Quantitative chemistry

State the numbers of atoms for each element in H_2O.

Conservation of mass and balanced chemical equations

Quantitative chemistry

State the number of atoms for each element in NH_3.

Conservation of mass and balanced chemical equations

Quantitative chemistry

State the number of atoms in $Ca(OH)_2$.

Conservation of mass and balanced chemical equations

Quantitative chemistry

State the number of atoms for each element in $Ca(OH)_2$.

Conservation of mass and balanced chemical equations

Quantitative chemistry

Balance $H_2 + O_2 \rightarrow H2O$.

Conservation of mass and balanced chemical equations

Quantitative chemistry

Balance $Cl_2 + KI \rightarrow KCl + I_2$.

Conservation of mass and balanced chemical equations

Quantitative chemistry

What is the relative formula mass of a compound?

Relative formula mass

Quantitative chemistry

What is the relative formula mass of H_2SO_4?

Relative formula mass

Quantitative chemistry

What is the relative formula mass of Na_2CO_3?

Relative formula mass

Quantitative chemistry

What is the relative formula mass of $Ca(OH)_2$?

Relative formula mass

Nitrogen = 1, Hydrogen = 3.

Hydrogen = 2, Oxygen = 1.

Calcium = 1, Oxygen = 2, Hydrogen = 2.

5

$Cl_2 + 2KI \rightarrow 2KCl + I_2$

$2H_2 + O_2 \rightarrow 2H_2O$

H = 1 x 2 = 2;
S = 32;
O = 16 x 4 = 64;
2 + 32 + 64 = 98

The sum of the relative atomic masses of the atoms in the compound.

Ca = 40;
O = 16 x 2 = 32;
H = 1 x 2 = 2;
40 + 32 + 2 = 74

Na = 23 x 2 = 46;
C = 12;
O = 16 x 3 = 48;
46 + 12 +48 = 106

Quantitative chemistry

Explain why some reactions may seem to involve a change in mass?

Mass changes when a reactant or product is a gas

Quantitative chemistry

Describe the mass changes that occur when a metal reacts with oxygen in a non-enclosed system.

Mass changes when a reactant or product is a gas

Quantitative chemistry

Describe the mass changes that occur during the thermal decomposition of metal carbonates in a non-enclosed system.

Mass changes when a reactant or product is a gas

Quantitative chemistry

Define uncertainty.

Chemical measurements

Quantitative chemistry

How do you calculate the range of a set of measurements?

Chemical measurements

Quantitative chemistry

What does a large range of a set of measurements about the mean signify?

Chemical measurements

Quantitative chemistry

What is the formula to calculate the uncertainty about the mean.

Chemical measurements

Quantitative chemistry

What are chemical amounts measured using?

Moles (HT)

Quantitative chemistry

What is the symbol for the mole?

Moles (HT)

Quantitative chemistry

How is the relative formula mass of a substance linked to the mole?

Moles (HT)

When a metal reacts with oxygen the mass of the metal oxide will be more than the mass of the metal because of the addition of oxygen gas.

In a non-enclosed system one of the reactants or products may be a gas and its mass has not been measured.

Uncertainty is the amount of error in your measurements.

When a metal carbonate decomposes the mass of the products will appear less than the mass of the reactants because carbon dioxide gas is given off.

A large range suggest the measurements are imprecise and there is a large uncertainty about the results.

The range is the highest repeat value minus the lowest repeat value.

Moles

Uncertainty = range / 2.

The mass of 1 mole of a substance is equal to its relative formula mass in grams. E.g. Mr of carbon = 12; therefore 1 mole of carbon has a mass of 12g.

Mol

Quantitative chemistry

Compare the number of particles in one mole of carbon (C) with the number of particles in one mole of carbon dioxide (CO_2).

Moles (HT)

Quantitative chemistry

What is the value of the Avogadro constant?

Moles (HT)

Quantitative chemistry

What is the formula that links the number of moles, relative formula (or atomic) mass and mass in grams?

Moles (HT)

Quantitative chemistry

How many moles are there in 44g of H_2O?

Moles (HT)

Quantitative chemistry

Calculate the mass of 0.4mol of CO_2.

Moles (HT)

Quantitative chemistry

Describe the following equation in terms of moles: $Mg + 2HCl \rightarrow MgCl_2 + H_2$.

Amounts of substances in equations (HT)

Quantitative chemistry

What is the formula to calculate the percentage mass of an element in a compound?

Amounts of substances in equations (HT)

Quantitative chemistry

Describe how you would balance an equation using the masses of the products and reactants.

Using moles to balance equations (HT)

Quantitative chemistry

12g of magnesium (Mg) react with 8g of oxygen (O_2) to produce 20g of magnesium oxide (MgO). Write a balanced equation for the reaction.

Using moles to balance equations (HT)

Quantitative chemistry

What is a limiting reactant?

Limiting reactants (HT)

6.02×10^{23} per mole

The number of particles in one mole of carbon is equal to the number of particles in one mole of carbon dioxide.

Number of moles = 44 / (1 x 2) + 16;
Number of moles = 44 / 18;
Number of moles = 2.4 mol

Number of moles = mass in grams / Mr of the substance

1 mole of magnesium reacts with 2 moles of hydrochloric acid to form 1 mole of magnesium chloride and 1 mole of hydrogen.

Rearrange the equation; mass = number of moles x Mr of the substance; mass = 0.4 x (12 + (16 x2); mass = 0.4 x 44; mass = 17.6g

Divide the mass of each substance by its relative formula mass to find the number of moles of each substance. Divide the number of moles of each substance by the smallest number of moles in the reaction. If the any of the numbers are not whole numbers, multiply all the numbers so that they become whole numbers.

Percentage mass of an element in a compound = (Ar x number of atoms of the element / Mr of the compound) x 100

The limiting reactant limits the amount of product made in a reaction.

Number of moles of magnesium = 12 / 24 = 0.5 moles
Number of moles of oxygen = 8 / 32 = 0.25 moles.
Number of moles of MgO = 20 / 40 = 0.5 moles.
Divide each substance by the smallest number of moles in the reaction (oxygen = 0.25);
Mg = 0.5 / 0.25 = 2; O_2 = 0.25 /0.25 = 1; MgO = 0.5 / 0.25 = 2. The balanced equation for the reaction is:

$2Mg + O_2 \rightarrow 2MgO$

Quantitative chemistry

Why is it common to use an excess of one of the reactants in a chemical reaction?

Limiting reactants (HT)

Quantitative chemistry

What does the mass of a product formed in a chemical reaction depend upon?

Limiting reactants (HT)

Quantitative chemistry

What is a solution?

Concentration of solutions

Quantitative chemistry

What is a solute?

Concentration of solutions

Quantitative chemistry

What is a solvent?

Concentration of solutions

Quantitative chemistry

What is the formula to calculate the concentration of a solution?

Concentration of solutions

Quantitative chemistry

How many cm^3 in 1 dm^3?

Concentration of solutions

Quantitative chemistry

What is the concentration of a salt solution when 20g of salt is dissolved in 500cm^3 of water?

Concentration of solutions

Quantitative chemistry

Explain how the concentration of the solution is related to the mass of the solute and the volume of the solvent (HT).

Concentration of solutions

Chemical changes

What are the products when metals react with oxygen?

Metal oxides

The mass of the limiting reactant.

To ensure that the other reactants involved are used up.

The solid part of a solution which has been dissolved.

A solution consists of a solute (solid) dissolved in a solvent (liquid).

Concentration = mass of the solute (g) / volume of solvent (dm3).

The liquid part of the solution.

Convert 500cm3 into 0.5 dm^3. Concentration = mass of solute / volume of solvent: concentration = 20 / 0.5 = 40g/dm^3

1000cm^3 = 1 dm^3

Metal oxides.

The more solute added for a given volume the higher the concentration of a solution. The more solvent added for a given mass of solute the lower the concentration of the solution.