Chestnut Grove Academy

Chemistry

3. Quantitative Chemistry

Revisiting Booklet

Name:

Positive Resilient Open-minded Unified Determined

Chemical measurements

What does the law of conservation state?

____

____

Complete the missing masses:

Magnesium + Oxygen → Magnesium oxide

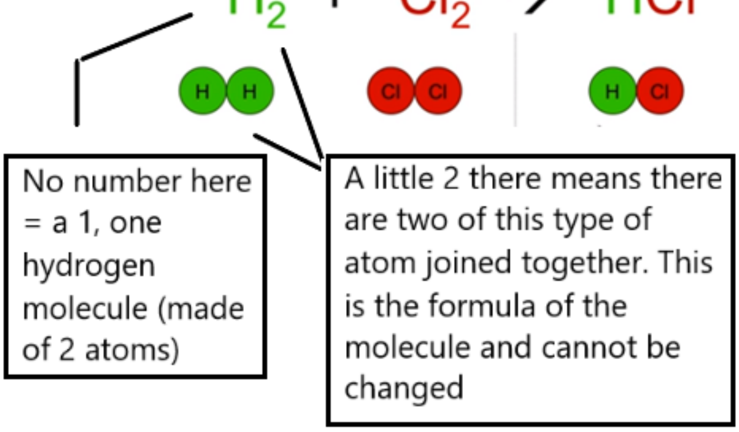
5 g + ______ → 5.6 g

Iron oxide + carbon monoxide → iron + carbon dioxide

150 g + 20g → 132g + ______ g

It is important to balance symbol equations to represent the law of conservation.

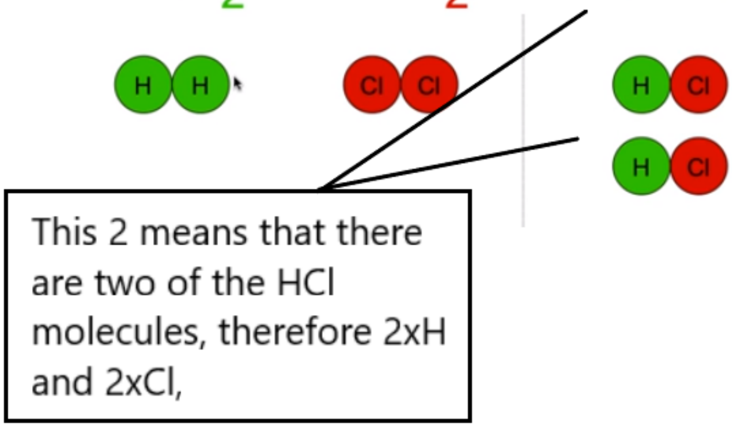
$$H_2 + Cl_2 \rightarrow HCl$$



Elements	Left	Right
H	2	1
Cl	2	1

You can only balance an equation by increasing the number of each type of molecule – adding a big number in front. For example:

$$H_2 + Cl_2 \rightarrow 2HCl$$



Elements	Left	Right
H	2	2
Cl	2	2

This equation is now balanced.

How many atoms are in the following:

$KMnO_4$

$Ca(OH)_2$

Try & balance the following equations:

1. $Al + O_2 \rightarrow Al_2O_3$

2. $Fe_2O_3 + CO \rightarrow Fe + CO_2$

3. C_3H_8 + O_2 → CO_2 + H_2O

4. NH_3 + O_2 → N_2 + H_2O

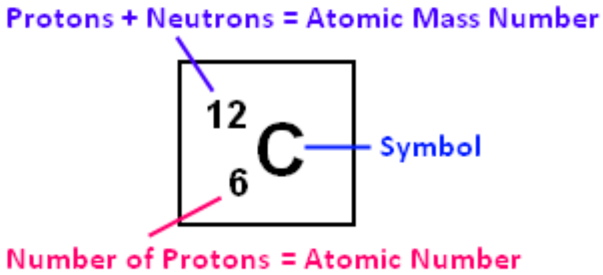
5. N_2 + H_2 → NH_3

6. HCl + Fe_2O_3 → $FeCl_3$ + H_2O

7. Fe + O_2 → Fe_2O_3

8. HCl + $Mg(OH)_2$ → $MgCl_2$ + H_2O

The relative atomic mass of an element is it's average mass compared to carbon, this mass takes into account the abundance of each isotope. The relative atomic mass of each atom can be found on the periodic table:



Carbon	
Relative atomic mass	
Atomic number	
Number of protons	
Number of neutrons	
Number of electrons	

What is an isotope?

Relative atomic mass of an atom can be calculated using the following equation:

$$\text{Relative Atomic mass of atom} = \frac{(\text{abundance} \times \text{atomic mass of isotope}) + (\text{abundance} \times \text{atomic mass of isotope})}{\text{total abundance}}$$

Calculate the following relative atomic masses:

1. bromine with 50% bromine-79 and 50% bromine-81

2. Magnesium with 79% magnesium-24, 10% magnesium-25 and 11% magnesium-26

What is relative formula mass (Mr)?

Calculate the relative formula mass for the following molecules:

- NaOH
- $CuSO_4$
- NH_3
- $Ba(OH)_2$

In a balanced chemical equation, the sum of the relative formula masses of the reactants in the quantities shown _______________ the sum of the relative formula masses of the products in the quantities shown.

Why would this reaction appear to involve a mass change?

$$Mg + 2HCl \rightarrow MgCl_2 + H_2$$

<u>Percentage Composition</u>

What is the percentage of:

1. N in NH_3
2. S in $FeSO_4$
3. S in H_2SO_4
4. O in $Al(OH)_3$
5. N in $(NH_4)_2SO_4$

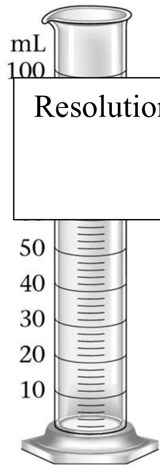
<u>Uncertainty</u>

Whenever a measurement is made there is always some uncertainty about the result obtained. We can estimate uncertainty in two ways:

1. Considering the resolution of measuring instruments
2. From the range of a set of repeat measurements

Resolution of instrument is plus or minus half of the smallest division that it measures to:

Measurement cm^3	Uncertainty cm^3	Minimum Volume cm^3	Maximum Volume cm^3
80.0	±0.05		
75.5	±0.10		
60	±0.20		
120	±0.25		



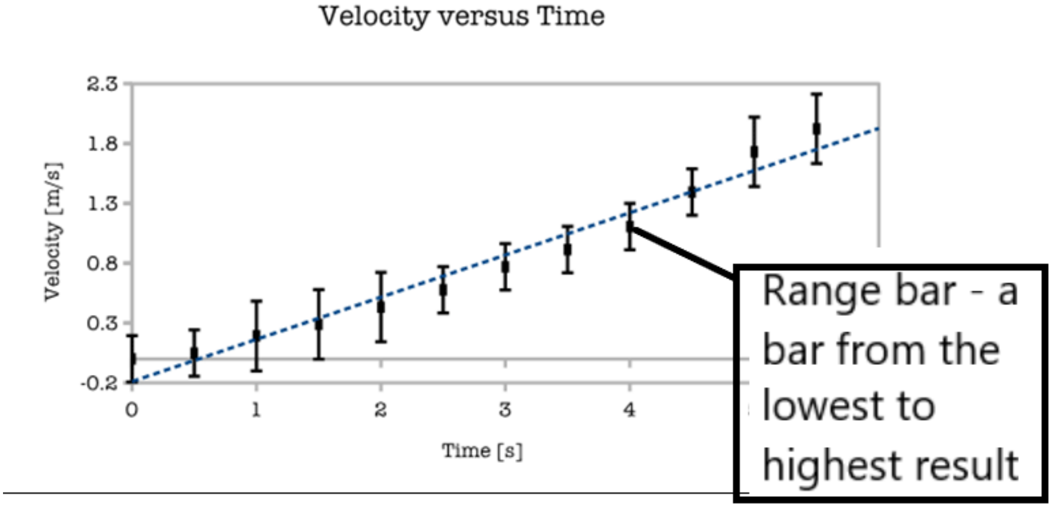
Resolution:

R

Range of data:

From data we could either calculate the uncertainty of a mean result or draw error/range bars on a graph – the larger the error/range bar to more uncertainty

Uncertainty of a mean result = range/2

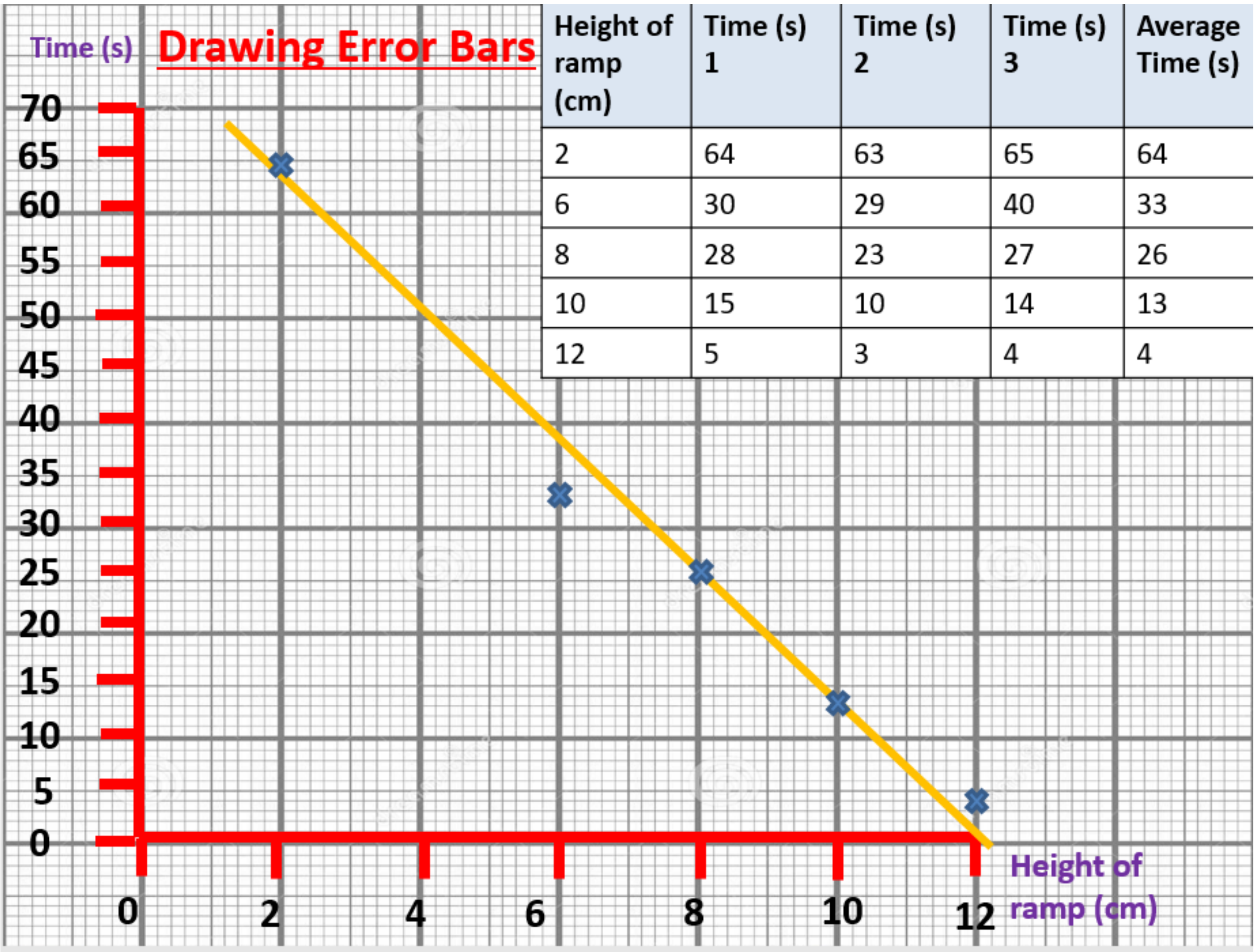


Calculate the missing mean for drop height 40cm.
Give the uncertainty in your answer.

Drop height in cm	Roll height in cm			
	Test 1	Test 2	Test 3	Mean
20	15	14	14	14
40	29	33	32	
60	47	19	46	46
80	65	61	63	63

Mean ……………….. cm Uncertainty ………………. Cm

Practise drawing the error/range bars below:



Height of ramp (cm)	Time (s) 1	Time (s) 2	Time (s) 3	Average Time (s)
2	64	63	65	64
6	30	29	40	33
8	28	23	27	26
10	15	10	14	13
12	5	3	4	4

What is meant by the term concentration?

____

____

Give three examples of solutions that need to be diluted and the reason why:

1. ____
2. ____
3. ____

What is the equation for calculating concentration from mass?

Volume is often recorded in dm^3

- $1ml = 1\ cm^3$
- $1l = 1\ dm^3$
- $1dm^3 = 1000cm^3$

What is $750cm^3$ in dm^3?

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1. 0.5 grams of sodium chloride is dissolved to make 0.05 dm^3 of solution in g/dm^3

2. 0.5 grams of sodium chloride is dissolved to make 0.05 cm^3 of solution in g/dm^3.

3. 6.7×10^{-2} grams of $Pb(C_2H_3O_2)_4$ are dissolved to make 3.5 dm^3 of solution in g/dm^3.