

Chapter : Errors And Approximation

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Topics to discuss

- 1) Types of Numbers (Exact & Approximate)
- 2) Significant digits
- 3) Accuracy and Precision
(Questions and Answers)

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① Types of Numbers :

There are two kinds of Numbers

a) Exact Number : Exact numbers are 1, 2, 3, $\frac{1}{2}$, etc.

b) Approximate Number : Approximate numbers are those that represent the numbers to a certain degree of accuracy.

eg. approximate value of π is 3.14
or 3.141592 (better approximation)

but we cannot write exact
value of π .

② Significant Digits : The digits that are used to express a number are called significant digits or significant figures.

eg. $\pi = 3.14159265358979\dots$

Such numbers can never be represented accurately.

We may write 3.14 or 3.1416.

It means we have to omit some digits.

This process is called rounding off.

The following statements describe the notion of significant digits.

- 1) All non-zero digits are significant.
- 2) All zeros occurring between non-zero digits are significant digits.
- 3) Trailing zeros following a decimal point are significant.
eg: 3.50, 78.0 have three significant digits each.
- 4) Zeros between the decimal point and preceeding a non-zero digit are not significant.

eg: $0.000123 = 123 \times 10^{-6}$ (3 significant figure)
 $0.0012 = 12 \times 10^{-4}$ (2 significant figure)

5) When the decimal point is not written, trailing zeros are not considered to be significant.

eg: 45 (2 significant digits)
4500.0 (5 significant digits)

9.56 (3 significant)

9.560 (4 significant)

9.5600 (5 significant)



③ Accuracy and Precision :

Accuracy : Accuracy refers to how close a measured value is to the true or accepted value.

Precision : Precision refers to how close repeated measurements are to each other, regardless of whether they are close to the true value.

True $\rightarrow 100m$
1st meas. $\rightarrow 90m$
2nd " $\rightarrow 91m$
3rd " $\rightarrow 92$

Q-1: What is the significant digits of following numbers?

(a) 85.713 \rightarrow 5 SD

(b) 0.004412 \rightarrow 4 SD

(c) 0.0259000 \rightarrow 6 SD

(d) 96 \rightarrow 2 SD

(e) 8600 \rightarrow 2 SD

(f) 8400.00 \rightarrow 6 SD

