Chemistry A Level at Dauntsey's

Course

We follow the OCR Chemistry A specification. Detailed information can be found at the link below.

http://www.ocr.org.uk/qualifications/as-a-level-gce-chemistry-a-h032-h432-from-2015/

Assessment

There are six teaching modules which we will cover over the two-year course. This specification is assessed as follows:

- Three exam papers to be sat at the end of the two-year course:
  - Paper 1 - 2h15 (100 marks) - assesses content from modules 1, 2, 3, 5.
  - Paper 2 - 2h15 (100 marks) - assesses content from modules 1, 2, 4, 6.
  - Paper 3 – 1h30 (70 marks) – assesses content from modules 1, 2, 3, 4, 5, 6.
- A 'practical endorsement', which will be assessed by completing teacher assessed practicals throughout the course, with the focus on achieving competence across a number of essential practical skills.

Teaching

Each class will have two Chemistry teachers, with each teacher taking one 'side' of the course. The two 'sides' of the course do not correspond directly to the content in the six modules, and there will be plenty of cross-over of concepts between the two sides.

Summer preparation

For those students who wish to do some preparation over the course, we recommend that you purchase a copy of 'Head Start to A-Level Chemistry', published by CGP:

Head Start to A Level Chemistry: *Bridging the gap between GCSE and A-Level*

https://www.cgpbooks.co.uk/secondary-books/as-and-a-level/a-level-books-on-kindle

In addition to this, it may be a good idea to go through the notes and practice problems on Maths for Chemistry which are attached as Appendix A below. They run through some of the basic maths skills which will be required in the Chemistry A Level course.

Appendix A - Some Key Mathematics for Chemistry

1. Converting units.

$1dm^3$ = 1 litre

$1\ cm^3$ = 1ml

$1dm^3$ = 1000ml = $1000cm^3$

Examples

a) Convert $25.2cm^3$ to dm^3

b) Convert 100ml to dm^3

c) Convert $0.25dm^3$ to cm^3

d) Convert 10^6litres to cm^3

2. Rearranging a formula.

If $a = \frac{b}{c}$ then $b = a \times c$ and $c = \frac{b}{a}$

Examples

a) If moles = Mass/RFM then Mass = ?

b) If moles = Mass/RFM then RFM = ?

c) If concentration = moles/volume then moles = ?

d) If concentration = moles/volume then volume = ?

3. Standard and index form.

A number in standard form is written as:

$a \times 10^b$

where $1 \leq a < 10$. The 'a' part is called the mantissa and 'b' is the exponent.

So, 1.2×10^{-3} is in standard form

0.12×10^{-2} is the same number though it is not in standard form. It is in index form and is still a correct way of writing the number!

NB. If you want to enter a number such as 10^{-3} into your calculator then you should remember to enter 1×10^{-3} not 10×10^{-3}. See example (a) below.

Examples

a) Use your calculator to calculate 0.25/(10^{-6})

b) What is 20.2 x 10^{-4} in standard form?

c) What is 0.0024 x 10^{-4} in standard form?

d) Calculate 10^{-9}/(6.02 x 10^{23})

4. Dividing by a fraction.

$z \div \frac{x}{y} = z \times \frac{y}{x}$ (turn the fraction upside down and multiply)

The top part of a fraction is the numerator.

The bottom part of a fraction is the denominator.

Examples

a) Divide 2.5 x 10^{-3} by 3/2

b) Divide 7.2 x 10^{3} by 0.1 (remembering that 0.1 = 1/10)

5. Significant Figures

The number of significant figures for a piece of data tells us how accurate it is.

e.g. 2.34 is 3 sig. figs or 3s.f.

0.0234 is 3 s.f. also

0.1 is 1 s.f. (it means we are *not* sure about whether it is 0.12 or 0.11 or 0.13 etc.)

0.100 is 3 s.f. (it means we *are* sure that it is *exactly* 0.100, not 0.12 or 0.105, etc)

When we do a calculation we should only quote our final answer to the number of sig. Figs in the *least accurate piece of data.*

e.g.

We have 9g of chlorine. A_r of Cl = 35.5. How many moles of chlorine atoms are there?

Moles = Mass/RFM (show your working!)

= 9/35.5 = 0.25352 mol = 0.3 mol (1 s.f.) since 9g is a 1 s.f. number.

It is very important, however, not to round your answers up or down in the *middle* of a long calculation, but to save this until the end.

e.g.

We have 9.2g of C_2H_6 (M_r = 30). What is exactly three times this amount in moles?

Firstly, note that the answer will be given to 2 s.f. since this is the least accurate data. Some students might say that multiplying by 3 is only a 1 s.f. number, but since it is exactly 3 we can treat it as 3.0 or 3.00 or even 3.000000!

Moles of C_2H_6	= Mass/RFM
	= 9.2/30 = 0.3066 mol
3 times this	= 3 x 0.3066 = 0.9198 = 0.92 mol (2 s.f.)
or rounding down	= 3 x 0.3 = 0.9 = 0.90 mol (2 s.f.)

The first of these two answers is better since it has not lost accuracy by rounding up or down too early in the calculation.

Examples

a) How many moles are in 6.00g of carbon atoms? A_r =12.0.
b) Calculate exactly six times the number of moles in 14.0g of sucrose (A_r = 342.3)

6. The use of 'per'

We can write grams per mole as g/mol or g mol^{-1}.

Notice that if we know the unit in this form it tells us the equation. For example, if the unit for concentration is mol/dm^3 then it tells us that to get concentration we divide the moles by the volume in dm^3.

Examples

a) Rewrite mol/dm^3 without the per symbol.

b) The unit of molar mass is g mol^{-1}. Give an equation involving molar mass.

7. Rules for dealing with Powers of Numbers.

$y^A \times y^B = y^{(A + B)}$

$y^A / y^B = y^{(A - B)}$

$(y^A)^B = y^{(A \times B)}$

$y^0 = 1$

These are useful in Chemistry for two reasons:

7(i) <u>Simplifying Expressions involving index form</u>

(without having to use a calculator!)

e.g.1 $(3 \times 10^3) \times (12 \times 10^{-3}) = 36 \times 10^{3-3} = 36 \times 10^0 = 36 \times 1 = 36$

e.g.2 $\dfrac{6 \times 10^{-3}}{3 \times 10^{-6}} = 6/3 \times 10^{-3-(-6)} = 2 \times 10^3$

e.g.3 $(2 \times 10^{-3})^2 = 2^2 \times (10^{-3})^2 = 4 \times 10^{-6}$

Examples - do not use a calculator

a) Simplify $(2 \times 10^3) \times (2.4 \times 10^2)$

b) Simplify $10^{-6} \times (8.5 \times 10^3)$

c) Simplify $(2.7 \times 10^{-2}) / (3 \times 10^{-3})$

d) Simplify $10^{-9}/10^{-6}$

e) Simplify $(8 \times 10^{-4})^2$

7 (ii) <u>Calculating and checking units</u>

e.g.1 moles = concentration x volume = mol dm^{-3} x dm^3 = mol dm^0 = mol

e.g.2 rate (mol dm^{-3} s^{-1}) = k x concentration (mol dm^{-3}). What are the units of k?

Rearrange to get an expression for k:

k = rate/concentration = $\dfrac{(\text{mol dm}^{-3}\ \text{s}^{-1})}{(\text{mol dm}^{-3})}$ = s^{-1}

Examples

a) K = $\frac{[\text{Concentration of } NH_3]^2}{[\text{Concentration of } N_2] \times [\text{Concentration of } H_2]^3}$

What is the unit of K?

b) rate (mol dm^{-3} s^{-1}) = k [concentration of I_2]^2. What are the units of k?

c) K = $\frac{[\text{Concentration of } SO_3]^2}{[\text{Concentration of } O_2] \times [\text{Concentration of} SO_2]^2}$

What is the unit of K?

We recommend the following websites to our A-level Chemistry students (you can click on the hyperlinks in the electronic version of this document):

- Catalyst, a science magazine for students aged 14-19
- Resources for students collated by Royal Society of Chemistry
- Chemistry World magazine from the RSC
- ChemNet (also from the RSC)
- New Scientist
- The Periodic Table videos from the University of Nottingham
- A level resources from the University of Liverpool
- Animations of organic reactions mechanisms from ChemTube3d
- Chemguide's A level chemistry notes (these are really good)
- A level resources from Knockhardy Publishing

The following links are to videos that will also be of interest to an A Level

Chemistry student.

- TED Talk- A crash course in Organic Chemistry

https://www.ted.com/talks/jakob_magolan_a_crash_course_in_organic_ch

emistry

- TED Talk- The chemistry of your smartphone https://www.ted.com/talks/cathy_mulzer_the_incredible_chemistry_powering_your_smartphone

- From Cambridge University- The strange new world of nanoscience.

https://www.youtube.com/watch?v=70ba1DByUmM

- The Christmas Lectures are also well worth a look.

https://www.rigb.org/christmas-lectures