

CHEMISTRY



11 - 12 TRANSITION WORK

Introduction

This work aims to prepare you for success in year 12. The jump in difficulty between GCSE and A level can be daunting and these tasks should make that a bit easier for you.

It will help develop skills such as balancing equations, predicting reactions and calculating masses. These skills are taught at GCSE but need to be reinforced before beginning your A Level course.

This work will be looked at and marked in the first lesson back, so bring it with you in September!

1 - Prepare for learning

For this subject you will need the following:

- Pens
- Pencils
- Ruler
- Scientific calculator
- Ring bound folder
- Plastic wallets for notes and handouts

We will provide textbooks for you, but if you wish to get ahead and purchase a revision guide, this is the one we recommend:

<https://www.cgpbooks.co.uk/secondary-books/as-and-a-level/science/chemistry/crar73-a-level-chemistry-ocr-a-year-1-2>

Tasks for learning

These tasks build on GCSE content you should already be familiar with, but there is a higher level of challenge. To the best of your ability, complete these tasks by hand and bring them to your first lesson.

Task 1 - Balancing Equations

0.1.1 Balancing equations

1. $\dots\text{C} + \dots\text{O}_2 \longrightarrow \dots\text{CO}$
2. $\dots\text{Ba} + \dots\text{H}_2\text{O} \longrightarrow \dots\text{Ba(OH)}_2 + \dots\text{H}_2$
3. $\dots\text{C}_2\text{H}_6 + \dots\text{O}_2 \longrightarrow \dots\text{CO}_2 + \dots\text{H}_2\text{O}$
4. $\dots\text{HCl} + \dots\text{Mg(OH)}_2 \longrightarrow \dots\text{MgCl}_2 + \text{H}_2\text{O}$
5. $\dots\text{N}_2 + \dots\text{O}_2 \longrightarrow \dots\text{NO}$
6. $\dots\text{Fe}_2\text{O}_3 + \dots\text{C} \longrightarrow \dots\text{Fe} + \dots\text{CO}_2$
7. $\dots\text{CH}_3\text{CH}_2\text{OH} + \dots[\text{O}] \longrightarrow \dots\text{CH}_3\text{COOH} + \dots\text{H}_2\text{O}$
8. $\dots\text{HNO}_3 + \dots\text{CuO} \longrightarrow \dots\text{Cu(NO}_3)_2 + \text{H}_2\text{O}$
9. $\dots\text{Al}^{3+} + \dots\text{e}^- \longrightarrow \dots\text{Al}$
10. $\dots[\text{Fe(H}_2\text{O)}_6]^{3+} + \dots\text{CO}_3^{2-} \longrightarrow \dots\text{Fe(OH)}_3(\text{H}_2\text{O)}_3 + \dots\text{CO}_2 + \dots\text{H}_2\text{O}$

Task 2 - Constructing Ionic Formulae

1. For each of the following ionic salts, determine the cation and anion present and use these to construct the formula of the salt. (5 marks)
 - a. Magnesium oxide
 - b. Sodium sulphate
 - c. Calcium hydroxide
 - d. Aluminium oxide
 - e. Copper(I) oxide
2. When an acid is added to water it dissociates to form H^+ ions (which make it acidic) and an anion. These acidic hydrogen atoms can be used to determine the charge on the anion. Deduce the charge on the anions in the following acids. The acidic H atoms, H^+ , have been underlined for you. (5 marks)
 - a. $\underline{\text{H}}_2\text{SO}_3$
 - b. $\underline{\text{H}}\text{NO}_3$
 - c. $\underline{\text{H}}_3\text{PO}_4$
 - d. $\text{HCOO}\underline{\text{H}}$
 - e. $\underline{\text{H}}_2\text{CO}_3$

Task 3 - Writing Equations from Text

The following questions contain a written description of a reaction. In some cases, the products may be missing as you will be expected to predict the product using your prior knowledge. For more advanced equations you may be given some of the formulae you need. For each one, write a balanced symbol equation for the process.

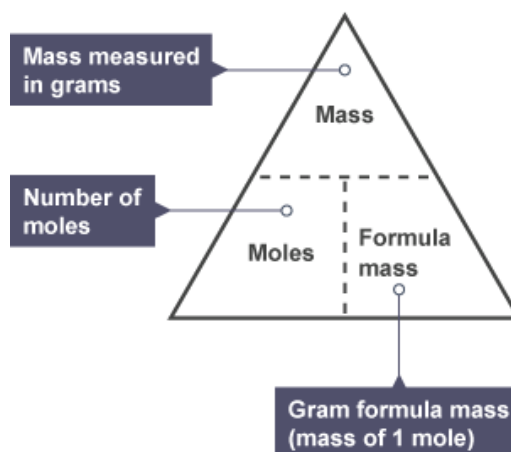
1. The reaction between silicon and nitrogen to form silicon nitride Si_3N_4 .
2. The neutralisation of sulphuric acid with sodium hydroxide.
3. The preparation of boron trichloride from its elements
4. The reaction of nitrogen and oxygen to form nitrogen monoxide.
5. The combustion of ethanol ($\text{C}_2\text{H}_5\text{OH}$) to form carbon dioxide and water only.
6. The formation of silicon tetrachloride (SiCl_4) from SiO_2 using chlorine gas and carbon.
7. The extraction of iron from iron(III) oxide (Fe_2O_3) using carbon monoxide.
8. The complete combustion of methane.
9. The formation of one molecule of ClF_3 from chlorine and fluorine molecules.
10. The reaction of nitrogen dioxide with water and oxygen to form nitric acid.

Task 4 - Moles and Mass

One mole of a substance is equal to 6.02×10^{23} atoms, ions or particles of that substance. This number is called the Avogadro constant.

The value of the Avogadro constant was chosen so that the relative formula mass of a substance weighed out in grams is known to contain exactly 6.02×10^{23} particles. We call this mass its molar mass.

Use the equation above to help you answer the following questions.

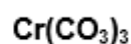
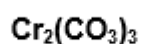


1. Calculate the amount of substance, in moles, in: (3 marks)
 - a. 32 g of methane, CH_4 (molar mass, 16.0 mol^{-1})
 - b. 175 g of calcium carbonate, CaCO_3
 - c. 200 mg of aspirin, $\text{C}_9\text{H}_8\text{O}_4$
2. Calculate the mass in grams of: (3 marks)
 - a. 20 moles of glucose molecules (molar mass, 180 g mol^{-1})

- b. 5.00×10^{-3} moles of copper ions, Cu^{2+}
c. 42.0 moles of hydrated copper sulfate, $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$
3. a. 3.09 g of a transition metal carbonate was known to contain 0.0250 mol.
i. Determine the molar mass of the transition metal carbonate. (1 mark)
ii. Choose the most likely identity for the transition metal carbonate from the list below:



4. 4.26 g of a sample of chromium carbonate was known to contain 0.015 mol.
Which of the following is the correct formula for the chromium carbonate? (2 marks)



BONUS QUESTION

If you had 1 mole of pennies which you could share with every person on earth how much could you give each person? Approximate world population = 8 000 000 000.

3 - Expand your mind

These tasks are not compulsory, but if you would like to delve a little deeper into your subject have a look at the websites below, pick the area that is the most interesting to you and write a summary of the science! It would be great to hear your opinions when we start the course.

Chemical bonds

<https://www.sciencenewsforstudents.org/article/explainer-what-are-chemical-bonds>

<https://chem.fsu.edu/chemlab/chm1046course/interforces.html>

Carbon chemistry

<https://bio.libretexts.org>

<https://www.vedantu.com/chemistry/carbon-and-its-importance>

Atoms and elements

<https://www.atomicarchive.com/science/physics/atomic-structure.html>

<https://www.compoundchem.com/2016/10/13/atomicmodels/>