Compulsory summer task

Summer Task Instructions:

A level Chemistry will use your knowledge from GCSE and build on this to help you understand new and more demanding ideas. You need to complete the following tasks to get you ready to start your studies in September. These activities directly link to the first 3 units you will study at A Level Chemistry, they will be assessed in a mini-assessment in the 2nd lesson back which (alongside) your initial assessment will confirm your suitability for A Level Chemistry. This booklet can either be printed off or filled in on your computer/paper.

Deadline for task:

First Chemistry lesson back after Summer holidays

Please email l.dawson@springwoodhighschool.co.uk if you have any questions

Task 1 -Key equations

Chemical equations are a fundamental aspect of chemistry. Complete the following equations using the text and links to support you.

Part 1 - metals and acids

When a metal reacts with an acid two products are released, these are a salt and hydrogen gas. The type of salt formed depends on the acid. The three strong acids you should be able to recall from GCSE are nitric acid, sulfuric acid and hydrochloric acid. These each form different salts. If the acid used is hydrochloric acid then the ending of the name of salt will be chloride, if the acid used is nitric acid the ending will be nitrate and for sulfuric acid the ending will be sulfate. The beginning of the name comes from the metal used. For example sodium + hydrochloric acid → sodium chloride + hydrogen (the ending is chloride due to the hydrochloric acid and the beginning is sodium as sodium is the metal used). It is important in reactions that you name the specific salt that is formed.

Now answer the following questions using the above text and the link provided.

1. metal + acid → _____ + _____
2. Iron + sulfuric acid → _____ + _____

3. Copper + Nitric acid → _____ + _____
4. Sodium + sulfuric acid → _____ + _____
5. Calcium + hydrochloric acid → _____ + _____

Part 2 - acid + base

When an acid and a base react together a neutralisation reaction takes place. Salt and water are always produced, however the type of base depends on whether there is an additional product. There are three types of bases you should be familiar with from GCSE chemistry. These are: metal oxides, metal hydroxides and metal carbonates. When any of these react with the acid salt and water are made, however with there is a metal carbonate you get the additional product of carbon dioxide.

Now answer the following questions using the above text and the link provided.

6. base + acid → _____ + _____
7. Iron oxide + sulfuric acid → _____ + _____
8. Copper hydroxide + Nitric acid → _____ + _____
9. Sodium carbonate + sulfuric acid → _____ + _____ + _____.
10. Calcium + hydrochloric acid → _____ + _____

Part 3 - symbol equations

In GCSE you needed to be able to construct symbol equations, this applies for A Level Chemistry also. However, there are more formulas you now need to learn in preparation for this. From GCSE you should be able to recall the formulas of the 3 acids.

1. Sulfuric acid = _____
2. Nitric acid = _____
3. Hydrochloric acid = _____

To construct full symbol equations you also need to know the charges on different ions. Some of these you will have to learn for A Level Chemistry (NH_4^+, CO_3^{2-}, SO_4^{2-}, OH^-, NO_3^-, PO_4^{3-}, Ag^+, Zn^{2+}). However, when working with groups 1-7 you should already be able to predict the charges on certain ions based on the group they are in.

What are the charges and formulas for the following:

1. Sodium ion: _____
2. Calcium ion: _____
3. Aluminium ion: _____
4. Chloride ion: _____
5. Oxide ion: _____

Once you have worked out or recalled the formula and charge for each ion you can then work out the formula of the compound. Here is a worked example for magnesium chloride:

- Step 1: write the ions next to each other with their charges

  Mg^{2+} Cl^-

- Step 2: Swap the numbers next to the charges onto the other element

  $MgCl_2$

Here are some links to worked examples: https://www.youtube.com/watch?v=a8PZQgSnh7k or https://www.youtube.com/watch?v=219b02FO7io

Now write out the following formulas:

1. Sodium oxide

2. Potassium nitrate

3. Magnesium sulfate

4. Sodium nitrate

5. Lithium chloride

Using your answers from the previous question write these equations out as balanced symbol equations:

1. Sodium + oxygen → sodium oxide

   _____

2. Potassium + nitric acid → potassium nitrate + hydrogen

   _____

3. Magnesium oxide + sulfuric acid → magnesium sulfate + water

   _____

4. sodium carbonate + nitric acid → sodium nitrate + water + carbon dioxide

   _____

5. Lithium + hydrochloric acid → lithium chloride

   _____

Task 2. Numeracy

You need to be able to convert between several units and learn several equations for A Level Chemistry. Most of these you will have come across from GCSE Chemistry, however some you may not have. Complete the following exercise to prepare you for the maths in chemistry. In each section there is a link to support you if you cannot remember how to do this.

Conversions

Convert the following into m^3:

1. $40cm^3$
2. $1000cm^3$
3. $75dm^3$
4. $980dm^3$
5. $12000cm^3$

Moles calculations

Calculate the relative formula mass (Mr) for each of the following, you can use these links to help you if you are unsure:

https://www.youtube.com/watch?v=it_fMQu5ivg&pp=0gcJCdgAo7VqN5tD or

https://www.youtube.com/watch?v=V4Pva9KWVsA

1. O_2

2. H_2SO_4

3. HNO_3

4. NaOH

5. H_2

What is the equation used to calculate moles from mass and relative formula mass?

_____

Now calculate the number of moles in each of the following, use this link to help you if you are unsure: https://www.youtube.com/watch?v=wPGVQu3UXpw

1. In 32g of O_2

2. 49g of H_2SO_4

3. 15.75g of HNO_3

4. 5g of NaOH

5. 0.5g of H_2

Rearrange the equation linking mass, moles and Mr to calculate mass:

_____

Now calculate the mass when you have the following, link here to help:

https://www.youtube.com/watch?v=AUbYSzFjZkA

1. 3mol of O_2

2. 0.5mol of H_2SO_4

3. 1.25mol of HNO_3

4. 2mol of NaOH

5. 0.15mol of H_2

Volume calculations:

The equation to work out volumes of gases at room temperature and pressure is:

volume(dm3) = moles x 24

Calculate the volumes of the following:

1. 2mol of a gas

   _____

2. 4mol of a gas

   _____

3. 0.5mol of a gas

   _____

4. 3mol of a gas

   _____

5. 2.7mol of a gas

   _____

Task 3. Bonding quiz

Bonding plays an important role in A Level Chemistry, most of the higher content cannot be accessed unless you understand the concepts of structure and bonding. Complete the following quiz on bonding. If you are unsure you can use these links to provide revision first.

1. Ionic bonds form between…
   a) two metals
   b) two non-metals
   c) a metal and a non-metal
2. Covalent bonding involves...
   a) transfer of electrons
   b) sharing of electrons
   c) free movement of electrons
3. Metals conduct electricity because...
   a) they have delocalised electrons
   b) they have tightly held electrons
   c) their atoms do not move
4. What type of bonding is found in water (H_2O)?
   a) ionic
   b) metallic
   c) covalent
5. Which of these substances has a giant ionic lattice structure?
   a) sodium chloride
   b) oxygen
   c) methane
6. In an ionic bond, the metal atom becomes...
   a) a negative ion
   b) a neutral atom
   c) a positive ion
7. Why do covalent substances usually have low melting and boiling points?
   a) their atoms are very heavy
   b) they have strong bonds between molecules
   c) they have weak intermolecular forces between molecules
8. Graphite conducts electricity because...
   a) it has a sea of delocalised electrons
   b) it has free electrons in layers
   c) it contains ions that can move
9. Why do ionic compounds conduct electricity when molten or dissolved?
   a) electrons can move freely
   b) ions are free to move
   c) the lattice becomes stronger
10. Which of these is a property of metals due to metallic bonding?
    a) brittle
    b) poor conductor of heat
    c) malleable
11. A covalent bond forms when two atoms...
    a) lose electrons
    b) gain electrons
    c) share electrons
12. Which of these substances is held together by metallic bonding?
    a) magnesium
    b) carbon dioxide
    c) sodium chloride
13. What type of structure does diamond have?
    a) simple molecular
    b) giant covalent
    c) metallic lattice
14. The electrons in a metal are best described as...
    a) fixed in place
    b) shared in pairs
    c) delocalised
15. Sodium (Na) reacts with chlorine (Cl) to form NaCl. What happens to the sodium atom?
    a) It shares one electron
    b) It loses one electron
    c) It gains one electron
16. Covalent compounds do not conduct electricity because...
    a) they have no electrons
    b) they are too dense
    c) they do not have free ions or electrons
17. Which of the following has both strong covalent bonds and weak intermolecular forces?
    a) diamond
    b) oxygen (O_2)
    c) sodium

To finish: complete the attached google form quiz to test what you have learned. Please input your name in the response, if there are any elements you struggle with, the form will provide you with links to revise these sections.

https://docs.google.com/forms/d/e/1FAIpQLSenuaC27D02n49_KurpvvdLTj617AWfYf08qZ7nwRDtKVQd4g/viewform?usp=dialog