Year 11 into Year 12 Transition Task

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Welcome to A-Level Chemistry

AQA Chemistry

https://www.aqa.org.uk/subjects/science/as-and-a-level/chemistry-7404-7405/specification-at-a-glance

You have just completed your GCSEs. For some of you, GCSEs were challenging, and you worked very hard for two years for your grade. Others might have achieved a good grade without ever breaking too much of a sweat, and others might have worked hard towards the end. Whichever of those groups you are in, A Level is different.

Work hard right from the start – this is the only one strategy that delivers success at this level. You will find this subject rewarding, interesting, stimulating, challenging, difficult, and a downright pleasure. Many students love this, and are hugely successful throughout their studies.

Some A level Chemistry students in the past did exceptionally well at GCSE, but their A level Chemistry grades did not match their expectations and previous success. It is because the subject is much more intellectually demanding than GCSE. These students adapt, improve, and normally succeed in the end. This is very impressive.

Chemistry is a challenging A Level that will test your resilience but brings with it huge rewards. Ensure you read this booklet carefully. Use the time you have before September constructively and come to your first lesson knowing exactly what to expect. It is going to be hard work, but fun. You must be willing to put in the time.

TRANSITION TASK 2

A level chemistry will use your knowledge from GCSE and build on this to help you understand new and more demanding ideas. Complete the following task to make sure your knowledge is up to date and you are ready to start studying:

Balancing chemical equations is the stepping stone to using equations to calculate masses in chemistry. There are loads of websites that give ways of balancing equations and lots of exercises in balancing.

Some of the equations to balance may involve strange chemicals - don't worry about that, the key idea is to get balancing right.

Use these links to help you review the content

http://bit.ly/pixlchem7
http://bit.ly/pixlchem8

Now balance the following equations

1. $H_2 + O_2 \rightarrow H_2O$
2. $S_8 + O_2 \rightarrow SO_3$
3. $HgO \rightarrow Hg + O_2$
4. $Zn + HCl \rightarrow ZnCl_2 + H_2$
5. $Na + H_2O \rightarrow NaOH + H_2$
6. $C_{10}H_{16} + Cl_2 \rightarrow C + HCl$
7. $Fe + O_2 \rightarrow Fe_2O_3$
8. $C_6H_{12}O_6 + O_2 \rightarrow CO_2 + H_2O$
9. $Fe_2O_3 + H_2 \rightarrow Fe + H_2O$
10. $Al + FeO \rightarrow Al_2O_3 + Fe$

TRANSITION TASK 3

A level chemistry will use your knowledge from GCSE and build on this to help you understand new and more demanding ideas. Complete the following task to make sure your knowledge is up to date and you are ready to start studying:

From this point on you need to be using an A level periodic table, not a GCSE one. There is one in the back of the specification your printed for Task 1.

Now that we have our chemical equations balanced, we need to be able to use them in order to work out masses of chemicals we need or we can produce.

Here is a comprehensive page on measuring moles, there are a number of descriptions, videos and practice problems.

You will find the first 6 tutorials of most use here:
http://bit.ly/pixlchem9

Now answer the following questions. Show your working.

1. How many moles of phosphorus pentoxide (P_4O_{10}) are in 85.2g?
2. How many moles of potassium are in 73.56g of potassium chlorate (V) ($KClO_3$)?
3. How many moles of water are in 249.6g of hydrated copper sulfate(VI) ($CuSO_4.5H_2O$)? For this one, you need to be aware the dot followed by $5H_2O$ means that the molecule comes with 5 water molecules so these have to be counted in as part of the molecules mass.
4. What is the mass of 0.125 moles of tin sulfate ($SnSO_4$)?
5. If I have 2.4g of magnesium, how many grams of oxygen(O_2) will I need to react completely with the magnesium?

   $2Mg + O_2 \rightarrow MgO$

TRANSITION TASK 4

A level chemistry will use your knowledge from GCSE and build on this to help you understand new and more demanding ideas. Complete the following task to make sure your knowledge is up to date and you are ready to start studying:

In chemistry a lot of the reactions we carry out involve mixing solutions rather than solids, gases or liquids. You will have used bottles of acids in science that have labels saying 'Hydrochloric acid 1M', this is a solution of hydrochloric acid where 1 mole of HCl, hydrogen chloride (a gas) has been dissolved in $1dm^3$ of water.

The dm^3 is a cubic decimetre, this is the same as 1 litre but from this point on as an A level chemist you will use the dm^3 as your volume measurement.

Use this link to review the concept and calculation of concentrations.

http://bit.ly/pixlchem10

Now answer these questions. Show your working.

1. What is the concentration (in mol dm^{-3}) of 9.53g of magnesium chloride ($MgCl_2$) dissolved in $100cm^3$ of water?

2. What is the concentration (in mol dm^{-3}) of 13.248g of lead nitrate ($Pb(NO_3)_2$) dissolved in $2dm^3$ of water?

3. If I add $100cm^3$ of 1.00 mol dm^3 HCl to $1.9dm^3$ of water, what is the molarity of the new solution?

4. What mass of silver is present in $100cm^3$ of $1moldm^{-3}$ silver nitrate ($AgNO_3$)?

5. The Dead Sea, between Jordan and Israel, contains 0.0526 mol dm^{-3} of Bromide ions (Br^-). What mass of bromine is in $1dm^3$ of Dead Sea water?

TRANSITION TASK 5

A level chemistry will use your knowledge from GCSE and build on this to help you understand new and more demanding ideas. Complete the following task to make sure your knowledge is up to date and you are ready to start studying:

One key skill in A level chemistry is the ability to carry out accurate titrations. You may well have carried out a titration at GCSE, at A level you will have to carry them out very precisely **and** be able to describe in detail how to carry out a titration - there will be questions on the exam paper about how to carry out practical procedures.

Use this link to review the content:

https://www.chemguide.co.uk/14to16/calculations/titrations.html

Now answer the following question. Show your working.

A solution of barium nitrate will react with a solution of sodium sulfate to produce a precipitate of barium sulfate.

$$Ba(NO_3)_{2(aq)} + Na_2SO_{4\ aq)} \rightarrow BaSO_{4(s)} + 2NaNO_{3(aq)}$$

What volume of 0.25 moldm^{-3} sodium sulfate solution would be needed to precipitate all of the barium from 12.5cm^3 of 0.15 mol dm^{-3} barium nitrate?

TRANSITION TASK 6

A level chemistry involves a lot of recording and manipulation of data including calculations. Understanding significant figures is a key component of this. Complete the following task to improve your understanding:

A successful chemistry student habitually labels all numbers, because the unit is important. Also of great importance is the number itself. Any number used in a calculation should contain only figures that are considered reliable; otherwise, time and effort are wasted. Figures that are considered reliable are called *significant figures*. Chemical calculations involve numbers representing actual measurements. In a measurement, significant figures in a number consist of: Figures (digits) definitely known + One estimated figure (digit)

Recording Measurements

When one reads an instrument (ruler, thermometer, graduate, burette, barometer, balance), they express the reading as one which is reasonably reliable.
For example, in the accompanying illustration, note the reading marked *A*.
This reading is definitely beyond the 7 cm mark and also beyond the 0.8 cm mark. We read the 7.8 with certainty. We further *estimate* that the reading is five-tenths the distance from the 7.8 mark to the 7.9 mark. So, we estimate the length as 0.05 cm more than 7.8 cm. All of these have meaning and are therefore significant. We express the reading as 7.85 cm, accurate to three significant figures. All of these figures, *7.85*, can be used in calculations.

In reading B we see that 9.2 cm is definitely known. We can include one estimated digit in our reading, and we estimate the next digit to be zero. Our reading is reported as 9.20 cm. It is accurate to three significant figures.

TRANSITION TASK 6

In an exam question use the lowest number of significant figures given in the question

Rules for Zeros
If a zero represents a measured quantity, it is a significant figure. If it merely locates the decimal point, it is not a significant figure.

Zero within a Number. In reading the measurement 9.04 cm, the zero represents a measured quantity, just as 9 and 4, and is, therefore, a significant number. A zero between any of the other digits in a number is a significant figure.

Zero at the Front of a Number. In reading the measurement 0.46 cm, the zero does not represent a measured quantity, but merely locates the decimal point. It is not a significant figure. Also, in the measurement 0.07 kg, the zeros are used merely to locate the decimal point and are, therefore, not significant. Zeros at the first (left) of a number are not significant figures.

Zero at the End of a Number. In reading the measurement 11.30 cm, the zero is an estimate and represents a measured quantity. It is therefore significant. Another way to look at this: The zero is not needed as a placeholder, and yet it was included by the person recording the measurement. It must have been recorded as a part of the measurement, making it significant. Zeros to the right of the decimal point, and at the end of the number, are significant figures.

Zeros at the End of a Whole Number. Zeros at the end of a whole number may or may not be significant. If a distance is reported as 1600 metres, one assumes two sig figs. Reporting measurements in scientific notation removes all doubt, since **all numbers written in scientific notation are considered significant**.

1 600 metres	1.6×10^3 metres	Two significant figures
1 600 metres	1.60×10^3 metres	Three significant figures
1 600 metres	1.600×10^3 metres	Four significant figures

TRANSITION TASK 6

Sample Problem #1: Underline the significant figures in the following numbers.

(a) 0.0420 cm answer = 0.0420 cm
(b) 5.320 in. answer = 5.320 in.
(c) 10 lb. answer = 10 lb.
(d) 0.020 ml answer = 0.020 ml
(e) 2 403 ft. answer = 2 403 ft.
(f) 80.5300 m answer = 80.5300 m
(g) 20.0 g answer = 20.0 g
(h) 2.4×10^3 kg answer = 2.4×10^3 kg

Now answer the following questions.

Question 1: Underline and give the number of significant figures in each of the following:

a) 402 m
b) 34.20 lbs
c) 0.03 sec
d) 0.00420 g
e) 3 200 liters
f) 0.0300 ft.
g) 5.1 x 104 kg
h) 0.48 m
i) 1 400.0 m
j) 78 323.01 g
k) 1.10 torr
l) 760 mm Hg

Question 2: Work out each of the following problems, observing significant figure rules. Show your working:

a) Three determinations were made of the percentage of oxygen in mercuric oxide. The results were 7.40%, 7.43%, and 7.35%. What was the average percentage?
b) A rectangular solid measures 13.4 cm x 11.0 cm x 2.2 cm. Calculate the volume of the solid.
c) If the density of mercury is 13.6 g/ml, what is the mass in grams of 3426 ml of the liquid?
d) A copper cylinder, 12.0 cm in radius, is 44.0 cm long. If the density of copper is 8.90 g/cm^3, calculate the mass in grams of the cylinder. (assume $\pi = 3.14$)

TRANSITION TASK 7

You will be expected to determine the formulae of chemical using their names and vice versa on a regular basis in A level Chemistry. In order to do this you will need to learn the common ions given as part of this task. You will be tested on them in your very first lesson.

Tips for Learning the Ions

1. An element's place on the table suggests the charge on the ion, since the neutral atom gains or loses a predictable number of electrons in order to obtain a noble gas configuration.

   - All Group 1 Elements (alkali metals) lose one electron to form an ion with a 1+ charge
   - All Group 2 Elements (alkaline earth metals) lose two electrons to form an ion with a 2+ charge
   - Group 13 metals like aluminium lose three electrons to form an ion with a 3+ charge
   - All Group 17 Elements (halogens) gain one electron to form an ion with a 1- charge
   - All Group 16 non-metals gain two electrons to form an ion with a 2- charge
   - All Group 15 non-metals gain three electrons to form an ion with a 3- charge

   Notice that cations keep their name (sodium ion, calcium ion) while anions get an "-ide" ending (chloride ion, oxide ion).

2. Metals that can form more than one ion will have their positive charge denoted by a roman numeral in parenthesis immediately next to the name of the metal e.g. Iron (II) and Iron III)

3. Some anions containing oxygen bonded to other elements end with the suffix '–ate' and are named based on the oxidation number of that element in the ion e.g. Sulfate (IV) and Sulfate (VI)

You will learn more about this later on, but for now just memorise the ions as shown on the next page.

TRANSITION TASK 7

A mastery of the common ions, their formulas and their charges, is essential to success in your first year of A-Level Chemistry.
You are expected to know all of these ions for your first lesson and you will be given a quiz on them. You will be allowed a periodic table.

Postive Ions (Cations)					
1+ Cations	*Name*	*2+ Cations*	*Name*	*Other Cations*	*Name*
H^+	Hydrogen	Be^{2+}	Beryllium	Al^{3+}	Aluminium
Li^+	Lithium	Mg^{2+}	Magnesium	Ga^{3+}	Gallium
Na^+	Sodium	Ca^{2+}	Calcium		
K^+	Potassium	Sr^{2+}	Strontium		
Rb^+	Rubidium	Ba^{2+}	Barium		
Cs^+	Caesium				
		Co^{2+}	Cobalt(II)	Co^{3+}	Cobalt(III)
Cu^+	Copper(I)	Cu^{2+}	Copper(II)		
Ag^+	Silver	Fe^{2+}	Iron(II)	Fe^{3+}	Iron(III)
Hg_2^{2+}	Mercury(I)	Hg^{2+}	Mercury(II)		
NH_4^+	Ammonium	Pb^{2+}	Lead(II)	Pb^{4+}	Lead(IV)
		Sn^{2+}	Tin(II)	Sn^{4+}	Tin(IV)

Negative Ions (Anions)			
1– Anions	*Name*	*2– or 3– Anions*	*Name*
H^-	Hydride	O_2^{2-}	Peroxide
F^-	Fluoride	O^{2-}	Oxide
Cl^-	Chloride	S^{2-}	Sulfide
Br^-	Bromide	Se^{2-}	Selenide
I^-	Iodide		
		$Cr_2O_7^{2-}$	Dichromate(VI)
OH^-	Hydroxide	CrO_4^{2-}	Chromate(VI)
HCO_3^-	Hydrogen Carbonate	CO_3^{2-}	Carbonate
HSO_4^-	Hydrogen Sulfate	SO_3^{2-}	Sulfate(IV)
CN^-	Cyanide	SO_4^{2-}	Sulfate(VI)
NH_2^-	Amide		
NO_2^-	Nitrate(III)	N^{3-}	Nitride
NO_3^-	Nitrate(V)	P^{3-}	Phosphide
ClO^-	Chlorate(I)	As^{3-}	Arsenide
ClO_2^-	Chlorate(III)		
ClO_3^-	Chlorate(V)	PO_4^{3-}	Phosphate
ClO_4^-	Chlorate(VII)	BO_3^{3-}	Borate
MnO_4^-	Permanganate or Manganate(VII)		