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ACCURACY, PRECISION AND SIGNIFICANT FIGURES.

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ACCURACY

The two terminologies 'accuracy' and 'precision' are invariably practised synonymously, but there exists a clear distinction between them as discussed below :

an accurate result is the one which matches very nearly with true value of a measured amount. The comparison is normally done with regard to the 'error'; and the accuracy is inversely proportional to it i.e., the greater the accuracy, the smaller is the error. 'Absolute error' is the difference between the experimental value and the true value.



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Example : An analyst determines a value of 70.55% anethole in a fresh sample of Nilgiri Oil that actually contains 70.25%, the absolute error is given by : $70.55 - 70.25 = 0.30\%$ The error thus obtained is invariably stated with regard to the actual size of the measured quantity i.e., either in percent (%) or in parts per thousand (ppt). Therefore, the relative error is given by : $0.30 / 70.25 \times 100 = 0.42\%$ or

$$0.30 / 70.25 \times 1000 = 4.2 \text{ ppt}$$



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PRECISION

It may be defined as—‘the agreement amongst a cluster of experimental results ; however, it does not imply anything with respect to their relation to the ‘true value’ ’. Precision designates ‘reproducibility’ of a measurement, whereas accuracy the correctness of a measurement. Precision invariably forms an integral part of accuracy, but ironically a high degree of precision may not necessarily suggest accuracy.



Example : A sample of pure Peppermint Oil is known to contain **30.10**

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± 0.03 per cent of Menthone. The results obtained by two Analysts-1 and 2 employing the same sample of peppermint oil and making use of the same analytical reagents and procedure are as stated below :

Analyst 1 : % Menthone : 31.01 ; 31.02 ; 31.003

Analyst 2 : % Menthone : 31.40 ; 31.46 ; 31.44

Here, the result obtained by analyst-1 is called precise result(repeatability of the data)



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SIGNIFICANT FIGURES

- **A significant figure is a digit which denotes the amount of the quantity in the place in which it stands.**
- **The digit zero is a significant figure except when it is the first figure in a number.**
- **Thus in the quantities 1.2680g and 1.0062g the zero is significant, but in the quantity 0.0025 kg the zeros are not significant figures; they serve only to locate the decimal point and can be omitted by proper choice of units, i.e. 2.5g. The first two numbers contain five significant figures, but 0.0025 contains only two significant figures.**



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