



Getting Ahead – Pre-course Work

#ThinkBrock

Chemistry A Level

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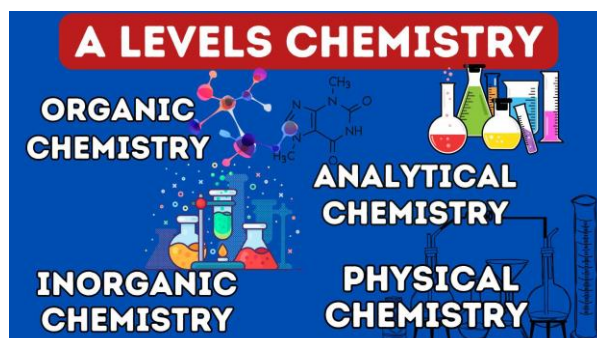
Welcome to **Chemistry A Level**. In preparation for the start of the course, please complete these tasks and have them with you to hand in during your first class in September.

These tasks should take you approximately four and a half hours to complete and are designed to give you an introduction to the subject, and the expectations we have for you to complete at least four and a half hours of independent study, per subject, per week.

Course Outline:

At Brock, you will study the OCR A Chemistry A-Level specification, which is divided into the following modules:

- 1) Development of practical skills in chemistry
- 2) Foundations in chemistry
- 3) Periodic table and energy
- 4) Core organic chemistry
- 5) Physical chemistry and transition elements
- 6) Organic chemistry and analysis



Around a quarter of the course requires mathematical skills. Therefore, some tasks will involve some GCSE maths questions to make sure you are comfortable with the skills that you will need throughout the course. Complete every task to the best of your ability. If you find any portion difficult, break it down into little chunks and go as far as you can, look for further sources on the web to offer more guidance on questions, if needed. Make a note if you have any stumbling blocks and talk to your teacher when you start, so we can support you. 😊



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Task 1- Using Maths in Chemistry: For all questions, you may use a scientific calculator.

Standard form and Significant figures: In the calculations you will be asked to perform as part of your A-level studies, you will need to be confident with both representing numbers in standard form and giving them to a certain number of significant figures. When numbers are very large or very small, they are written in **standard form**. In standard form a number is written in the format:

$$a \times 10^n \text{ e.g. } 24000 \text{ can be written as } 2.4 \times 10^4$$

Worked example: Standard form

Question

Express 0.00268 in standard form.

Answer

Step 1: Identify the value for 'a.' In this case it will be 2.68.

Step 2: Work out how many places the decimal place must be moved to form this number.

0 . 0 0 2 6 8

The decimal place must move 3 places to the right to become 2.68.

This number of places is the value for the 'n.' If the decimal point moves to the right 'n' is negative. If the decimal place moves to the left 'n' is positive.

Step 3:

Substitute your values into the general format, $a \times 10^n$

Question 1:

a) Express the following numbers in standard form:

- i. 0.0023 iii. 2750000
- ii. 1032 iv. 0.000528

b) Write out the following numbers in ordinary form:

- i. 2.01×10^3 iii. 8.41×10^2
- ii. 5.2×10^{-2} iv. 1.00×10^{-4}

c) For each of the pairs of numbers below, identify which is the bigger number:

- i. 1.43×10^{23} or 1.43×10^{24}
- ii. 5.16×10^{-3} or 5.16×10^{-4}
- iii. 12.4×10^{23} or 1.50×10^{24}



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Worked example: Significant figures

Question

Express 0.56480900 to 3 significant figures.

Answer

Step 1: Identify the numbers which are significant using the rules below:

Rule 1: Any number that isn't 0 is significant.

Rule 2: Any 0 that is between two numbers that are not 0 is significant.

Rule 3: Any 0 that is before all the non-zero digits is not significant.

Rule 4: Any 0 that is after all of the non-zero digits is only significant if there is a decimal point. In this case the significant numbers are 0.56480900.

Step 2: Identify the three most significant figures. These are the significant numbers which are furthest to the left (have the biggest values) i.e. 0.56480900.

Step 3: Look at the next number. If this number is 5 or above, then round up. If this number is 4 or less, do not round up.

In this case the next number is 8, so we round up to 0.565.

Question 2: Express the following numbers to the number of significant figures indicated:

- a) 4.74861 to 2 sig. fig.
- b) 507980 to 3 sig. fig.
- c) 809972 to 3 sig. fig.
- d) 06.345 to 3 sig. fig.
- e) 7840 to 3 sig. fig.
- f) 0.007319 to 3 sig. fig.

Question 3: Carry out the following calculations, expressing the numbers in standard form to the number of significant figures stated:

- a) $(4.567 \times 10^5) \times (2.13 \times 10^{-3})$ to 3 sig. fig.
- b) $(1.567 \times 10^3) \div (2.245 \times 10^{-1})$ to 4 sig. fig.
- c) $(5.4 \times 10^{-1}) \div (2.7 \times 10^{-3})$ to 1 sig. fig.
- d) $(2.00 \times 10^{-2}) \times (2.00 \times 10^{-4})$ to 3 sig. fig.



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Converting between units: These are essential to being able to answer questions correctly in A-Level chemistry.

Here is a list of the units you will see used during your chemistry A-Level. If some look unfamiliar, don't worry, you may not have come across them before, and we will teach them to you throughout the course.

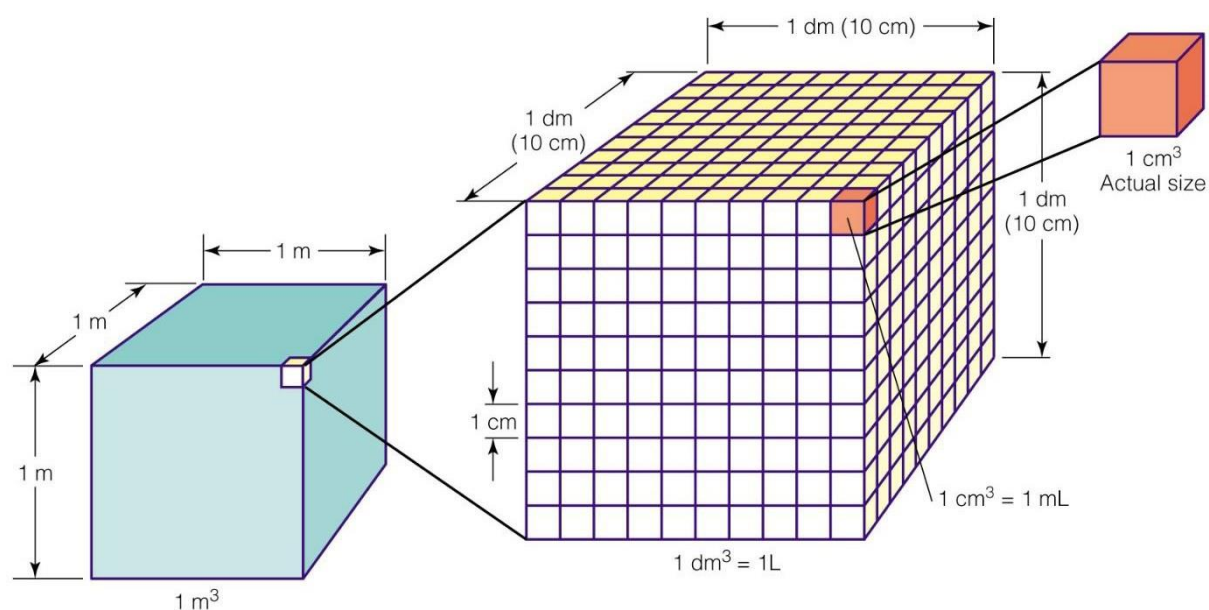
Length: mm, cm and m

Volume: cm^3 , dm^3 and m^3

For mass: g and kg.

Concentration: mol/dm^3 (mol dm^{-3}) and g/dm^3 (g dm^{-3})

Temperature: $^{\circ}\text{C}$ and Kelvin, K Note: 0°C is 273K



Complete the table by converting between cm^3 , dm^3 and m^3

cm^3	dm^3	m^3
1000000	1000	1
50		
	1	
		0.0034
	0.5	
25		
670		



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Question 1: Convert the following volumes:

- a) 12.2 cm^3 into dm^3
- b) 0.015 cm^3 into dm^3
- c) 132 dm^3 into cm^3
- d) 0.054 dm^3 into cm^3
- e) 25 dm^3 into m^3
- f) 0.48 m^3 into dm^3
- g) 25 cm^3 into m^3
- h) 381 m^3 into cm^3

Question 2: Which is bigger?

- a) What temperature is 0°C in K?
- b) What temperature is 1000 K in $^\circ\text{C}$?
- c) How many kg is 5 g ?
- d) How many m^3 is 14 dm^3 ?
- e) Order these from largest to smallest: 700 cm^3 , 0.06 dm^3 , $6.4 \times 10^{-4} \text{ m}^3$
- f) Order these from largest to smallest: 18 kg , $1.8 \times 10^5 \text{ g}$, $1.8 \times 10^{-4} \text{ g}$, $1.8 \times 10^2 \text{ kg}$



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Rearranging Equations:

Worked example: Rearranging equations

Example 1: $d = mV$ make m the subject**Answer:** To get rid of the V on the right side, multiply both sides by V

$$Vxd = m$$

This is better written out

$$m = Vd$$

Example 2:Concentration = $\frac{\text{mol}}{\text{volume}}$ make volume the subject**Answer:** Times both sides by volume

$$\text{Volume} = \frac{\text{mol}}{\text{conc}}$$

Example 3: $PV = nRT$ make T the subject.**Answer:** To get rid of the nR on the right side, divide both sides by nR

$$T = \frac{PV}{nR}$$

Question 1:

- Rearrange $n = C \times V$ to make C the subject of the formula.
- Rearrange $n = C \times V$ to make V the subject of the formula.
- Rearrange the equation $pV = nRT$ to make p the subject of the formula.
- Rearrange the equation $pV = nRT$ to make n the subject of the formula.
- Rearrange the equation $pV = nRT$ to make R the subject of the formula.



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Even though these next questions are a bit trickier, follow the same method (what you do to one side, you must do to the other side).

Rearrange these equations in multiple steps, writing down your workings.

Question 2:

- a) Rearrange $248 - 376 = x + 202$ to find the value of x
- b) Rearrange $y + 123 = -478 + 1020$ to find the value of y

Please try to attempt the following questions if you are unable to achieve the correct value; that's ok. Please make a note, and we will support you with this in September. 😊

Question 3:

- a) 6. Rearrange $102 + 2(-346) = -135 - z$ to find the value of the unknown z

b) $\frac{V_1}{T_1} = \frac{V_2}{T_2}$ make T_2 the subject

Extension:

Solve $F = \frac{9}{5}C + 32$ make C the subject

Please now mark your answers in a different colour pen:

Answer to questions:**Standard form and significant figures****Question 1:**

- a) i. 2.3×10^{-3} ii. 1.032×10^3 iii. 2.75×10^6 iv. 5.28×10^{-4}
- b) i. 2010 ii. 0.052 iii. 841 iv. 0.0001
- c) i. 1.43×10^{24} ii. 5.16×10^{-3} iii. 1.50×10^{24}

Question 2:

- a) 4.7
- b) 508000
- c) 810000
- d) 6.35
- e) 7840
- f) 0.00732

Question 3:

- a) 9.73×10^2
- b) 6.980×10^3
- c) 2×10^2
- d) 4.00×10^{-6}



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Question 1: Converting the following volumes:

- a) 0.0122 dm^3
- b) 0.000015 dm^3 or $1.5 \times 10^{-5} \text{ dm}^3$
- c) 132000 cm^3
- d) 54 cm^3
- e) 0.025 m^3
- f) 480 dm^3
- g) 0.000025 or $2.5 \times 10^{-5} \text{ m}^3$
- h) 381000000 cm^3 or $3.81 \times 10^8 \text{ cm}^3$

Question 2: Which is bigger?

- a) 273 K
- b) 727°C
- c) 5×10^{-3}
- d) 0.014 m^3
- e) $700 \text{ cm}^3 > 6.4 \times 10^{-4} \text{ m}^3 > 0.06 \text{ dm}^3$,
- f) $1.8 \times 10^2 \text{ kg} = 1.8 \times 10^5 \text{ g} > 18 \text{ kg} > 1.8 \times 10^{-4} \text{ g}$,

Rearranging Equations:

Question 1:

- a) $c = \frac{n}{v}$
- b) $v = \frac{n}{c}$
- c) $p = \frac{nRT}{v}$
- d) $n = \frac{pV}{RT}$
- e) $R = \frac{pV}{nT}$

Question 2:

- a) $x = 248 - 376 - 202$
 $x = -330$
- b) $y = -48 + 1020 - 123$
 $y = 419$

Question 3:

- a) $z = -102 + 2 \times 1020 - 123$
 $z = 455$
- b) $T_2 = \frac{V_2 T_1}{V_1}$

Extension:

$$C = \frac{5}{9}F - 17.7$$

Or you can write it out

$$C = \frac{5}{9}(F - 32)$$



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Part 2: Research activities

<https://www.youtube.com/watch?v=LtOWYQBQdoY>



BBC Documentary Atom 2 The Key to The Cosmos - YouTube

Using this documentary and your own research, answer the following questions on the **Development of the atomic model**:

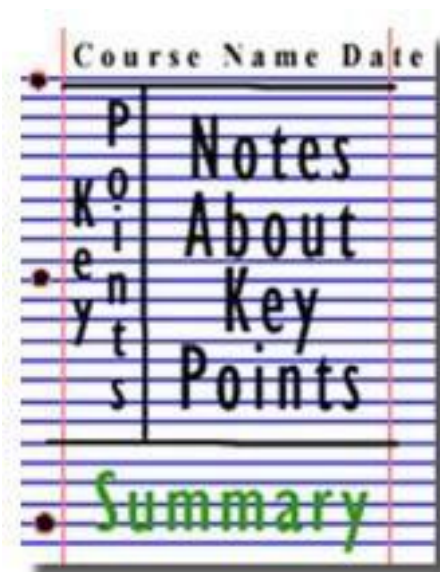
1. What were the major ideas about atoms that led to the current model of the atom?
2. Who were the Scientists involved?
3. How was new information found?

Summarise this information into no more than two sides of A4 and present your information as Cornell notes:

Use these to help you (How to make Cornell notes):

<https://www.youtube.com/watch?v=lsR-10piMp4>

<http://coe.jmu.edu/learningtoolbox/cornellnotes.html>





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Task 3: Things to revise before starting the course

How confident do you feel in the Chemistry topics covered at GCSE?

	Knowledge statement	Understanding
<u>1</u>	I know the meanings of the words' atom, element, molecule, compound, and ion, and when to use them.	
<u>2</u>	I know how to write the formula for the 1 st 20 elements from the periodic table in an equation.	
<u>3</u>	I know how to work out the formulae of the key ions.	
<u>4</u>	I know how to balance charges in order to write the formulae for ionic compounds.	
<u>5</u>	I know how to name ionic compounds.	
<u>6</u>	I know how to predict whether a compound is ionic or covalent.	
<u>7</u>	I know how to write the formula for a covalent compound from its chemical name.	
<u>8</u>	I know how to write balanced symbol equations when given the word equation.	
<u>9</u>	I know the reactions between an acid and d) a reactive metal e) a metal hydroxide f) a metal oxide g) a metal carbonate	
<u>10</u>	a) I know the formulae for the common acids: <i>hydrochloric acid, nitric acid and sulfuric acid</i>	

Control+Click on the numbers to go to a video on the topic

Fill in this table using the "traffic light" system:

Green = understand fully

Amber = shaky understanding (should look over)

Red = do not understand at all (work on before September)



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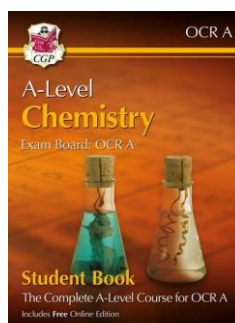
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After all the maths questions you have completed (well done for completing all of the questions in task 1 😊). Again, using the traffic light system, please fill in the table with how confident you feel in each area.

How are your maths skills?

	Knowledge statement	Understanding
<u>1</u>	I know how to write a number to a given number of significant figures.	
<u>2</u>	I know how to determine the number of significant figures a calculated answer should have.	
<u>3</u>	I know how to convert a number into standard form and from standard form to longhand form.	
<u>4</u>	I know how to carry out calculations using numbers in standard form.	
<u>5</u>	I know how to rearrange algebraic equations.	

Getting Equipped:



Textbook: A-Level Chemistry for OCR A: Year 1 & 2 Student Book with Online Edition*
(ISBN: 9781789086683)

Pens (at least two colours)
Pencils
Rubber
Ruler
A4 Level Arch Folder with at least 4 dividers

***Note:** If you are going to be a recipient of the college Bursary, please do not buy this book.

Well done for completing all the Pre-Course Work. We look forward to seeing you in September. 😊