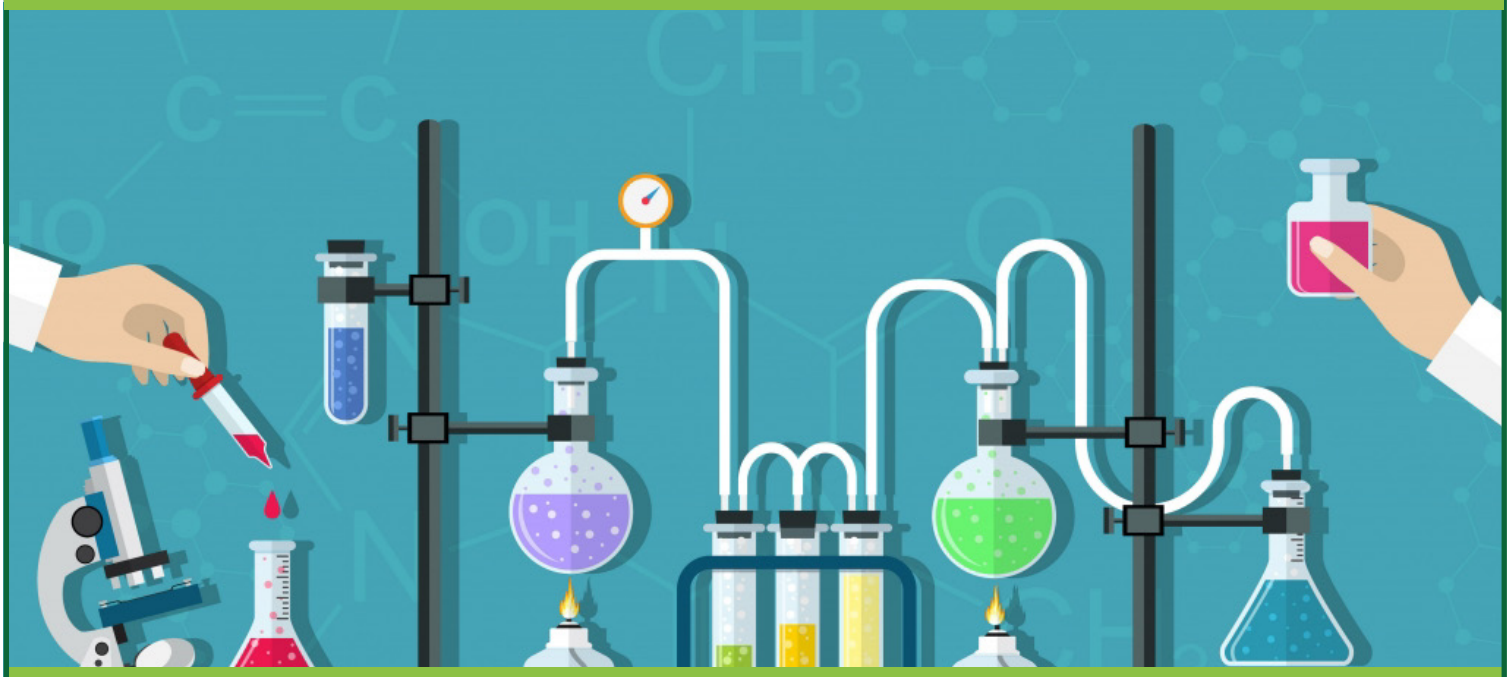
Bentley Wood
High School for Girls

Chemistry
GCSE to A level

Bridging Work
Year 11 into 12 for 2021/22



Name: _____

Tutor Group: _____

Teacher: _____

Year 11 to 12 AS Level Chemistry Bridging Work

Welcome to Bentley Wood Chemistry!

This work has been designed to help you bridge the gap between your GCSE science studies and the AS Chemistry course. This work will be essential for you to complete prior to your studies with us in September.

Why is bridging work important?

Bridging work for AS/A Level chemistry is crucial to help you start approaching scientific problems creatively and innovatively as scientists do in everyday life! This work should also help you gauge whether this is the best subject choice for you – you only have four choices so getting this right will be important for your academic career in sixth form.

This booklet is separated into two sections:

1. Section 1: Subject based knowledge – aimed at building cumulatively on your GCSE chemistry knowledge.
2. Section 2: Skills based knowledge – transferable skills that are vital for your success at A Level chemistry.

There will also be an optional research task to complete for those who would like to stretch their learning even further before our September start!

Is the bridging work assessed?

In short – yes! This will be the first assessed piece of work your AS teacher will mark. It will enable us to understand your strengths and your areas for improvement. It will also provide us with the opportunity to gauge your work ethic and whether this is to the standard we would expect to see at AS/A Level Chemistry.

AS/A Level Chemistry

Studying AS/A Level Chemistry will develop your organisational skills as well as your subject knowledge. You will need to have the ability to work well autonomously as we will expect additional reading around topics – this will ensure you can perform the best you can throughout your studies.

Across the two-week timetable, you will have twelve fifty minute lessons where we will be embedding theoretical learning with practical work. This will enable you to prepare for undergraduate practical skills in Higher Education should you choose to continue your studies in chemistry.

We study AQA A Level Chemistry at Bentley Wood. To support your learning, you will have access to digital Chemistry A Level textbooks to compliment your studies. There are other resources we recommend to supplement and extend your learning and revision during the exam periods:

- https://www.physicsandmathstutor.com/chemistry-revision/
- https://www.savemyexams.co.uk/a-level-chemistry-aqa/
- https://www.chemguide.co.uk/
- The Royal Society of Chemistry (rsc.org)
- https://www.cgpbooks.co.uk/secondary-books/as-and-a-level/science/chemistry/car73-a-level-chemistry-aqa-year-1-2-complete-revi
- https://www.cgpbooks.co.uk/secondary-books/as-and-a-level/science/chemistry/caf71-new-a-level-chemistry-aqa-revision-question
- Recommended podcasts for wider learning: https://www.chemistryworld.com/podcasts

Year 11 to 12 AS Level Chemistry Bridging Work

Section 1: Subject Based Knowledge

Q1.

A student investigated the reactions of copper carbonate and copper oxide with dilute hydrochloric acid.

In both reactions one of the products is copper chloride.

(a) A student wanted to make 11.0 g of copper chloride. The equation for the reaction is:

$$CuCO_3 + 2HCl \rightarrow CuCl_2 + H_2O + CO_2$$

Calculate the mass of copper carbonate the student should react with dilute hydrochloric acid to make 11.0 g of copper chloride.

_____

_____

_____

Mass of copper carbonate = _____ g

(4)

(b) The percentage yield of copper chloride was 79.1 %.

Calculate the mass of copper chloride the student actually produced.

_____

_____

Actual mass of copper chloride produced = _____ g

(2)

(c) Look at the equations for the two reactions:

Reaction 1 $CuCO_3(s) + 2HCl(aq) \rightarrow CuCl_2(aq) + H_2O(l) + CO_2(g)$

Reaction 2 $CuO(s) + 2HCl(aq) \rightarrow CuCl_2(aq) + H_2O(l)$

The percentage atom economy for a reaction is calculated using:

$$\frac{\text{Relative formula mass of desired product from equation}}{\text{Sum of relative formula masses of all reactants from equation}} \times 100$$

Calculate the percentage atom economy for Reaction 2.

_____

_____

_____

_____

_____

_____

Percentage atom economy = _____ %

(3)

(d) The atom economy for Reaction 1 is 68.45 %.
Compare the atom economies of the two reactions for making copper chloride.

Give a reason for the difference.

_____

_____

(1)

(Total 10 marks)

Q2.

This question is about Group 7 elements.

Chlorine is more reactive than iodine.

(a) Name the products formed when chlorine solution reacts with potassium iodide solution.

_____

_____

(1)

(b) Explain why chlorine is more reactive than iodine.

_____

_____

_____

_____

_____

_____

(3)

(c) Chlorine reacts with hydrogen to form hydrogen chloride.

Explain why hydrogen chloride is a gas at room temperature.

Answer in terms of structure and bonding.

_____

_____

_____

_____

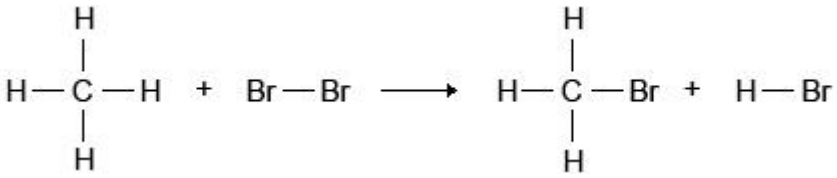
_____

_____

(3)

(d) Bromine reacts with methane in sunlight.

The diagram below shows the displayed formulae for the reaction of bromine with methane.



The table below shows the bond energies and the overall energy change in the reaction.

	C—H	**Br—Br**	**C—Br**	**H—Br**	**Overall energy change**
Energy in kJ/mol	412	193	**X**	366	−51

Calculate the bond energy **X** for the C—Br bond.

Use the diagram and the table above.

_____

_____

_____

_____

_____

_____

_____

Bond energy **X** =_____ kJ/mol

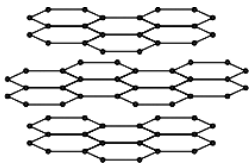
(4)

(Total 11 marks)

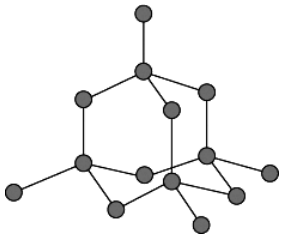
Q3.

Graphite and diamond are different forms of the element carbon. Graphite and diamond have different properties.

The structures of graphite and diamond are shown below.



Graphite



Diamond

(a) Graphite is softer than diamond.

Explain why.

_____

_____

_____

_____

_____

_____

_____

_____

(4)

(b) Graphite conducts electricity, but diamond does not.

Explain why.

_____

_____

_____

_____

_____

_____

(3)

(Total 7 marks)

Q4.

This question is about copper.

(a) Copper can be extracted by smelting copper-rich ores in a furnace.

The equation for one of the reactions in the smelting process is:

$$Cu_2S(s) + O_2(g) \longrightarrow 2\,Cu(s) + SO_2(g)$$

Explain why there would be an environmental problem if sulfur dioxide gas escaped into the atmosphere.

_____

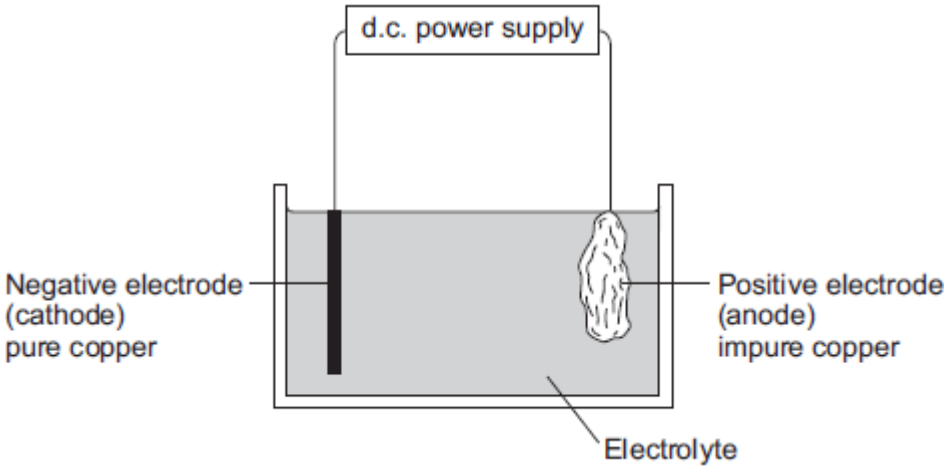
_____

_____

_____

(2)

(b) The impure copper produced by smelting is purified by electrolysis, as shown below.



Copper atoms are oxidised at the positive electrode to Cu^{2+} ions, as shown in the half equation.

$$Cu(s) \longrightarrow Cu^{2+}(aq) + 2e^-$$

(i) How does the half equation show that copper atoms are oxidised?

_____

_____

(1)

(ii) The Cu^{2+} ions are attracted to the negative electrode, where they are reduced to produce copper atoms.

Write a balanced half equation for the reaction at the negative electrode.

_____

(1)

(iii) Suggest a suitable electrolyte for the electrolysis.

_____

(1)

(c) Copper metal is used in electrical appliances.

Describe the bonding in a metal, and explain why metals conduct electricity.

_____

_____

_____

_____

_____

_____

_____

_____

_____

(4)

(Total 9 marks)

Q5.

Scientists found that a compound contained: 22.8% sodium; 21.8% boron; and 55.4% oxygen. Use the percentages to calculate the empirical formula of the compound. To gain full marks you **must** show all your working.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Empirical formula = _____

(Total 5 marks)

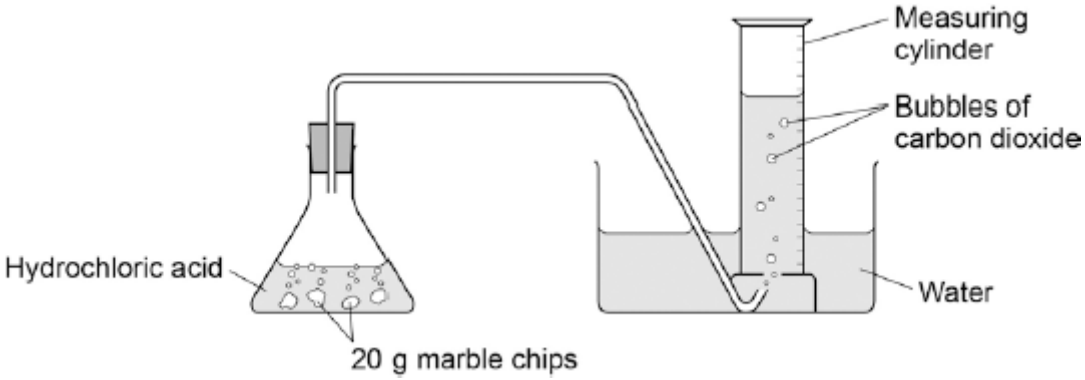
Q6.

Marble chips are mainly calcium carbonate ($CaCO_3$).

A student investigated the rate of reaction between marble chips and hydrochloric acid (HCl).

Figure 1 shows the apparatus the student used.

Figure 1



(a) Complete and balance the equation for the reaction between marble chips and hydrochloric acid.

_____ + _____ → $CaCl_2$ + _____ + _____

(2)

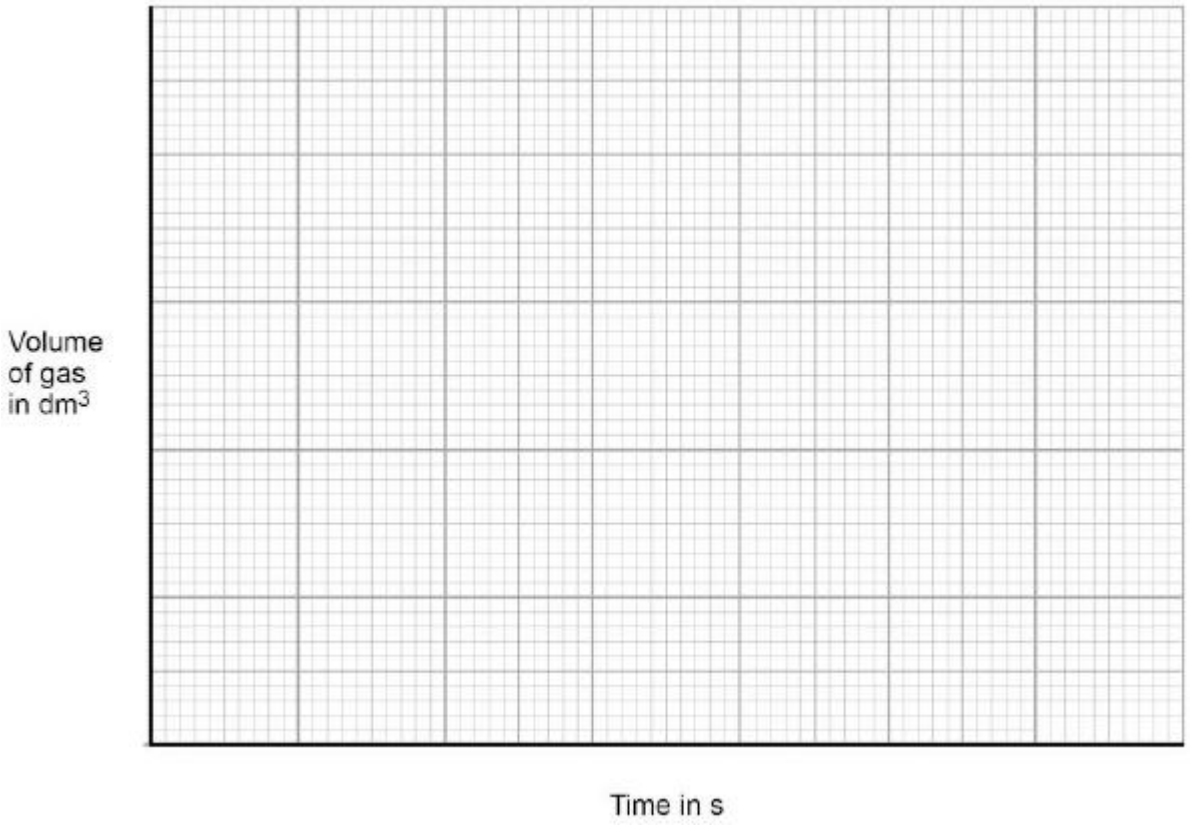
(b) The table below shows the student's results.

Time in s	Volume of gas in dm^3
0	0.000
30	0.030
60	0.046
90	0.052
120	0.065
150	0.070
180	0.076
210	0.079
240	0.080
270	0.080

On **Figure 2**:

- Plot these results on the grid.
- Draw a line of best fit.

Figure 2



(4)

(c) Sketch a line on the grid in **Figure 2** to show the results you would expect if the experiment was repeated using 20 g of smaller marble chips.

Label this line **A**.

(2)

(d) Explain, in terms of particles, how and why the rate of reaction changes during the reaction of calcium carbonate with hydrochloric acid.

_____

_____

_____

_____

_____

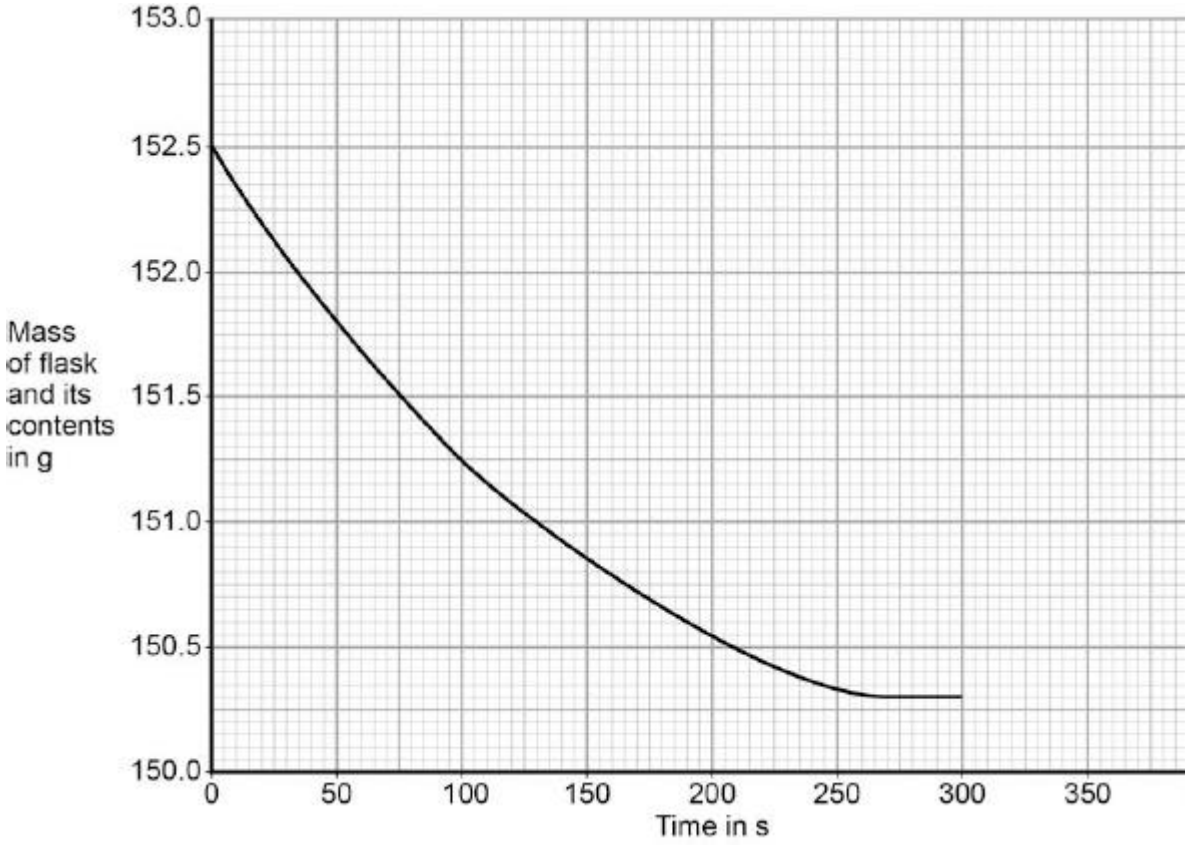
_____

(4)

(e) Another student investigated the rate of reaction by measuring the change in mass.

Figure 3 shows the graph plotted from this student's results.

Figure 3



Use **Figure 3** to calculate the mean rate of the reaction up to the time the reaction is complete.

Give your answer to three significant figures.

_____

_____

_____

_____

_____

_____

_____

_____

Mean rate of reaction = _____ g / s

(4)

(f) Use **Figure 3** to determine the rate of reaction at 150 seconds.

Show your working on **Figure 3**.

Give your answer in standard form.

_____

_____

_____

_____

_____

Rate of reaction at 150 s = _____ g / s

(4)

(Total 20 marks)

Year 11 to 12 AS Level Chemistry Bridging Work

Section 2: Skills Based Knowledge

1. Convert these numbers to standard form:

a 0.003
b 5 000
c 0.4
d 7 000 000
e 20 000
f 0.0005

2. Convert these numbers in non-standard form:

a 6×10^{-6}
b 6×10^{6}
c 1×10^{-3}
d 1×10^{3}
e 8×10^{5}
f 8×10^{-5}

3. Round each of the following numbers to the required number of significant figures:

a) 1 478 258 (5sf)

……

b) 0.08956 (3sf)

……

c) 7.00198 (2sf)

……

d) 4 (3sf)

……

e) 0.01 (4sf)

……

f) 0.02314 (2sf)

……

Year 11 to 12 AS Level Chemistry Bridging Work

4. Balance the following equations:

1) $Ca + O_2 \rightarrow CaO$

2) $Na_2O + H_2O \rightarrow NaOH$

3) $Al + O_2 \rightarrow Al_2O_3$

4) $Na + Cl_2 \rightarrow NaCl$

5) $Na_2CO_3 \rightarrow Na_2O + CO_2$

6) $K + O_2 \rightarrow K_2O$

7) $C_4H_8 + O_2 \rightarrow CO_2 + H_2O$

8) $Fe_2O_3 + HCl \rightarrow FeCl_3 + H_2O$

9) $F_2 + KBr \rightarrow KF + Br_2$

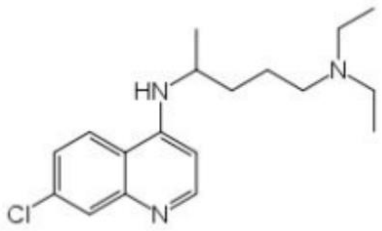
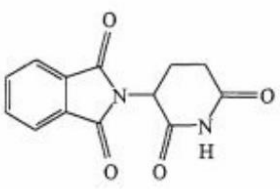
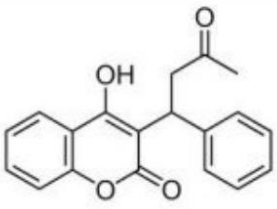
10) $C_5H_{12} + O_2 \rightarrow CO_2 + H_2O$

11) $NH_3 + O_2 \rightarrow NO + H_2O$

12) $HNO_3 \rightarrow NO_2 + H_2O + O_2$

Optional Research Task

Choose one (or more) of the following pharmaceutical drugs and find out:

1. **Common brand names**
2. **Class of drug**
3. **Brief history of discovery**
4. **State the chemical functional group found in the compound**
5. **Uses**
6. **List any side effects**

Chloroquine	Thalidomide	Warfarin