
GENERAL CHEMISTRY
1
Dr M.F
Dr A.E

Introduction

Define

Chemistry

Is the study of **Properties** of Matter and **Changes** That occur in matter (دراسة خواص الماده و التغيرات التى تحدث بها)

Matter

Anything that has **mass** and **takes up space.** (يشغل حيز من الفراغ)

Properties of Matter خصائص المادة

A) **Occupies space**

B) **Has mass and inertia**

C) **Has chemical and physical properties.**

Changes

Physical changes

♣ Composition remains **unchanged**

Chemical change (reaction)

♣ Composition is **changed**

Matter

Pure Substance

Element

♣ Cannot be **decomposed** into simpler substances

(atom: C, Na, Fe, ..)

(molecule: H_2, N_2, O_2,)

Compound

♣ Can be **decompsed** chemically into simple elements

(H_2O, NaCl)

Mixture

Homogeneous

♣ Uniform

ex:NaCl in water

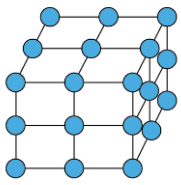
Heterogeneous

♣ Not uniform

ex: Sand in water

States of Matter (حالات المادة)

Solid

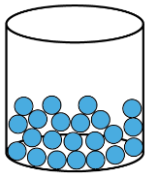


♣Molecules **Not move**

♣ Fixed **volume**

♣ Fixed **Shape**

Liquid

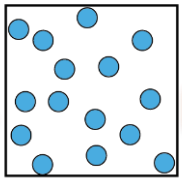


♣Free to move

♣ Fixed **volume**

♣ **Not** Fixed **Shape**

Gas

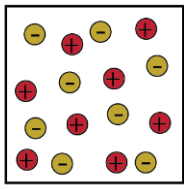


♣Free to move

♣ **Not** Fixed **volume**

♣ **Not** Fixed **Shape**

Plasma



♣Plasma is an **Ionized gas.**

Significant Figures (SF)

Define

the digits in a number that express its precision and reliability, including both certain and estimated values in a measurement.

(الأرقام التي تعطي معلومات دقيقة عن قيمة محسوبة أو مقاسة)

Number Of Significant Figures

Non-Zero (1-9)

(Always Significant)

Zero

(Significant or not according to position)

Zero in between

(بين الأرقام)

(Always Significant)

Ex: 2305

∴ No of SF's = 4

Trailing Zero

(بعد الأرقام)

Decimal

(Significant)

Ex: 140.00

∴ No of SF's = 5

No Decimal

(Not Significant)

Ex: 14000

∴ No of SF's = 2

Leading Zero

(قبل الأرقام)

(Not Significant)

Ex: 0.0052

∴ No of SF's = 2

Calculations Rules

1 Addition /Subtraction

The final answer is written according to the **fewest decimal number** present in calculation

EXAMPLE

$$40.2 + 33.24 + 56.789 = 130.2$$

(اقل رقم عشرى) 1 decimal 2 decimal 3 decimal

2 Multiplication / Division

The final answer is written according to the **fewest significant number** present in calculation

EXAMPLE

1. $10.3 \times 2.1 = 22$ ∴ write final answer as 2 SF's

   3 SF's 2 SF's

2. $10.3 \times 2.10 = 21.6$

   3 SF's 3 SF's

3. $2400 \times 3.45 \times 16.21 = 134{,}218.8 \approx 130{,}000$

   2 SF's 3 SF's 4 SF's

Rounding

1. If this digit is greater than 5, round up:

EXAMPLE rounding 1.2161 (to 3 significant figures) → 1.22.

2. If digit is less than five, drop it:

EXAMPLE rounding 1.2141 (to 3 significant figures) → 1.21.

3. If the digit to be dropped is 5, and that 5 is followed non-zero digit, round up:

EXAMPLE 78.657 (to 3 significant digits) → 78.7

4. If the digit to be dropped is 5, and that 5 is followed by a zero, the last remaining digit is increased by one if it is odd, but left as it is if even:

EXAMPLE 2.5350 (to 3 significant digits) → 2.54

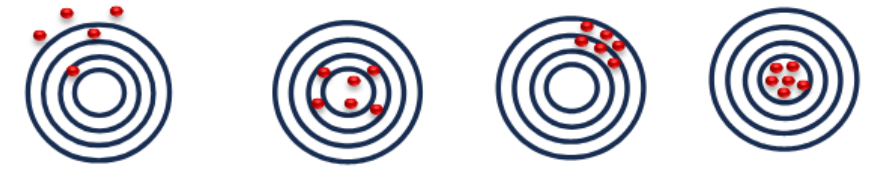
2.5250 (to 3 significant digits) → 2.52

Accuracy

The agreement of the value to the True value
(Closeness of measurements to the true value)
(هو مدى التقارب ما بين القيمة المقاسة والقيمة الحقيقة)

Precision

The degree of agreement among several measurements of same quantity. (Reflect Reproducibility)
(هو مدى التقارب ما بين القيم المقاسة وبعضها البعض)



.Not accurate .Not Precise | .Accurate .Not Precise | .Not accurate .Precise | .Accurate .Precise

Error

Difference between measurements and true value

Types of Errors

1. **Systematic error:**

   Limitations on the sensitivitv of the instruments

2. **Systematic error:**

   Limitations in experimenter

Quiz

Choose the correct

1 The degree of agreement among several measurements of the same quantity is called …….. It reflects the reproducibility of a given type of measurement.

A) certainty B) significance C) accuracy D) Precision E) error

2 Express 0.00560 in exponential notation.

A) 5.60×10^{-3} B) 5.60×10^{3} C) 5.60 D) 5.6×10^{3} E) none of these

3 The agreement of a particular value with the true value is called

A) significance. B) accuracy. C) error. D) certainty. E) precision.

4 How many significant figures are there in the number 3.1400?

A) 2 B) 4 C) 5 D) 3 E) 1

5 Using the rules of significant figures, calculate the following: $\frac{6.167+87}{5.10}$

A) 18.27 B) 18 C) 105 D) 18.3 E) 19

6 Consider the numbers 23.68 and 4.12. The sum of these numbers has……. significant figures, and the product of these numbers has…….. significant figures.

A) 4.4 B) 3.4 C) 4.3 D) 3.3 E) none of these

7 A scientist obtains the number 0.045006700 on a calculator. If this number actually has four (4) significant figures, how should it be written?

A) 0.4501 B) 0.045 C) 0.04500 D) 0.04501 E) 0.4567