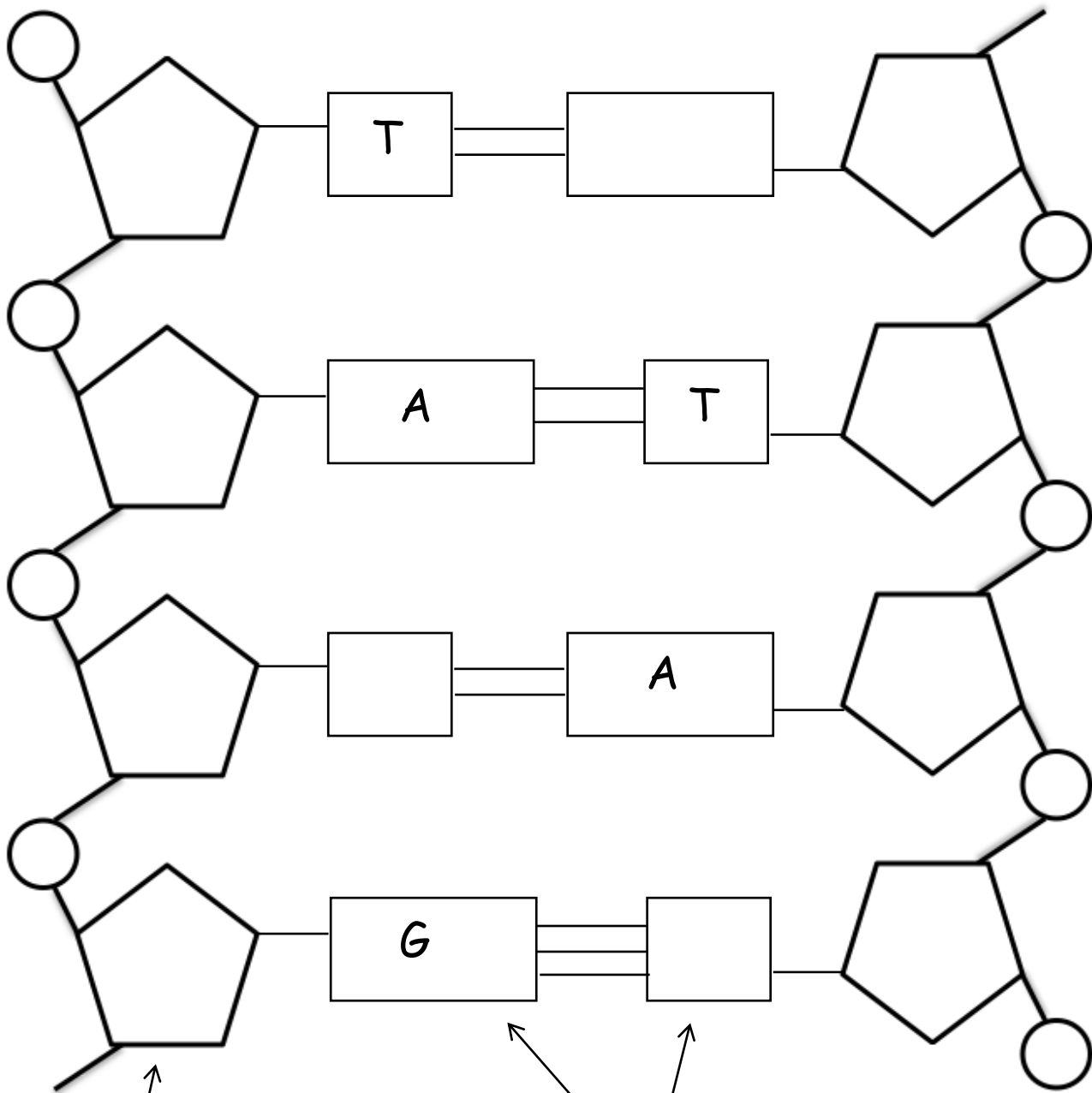


M \_\_\_\_\_ c \_\_\_\_\_



W \_\_\_\_\_  
b \_\_\_\_\_ c \_\_\_\_\_

The Structure of DNA (notice the number of bonds between bases)



1. Label the different components of the DNA as 'base', 'phosphate group' or 'deoxyribose sugar'.

2. Add the missing complementary base pairs to the diagram.

## Tests for Negative Ions (Anions)

*You have seen how to test for some of the first parts of a chemical compounds. Now you are going to learn how to test for some of the second parts.*

### Apparatus:

- Test tubes
- Delivery tube to fit test tube

### Access to:

- Dilute nitric acid
- Silver nitrate solution
- Dilute hydrochloric acid
- Barium chloride solution
- Lime water
- Samples of a solid chloride, bromide, iodide, sulphate, carbonate

### Safety:



Wear goggles



Hydrochloric acid - corrosive



Calcium & copper chloride - harmful



Barium chloride - poisonous

### Test for chlorides, bromides and iodides:

---

- Put 1 small spatula of the chloride, bromide or iodide in a test tube.
- Add about 5cm<sup>3</sup> water and shake to dissolve the compound.
- Add a few drops of dilute nitric acid.
- Add a small amount of silver nitrate solution and record your results in the table.

### Observations:

Compound	Colour immediately	Colour after a few minutes	Anion present	
			Name	Formula
Potassium chloride				
Potassium bromide				

Potassium iodide				
------------------	--	--	--	--

**Test for Sulphates:**

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- a. Put 1 small spatula of the sulphate in a test tube.
- b. Add about 10cm<sup>3</sup> water to dissolve it.
- c. Add barium chloride solution dropwise until you see a result.

**Observation:**

When the barium chloride was added to the sulphate solution . . . . .  
. . . . .

**Word equation:**

Sodium sulphate + barium chloride →

**Balanced equation:**

Formula of sulphate ion:

**Test for carbonates:**

---

- a. Put a spatula full of the carbonate into a test tube.
- b. Put 5cm<sup>3</sup> limewater into another test tube.
- c. Add 5cm<sup>3</sup> dilute hydrochloric acid to the carbonate.
- d. Quickly put the bung of the delivery tube in the test tube with the other end in the lime water.
- e. Record your results.

**Observation:**

When the acid was added the carbonate .....

The lime water turned .....

The gas was .....

**Word equation:**

Hydrochloric acid + calcium carbonate →

**Balanced equation:**







Formula of carbonate ion:

## Flame Tests

These tests allow us to identify unknown compounds. The cation is the positively charged ion involved in the compound. For it to be positive it must have lost an electron have a look at what colours are expected for the following cations in the compounds below  
\*note it depends on charge\*

All compounds of a particular element give the same flame colour, but the chlorides are the best to use because they vaporise relatively easily in a Bunsen flame. This experiment will allow you to determine the characteristic flame colours of certain elements in Groups 1 and 2 of the periodic table.

<p><b>Apparatus:</b></p> <ul style="list-style-type: none"><li>• Nichrome wire</li><li>• Lithium chloride</li><li>• Calcium chloride</li><li>• Potassium chloride</li><li>• Sodium chloride</li></ul> <p><i>You will need access to:</i></p> <ul style="list-style-type: none"><li>• Concentrated hydrochloric acid</li><li>• Small beakers (100cm<sup>3</sup>)</li></ul>	<p><b>Safety:</b></p> <ul style="list-style-type: none"><li> Wear goggles</li><li> Concentrated hydrochloric acid - corrosive</li><li> Calcium &amp; copper chloride - harmful</li><li> Barium chloride - poisonous</li></ul>
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### **Get familiar with the Colours produced from these flame test.**

Below is the typical method steps you would follow during a flame test

1. Clean a nichrome wire by heating it in a Bunsen flame, dipping it in a beaker of concentrated acid and then heating it again; continue with this until the wire produces little or no colour in the flame.
2. Dip the clean wire into the acid and then into the powdered compound.
3. Hold the wire so that the solid is in the edge of the flame and note any colour in the flame that results. Write your observations in the table below.

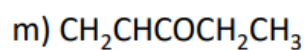
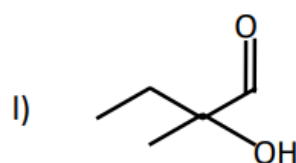
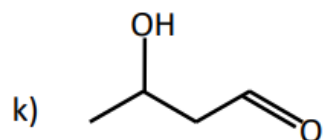
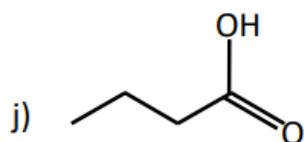
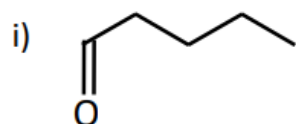
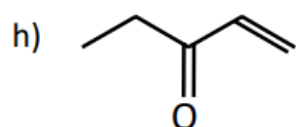
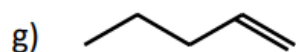
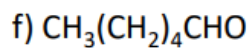
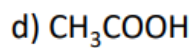
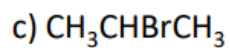
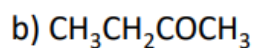
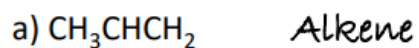
State the expected outcomes

Compound	Flame Colour	Cation Present	
		Name	Formula
Sodium chloride			
Lithium chloride			
Calcium chloride			
Potassium chloride			
Barium chloride			
Copper chloride			

The final task on the following page is a functional group challenge. Knowing or being able to identify the functional groups in a chemical structure could allow for scientists to determine the expected behaviour of a chemical.

Use the following link to assist you in identifying the organic compounds [Functional Groups In Organic Chemistry \(masterorganicchemistry.com\)](http://masterorganicchemistry.com)

**Q1** Identify the functional groups in each of the molecules below. The first example has been done for you



Hand-in date for getting ready for pack for Double award =  
11<sup>th</sup> September