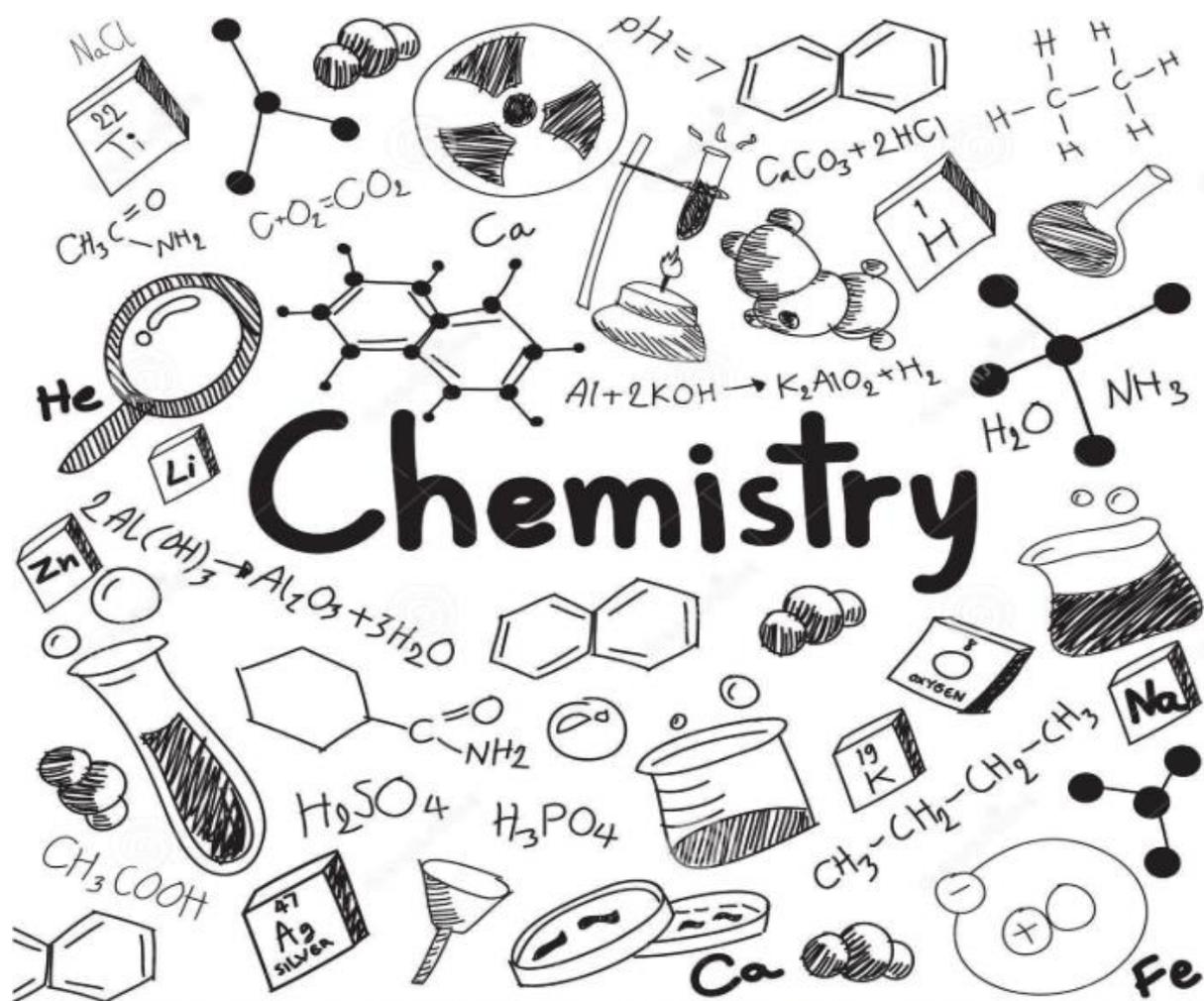


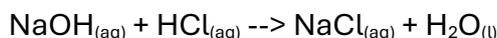
Newstead Wood School

Bridging Tasks



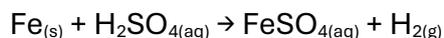
Task 1 – Chemistry Calculations

1) Sodium hydroxide neutralises hydrochloric acid as shown in the equation:



A student found that 27.20 cm³ of 0.100 mol/dm³ sodium hydroxide neutralised 5.00 cm³ of hydrochloric acid. Calculate the concentration of the hydrochloric acid in mol/dm³.

2) 'Iron tablets' usually contain iron sulphate (FeSO₄). This salt can be made by reacting iron with sulphuric acid.



Calculate the mass of iron sulphate that could be obtained from 4.00 g of iron.

3) A "drink-driving" offence is committed if the blood alcohol level of a driver is over 80 mg of ethanol per 100 cm³ of blood. What is the concentration (in mol/dm³) of ethanol if there are 80 mg of ethanol per 100 cm³ of blood?

(1g = 1000mg; M_r of ethanol is 46 g/mol; 1dm³ = 1000cm³)

4) Salicylic acid (C₇H₆O₃) can be made into aspirin (C₉H₈O₄). The equation for the reaction is shown below:



Calculate the maximum mass of aspirin that could be made from 2.00 g of salicylic acid. (M_r: C₇H₆O₃ = 138; C₉H₈O₄ = 180)

5) 31cm³ of NaOH was neutralised by 25cm³ of sulphuric acid. The concentration of the sulphuric acid was 1.5 moles per dm³. Calculate the concentration of the sodium hydroxide.

6) Analysis of a compound shows that it contains:

76.0% lead (Pb)

13.0% chlorine (Cl)

2.2% carbon (C)

8.8% oxygen (O)

Which is the empirical formula of this compound.

(Relative atomic masses: Pb = 207; Cl = 35.5; C = 12 ; O = 16)

Task 2 – Data Analysis

Research Question: “To determine which brand of aspirin dissolves the fastest”

Gemma timed how long an aspirin tablet took to dissolve in 40 cm³ 0.20M HCl. She stopped the clock when she could no longer see the tablet reacting.

Results

| Brand of Aspirin | Mass of Aspirin(±0.01g) | Time to dissolve(±1s) | Rate of reaction(g/s) |
|------------------|-------------------------|-----------------------|-----------------------|
| Bayer | 0.25 | 184 | |
| | 0.25 | 167 | |
| | 0.24 | 179 | |
| Advil | 0.17 | 145 | |
| | 0.19 | 139 | |
| | 0.20 | 138 | |
| Tylenol | 0.34 | 231 | |
| | 0.36 | 217 | |
| | 0.37 | 209 | |
| Ecotrin | 0.28 | 58 | |
| | 0.31 | 75 | |
| | 0.30 | 64 | |

Analysis

- Calculate the Rate of Reaction for each test in g/s.
- Give the mean Rate of Reaction for each brand, ignoring anomalies.
- Give the range of results for each brand and find the absolute error using:
$$\text{absolute error} = \frac{\text{range}}{2}$$
- Find the percentage error using:
$$\% \text{ error} = \frac{\text{absolute error}}{\text{mean value}}$$
- Find the percentage error for each apparatus used in the Ecotrin reaction:
 - Measuring cylinder: (±0.50cm³)
 - Stopwatch: (±1.0s)
 - Balance: (±0.01g)
- How does the % error of your results compare to the total % error of your apparatus?
- How can you improve the experiment to gain more accurate results?
- What further work could you do to give more evidence to address your research question?
- Draw a graph to represent the data you have collected.

Task 3 – History of the Atom

Introduction

No one yet has been able to look inside atoms to see what they are really like. The typical picture of an atom we have in our minds is neither 'the truth' nor 'the right answer' – it is a good working *model* which helps to explain many phenomena. Much evidence has been gathered to support the current model of an atom. The model may change as more evidence comes to light, and it is very likely to become more detailed.

Purpose

Each year some students find it difficult to let go of the planetary model of the atom discovered by Ernest Rutherford and studied at GCSE. Scientists later built on this work to give a more detail model of the electronic structure in an atom.

What you do

Write a report on the development of the electronic structure of an atom by scientists including Niels Bohr, Wolfgang Pauli and Erwin Schrodinger. The report (maximum one page) must include at least one diagram and at least 3 sources, cited using Harvard referencing.