UNIT 1

MEASUREMENTS

Q.1 How can we classify the study of nature? What is physics?

Answer

The study of nature may be classified into two branches:

1. Biological Science

The science of **living** things is called Biological science.

2. Physical Science

The science of **non-living** things is called Physical science.

Physics:

Physics is the branch of science concerned with **properties** of matter and energy and the **relationship** between them.

In other words, physics is basically the study of **how objects behave.**

Physics is an important and the basic part of physical science.

It is the **experimental science**.

Q.2. Describe the main frontiers of fundamental science. Describe some new branches of physics?

Answer

There are three main frontiers of fundamental science.

1) The world of **extremely large** (i.e. universe).
2) The world of the **extremely small** (i.e. particles such as electrons, protons, neutrons, mesons and others)

3) Thee world of **middle-sized** things (from molecule at one extreme to the Earth at the other). It is the world of **complex matter.**

By the end of 19^{th} century many physicists started believing that everything about physics has been discovered. However, about the beginning of the 20^{th} century many new experimental facts revealed that the laws formulated by the previous investigations need modification.

1. Nuclear physics

The branch of physics which deals with atomic nuclei is called nuclear Physics.

2. Particle physics

The branch of Physics which is concerned with ultimate particles of which matter is composed is called particle Physics.

3. Relativistic Mechanics

The branch of Physics which deals with velocities approaching that of light is called relativistic mechanics

4. Solid State Physics

The branch of Physics which is concerned with the structure and properties of solids is called solid state Physics.

Other Branch of Physics

Physics is most fundamental of all sciences and provides other branches of science. Basic principle and fundamental law. The overlapping of physical and other fields gave birth to new branches

5. Astrophysics

The branch of Physics concerned with physical and chemical properties, origin and evolution of the celestial bodies

6. Biophysics

The branch of physics which deals with scientific study of biological processes in terms of the law of Physics. For example, Echolocation in bats and Stresses and strains in skeletal and muscular structures.

7. Aerodynamics

The branch of physics which deals with the study of the movement of air and other gases. It includes the study of the interaction of air with moving objects. Such as airplanes and of the effects of moving air on stationary objects, such as buildings.

8. Cosmology

The branch of physics which deals with the behaviour of the material universe in its entirety. It is the one of widest subjects in the spectrum of Physics.

9. Physical Chemistry

The branch of chemistry that is concerned with physical structure of chemical compounds, the amount of energy they have, the way they react with other compounds and the bonds that hold their atoms together.

10. Physical Oceanography

It is the study of physical conditions and physical processes within the ocean, especially the motions and physical properties of ocean waves.

11. Medial Physics

It is application of physics to medicine. It generally concerns physics as applied to medical imaging and radiotherapy.

12. Geophysics

It is the physics of the Earth and its environment in space. Its subjects include the shape of the Earth. Its gravitational and magnetic fields, the dynamics of the Earth as a whole and of its component parts, the Earth's internal structure, composition and tectonics, the generation of magmas, volcanism and rock formation, the hydrological cycle including snow and ice, all aspects of the oceans, the atmosphere, ionosphere, magnetosphere and solar-terrestrial relations, and analogous problems associated with the moon and other planets.

13. Engineering Physics (EP)

It is an academic degree, available mainly at the levels of B.Tech, B.Sc, M.Sc and Ph.D Unlike other engineering degrees (such as aerospace engineering or electrical engineering), EP does not necessarily include a particular branch of science or Physics. Instead, EP provides a more thorough grounding in applied Physics of any area chosen by the student (such as optics, nanotechnology micro, fabrication, mechanical engineering, electrical engineering, control theory, aerodynamics, energy or solid-state Physics.

14. Plasma

A plasma is a gas in which an important fraction of the atoms is ionized so that the electronics and ions are separately free. In Physics and chemistry, plasma is a state of matter similar to gas in which a certain portion of the particles are ionized. The basic premise is that heating a gas dissociates its molecular bonds, rendering it into its constituents' particles, positive ions and negative electrons.

The presence of a non-negligible number of charge carriers makes the plasma electrically conductivity to that it responds strongly to electromagnetic fields. Plasma, therefore, has properties quite unlike those of solids, liquids, or gases and is considered a distinct state of matter. Like gas, plasma does not have a definite shape or a definite volume unless enclosed in a container. Unlike gas under the influence of a magnetic field, it may form structures such as filaments, beams and double layers. Some common plasma are starts and neon.

15. Magneto Hydrodynamics (MHD)

Magneto fluid dynamics or hydro magnetic is the branch of Physics which studies the dynamics of electrically conducting fluids.

Examples of such fluids include plasma, liquid metals and salt water. The word magneto-hydrodynamic (MHD) is derived from magneto - meaning magnetic field and hydro - meaning liquid and dynamics meaning movement. The idea of MHD is that magnetic fields can induce current in a moving conductive fluid, which create forces on the fluid, and also change the magnetic field itself.

16. Space Physics

It is also known as space plasma physics. It is the study of plasmas as they occur naturally in the universe. As such, it encompasses a far-ranging number of topics, including the sun, solar wind, planetary magnetospheres and ionospheres, auroras, cosmic rays and synchrotron radiation.

Space Physics is a fundamental part of the study of space weather and has important implication not only to understanding the universe, but also to practical every-day life, including the operating of communications and weather satellites.

Space Physics is unique from other fields of astrophysics which study similar phenomenon in that space Physics utilizes measurements from high altitude rockets and spacecraft.

17. Super fluidity

It is state of matter in which the matter behaves like a fluid without viscosity and with infinite thermal conductivity. The substance, which looks like a liquid, will flow uncontrollably, and also will be at exactly the same temperature throughout itself.

Superfluidity is the frictionless flow and other exotic behavior observed in liquid helium at temperatures near absolute zero (-273.15°C or -459.67°F), and (less widely used) similar frictionless behavior of electrons in a superconducting solid.

18. Superconductivity.

It is an electrical resistance of exactly zero which occurs in certain material below a characteristic temperature.

Superconductivity is a phenomenon observed in several metals and ceramic materials. When these materials re cooled to temperatures ranging from near absolute zero (0 degrees Kelvin, -273 degree Celsius) to liquid nitrogen temperature (77K, -196C), their electrical resistance drops with a jump down to zero. The temperature at which electrical resistance is zero is called the critical temperature (T_c) and varies with the individual material. For practical purposes, critical temperatures are achieved by cooling materials with either liquid helium or liquid nitrogen.

Because these materials have no electrical resistance, meaning electrons can travel through them freely, they can carry large amounts of electrical current for long period of time without losing energy as heat. Superconducting loops of wire have been shown to carry electrical currents of several years with no measurable loss. This property has implications for electrical power transmission, if transmission lines can be made of superconducting ceramics, and for electrical-storage devices.

19. Optics

It is the branch of physics which involves the behavior and properties of light, including its interactions with matter and the construction of instruments that use or detect it. Optics usually describes the behavior of visible, ultraviolet, *and* infrared light.

20. Hydrodynamics

The branch of science that deals with the dynamics of fluids, especially incompressible fluids in motion.

It is concerned with mechanical properties of fluids. It tells that how quickly an object can travel in a fluid, for example a person swimming in water.

21. Electromagnetism

It is one of the four fundamental interactions in nature. The other three are the strong interaction. The weak interaction and gravitation

Electromagnetism is the force that causes the interaction between electrically charged particles: the areas in which this happens are called electromagnetic fields.

Electromagnetism is also the force which holds electrons and protons together inside atoms. Which are the building blocks of molecules. This governs the processes involved in chemistry, which arise from interactions between the electrons inside and between atoms.

Q.3. What are physical quantities? Discuss its different types and way to measure the base quantities.

Answer

Physical Quantities

All those quantities in terms of which law of physics can be described are called physical quantities.

Types of Physical Quantities

Physical quantities are divided into:

(i) Base Quantities **(ii)** Derived Quantities

Base Quantities

The minimum number of those physical quantities in terms of which other physical quantities can be defined are called base quantities.

Example: length, ass, time etc.

Derived Quantities

Physical quantities whose definitions are based on other physical quantities are called derived quantities.

Example: velocity, acceleration, momentum, force etc.

Measurement of Base Quantities

The measurement of base quantities involves two steps:

(i) The choice of standard

(ii) The procedure for comparing the quantity to be measured with standard.

Properties of an Ideal Standard

An ideal standard has two principal characteristics:

(i) It is accessible **(ii)** It is invariable

These two requirements are often incompatible and compromise has to be made between them.

Q.4. What is international system of units? Discuss the units upon which it is build up. Answer

International System of Unit

In1960, an international committee agreed on a set of definitions and standard to describe the physical quantities. The system that was established is called the system international (SI). The system international is formed from three kinds of unit:

(1) Base units **(2)** Supplementary units **(3)** Derived units

(1) Base units

There are seven base units for different physical quantities.

Length, mass, time, temperature, electric current, luminous intensity, amount of substance

Length	*l*	Meter	m
mass	m	Kilogram	kg
Time	t	Second	s
Temperature	T	Kelvin	K
Electric current	I	Ampere	A
Luminous Intensity	K	Candela	cd
Amount of substance	n	Mole	mol

Standard definitions of base units

(i) Meter

The distance travelled by light in vacuum during a time of 1/299,792,458 second

(ii) Kilogram

It is defined as the mass of a Platinum (90%) and iridium (10%) alloy cylinder, 3.9 cm in diameter and 3.9 cm in height. Kept at the International Bureau of Weights and Measures in France. This mass standard was established in 1901.

(iii) Second

The duration in which the outermost electron of the cesium 133 atoms makes 9,192,631,770 vibrations.

(iv) Kelvin

It is the fraction 1/273.16 of the thermodynamics temperature of the triple point of water

(5) Ampere

The unit of electric current is ampere. It is that constant current which if maintained in two straight parallel conductors of infinite length, of negligible circular cross-section and placed a meter of length.

(6) Candela

The unit of luminous intensity is candela. It is defined as the luminous intensity in the perpendicular direction of a surface of 1/60000 square meter of a black body radiator at the solidification temperature of platinum under standard atmospheric pressure.

(7) Mole

The mole is the amount of substance of a system which contains as many elementary entities as there are atoms in 0.012 kg if carbon 12 one mole of any substance contains 6.0225×10^{23} entities.

(2) Supplementary Units

The units which are neither base units nor derived units are called supplementary units. They are.

(i) Plane angle **(ii)** The solid angle

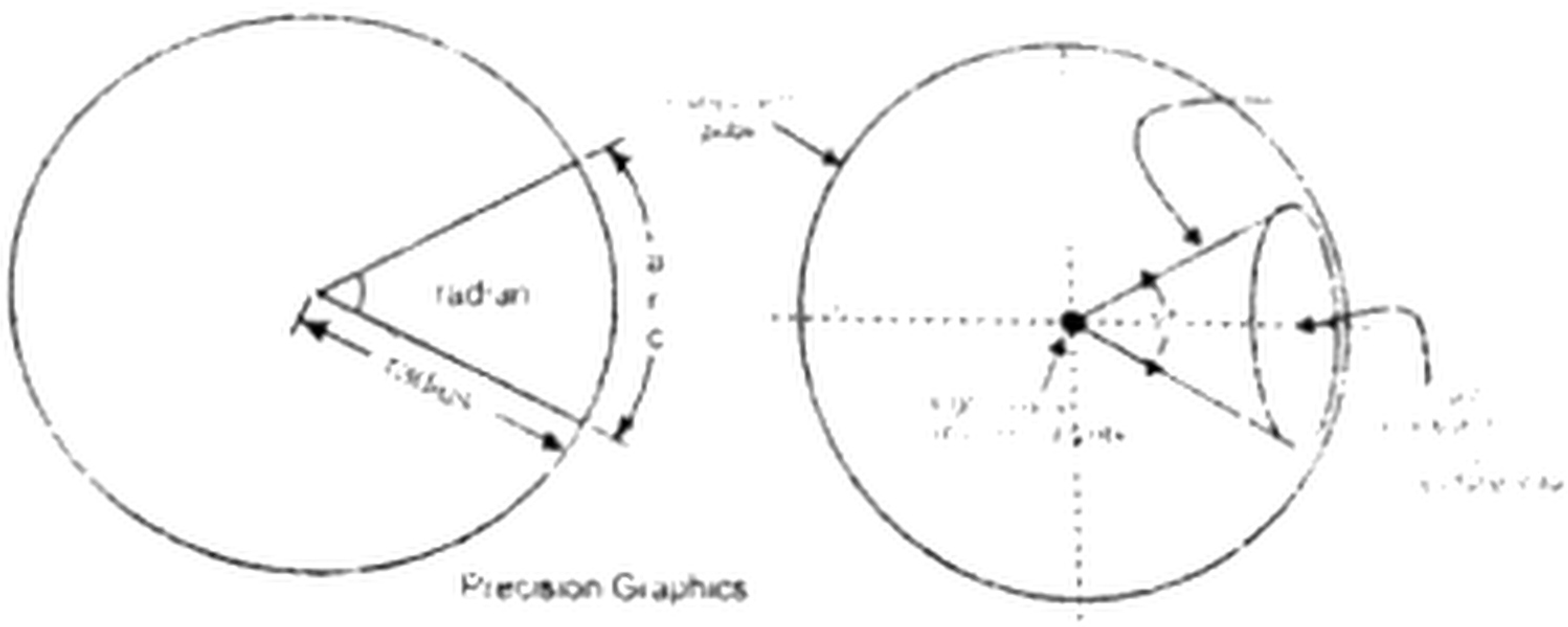
Standard Definitions of Supplementary Units

(i) Radian

It is the plant angle between two radii of a circle which cut off on the circumference on arc equal in length to the radius of the circle. It is shown in figure

(ii) Steradian

It is the solid angle (three-dimensional angle) subtended at the center of sphere by an area of its surface equal to square the radius of the sphere. It is shown in figure.



Radian Steradian

Physical Quantities	SI Unit	Symbol
Plane angle	Radian	rad
Solid angel	Steradian	sr

(3) Derived Units

The SI units for measuring all other physical quantities are derived from the base and supplementary units, such units are called derived units.

Physical Quantity	**Unit**	**Symbol**	**In terms of base unit**
Force	Newton	N	$Kg\ m\ s^{-2}$
Work	Joule	J	$Nm = kg\ m^2 s^2$
Power	Watt	W	$Js^{-1} = kg\ m^2 s^{-3}$
Pressure	Pascal	Pa	$Nm^{-2} = kg\ m^{-1}\ s^{-2}$
Charge	Coulomb	c	As

Q.5. Write down the conventions for indicating the units. What are sciatic notations?

Answer

Conventions for Indicating the Units

Use of SI units requires special care, more particularly in writing prefixes:

(i) Full name of the unit does not be with a capital letter even if named after scientist e.g. newton.

(ii) The symbol of units after a scientist has initial capital such as N for newton.

(iii) The prefix should be written before the unit without any space, such as 1×10^{-3} m is written 1mm.

(iv) A combination of base units is written each with one space apart. For example, Newton meter is written as Nm.

(v) Compound prefixes are not allowed. For example, 1μμF may be written as 1ρF.

(vi) A number such as 50×10^4 cm may be expressed in scientific notation as 4.0

x 10^2m.

(vii) When a multiple and not the base unit is raised to a power, the power applies

(viii) Measurement in practical work should be recorded immediately in the most convenient unit e.g. Micrometer screw gauge measurement in mm, and the mass of calorimeter in grams. But before calculation for the result, all measurements must be converted to appropriate SI base unit.

Factor	Prefix	Symbol
10^{-18}	atto	a
10^{-15}	femto	f
10^{-12}	pico	p
10^{-9}	nano	n
10^{-6}	micro	μ
10^{-3}	milli	m
10^{-2}	centi	c
10^{-1}	deci	d
10^{1}	deca	da
10^{3}	kilo	k
10^{6}	mega	M
10^{9}	giga	G
10^{12}	tera	T
10^{15}	peta	P
10^{18}	exa	E

Scientific Notation

Numbers are expressed in standard from called scientific notation, which employs power of ten. The internationally accepted practice is that there should be only one non-zero digit left of decimal Thus the number 1347 should be written as 1.347×10^3 and 0.0023 should be expressed as 2.3×10^3.

Q.6. What are the sources of errors in the measurement of physical quantity? What are the types of errors? How can we reduce the error in any measurement?

Answer

Errors and Uncertainties

All physical measurements are uncertain and imprecise to some limit. There are three sources of errors.

Sources of errors

(i) Negligence or inexperience of a person.

(ii) Faulty apparatus.

(iii) Inappropriate method or technique.

The uncertainty is usually described as an error in measurement.

Type of Errors

There are two major types of errors.

(1) Random error **(2)** Systematic error

Random Error

Random error is said to take place when repeated measurements of the quantity gives different values under the same conditions.

Causes

It is due to some unknown reason.

Reduction of random Error

The random error can be reduced by taking several readings of same quantity and then taking their mean value.

Systematic Error

Systematic error occurs when all the measurements of particular quantity are affected equally, these give consistent difference in the readings.

Causes

The systematic error may occur due to

(i) Zero error in measuring instrument.

(ii) Poor calibration of instrument.

(iii) Incorrect calibration on the measuring instruments.

Reduction of Systematic Error

Systematic error can be reduced by comparing the instrument with another instrument which is known to be more accurate. Thus, systematic error is reduced by applying a correction factor to all the reading taken on an instrument.

Q.7. What are scientific figures? How can we estimate the number of significant figures in the physical measurement and explain the way to rounding off data?

Answer

Significant Figures

In any measurement, the accurately known digits and the first doubtful digit are called significant figures. In other words, a significant figure is the one which is known to be reasonably reliable.

How to increase the number of significant figures

We can increase the number of significant figures in a measurement by improving the quality of our measuring instrument.

General Rules for deciding number of significant figures

(1) Digits

(i) All digits 1, 2, 3, 4, 5, 6, 7, 8, 9 are significant.

(ii) Zeros may or not be significant.

Rules for zeros

(i) A zero between two significant figures is itself significant.

(ii) Zeros to the left of significant figures are not significant.

For Example

None of the zeros in 0 0046 or 02 59 is significant.

(Note: these zeros are used only to locate decimal position)

(iii) Zeros to the right of significant figure may or may not be significant.

(iv) In decimal fraction, zeros to the right of significant figure are significant.

For Example

All the zeros in 3.570 or 7.4000 are significant.

However, in integers such as 8000 kg, the number of significant zero is determined by the accuracy of the measuring instrument.

If the measuring scale has a least count of 1 kg then there are four significant figures written in scientific notation as 8.000×10^3 kg.

If the least count of the scale is 10 kg, then the number of significant figures will be 3 written in scientific notation as 8.00×10^3 kg.

If the least count of the scale is 100 kg, then number of significant figures will be 2 written in scientific notation as 8.0×10^3 kg.

If the least count of the scale is 1000 kg, then the number of significant figures will be 1 written in scientific notation as 8×10^3 kg

(v) When the measurement is recorded in scientific notation or standard form, the figures other than the powers of ten are significant figures.

For example

A measurement recorded as 8.70×10^4 kg has three significant figures.

(2) Multiplication and division of Numbers

In multiplying or dividing number, keep a number of significant figures in the product or quotient not more than that contained in the least accurate factor.

$$\frac{5.348 \times 10^2 \times 3.54 \times 10^1}{1.336} = 1.45768982 \times 10^{\cdot}$$

As the factor 3.64×10^4, the least accurate in the above calculation had three significant figures, the answer should be written to three significant figures only.

(3) Addition or Subtraction of Numbers

In adding or subtracting number, the number of decimal places in the answer should be equal to the smallest number of decimal places in any of the quantities being added or subtracted.

In this case, the number of significant figures is not important. It is the position of decimal that matters.

For example

Suppose we wish to add the following quantities expressed in meters.

Correct answer (i) 75.5m (ii) 8.13

In case (i) 75.5 have the smallest number of decimal places, thus the answer is rounded off to the same position which is 75.5m.

In case (ii) the number 8.13 has the smallest number of decimal places and hence, the answer is round off to the same decimal positions which is then 8.13 m.

Q.8. Describe the rules for rounding of data up to appropriate precision.

Answer

Rounding Off Data

The non-significant figures should be deleted by using the following rules:

1) If the first digit dropped is less than 5, the last digit retained should remain unchanged.

2) If the first digit dropped is more than 5, the digit to be retained is increased by one.

3) If the digit to be dropped is 5, the previous digit which is to be retained is increased by one. If it is Odd and retained as such if it is even. For example, the following numbers are rounded off to three significant figures as follows.

43.75	is rounded off as	43.8
56.8546	is rounded off as	56.9
73.650	is rounded off as	74.6
64.350	is rounded off as	64.4

Q.9. What do u understand by the term's precision and accuracy?

Answer

Precision

Precision means how close the measured values are to each other. The precision of a measurement depends upon the least count of measuring instrument. The smaller the unit, the more precise the measurement. The precision of a measurement describes the units you used to measure something. For example. You might describe your height as 'about 6 feet'. That wouldn't be very precise If however, you said that you were '74 inches tall' that would be more precise.

A precise measurement is the one which has less absolute uncertainty.

The precision of a measurement is determined by the instrument or device being used.

Accuracy

Accuracy means how close a measured value (result) is to the actual (true) value. The accuracy of a measurement is the difference between your measurement and the accepted correct answer. The bigger the difference, the less accurate your measurement. An accurate measurement is one which has less fractional or percentage error. The accuracy of measurement depends on the fractional or percentage uncertainty in that measurement.

Example

When the object is recorded as 25.5 cm by using a meter rod having smallest division in millimeter. It is the difference of two reading of the initial and position. The uncertainty in the single reading as discussed before is taken as - 0.05 cm which is now double and called absolute uncertainty equal to 0.1 cm (i.e 0.05±0.05= 0.1). Absolute uncertainty, in effect, is equal to the least count of the measuring instrument. This is called precision:

Case (i)

Precision or absolute uncertainly (least count) = 01.cm

Fractional uncertainty = $\frac{0.1cm}{25.5cm} = 0.004$

Percentage uncertainty = $\frac{0.1cm}{25.5cm} \times \frac{100}{100} = \frac{0.4}{100}$ =0.4%

Case (ii)

Another measurement taken by Vernier Calipers with least count as 0.01 cm is recorded as 0.45 cm.

It has

Precision or absolute uncertainty (least count) = ±0.01 cm

Fractional uncertainty = $\frac{0.01cm}{0.45cm}$ =0.02

Percentage uncertainty = $\frac{0.01cm}{0.45cm} \times \frac{100}{100} = \frac{2.0}{100}$ = 2.0%

So, the reading 25.5 cm taken by meter rule is although lea precise but is more accurate having less percentage uncertainty or error. Whereas the reading 0.45 cm taken relative measurement which is important. The smaller a physical quantity, the more precise instrument should be used. Here the measurement 0.45 cm demands that a more precise instrument, such as micrometer screw gauge with least count 0.001 cm, should have been used

Q.10. How can you assess the total uncertainty in the final result?

Answer

Assessment of Total Uncertainty in the Final Result

Every measurement has a degree of uncertainty associated with it. The uncertainty derives from the measuring device and from the skill of the person doing the measuring. The total uncertainty in the final result can be found as follows:

In Case of Addition and Subtraction

Absolute uncertainties are added.

For example

The distance 'x' found by the difference between two separate position measurements

$x_1 = 10.5 \pm 0.1$ cm

and $x_2 = 26.8 \pm 0.1$ cm

The difference x between them is recorded as

$x = x_2 - x_1$

$= (26.8 \pm 0.1) - (10.5 \pm 0.1)$

$= 16.3 \pm 0.2$ cm

In Case of Multiplication and Division

Percentage uncertainties are added

For example

The maximum possible uncertainty in the value of resistance R of conductor determined from the measurements of potential difference V and resulting current flow 'I' by using

V = IR is found as follows:

$V = 5.2 \pm 0.1v$

$I = 0.84 \pm 0.05$ A

The %age uncertainty for v $= \frac{0.1}{5.2} \times \frac{100}{100}$ = about 2%

The %age uncertainty for I $= \frac{0.05}{0.84} \times \frac{100}{100}$ = about 6%

Hence total uncertainty in the value of resistance R and V is divided by I is 8%.

The result is thus given as R = ® $\frac{5.2}{0.84A} = 6.191A$

Because % age uncertainty for V is 2% and for I is 6%. So,

Total uncertainty = 2%+6% = 8%

Hence R = 6.2 ± 8% ohms

R = 6.2 ±0.5 ohms [8% of 6.2 = 8/100×6.2 = 0.5]

In case of Power Factor

Multiply the percentage uncertainty by that power.

For example

In the calculation of the volume of a sphere using v= $\frac{4}{3}\pi r^3$

%age uncertainty in v = 3x%age uncertainty in radius r.

When the uncertainty is multiplied by power factor, then it increases the precision demand of measurement. If the radius of a small sphere is measured as 2.25 cm by a Vernier calipers with least count 0.01 cm, then the radius r is recorded as r = 2.25±0.01cm.

Absolute uncertainty in r = Least count = ±0.01 cm

%age uncertainty in r = $\frac{0.01cm}{2.25cm} \times \frac{100}{100} = 0.4\%$

Total percentage uncertainty mV = 3 × 0.4 = 1.2%

Thus, volume V = $\frac{4}{3}(\pi r^3)$

= 4.3 (3.14) ×(2.25)^3

= 47.689 cm^3 with 1.2% uncertainty

Hence the result should be recorded as

V = 47.7 ± 0.6 cm^3

In case of Average value of Many Measurement

(i) Find the average value of measured values.

(ii) Find deviation of each measured value from the average value.

(iii) The mean deviation is the uncertainty in the average value.

The six reading of the micrometer screw gauge to measure the diameters of a wire in mm are:

1.20, 1.22, 1.23, 1.19, 1.22, 1.21

The average = $\frac{1.20+1.22+1.23+1.19+1.22+1.21}{6}$ =1.21mm

The deviation of the readings, which are the differences without regards to the sign, between each reading and average values are 0.01, 0.01, 0.02, 0.02, 0.01, 0.00

$$\text{Mean of deviation} = \frac{0.01+0.01+0.02+0.02+0.01+0.00}{6} = 0.01 \text{ mm}$$

In case of timing experiment

The uncertainty in the time period is found by dividing the least count of timing measurement instrument by the number of vibrations.

For Example

The time of 30 vibrations of a simple pendulum recorded by a stop watch accurately up to one tenth of second is 54.65. Thus, the time period is given by

$$T = 54.6/30 = 1.82s$$

$$\text{Uncertainty in time period} = \frac{\textit{Least count}}{\textit{No of vibrations}} = \frac{0.1s}{30}$$

Thus, time period T is written as $T = (1.82 \pm 0.003)s$

Q.11. What do you understand by dimensions of physical quantities? Explain with examples. Also write its uses.

Answer

Dimension of Physical Quantities

The dimensions of physical quantity represent nature of that physical quantity. Each basic physical quantity represented is by a specific symbol with in square brackets. The dimension of length, mass and time are [L], [M] and [T] respectively.

(i) Speed

$$\text{As speed} = \frac{\text{Length}}{\text{Time}}$$

$$\text{Dimension of speed} = [v] = \frac{\text{Dimension of length}}{\text{Dimension of time}} = \frac{[L]}{[T]} = LT^{-1}$$

(ii) Acceleration

As acceleration = $\frac{\text{Velocity}}{\text{Time}}$

Dimension of acceleration = [a] = $\frac{\text{Dimension of Velocity}}{\text{Dimension of time}}$

$$[a] = \frac{[LT^{-1}]}{[T]} = [LT^{-1}][T^{-1}] = [T^{-2}]$$

(iii) Force

As force = mass × acceleration

Dimension of force = dimension of mass × dimension of acceleration

$[F] = [M]\ [LT^{-2}]$

$[F] = [MLT^{-2}]$

Uses of Dimensions

Using the method of dimensions called the dimensional analysis, we can check the correctness of a given formula or an equation and can also derive it.

(i) Checking the homogeneity of the physical equation

In order to check the correctness of an equation, we are to show that dimension of the quantities on both sides if the equation is the same, irrespective of the form of the formulas. This is called the principle of homogeneity of dimensions.

(ii) Deriving the possible formula

The success of this method for deriving a relation for physical quantity depends on the correct guessing of various factor on which the physical quantity depends.