Uncertainty in measurement

Many a time in the study of chemistry. One has to deal with experimental data as well as theoretical calculations. There are meaningful ways to handle the number conveniently and present the data realistically with certainty to the extent possible. These ideas are discussed below in detail.

Uncertainty in measurement is divided into three subtopics

1. Scientific Notation
2. Significant figures
3. Dimensional analysis

1. Scientific Notation :

Some questions related to this topic.

Q1. $(6.65*10^4) + (0.895*10^4)$

a. $75.45*10^3$
b. $7.545*10^4$
c. $754.5*10^2$
d. All the above

Q2. $(5.6*10^5) * (6.9*10^8)$

a. $38.64*10^{13}$
b. $0.3864*10^{15}$
c. $3.864*10^{14}$
d. All the above

After learning this topic you can able to solve this type of question.

Scientific Notation: In chemistry is the study of atoms and molecules.

Large numbers or small numbers like the Planck constant, speed of light etc are very large numbers so here very difficult to solve the problems

Scientific Notation $N * 10^n$

Where n is the exponent having positive or negative numbers

And N is a number also called a digit term which varies between 1.000……..9.999……

A. Addition and Subtraction of Scientific Notation

1. Addition

Example.

$(6.65*10^{4}) +(8.95*10^{3})$

Condition 1 you should have equal power

$(6.65*10^{4})*(0.895*10^{4})$

$7.545*10^{4}$ answer

2. Subtraction

Example.

$(2.5*10^{-2}) +(4.8*10^{-3})$

Condition 1 you should have equal power

$(2.5*10^{-2}) +(0.48*10^{-2})$

$(2.5 +0.48)10^{-2}$

$2.02*10^{-2}$

B. Multiplication and Division of Scientific Notation

Multiplication

Examples

$(5.6*10^{5}) * (6.9*10^{8}) =(5.6*6.9)(10^{5+8}) = 38.64*10^{13}$ **$= 3.864*10^{14}$**

Division

Examples $(2.7*10^{-3}) / (5.5*10^{-4}) =(2.7/5.5)(10^{-3-4})=0.4909*10^{-7}=$ **$4.909*10^{-8}$**

Significant figure

Some rules of Significant figure

1. **All non-zero digits are Significant**

Example:

4562= there is **4** Significant

2552.2145 =there is **8** Significant

2. **Zero between two non-zero digit are Significant**

Example; 5006 = **4** Significant

101 = **3** Significant

3. **Zeros at the end or right of a number are significant**
   Example: 100.0 = **4** significant
   100 = **1** significant
4. **Zeros preceding to first non-zero digit are not significant**
   Example: 0.025= **2** significant
   0.0002**= 1** significant

5. **Power of 10**

Example: $1.045*10^4$= **4** significant

$2.04*10^4$= **3** significant

6. **Counting numbers of object or pure number**

Example: 4 balls = Infinite significant

53 Apple = Infinite significant