A Level Chemistry

Transition Booklet

This booklet contains a series of tasks designed to refresh your GCSE Chemistry knowledge to prepare you for starting your A level studies.

**Year 11 into Year 12 Transition Work: Chemistry A level**

The step up from GCSE to A level Chemistry is large and we would like everyone to get off to a running start by doing a bit of preparation and revisiting some key skills (chemistry and maths) from GCSE.

This booklet contains different tasks to help with the transition to A level.

**Charges on ions**

**Task 1**

Learn the formulas of the ions in the table below:

|  |  |
| --- | --- |
| Positive ions | Negative ions  |
| Group 1 ions:Lithium, Li+Sodium, Na+potassium, K+Group 2 ions: magnesium, Mg2+calcium Ca2+barium Ba2+ | Group 3 ions: aluminium, Al3+Other common ions:Silver, Ag+Zinc, Zn2+Ammonium, NH4+Hydrogen, H+ | Group 7 ions: fluoride, F-chloride Cl-bromide Br-iodide I-Group 6 ions: oxide, O2-Sulphide, S2-  | Other common ions:Nitrate, NO3-Sulfate, SO42-Carbonate, CO32-Hydrogencarbonate, HCO3-Hydroxide, OH- Hydride, H- Phosphate, PO43- |

You will need to learn the formulas of all the above ions, as it essential that you can have them at your fingertips for writing equations throughout the course. Expect to have a quick test on these in week 1 or 2.

**Task 2 Working out Formulas of ionic compounds**

**Use the charges on the ions to work out the formulas of the ionic compounds listed below, the overall charge on the compound should be 0. Use this to work out how many of each ion is needed in the formula :**

1) silver bromide …………………………

2) sodium carbonate ……………………

3) potassium oxide ………………………

4) iron (III) oxide …………………………..

5) chromium (III) chloride ……………

6) calcium hydroxide ……………………

7) aluminium nitrate ……………………

8) sodium sulfate ………………………….

 9) lead (II) oxide …………………………..

 10) sodium phosphate ………………….

11) zinc hydrogencarbonate ……………

12) ammonium sulphate ………………

13) gallium hydroxide ……………………

14) strontium selenide …………………

15) radium sulfate ………………………….

16) sodium nitride ………………………….



**Balancing Equations**

From an early age you should have been able to balance chemical equations. However, at A level, you will often need to:

• work out the formulas yourselves

• work out what is made (so you need to know some basic general equations)

• for reactions involving ions in solution, write ionic equations

 Some general reactions you should know:

|  |  |
| --- | --- |
| General Reaction | Examples |
| substance + oxygen → oxides  | 2 Mg + O2 → 2MgO2 H2S + 3 O2 → 2 H2O + 2 SO2C3H8 + 5 O2 → 3 CO2 + 4 H2O  |
| metal + water → metal hydroxide + hydrogen | 2 Na + 2 H2O → 2 NaOH + H2  |
| metal + acid → salt + hydrogen | Mg + 2 HCl → MgCl2 + H2  |
| oxide + acid → salt + water | MgO + 2 HNO3 → Mg(NO3)2 + H2O  |
| hydroxide + acid → salt + water | 2 NaOH + H2SO4 → Na2SO4 + H2O  |
| carbonate + acid → salt + water + carbon dioxide | CuCO3 + 2 HCl → CuCl2 + H2O + CO2  |
| hydrogencarbonate + acid → salt + water + carbon dioxide | KHCO3  + HCl → KCl + H2O + CO2  |
| ammonia + acid → ammonium salt  | NH3 + HCl → NH4Cl  |
| metal carbonate → metal oxide + carbon dioxide (on heating) | CaCO3  → CaO + CO2  |

**Task 3**

Learn the word equations (in the above table) for the general reactions.

**Task 4**

1) Balance the following equations.

Mg + HNO3 → Mg(NO3)2 + H2 ……………………………………………………………………….

CuCl2 + NaOH → Cu(OH)2 + NaCl …………………………………………………………….

SO2 + O2 → SO3 ………………………………………………………………………………………….

C4H10 + O2 → CO2 + H2O ………………………………………………………………………………..

2) Give balanced equations for the following reactions.

a) sodium + oxygen → sodium oxide

b) aluminium + chlorine → aluminium chloride

c) calcium + hydrochloric acid → calcium chloride + hydrogen

d) ammonia + sulphuric acid → ammonium sulphate

**Atomic Number, Mass Number and Isotopes**

**Task 5**

Complete the following passages and the table:

**Atomic number** = number of …………………..

**Mass number** = number of ………………….. + number of …………………….

The number of protons, neutrons and electrons in an atom can be worked out using the atomic number and mass number.

Number of protons = ……………………………………………………………………..………………

Number of neutrons = ……………………………………………………………………………………

Number of electrons = ……………………………………………………………………………………

|  |
| --- |
| Atoms of the same element have the same number of ………….......... . In fact, it is the number of ………………… that determines what type of atom it is (e.g. all atoms with 6 protons are carbon atoms). Atoms of different elements have different numbers of …………………. . **Isotopes** are atoms with the same number of ………………. but a different number of ………………… . This means they are atoms of the same …………………….. with the same ………………. number but a different ……………… number  |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Atom | Atomic number | Mass number | Number of protons | Number of neutrons | Number of electrons  |
| 23Na11 |  |  |  |  |  |
| Li | 3 | 7 |  |  |  |
| Ar |  | 40 | 18 |  |  |
| K |  |  | 19 | 20 |  |
| Al |  |  |  | 14 | 13 |
| 235U92 |  |  |  |  |  |
| 238U92 |  |  |  |  |  |

**Structure and Bonding**

Key ideas from structure and bonding at GCSE will be revised and developed in term 1. Make sure you are confident with concepts from GCSE.

**Task 6**

Make a summary of the different types of bonding and structure in the table below:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Monatomic | Simple Molecular | Giant Covalent | Ionic | Metallic |
| Type of substancesAnd examples | Group 0 elements e.g. He, Ar, Ne |  |  |  |  |
| Type of bonding present | None |  |  |  |  |
| Description of structure | Individual atoms with very weak forces between them |  |  |  |  |
| LabelledDiagram to represent the structure |  |  |  |  |  |
| Name of particles | Atoms |  |  |  |  |
| Properties | Very low Boiling pointsNon-conductorsInsoluble |  |  |  |  |

**Task 7**

Draw dot and cross diagrams to represent the covalent bonding in the following molecules:

1. CH4
2. NH3
3. HCl
4. O2
5. CO2

**Task 8**

1. Draw diagrams to show how a magnesium atom reacts with an oxygen atom to form magnesium oxide, MgO Your diagram should show the electron transfer process.
2. Draw diagrams to show how a calcium atom reacts with chlorine atoms to form magnesium oxide, CaCl2. Your diagram should show the electron transfer process.

**Essential Maths skills for A Level chemistry**

**Significant figures**

A significant figure is any digit which you are confident is correct. A non-significant figure is any digit that you can’t be sure about. It’s important to recognise how many significant figures a value has been quoted to and how to round your own data to an appropriate number of significant figures.

Remember:

* Count the number of significant figures from the first non-zero digit.
* Zeros at the start of a number are not significant.

So: 187.23 is given to 5 s.f.

0.038 is given to 2 s.f.

 448 000 is given to 3 s.f.

* The rule for significant figures in calculations is to give your final answer to the same number of significant figures as the data value with the **fewest** significant figures used in the calculation.

**Task 9**

1. How many significant figures are each of these values given to?

1. 221 985 Pa ……………………………………………..
2. 15 200 g ……………………………………………..
3. 39.00 K ………………………………………………
4. 0.00186 mol …………………………………………..

2. Write each of the following to the number of significant figures shown:

a) 345789 4 sig figs ………………………… d) 6.0961 3 sig figs …………………………...

b) 297300 3 sig figs ……………………….. e) 0.001563 3 sig figs ……………………….

c) 0.07896 3 sig figs ………………… ……. f) 0.010398 4 sig figs …………………. ……

3. Complete the following sums and give the answers to the appropriate number of significant figures.

a) 6125 x 384 ………………………………………………………………………………………………...

b) 25.00 x 0.01 0 …………………………………………………………………………………………..

c) 13.5 + 0.18 ……………………………………………………………………………………………….

4. 0.175 moles of sodium chloride were dissolved in 1.2 dm3 of water.

Use the formula concentration (mol dm-3) = moles/volume (dm3) to calculate the concentration of the solution and quote your answer to the correct number of significant figures.

……………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………..

**Standard form**

Standard form tidies up very big or very small numbers in calculations.

For example, there are 602 000 000 000 000 000 000 000 particles in 1 mole. This is much easier to write as 6.02 x 1023

Or 0.0051 m3 is easier to write as 5.1 x 10-3 m3

**Task 10**

Write the following in standard form:

1. 0.000 035 mol.dm-3 ………………………………………………………………………….
2. 201500 Pa ………………………………………………………………………….
3. 0.0167 moles ……………………………………………………………………….…
4. 6850000000 dm3 ………………………………………………………………………….
5. 0.000000382 g ………………………………………………………………………….

Complete the following calculations and give the answers to the appropriate number of significant figures.

a) 6.125 x 10-3 x 3.5 ……………………………………………………………………………………...

b) 4.3 x 10-4 / 7.00 ………………………………………………………………………………………..

c) 4.0 x 108 + 35000 ……………….........................................................................

d) 0.00156 + 2.4 x 103 …………………………………………………………. …………………….

e) 6.10 x 10-2 – 3.4 x 10-5 …………………………………………………………………………..

f) 8.00 x 10-3 x 0.100 x 10-3 ……………………………………………………………………….

**Converting units**





**Task 11**

Convert the following units:

1. 10 kg into g ………………………………………….
2. 360 mg into g …………………………………………
3. 360 cm into m ………………………………………….
4. 360 cm3 into m3 ………………………………………..
5. 250 cm3 into dm3 ………………………………………….
6. 2 dm3 into mm3 …………………………………………
7. 42357 g into mg …………………………………………
8. 4.1 kJ mol-1 to J mol-1 …………………………………………….
9. During a titration, 31 cm3 of an alkali is needed to neutralise 0.025 dm3 of an acid. What is the total volume of the acid and alkali in cm3? ………………………………………………
10. What is the total mass, in grams, of 137 mg, 4g and 32kg? …………………………………………………………………………………………………………………………………...

**Using Formulae**

Formulae are used often in chemistry, as they give a relationship between two or more quantities. It is an essential skill that you need to be able to **rearrange formulae**, **substitute** values, **converting to the correct units** if needs be.

You should be familiar with these formulae:

Number of moles = mass of substance (in g)

 Relative molecular mass, Mr

Concentration (mol dm-3) = number of moles

 Volume of solution (dm3)

**You should always show your working**: give the formula

input values

then calculate your answer.

Always give the **correct units** with your answer.

**Task 12**

Show your working for each of these calculations.

1. The Mr of CO2 is 44. Calculate the number of moles in 125g of CO2

……………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………

1. 5.0 moles of CaCl2 is dissolved in 750 cm3 of water. What is the concentration in mol.dm-3?

……………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………..

1. 2.0 g of NaOH were dissolved in 250 cm3 of water in a flask.
2. How many moles of NaOH are in this solution?
3. What is the concentration of the solution in mol.dm-3?

………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………

**Rearranging equations**

Equations are used in chemistry in year 12 and 13. It is essential that you can rearrange equations before you begin A level chemistry.

Remember: Whatever you do to one side, you need to do to the other side of the equation.

For example, to rearrange c = n (concentration = number of moles /volume) to find n:

 V

Multiply both sides by v: c x v = n x v the ‘v’s cancel out

 v

 So c x v = n

**Task 13**

Rearrange these equations:

1. c = n to find v ……………………………………………………………………………….

 v

2. mass = moles to find moles …………………………………………………………………………………

 Mr

3. pV = nRT to find T …………………………………………………………………………………………………

4. Rate = k[NO]2 to find [NO] …………………………………………………………………………………...

5. G = H –T S to find T ……………………………………………………………………………………....