

Chapter = 01

Physical Quantities and Measurements

Q1) Define Physics. Name the branches of Physics



Physics:

Physics is the branch of science which observes the nature represents it mathematically and conclude with the experiment.

Branches of Physics:

1. Mechanics
2. Thermodynamics
3. Electricity
4. Magnetism
5. Atomic Physics
6. Optics
7. Sound
8. Nuclear physics
9. Particle physics
10. Astrophysics
11. Plasma physics
12. Geo physics



Q2) Define the branches of physics

MECHANICS

This branch of physics is mainly concerned with the laws of motion and gravitation.

THERMODYNAMICS

Thermodynamics deals with heat and temperature and their relation to energy and work.

ELECTRICITY

Electricity is the study of properties of charges in rest and motion

MAGNETISM

Magnetism is the study of magnetic properties of materials



ATOMIC PHYSICS

Atomic physics deals with the composition structure and properties of the atom

OPTICS

Optics studies physical aspects of light and its properties with the help of optical instruments.

SOUND

Sound is the study of production, properties and applications of sound waves.

NUCLEAR PHYSICS

Nuclear physics deals with the constituents, structure, behavior and interactions of atomic nuclei.

PARTICLE PHYSICS

Particle Physics studies the elementary constituents of matter and radiation, and the interactions between them.

ASTROPHYSICS

The study of celestial objects with the help of laws of physics is known as Astrophysics.

PLASMA PHYSICS

The study of ionized state of mater and its properties is known as Plasma Physics.

GEO PHYSICS

The study of internal structure of earth is known as Geo physics.

Q3)Give some importance of physic.

IMPORTANCE OF PHYSIC

Automobile's technology is based on principles of thermodynamics.

Nuclear energy is used on large scale to produce electric power.

Radar technology is based on the role of physics

Laser are widely used in medical science

Electrical device used as home appliances are based on physics rules and laws.



Q4) Define fundamental physical quantities. How many fundamental physical quantities are there? Name them also give their unit and symbol

FUNDAMENTAL PHYSICAL QUANTITIES

Physical quantities which cannot be explained by other physical quantities are called fundamental physical quantities

There are seven fundamental physical quantities

Fundamental quantities	S.I Unit	Symbol of Unit
Length	meter	m
Mass	Kilogram	kg
Time	second	s
Electric current	Ampere	A
Temperature	Kelvin	K
Amount of substance	mole	mol
Luminous intensity	candela	cd

Q5) Define derived Physical quantities. Name some derived Physical quantities also give their unit and symbol

DERIVED PHYSICAL QUANTITIES

Physical quantities which are explained on the basis of fundamental physical quantities are called derived physical quantities.

Derived Quantities	S.I Unit	Symbol of Unit
Volume	cubic meter	m^3
Velocity	meter per second	ms^{-1}
Force	Newton	N
Density	kilogram per cubic meter	kg/m^3

Acceleration	meter per second square	m/s^2
--------------	-------------------------	---------

Q6) Define standard length?



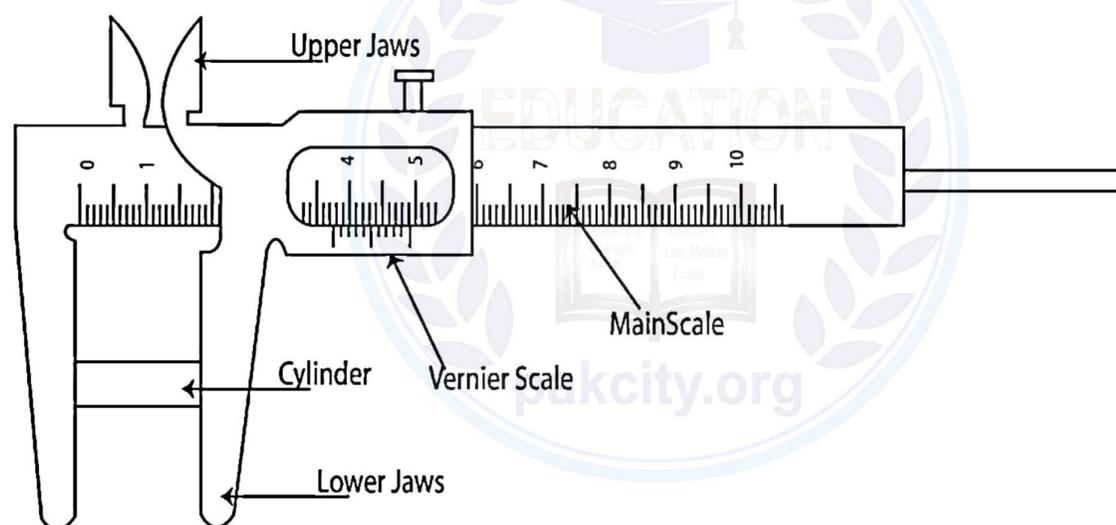
STANDARD LENGTH

The length is defined as the minimum distance between two points lying on same plane

Q7) What is vernier caliper?

VERNIER CALIPER

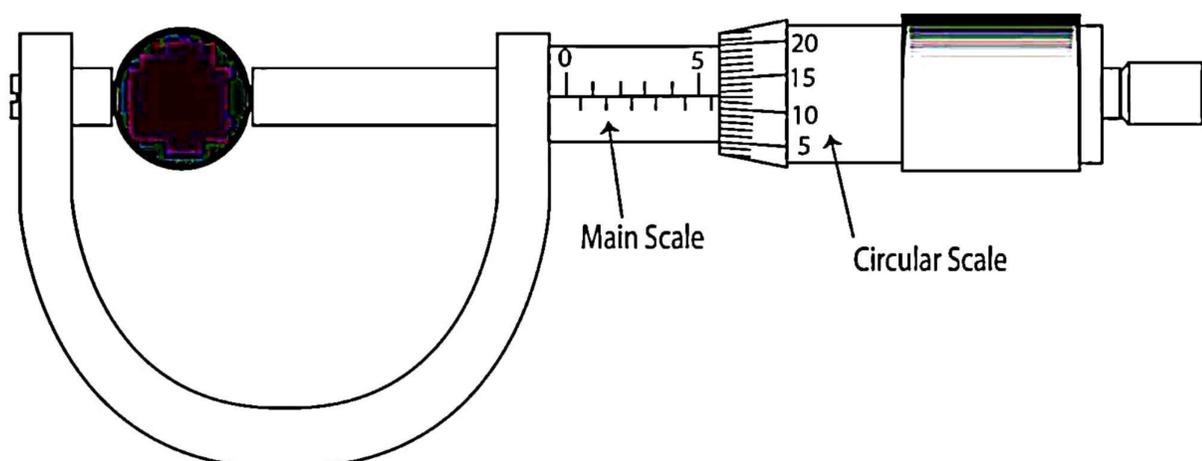
The Vernier Caliper is a precision instrument that can be used to measure internal and external distance extremely accurate. It has both an imperial and metric scale. A Vernier caliper has main jaws that are used for measuring external diameter, as well as smaller jaws that are used for measuring the internal diameter of objects.



Q8) What is Screw gauge?

SCREW GAUGE

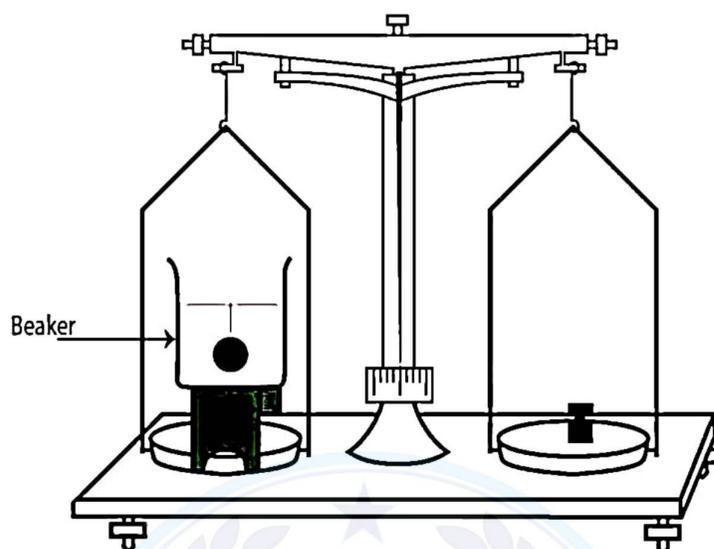
Screw gauge is extensively used in engineering field for obtaining precision measurements. Micrometer screw gauge is used for measuring extremely small dimensions. A screw gauge can even measure dimensions smaller than those measured by a Vernier Caliper



Q9) What is physical balance?

PHYSICAL BALANCE

The **Physical balance** is an instrument used for measurement of mass. It is mostly used in laboratory. It works on the principle of moments.



Q10) What is prefix? List some prefixes.

PREFIX

A **unit prefix** is a specifier. It indicates multiples or fractions of the units.

tera	T	10^{12}
giga	G	10^9
mega	M	10^6
kilo	k	10^3
hecto	h	10^2
deka	da	10^1
deci	d	10^{-1}
centi	c	10^{-2}
milli	m	10^{-3}



Q11) What is density?

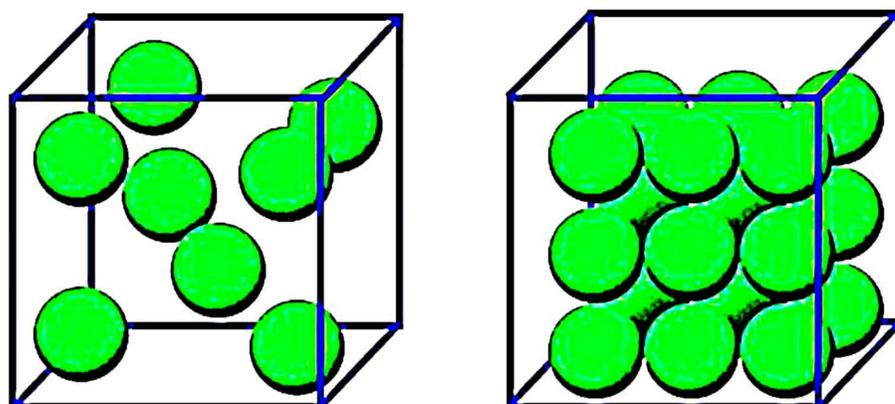
DENSITY

The term density of a substance is defined as mass of substance (m) per unit volume (V). It is denoted by Greek letter ρ (rho)

FORMULA

$$\rho = \frac{m}{V}$$

Density

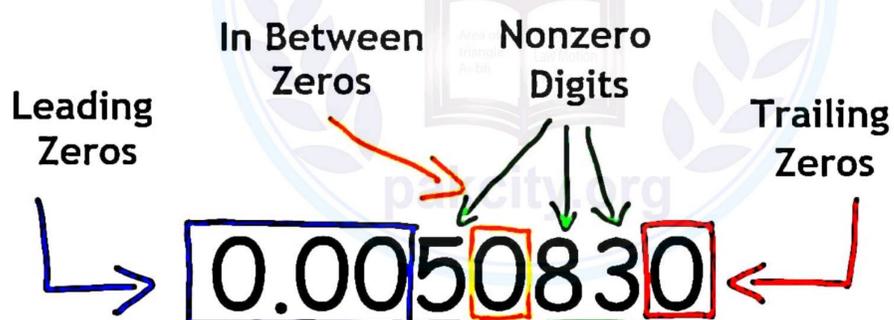


Q12) What is the significant figure discuss the rules for significant figure?

SIGNIFICANT FIGURE

The numbers of reliably known digits in a value are known as significant figures.

Significant Figures



Rule	Example
1. All non-zeroes are significant	2.25 (3 significant figures)
2. Leading zeroes are NOT significant	0.00000034 (2 significant figures)
3. Trailing zeroes are significant ONLY if an explicit decimal point is present	200 (1 significant figure) 200. (3 significant figures) 2.00 (3 significant figures)
4. Trapped zeroes are significant	0.00509 (3 significant figures) 2045 (4 significant figures)

Numerical / Exercise

Q1. What is the mass a solid iron wrecking ball of radius 18cm. if the density of iron is 7.8 gm/cm³?

Data



$$r = 18\text{cm}$$

$$\rho = 7.8 \text{ gm/cm}^3$$

$$m = ?$$

Solution

$$\rho = m/v$$

$$V = \frac{4}{3}\pi r^3$$

$$V = \frac{4}{3}\pi(18)^3$$

$$V = 24432.192 \text{ cm}^3$$

$$7.8 = m/24432.192$$

$$7.8 \times 24432.192 = m$$

$$m = 190571.1 \text{ gm OR } 190.57 \text{ kg}$$

Practice of Q1.

What is the mass a solid iron wrecking ball of radius 6cm. if the density of iron is 12.2 gm/cm³?

Q2. Convert mass of Sun 2 000 000 000 000 000 000 000 000 000 000 kg. into Scientific Notation.

$$\text{Mass} = 2\,000\,000\,000\,000\,000\,000\,000\,000\,000 \text{ kg}$$

$$M = 2 \times 10^{30}$$

Practice of Q2.

Convert mass of earth 6 000 000 000 000 000 000 000 000 kg. into Scientific Notation.

Practice of Q2.

Convert velocity of light 3 000 000 00 m/s. into Scientific Notation.

Q3. Convert mass of an electron 9.11×10^{-31} kg into standard form.

$$M = 9.11 \times 10^{-31} \text{ kg}$$

$$m = 0.000\,000\,000\,000\,000\,000\,000\,000\,000\,911 \text{ kg}$$

Practice of Q3.

Convert charge of an proton 9.1×10^{-19} C into standard form.

Practice of Q3.

Convert gravitational constant $6.67 \times 10^{-11} \text{ Nm}^2/\text{kg}^2\text{C}$ into standard form.

Q4. How many significant figures are there in the base area of a cylinder whose diameter is 5 cm

Data



$$d = 5 \text{ cm}$$

S.F in area = ?

Solution

$$A = \pi r^2$$

$$R = d/2 = 5/2 = 2.5 \text{ cm}$$

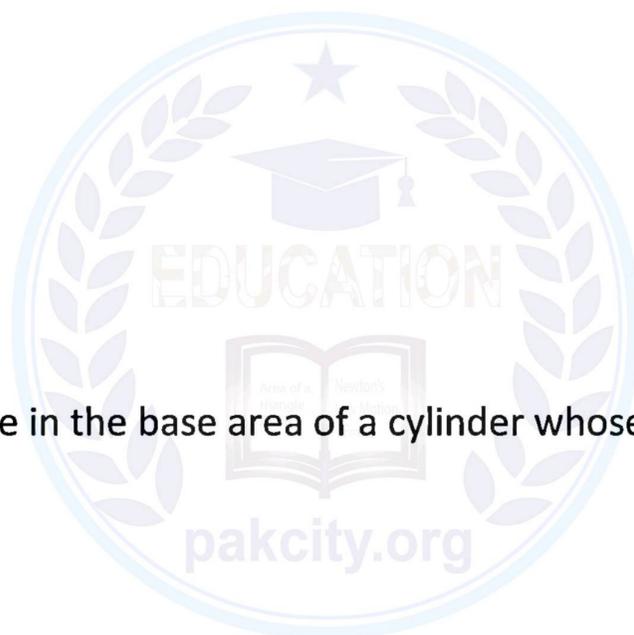
$$A = 3.142 \times (2.5)^2$$

$$A = 19.6375 \text{ cm}^2$$

$$\text{S.F} = 6$$

Practice of Q4.

How many significant figures are there in the base area of a cylinder whose diameter is 7 cm



Q5.

Complete the table

<u>Column A Action</u>	<u>Column B Branch</u>
Cooking Bar B.Q	Thermodynamics
Riding a bicycle	
Turning the Bulb on	
Looking for Giant Galaxies	
Producing a loud sound	
Obtaining energy from Earth	
Describing an atom	

<u>Physical Quantity</u>	<u>S.I Unit</u>	<u>Type</u>
Current	<u>Ampere</u>	<u>Base</u>
<u>Volume</u>	m ³	<u>Derived</u>
<u>Time</u>	Sec	Base
Temperature	<u>K</u>	Base
<u>Force</u>	N	<u>Derived</u>
Density	Kg per m ³	<u>Derived</u>
Acceleration	<u>ms⁻²</u>	<u>Derived</u>

Q6. Convert the following values.

- 1) 230 cm = 2.3 m
- 2) 250 g = 0.25 kg
- 3) 0.5 s = 0.0005 ms
- 4) 0.8 m = 0.0008 mm
- 5) 350ms = 350000s
- 6) 1.2Kg = 1200 g



Q7. Write the correct prefix of notion

- 1) 75000m = 750 h
- 2) 2/1000 sec = 2 m
- 3) 1/1 000 000 g = 1 μ
- 4) 1000 000 000 m = 1 M

Q8. Write values in standard OR scientific notation

- a) The radius of 1st orbit of Hydrogen atom is $r = 0.53 \text{ \AA} = \underline{0.53 \times 10^{-10} \text{ m} = 0.000\ 000\ 000\ 053 \text{ m}}$
- b) 1 light year is 2628 000 000 000m = $2.628 \times 10^9 \text{ m}$
- c) Vacuum pressure = $2.7 \times 10^{-4} \text{ torr} = \underline{0.00027 \text{ torr}}$

Q9. A wooden piece is made in different shapes take length (l) = radius (r) = 2m Calculate its volume as a:

- a) Sphere b) Cube c) Cylinder d) Pyramid

a) Sphere

Data

$$r = 2\text{m}$$

$$V = \frac{4}{3}\pi r^3$$

$$V = \frac{4}{3} \times 3.142 \times (2)^3$$

$$V = 33.51 \text{ m}^3$$

b) Cube

$$l = 2$$

$$V = l^3$$

$$V = 2^3 = 8\text{m}^3$$

c) cylinder

$$V = \pi r^2 h$$

$$V = 3.142 (2)^2 \times 2 = 25.136 \text{ m}^3$$

d) Pyramid

$$V = \frac{l^3}{3} = \frac{2^3}{3} = 2.667 \text{ m}^3$$



Q10. Find the density of wood as sphere and cube if the mass of wood is 1kg. Is there any change in density due to shape?

Data

$$M = 1\text{kg}$$

$$V(\text{sphere}) = 33.51 \text{ m}^3$$

$$\rho(\text{sphere}) = ?$$

$$V(\text{cube}) = 8 \text{ m}^3$$

$$\rho(\text{cube}) = ?$$

Solution

$$\rho = \frac{m}{v}$$

$$(\text{sphere}) \rho = \frac{1}{33.51} = 0.03 \text{ kg/m}^3$$

$$(\text{cube}) \rho = \frac{1}{8} = 0.125\text{kg/m}^3$$

Yes, density is different for sphere and cube, because the volume is different.



Q11. Write significant numbers in the following values.

1) 980 has 2 Significant numbers.

2) 91.60 has 4 Significant numbers.

3) 10010.100 has 8 Significant numbers.

4) 0.0086 has 2 Significant numbers.

5) 60 has 1 Significant numbers.

6) 6250 has 3 Significant numbers.

7) 13.20 has 4 Significant numbers.

8) 41.70 has 4 Significant numbers.

9) 80070.700 has 8 Significant numbers.

10) 30200.050 has 8 Significant numbers.

11) 0.0071 has 2 Significant numbers.

12) 0.0092 has 2 Significant numbers.

