

Accuracy and precision in measurement:-

The accuracy tells us that how closer is the observed value to the true value.

While precision tells us ~~how~~ upto what resolving limit the value has been measured.

For example, if real value is 7.29 and measured values are 7.3 and 7.21,

then 7.3 is more accurate but 7.21 is more precise.

errors of measurement:-

The uncertainty in the measurement by instrument is called error

① Systematic error:-

~~It can take place~~

It is always one sided i.e. either it is +ve or -ve

It can take place due to

i) Instrumental fault ✓

ii) Imperfect technician ✓

iii) Personal error ✓

② Least error:-

Due to precision of instrument, there is always a certain error in the measured value which is called least count error.

③ Random errors:-

When the measurement is repeated several times, the measured value differs from the previous one, this type of error is Random error.

Let $x_1, x_2, x_3, \dots, x_n$
be n observations.

mean value

$$x_{\text{mean}} = \frac{x_1 + x_2 + x_3 + \dots + x_n}{n}$$

absolute error:-

$$\Delta x_1 = |x_{\text{mean}} - x_1|$$

$$\Delta x_2 = |x_{\text{mean}} - x_2|$$

$$\Delta x_3 = |x_{\text{mean}} - x_3|$$

$$\Delta x_n = |x_{\text{mean}} - x_n|$$

mean absolute error

$$\Delta x_{\text{mean}} = \frac{\Delta x_1 + \Delta x_2 + \dots + \Delta x_n}{n}$$

Then observe the value of measurement can be written as

$$x = x_{\text{mean}} \pm \Delta x_{\text{mean}}$$