

Chapter 1 PHYSICAL QUANTITIES AND MEASUREMENT

Q.1 what is physics? Also describe its important branches?

PHYSICS :-> The branch of science which deals with the study of properties, energy and their mutual relationship is called physics”

Some important branches of physics are given below

1. **Mechanics**:-It deals with the motion of bodies under the action of force.
2. **Heat and thermodynamics**:-It deals with the study of nature, properties. and uses of heat energy. And also deals with transformation of heat energy from one form to another form.
3. **Optics**:- it deals with the propagation, reflection, refraction, dispersion and wave properties of light.
4. **Electricity and magnetism**:- it deals with the study of charges at rest as well as in motion.
5. **Atomic physics**:-it deals with the structure and properties of individual atom.
6. **Nucleus physics**:- it deals with the structure and properties of nucleus of an atom.
7. **Solid state physics**:-it deals with the properties of matter in solid state.
8. **Particle physics**:- it deals with the study of elementary particles.
9. **Plasma physics**:-which is the fourth state of matter. And occurs in ionized state.
10. **Quantum physics**:-quanta is studied in this branch which is the discrete and individual particles of energy.
11. **Semiconductor physics**:- whose properties lie b/w conductor and insulator.
12. **Astro physics**:- it deals with the study of heavenly bodies.
13. **Bio physics**:- study of biology based on the principle of physics is called bio physics.
14. **Geo physics**:- it deals with the study of earth and atmospheric.
15. **Health physics**:- it deals with the study of diseases and their treatment.

Q.2 define measurement, unit and magnitude?

Measurement:-the comparison of an unknown quantity with some standard is called measurement.

Unit:-the standard with which things are compared is called unit-egmeter, kg,second.

Magnitude:- A number with a proper unit is called magnitude. eg 3kg is magnitude.

Q.3 what is meant by physical Quantities? Also explain basic and derived quantities?

Physical Quantity:- Those quantities which can be measured are called physical quantities.

Basic quantities:-those physical quantities which are not derived from other quantities and but other quantities are derived from them are called basic quantities. These are seven in number. The units of basic quantities are called basic units in opposite table the units, quantities are seven and symbols.

Table.1

S.No	Quantities	Symbols	Unit	symbols
1	Length	L	Meter	m
2	Mass	m	Kilogram	Kg
3	Time	t	Second	Sec
4	Electric current	I	Ampere	A
5	Temperate	T	Kelvin	K
6	Intensity of light	L	Candela	cd
7	Amount substance	n	mole	m

Derived quantities:-those physical quantities which are derived from base quantities usually when quantity is derived or multiplied by another base quantity we get derived quantity suppose area is a derived quantity which is derived from two base quantities by multiplying with each other i.e length x length= Area. The unit of derived quantities is called derived quantities. Some derived quantities and their units are given in table.

s.no	Derived quantity	Unit	symbol
1	Force	Newton	N
2	Work	Joul	J
3	power	Walt	W
4	Pressure	Pascal	Pa
5	Speed	Meter/second	m/sec
6	Electric charge	Coulomb	c
7	acceleration	m/sec ²	m/sec

Table2

Q.4 write a short note an system international (S.I)?

Ans. In 1960 an international conference was held near Parisian which it was decided to introduce such a system of unites which could be used all over the world.so they introduce system international 2-e S.I

This system is based on seven basic quantities which are given in table 1 of Q.3.

Q.5 what are prefixes? Why we use it?

Ans. **Prefixes:-**the multiples and submultiples of the power of 10 which are used with basic units, they have their own specific names and symbols and they are called prefixes like kilo (10^3), milli (10^{-3}) etc.

Need of prefixes:-some time we have to deal with quantities that are either very small or very large as compared to basic unit in such cases we need to use prefixes.

For example:- to measure the thickness of a paper we use smaller smaller unit like milli meter (,mm) rather than meter (m). Similarly it we want to measure the distance b/w two big cities then we need greater unit like kilometer (km) rather than meter.

This under such conditions for convenience we express the table of prefixes at is given below.

Power	Prefix	Symble	Power	Prefix	Symble	Power	Prifixe	symble
10^{-15}	Atto	A	10^{-3}	Milli	M	10^6	Mega	Mm
10^{-15}	Femto	F	10^{-2}	Centi	C	10^0	Giga	G
10^{-12}	Pico	P	10^{-1}	Deci	D	10^{12}	Tera	T
10^{-9}	Nano	N	10^1	Deca	De	10^{-15}	Peta	P
10^{-6}	micro	u	10^3	Kilo	k	10^{-18}	exa	e

Q.6 what is scientific notation? How we convert a given number in scientific? Explain?

Ans. **Scientific notation:-** A very large number "N" expressed in the form of " M x 10^n " where "m" is a number whose 1st digit is non-zero and "n" is a + ve or – ve power of "10".

Conversion to scientific:- A number "N" can be expressed scientific by following method.

1. Write the number instandard form ie N= 98,000.
2. Put the decimal point after its non – zero digits ie N=9.8000
3. Now multiply 10 with "M" or 9.8 ie 9.8×10
4. Count the number of digits b/w new and old decimal point and write it as power of 10 .ie 9.8×10^4

5. If decimal point is removed to left side then "n" is + ve and if decimal point is removed to right side then "n" is -ve.
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Q.7 describe the purpose, construction and use of venire caliper.

Ans. Venire caliper:-A device which is used for the measurement of length and diameter etc. of small objects is called venire caliper.

Construction:- it consists of two scales is known as main scale (M.s) which is graduated in cm or mm. The other scale is known as venire scale (v.s) which slides over M.S it's length is 9mm which is divided into "10" equal parts.

The upper jaws of venire caliper are used for internal diameter which the lower jaws are used for external diameter of a body.

Least count :- the minimum distance which can be measured by a venire caliper is called its least count the least count of venire caliper is 0.01 cm or 0.1 mm.

Zero Error And its Correction. On closing the jaws of venire caliper it zero of v.s does not coin side with zero of "M.S" then there is an error in instrument known as zero error. If zero of v.s lies behind the zero of M.S then there is + ve error which is subtracted from actual reading.

Q.8 describe the purpose, construction and use of screw gauge ?

Ans. **Screw gauge:-** A device which is used for the measurement of thickness of very small objects is called screw gauge.

Construction:- it consists of u-shaped metal frame one end of this frame is fitted with a stud "A" and the other end is fitted with a graduated hollow cylinder there is a circular scale (SC) around the cylinder which consists of 100 division.

Least count:- the minimum distance which can be measured by a screw gauge is called its least count which is equal to 0.01mm.

Zero error and its correction:- if zero of circular scale does not coin side with zero of linear scale. Then there is an error in instrument known as zero error. If zero of circular scale remains ahead the horizontal line then there is - ve error which is added to actual reading.

If zero of circular scale remains behind the horizontal line then there is + ve error which is subtracted from actual reading.

Q.9 what is significant figure? Also give rules for determining significant figures?

Ans. **Significant figure:-** an any measurement the combination of accurately known and the 1st doubt full are called significant figures.

Suppose we want to measure the length of a rod by three persons with the help of a meter rod which 10.73, 10.74 and 10.75 respectively. So, an this case we are agree with 10.7 and these digits are called accurate known digits but about 3,4 and 5 are in doubt so these are called doubt full digits. But the number of significant figure we have in this case is four.

Rules for determining significant figure:-Rules for determining of a significant figure are given below.

1. Zeros b/w non-zero digits are significant eg 2008 has 4 s.fig.
2. Zeros on left side of non-zero are not significant eg 0.00089 has two significant figure.
3. Zeros on right side of decimal are significant 2.e 4.3000 has five significant figure.
4. All non-zero digits are significant 2.e 4839 has four significant figures.
5. In case of scientific notation all digits before power 10 are significant. Eg 3.8×10^{-6} has two significant figures.

Q.10 what are the rules for rounding all of non-significant figures?

Ans. Rules for rounding all of non-significant figure are given.

1. If last digit is less than 5 then it will be ignored for example 475.83 is rounded to 475.8.
2. If dropping digit is greater than five. Then digit before 5 is increased by 1 eg 5.37> 5.4
3. If dropping digit is "5" and digit before 5 is even then it will remain unaffected eg 14.45 to 14.4.
4. If dropping digit is "5" and digit before 5 is odd then it will increased by "1" eg. 87.35 to 87.4

Q.11 write the various lab safety precaution ?

Ans. Some lab safety precautionary given below.

1. Never perform any experiment with the permission of teacher.
2. study your experiment carefully before performing.
3. Use the safety equipment available for you.
4. In case of any accident or injury informs your teacher.
5. Smother the fire by blanket.
6. Don't taste any chemical substance.
7. Place the broken substances in the designated container.
8. If you spill certain chemicals, wash it off with water at once.

9. Keep the combust able and explosive material away from open flam.
 10. Use safety goggle while performing experiment.
 11. Check the electrical circuit by teacher before activation.
 12. Turn off water, gas or electric circuit when your experiment is performed.
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Conceptual questions

Q.1 give some examples of word done by physics?

Ans. Some examples of application of work don by physics are given below.

1. Development of electronic devices like T.V radio , computer and radar are due to discovery of electronic.
 2. A geo stationary satellite helps us in forecasting weather and in geographical survey.
 3. The discovery of radio= active and X-rays led to many medical uses.
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Q.2 name the convenient unit you will use to measure?

1. Width of a book (b) length of a room (c) diameter of a wire.

Ans. The convenient unit for measure meant of width of book is centimeter or inch (b) for length of room is foot. (c) for diameter of a wire is millimeter.

Q.3 name the most convenient unit of you will use to measure?

- (a) mass of candy (b) bag of sugar (c) mass of cricket ball?

Ans. The most convenient unit for (a) mass of candy is milligram (b) bag of sugar is kg (c) mass of cricket ball is gram.

Q.4 For Ans see page.2 .Q3.

Q.5 For Ans see page 2. Q3.derived Quantity.

Q.7 Digital stopwatch are most commonly used in physics measurement why?

Ans. Digital stopwatch are most commonly used in physics measurement because it gives more correct time as compared to analog stopwatch. An analogue stopwatch can measure to an accuracy of 0.1 sec while a digital stopwatch measure to an accuracy of 0.01 sec.

Q.8 give the names and symbols of the prefixes used to represent the values of

- a) 10^{-3} b) 10^{-6} c) 10^{-9} d) 10^{-12} .

Ans. For Ans see page 3 . Q5.

Q.9 how much water in units of liter can fill a water tank of 1m³ capacity Explain?

Ans. We know that:- 1m = 100cm then $(1\text{m})^3 = (100\text{cm})^3$

$$\rightarrow 1\text{m}^3 = 100 \times 100 \times 100 \text{cm}^3 \rightarrow 1\text{m}^3 = 1000 \times 1000 \text{cm}^3 \text{----} (!)$$

We also known that:- 1 liter = 1000 cm³

Putting this in equation (!) we get: $1\text{m}^3 = 1000 \times 1 \text{ liter}$.

$\rightarrow 1\text{m}^3 = 1000 \text{ liter}$. Hence a tank of 1m³ water can fill 1000 liter of water.

Q.10 explains the statement "A micrometer screw gauge measure more accurately than verniercaliper?"

Ans. A micrometer screwgauge can measure more accurately than a venire caliper because the least out of screwgauge which is 0.01mm is less than that of venire caliper which is (0.1mm).

Q.11 For Ans see – ve error of screwgauge Q.8.

Q.12 how can we find the volume of a small pebble by the help of measuring cylinder?

Ans. We can find the volume of small pebble with a Measuring by following method.

1. Take some water in measuring cylinder.
2. Note the volume and call it "v₁".
3. Now drop the pebble into measuring cylinder.
4. Again note the temperature and call it "v₂"
5. Now find the volume "Δv" by following formula

$$\Delta v = v_2 - v_1$$

Q.1 give the points to advocate that physics is linked with biology, Chemistry, geography and astronomy.

A) .physics is linked with biology because:-

- (1) X-ray and radioactive x-rays are invention of physics which plays an important role in field of biology.
- (2) Convex and concave mirror are used for sight effect.
- (3) The moment of muscles and bones follow physics principle.
- (4)the effect of gravity on organism is explained by physics.
- (5) the effect of light and temperature on organism is explained by physics.

B)

Physics is linked with chemistry because:-

- 1) X-rays are the invention of physics, used in chemistry.
- 2) We use principles of physics in designing chemicals.
- 3) By principles of physics we can find mass number and charge number.

4) Various branches of chemistry are based on principles of physics like thermo chemistry, physics, chemistry etc.

c) physics is linked with geography because:-

- 1) Telescope is the invention of physics which is used by geologist.
- 2) Magnetic "N" & "S" poles used by geologist.
- 3) Angle of inclination is the invention of physics which is used by geologist for finding angle of inclination.
- 4) with the help of pressure geologist observe various changes at sea level.

d) physics is linked with astronomy because:- equation of motion, telescope, satellite, gravity, space time etc. deals with the physics which are used by Astronomist for different purposes.

Numerical problems

Q.1 Express the following in power of 10.

- Ans. (A) 7 nanometer = 7×10^{-9} m b) 96 mega Walt = 96×10^6 walt.
 c) 2 giga bite = 2×10^9 bite d) 43 Pico farad = 43×10^{-12} farad.

Q.2 for each of these identify the number of significant figures. And in scientific notation.

- Ans. (A) 706.5:- there are four significant figures in 706.5
 $706.5 = 7.06 \times 10^2$
 b) 0.067800 sec: - there are five significant figure in 0.067800 in and
 $0.067800 = 6.7 \times 10^{-2}$ sec

Q.3 change to scientific notation.

- Ans. (A) Diameter of Hlv = 0.000 0001m = 1×10^{-7} m.
 b) Diameter of sun = 1000 000 000 = 1×10^9 m.

Q.4 A beaker contain 200ML of water(14 to = 1000 cm³)

Ans. What is volume in m³ and cm³

$$V = 200\text{ml} = 200 \times 10^{-3} \text{ L}$$

We know that:- 1 liter = 1000 cm³

$$\text{Then } 200\text{ml} = 200 \times 10^{-3} \times 1000 \text{ cm}^3$$

$$200\text{ml} = 200 \times 10^{-3} \times 10^3 \text{ cm}^3$$

$$\underline{200\text{ml} = 200\text{cm}^3}$$

To get volume in m³ we divide cm³ by (100)³

$$200\text{ml} = 200 \text{ m}^3 / (100)^3$$

$$200 \text{ mL} = \text{m}^3 / (10^2)^3$$

$$200\text{ml} = 200 \text{ m}^3 / 10^6$$

$$\underline{200\text{ml} = 200 \times 10^{-6} \text{ m}^3}$$