Chemistry grade 11 chapter 1

Fundamental concepts in a chemistry

Chemistry is deals with the specific aspects of matter

-study about. composition

Transformation

property and structure of matter

*An experiment science

Essences of chemistry

The main roles of chemistry in solving the problem of man kind are:-

- **In pharmaceutical**:- to make drugs medical equipment and medicine.
- **In agriculture:-** To prepare:

- Fertilizer :to improve soil fertility and get high crop yield.

-herbicides:-to kill weed

- patricides:- to improve crop and our health

- chemical used to decrease acidity of soil example_ sodium ash($Na\ CO_3$)

- In construction and building to make metals non metal:- cement, paints, ceramic glasses and steel.
- In chemical industry :acids, bases, alcohol, fuel ,sugar,oil cosmetics.

Change in Matter

1. **Chemical changes** : called chemical reaction

there is a change in a composition of substances mass of substance.
example oxidation reaction

-burning of substance and interesting.

- fermentation, digestion, addition of sodium in a water

2. **physical changes** :- they do not change in a composition of a substance.
   - they can easily recovered or reversed example, physical state of matter (solid, liquid and gas)
   - dissolving substance (Nacl in H_2O)
   - mechanical change (powdering and tearing)

   Properties:- is the characteristics of identity of a substance used to differentiate one substance from another.

   there are two types of physical property

1 . **extensively physical property** :-are property which depend on the amount of sample. -They vary from sample to sample

2. **Intensive property:**- they do not on the amount of sample

   - useful in different substance because they do not vary from sample to sample.

Example, the intensive property of copper wire are density ,colour , melting point and hardness.

Major field of chemistry

1. inorganic chemistry :-is the study of all non- carbon containing compounds except: Co ,CO_2 carbonates (Na_2 Co_3), cyanide (KCN),Cyanates(AgcNo).
2. Organic chemistry:- is the study of carbon containing compounds. it is the chemistry of carbon and other few elements, such as, sulphur ,oxygen ,nitrogen ,halogens.
3. physical chemistry :-is the study of the physical properties of materials, such as:- thermodynamics
   - spectroscopy
   - quantum chemistry
   - chemical kinetics and electro chemistry chemistry.
4. Analytical chemistry:-is concerned with the development of the oritical foundation and method of chemical analysis chemical analysis maybe:-
   - Qualitative Analysis:- reveals the chemical identity of species in a sample

- Quantitative analysis established the relative amount of species in a sample by numberical terms

Measurements and Units in Chemistry

SI units [The international system of Unit]

Unit of measurement:-is a definite magnitude of Physical quantity (mass, length , time , temperature) .

* All measurement consists of two parts

1. Scalar (numberical) Quantity .
2. Unit designation :
   Example : When an object was 6m longs ,6 scalar (numberical) meter - Unit designation

Basic SI units

#The two SI Unit Commonly used for express ing the fundamental Physical quantities (length, mass, time) are are.

1.The Cgs system:- it consist of centimetre,gram and second

2. The Mks system:- it consist of mater, kilogram and second

The seven SI unit

Physical quantities	SI Unit	symbol
1. Mass	kilogram	Kg
2. Length	Meter	M
3. Time	second	S
4. Temperature	Kelvin	K
5. Amount of substance	Mole	Mol.
6. Electric current	Ampere	A
7. Luminous intensity	Candela	Cd

1. Mass :- is the amount of matter present in it. Not affected by gravity
2. Length :-measured by meter (m) ,Km ,cm, and mm
   - On submicroscopic scale: micro metre ,nano meter (nm)

3. Time :- the SI unit of measuring interval is second other are :-ms, ns, ps, hour, minute, day, months, year
4. Temperature :- is the measure of average kinetic energy of a particle.
5. Amount of Mole

Number of Mole = given mass / Molar mass

Derived SI unit

1. Force :- is the product of mass and acceleration
   F =ma =Kg.m/s^2. ✓ newton
2. Volume :- is the space occupied by a substance
   * volume is measured by
   - Cylinder -pippete
   - burette. – volume flask
   - unit of volume are :-
     1 L =1000cm^3
     1ml =100cm^3
     1L =1000ml
3. Density :- is the mass per volume of a substance g =m/v
   unit of density are : g/$cm^{3,}$ Kg/$m^{3,}$ g/ml.
4. Pressure is force per area.
   P =F/A
   - There is ppressure is pascal (pa). Other unitp of pressure are atmosphere (atm), millimetre of mercury (mmHg), centimetre of mercury (cmHg) torr.
     1 atm =76 cmHg =760mmHg =760torr =101325pa
     - 1 mmHg =1 torr
     - 1 kpa = 1000pa

Common prefix used in unit send conversion of unit

table 1.3 send common prefix used in unit

Prefix	Symbol	Factor
Exa	E	10^{18}
PETA	P	10^{15}
TERA	T	10^{12}
Giga	G	10^{9}
Mega	M	10^{6}
Kilo	K	10^{3}
Hecto	H	10^{2}
Deca	D	10^{1}
Deci	d	10^{-1}
Centi	C	10^{-2}
Milli	m	10^{-3}
Micro		10
Nano	n	10
Pico	P	10
Femto	F	10
Atto	a	10

Uncertainty in measurements

In scientific work there are two kinds of number

1. **Exact number** :-(whose valley are now exactly). -are those that have define values
   - are in the desert resort from counted number of object
2. **Inexact number** :- are a number obtained by measurement.
   - The most important of caused of uncertainty are :-
     - ✓ The person doing the measurement
     - ✓ The measuring device
     - ✓ The environment
     - ✓ Variability in the item being measured

Uncertainties in measurement can be caused by mainly:

- Observational error
- Instrumental error

- Environment where the measurement is being made
- Variability in the item measured

It is very difficult to obtain the exact value of any measurement due to the above causes of uncertainty.

Precision and accuracy in measurements

Accuracy :- is the extent to which a measured value coincides with the true value of the measured quantity.

- ✓ refers to how closely individual measurements agree with the correct or true value
- ✓ It can be applied to a single measurements and

Precision :- is the agreement or closeness among several measurement of the same quantity.

- ✓ is the measure of how clearly individual.
- ✓ Measurements are a agree with one another is the quality of being exact.
- ✓ precision express the degree of reproductive meteor agreement between painted measurement.

Example: The true value of the density of water at 4°C and 1atm is 1g/mL. Student x and student y determined the density of water at 4°C and latm and obtained the following values in g/mL.

Student	Trial						Average
	1	2	3	4	5	6	
X	0.91	0.92	0.90	0.88	0.89	0.91	0.90
Y	1.10	0.99	1.01	0.97	0.91	1.03	1.00

1. Which set of data is the most precise?
2. Which set of data is the most accurate?

Solution: a) The data of student x are closer to each other and hence are precise. But student x has made inaccurate measurement ,because the average value is less than the true value.

b) Student y has made less precise but accurate measurement because the average value agrees with the accepted or true value.

Errors = |True value – measured value|

There are two types of errors in measurement. These are:

- Mainly affect the precision of measurement

Precision and accuracy are linked with two common types of observational errors :- . 1. random error
2.systematic errors

Random error –affects the precision of the test

- vary in direction and magnitude
- Makes the measurement less precise, but not in any particular direction.
- Actual value may be either greater than or smaller than the value recorded
- They a rise mostly from indequency or for limitation in the instrument
- it is the result of how precisely someone can read a meter or scale.

source of random error

- natural variation in real world or experimental context
- Unrealible measurements in the instruments
- individual different between participants or unit.
- Poorly controlled experimental procedure.

systematic error – primarily influence measurements accuracy

- systematic error means your measurement of the same thing will vary in predictable ways or every measurements will differ from the true measurement in the same a direction.
- Lie in one direction of the true value, that is all above or all below the true value.

- Caused by instruments and personal errors

Decimal place

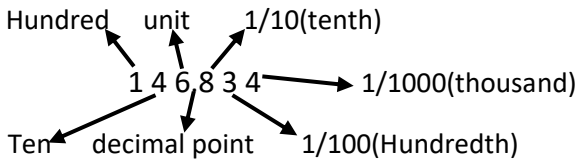
A decimal place refers to the number of digit to the decimal point . each successive position to the right of a decimal point has denominator place , and in 0.086,0 is the first decimal place , 8 is the second , 7 is the third .

A point or dot (.) used to separate the whole number part from the frictional part of a number is called a decimal point.

Decimal place and rounding off

A decimal place :- is the numbers of digital to the right of the decimal point.

A decimal point :- is used to isolate the fraction part from the whole number part.



Rounding off :-is finding a number that is closest to a given number but with fewer digits.

Follow the following simple rules for rounding off a number

1. If the digit to be removed is from 0 to 4, the preceding digit is unchanged

Example: Round off 7. 63245 to two decimal places.

2. Ifhe digit to be removed is from 6 to 9, we add one to the preceding digit.

Example: round off 8.73625 to two decimal place.

Solution: We report as 8.74 because 6 is a digit greater than 5 as a result we add 1 to the preceding digit

3. If the digit to be removed is 5, we drop 5 if the preceding digit is even and we add one if it odd.

Example: Round off the following to two decimal places.

a. 9.185 b. 17.175

Solution a) 9. 18 because 8 iseven

b) 17.18 because 7 is o

Note: i) If 5 is followed by zeros only, the left most digitis unchanged.

Ii). If 5 is followed by non-zeros, the final digit increased by .

Example : a) 146.8500 rounds to 146.8, but 146.8514 round to 146 9

b) 21.6500---21.6 but 21.6534 --- 21.7

Significant Figures

Significant figures are those digits that correctly indicate the precision of a measurement. So significant figures show both the limits of accuracy and where the uncertainty begins. For this reason, it is important to indicate the margin of error in measurement by clearly indicating the number of significant figures, which are the meaningful digits in a measured or calculated quantity.

- ✓ Significant figures are the meaningful digits in a reported number. The last digit in a measured number is referred to as uncertain digits and the uncertainty associated with a measured number is generally considered as +1 in the place of the last digit.
  - ✓ When we report the width of a card to be 2.5cm, we areimplying 3 that its width is 2.5 +0.1cm.
  - ✓ if the width of the card is 2.45cm, this implies its width is 2.45 + 0.01cm.

Rules te determine number of significant figures (sf)

1. Any digit that is not zero is significant. Eg. 156.3 has four sf .
2. Zeros located between non – zero digits are significant. Eg.406has three sf
3. Zeros to the left of non – zero digit are not significant. Eg. 0.00231 has three sf
4. Zeros to the right of the last non – zero digit are significant if th number contains a decimal point. Eg. 3.100 has four sf
5. Zeros to the right of the last non – zero digit in a number without decimal point may or may not be significant. To avoid ambiguity, us scientific notation.

Example

500 May have different significant figures.

. $5x10^2$ = 1sf 5.00×10^2 = 3 sf

⇨ $5.0x10^2$ =2 sf

. **Calculations with significant figures**

1. In addition and subtraction, the answer cannot have more digits to the right of the decimal point than any of the original numbers.

EXAMPLE

103.50 <——two digits after the decimal place

+0.316 <—three digits after the decimal place

102.816<—round to 102.82

2. In multiplication and division, the number of significant figures in the product or quotient is determined by the original number that has the smallest number of significant figures.

example :- 1.4 x 8.011 = 11.2154 ← round to 11 3. Exact numbers can be considered to have an infinite number of significant numbers and do not limit the number of significant figures in a calculated result.

Scientific method

_is unique and require any explanation of hotties seem to be based on the result of experiments and observation.

- ✓ Is logical care full and systematic approach to solve scientific problem.

Steps in scientific method

1. Observation is looking through carefully the nature of an event.

- ✓ There are two types of observations.

Qualitative observations have no numbers with them.

Exampie

The sky is blue . Honey is sweet.

Water is liquid.

Quantitative Observations have numbers with thern and are more useful.

Example: A book weighs 10 grams.

Water boils at 100°C.

2. **Hypothesis** is tentative explanation for an observation.
✓ Hypothesis is useful if it can be used to make predictions.
3. **Experiment or testing hypothesis i**s examining facts about hypothesis
4. **Theory** is tested hypothesis.
✓ it always serves as aid to new experiment and is constantly being tested
✓ It can be rejected or modified when it is proven incorrect.
5. **Scientific law** is a general statement that summarizes facts that come from many experiments.

Examples. The law of gravitational force.
The law of conservation of mass.

Some experimental skill in chemistry

Chemistry is an experimental science that relates theoretical study with practical activities.

Chemistry laboratory apparatus

->Laboratory equipments are classified into three based on their uses.

These are:-

1. Reaction vessels are used for the occurrence of a reaction.

Example

Beakers, flasks, test tubes.

2. Measuring equipments are used to measure the quantities of substances.

Example.

Measuring cylinder, pipet, buret, balance, thermometer, volumetric falsks.

3. Supporting and heating devices :

Example:

Stand, clamp, test tube holder, tong, Bunsen burner, splint Jamp. Ae

Chemistry Laboratory Safety rules

- **Follow the following laboratory safety rules when you perform an activity in the laboratory.**

1. Wear goggles, gloves and laboratory coat

2. Wear shoes that cover your feet

3.Tie back loose hair

4.Do not taste any chemical

5.Do not suck the Solutions in the pipette by mouth, rather use a rubber suction bulb or other device to fill a pipette

6.If a concentrated acid is spilled or splashed on your body, first wash the affected part with running water and then with 10% NaCO Solution.

Writing a laboratory report

A laboratory report is a written composition of the results of ar experiment. –

- Laboratory report includes

1. Title

2. Objective

3. Materials and chemicals used

4. Procedure

5. Observation

6. Result and discussion

7. Conclusion