**Maths for Chemists Questions**

**MS 0.0 Recognise and make use of appropriate units in calculations**

Fill in the tables to show that you can convert between different units.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| ͦC | K |  | Pa | kPa | atmospheres |
| 5 |  |  |  |  | 3 |
| 67 |  |  |  | 34 |  |
| 1007 |  |  |  | 7 |  |
|  | 302 |  | 134567 |  |  |
|  | 5645 |  | 7894637 |  |  |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| cm3 | dm3 | m3 |  | g | kg |
|  |  | 3 |  | 34 |  |
|  |  | 45 |  | 256943 |  |
|  | 674 |  |  |  | 5 |
| 145678 |  |  |  |  | 7.87 |
| 453967390 |  |  |  |  | 1842 |

**MS 0.1 Recognise and use expressions in decimal, ordinary and standard form**

Change these numbers into standard form:

6000

450

80000

9000

400000

750000

0.0234

0.0067

0.00000000234

**MS 0.2 Use ratios, fractions and percentages**

Simplify the following ratios to their simplest forms.

2:4

4:8:12

3:5:9

3:9:18

Complete the table to show the conversion of percentages, fractions and ratios.

|  |  |  |
| --- | --- | --- |
| Ratio  | Fractions | Percentages |
| 3:4 |  |  |
|  | 5/6, 1/6 |  |
|  |  | 35%, 65% |

**MS 0.3 Estimate results**

For a reaction that takes 2 minutes and 30 seconds at 345K, how fast would the reaction be at the following temperatures?

335K 355K 375K

**MS 0.4 Use calculators to find and use power, exponential and logarithmic functions**

Use your calculator to find out the answers to each of these:

45

69

311

123

Calculate log10 of the following numbers:

1000

1768

17873405

5678356

**MS1.1 Use an appropriate number of significant figures**

Complete the table

|  |  |  |  |
| --- | --- | --- | --- |
|  | Rounded to 1 significant figure | Rounded to 2 significant figures | Rounded to 3 significant figures |
| 1.236749 |  |  |  |
| 46.23817 |  |  |  |
| 4563820 |  |  |  |
| 31036 |  |  |  |
| 0.0126839 |  |  |  |
| 2.787492 |  |  |  |
| 0.00002874 |  |  |  |

**MS1.2 Find arithmetic means**

Find the mean of each set of titration data:

12.1, 12.2, 12.2

10.9, 10.8, 10.7, 10.5

13.5, 13.3, 13.3, 13.2, 13.2

In a GCSE exam, 35% of the final mark is awarded for exam 1, 40% for exam2 and 25% for the coursework. What is the final percentage for each of these students?

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Exam 1 % | Exam 2 % | Coursework % | Final mark |
| Student A | 65 | 54 | 89 |  |
| Student B | 34 | 37 | 54 |  |
| Student C | 67 | 58 | 78 |  |
| Student D | 54 | 57 | 56 |  |
| Student E | 76 | 78 | 79 |  |

**MS 1.3 Identify uncertainties in measurements and use simple techniques to determine uncertainty when data are combined**

Calculate the uncertainty and the percentage uncertainty of:

A measurement of the height of bubbles, measured with a ruler where the smallest increment is 1mm. The readings observed were 5, 8 and 17mm.

A measurement of a volume of hydrochloric acid, measured using a measuring cylinder where the smallest measurement was 0.2cm3.

**MS 2.1 Understand and use the symbols =, <, <<, >, >> ~** 

Write the correct symbol next to the meaning.

|  |  |
| --- | --- |
|  | directly proportional to |
|  | reversible reaction (both forward and backward reaction occur) |
|  | Equals  |
|  | greater than |
|  | less than |
|  | approximately |
|  | much less than |
|  | much greater than |

**MS 2.3 Substitute numerical values into algebraic equations using appropriate units for physical quantities**

Calculate the number of moles in 5g of methane.

Calculate the concentration of a solution which contains 12g of sodium chloride in 2dm3.

**MS 2.4 Solve algebraic equations**

Rearrange PV = nRT to make n the subject.

Rearrange q=mcΔT to make m the subject.

Rearrange number of moles = mass/Mr to make mass the subject.

**MS 2.5 Use logarithm in relation to quantities that range over several orders of magnitude**

Use your calculator and the equation pH = -log10[H+] to calculate the pH of the following solutions:

1M HCl

1.5MHCl

3M HCl

1M H2SO4

**MS 3.2 Plot two variables from experimental or other data**

Plot a graph of the following data:

|  |  |
| --- | --- |
| Time / minutes | Volume of gas produced / cm3 |
| 10 | 95 |
| 15 | 100 |
| 20 | 105 |
| 40 | 120 |
| 60 | 145 |

**MS3.3 Determine the slope and intercept of a linear graph**

Calculate the gradient and the intercept of each of the lines:

AB: AC: BC:



**MS 3.5 Draw and use the slope of a tangent to a curve as the measure of rate of change**

For the graph that you drew in Exercise 3.2, calculate the rate of reaction at 0, 30 and 60 seconds.