Al-Saudia Virtual Academy
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Measurement

Q1. What is meant by Measurement?

Ans. MEASUREMENT

The following information about a body or an event is called measurement.

i. Size and nature of a body is described with a scale.

ii. A clock describes an event.

iii. Hence the reading will give the scale or clock about a body or an event is known as measurement.

Q2. Define the term UNIT?

Ans. UNIT:

Such quantities that are used to express physical quantities are called UNIT.

Examples:

Unit of mass is known is Kilogram.

Unit of weight is Newton.

Unit of distance is Meter.

In short, without mentioning unit we cannot describe any physical quantity.

Q3. What do you mean by fundamental Unit?

Ans. FUNDAMENTAL UNIT:

Units used to express fundamental quantities are called Fundamental Units.

OR

The unit of quantity of matter, Length and time are called Fundamental units. Because these are very essential for any experiment. We cannot define anybody, event or any experiment without these fundamental units.

Q4. What do you mean by derived units?

Ans. DERIVED UNITS:

The units, which are derived from fundamental units, are called Derived Units.

Example:

Unit of Area is derived from unit of distance or length. Similarly the division of distance and time derives the unit of velocity, unit of volume is also derived from distance or length.

Q5. What is meant by System of units?

Ans. SYSTEM OF UNITS:

The fundamental units and derived fundamental units are called System Units.

Q6. How many systems of units in World?

Ans. There are four system of unit in the world, which are as follows:

1. M.K.S System (Meter – Kilogram – Second)
2. C.G.S System (Centimeter – Gram – Second)
3. F.P.S. or BE System (Foot – Pound – Second) or British Engineering System
4. S.I.System (System International)

Q7. Give the unit of mass, distance and time in different system of Units?

Ans.

Name of system	Unit of Length Or Distance	Unit of Mass	Unit of Time
M.K.S System	Meter (m)	Kilogram (Kg)	Second
C.G.S.System	Centimeter (cm)	Gram (g)	Second
F.P.S or BE System	Foot (ft)	Slug	Second
S.I System	Meter (m)	Kilogram (kg)	Second

Q8. **What is meant by System of International? Also write the basic units of S.I.**

System?

Ans. **SYSTEM OF INTERNATIONAL (S.I. System):**

For two centuries a large number of conversion factors had to be memorized to convert basic units into practical units and vice versa. This difficulty was removed in MKSA (meter-kilogram-second-ampere) system, in which ampere was adopted as a fundamental electrical unit. This MKSA system had been internationally adopted and called S.I. System.

Fundamental Unit of S.I. system

Units of length or distance meter (m)

Unit of Mass Kilogram (kg)

Unit of time Second (Sec)

Unit of Current Ampere (Amp)

Q9. What is difference between M.K.S. and S.I. System?

S. No	M.K.S. System	S.I. System
1.	It has three fundamental units.	It has four fundamental units.
2.	It stands for the unit of mass, distance and time.	It stands for the units of mass, Distance time & current.
3.	The unit of mass, distance and time is Kg, meter and Sec respectively.	The unit of mass, distance time and current are Kg, meter, Sec and Ampere respectively.

Q10. Write short note on following. i. Meter ii. Kilograms iii. Second iv. Ampere

Ans. **METRE:**
It is the unit of length in 1983, the general conference in S.I. system of weight and measures defined "one meter length as the length of the path traveled by light in a vacuum during a time interval of 1/29979.2458 of a second.

KILOGRAM:
It is the unit of mass in S.I. System. The standard kilogram is the mass of certain cylindrical piece of platinum iridium alloy kept at Sevres France. The cylinder is 3.9 cm in diameter and 3.9cm in length.

SECOND:
It is the unit of time in all system. It is defined as the duration of 9192631778 cycles of the radiation corresponding to the transition between two levels of the ground state of the Cesium atom. It is denoted by "sec".

AMPERE:

It is the unit of current in S.I.system. Its symbol is "A". It is defined as the current which is flowing in two straight parallel wires of infinite length placed one meter apart in a vacuum, will produce on each of the wire with a force 2x107 Newton per meter length.

Q11. Write the important fundamental and derived units of S.I.system?

Ans. **DERIVED UNITS:**

Angle	Kilogram per cubic meter	Henry
Density	Meter per second	Weber
Speed	Newton	Tesla
Force	Pascal	Kg/m3
Pressure	Joule	m/second
Energy-Work-Heat	Watts	H
Power	Volts	Pascal
Charge	Coulomb	Joule
Electric Potential	Ohm	Watt
Resistance	Siemens	volts
Conductance	Farad	coulomb
Capacitance	Magnetic Field	ohm
Inductance	Radians	Siemens
Magnetic Flux	Weber	farad
		Henry

IMPORTANT UNITS

S. No	Physical Quantities	Units
1.	Temperature	Kelvin (K)
2.	Light Intensity	Candela (Cd)
3.	Amount of matter	Mole (n)

Q12. Give the rule of Notation in SI. System?

Ans. The following are the important rule for notations

i. Full stop should not use in any unit e.g., J.S is wrong, JS is correct.

ii. Similarly cms is wrong, whereas cm is correct.

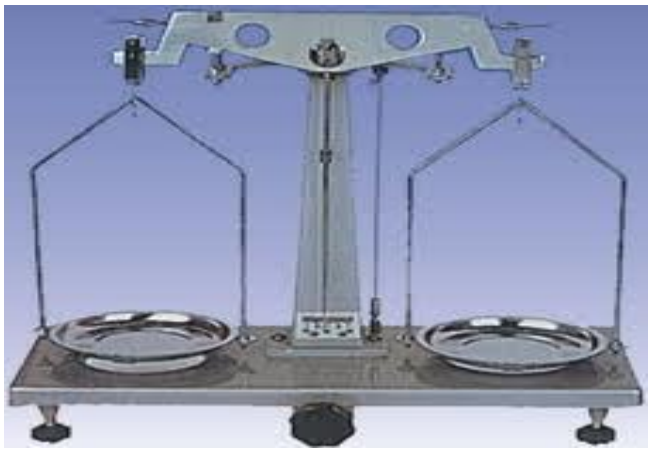
iii. We often write Kg/m^3, m/s, but correct is Kgm^{-3}, ms^{-1}

Q13. Write short note of following:

i. Physical Balance ii. Vernier Calliper iii. Stop Watch

iv. Micrometer Screw Gauge v. Measuring Cylinder

Ans. **PHYSICAL BALANCE:**



Construction:

i. It is the first hand of lever in which length of both arms is equal.

ii. The beam between two arms is made-up of Aluminum The beam A is provided with two identical pans P & P' suspended by knife edges K and K '.

iii. When we rotate the screw B, the knife lifts the beam up from the support T and R is a pillar. The pans are lifted up from the base

Working:

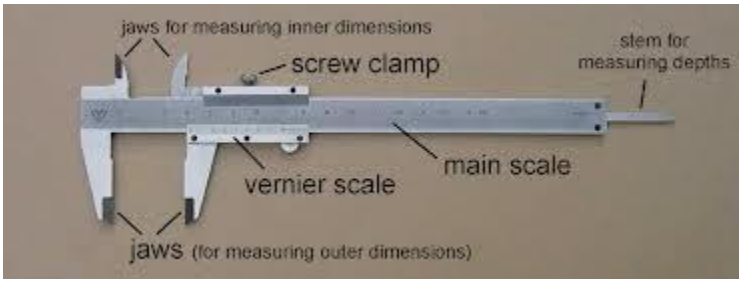
i. The beam is made horizontal with the help of screw F and F '.

ii. The body whose mass is to be determined is put on the left pan and known mass I put on the right pan.

iii. Maintaining the pointer at zero position, the mass is determined.

iv. It should be noted that the physical balance measures mass, certainly not the weight and it is quite independent of the value of "g".

VERNIER CALLIPER:



Construction:

i. A vernier caliper is consists of a rectangular steel bar whose one side is graduated in cms.
ii. It consists of two scales, one is called Main scale and other is called Vernier Scale.
iii. The vernier scale freely moves on the main scale.
iv. Vernier scale is 9mm long and is divided into 10 equal parts.
v. The difference between main scale and vernier scale is 0.1mm or 0.01cm, which called Vernier constant or "Lease Count".
vi. Least count is used to find the fractional part.
vii. With help of this device we can accurately make measurement up to one tenth (1/10) of a millimeter or one hundredth (1/100) of a centimeter.

Use:

i. The vernier slides move on main scale until its jaw just touch the ends of the object being measured.
ii. Suppose a reading of 5.34cm is shown in figure.
iii. This is the reading of main scale.
iv. When a nearest perpendicular line of a vernier scale is coincides with a main scale marks. The reading obtained in division is called Vernier scale reading. Suppose it is 4 divisions as shown in the above figure.

MICROMETER SCREW GUAGE:

Construction:

i. It has two scales, one is called main scale and other is called Circular scale.

ii. It is used to measure the diameter and thickness of small objects.

iii. Spindle is an important part in Screw gauge as shown in figure.

iv. Spindle is fitted with a graduated thimble.

v. To protect the screwed portion it kept into enclosed cylinder.

vi. Spindle moves through 0.5mm or 0.05cm for each complete rotation. This distance is called pitch of the screw gauge.

Use:

i. The circular scale moves on main scale, which is in millimeter.

ii. When the object is being measured, we rotate circular scale clockwise till spindle just touches the object. Now we may take reading.

STOP WATCH:

Construction:

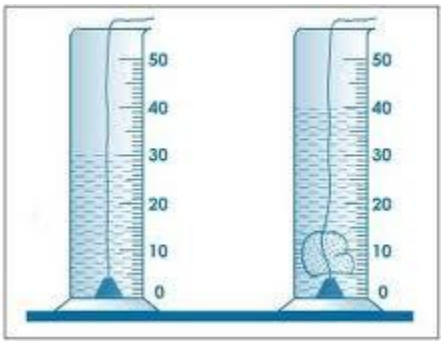
i. We use a stopwatch for measurement of time, in our laboratories.

ii. It has two hands M and S.

iii. ‘M’ is for minutes and ‘S’ is for seconds.

iv. Normally both M and S coincide with position o2f zero.
v. The button ‘B’ is pressed and released for recording the time interval between the start and stop of the event.
vi. By pressing and releasing button ‘B’ the needle, of stopwatch returned at zero and ready for next fresh reading.

MEASURING CYLINDER:



Construction:
i. It is made-up of glass.
ii. A scale in cubic centimeter or millimeter printed on it.
iii. It is used to find volume of liquids.
iv. When we pour liquid into the cylinder, the level of liquid in the cylinder is noted.
v. We should keep the eye in level with the bottom of the meniscus of the liquid in order to read the volume correctly.
vi. The liquid surface and the cylinder must be on a horizontal table.

Q14. Define the following:
i. Directly Proportional
ii. Inversely Proportional
iii. Proportional Constant

Ans. **DIRECTLY PROPORTIONAL**
Such relation between two physical quantities in which one is increased other is also increased, and similarly when one is decreased, the other is decreased, is called Directly Proportional.
Example:

$$\mathbf{V \propto T}$$

This equation shows the relation of directly proportional between Volume and Absolute Temperature.

INVERSLY PROPORTIONAL:

If one physical quantity is increasing, then the other is decreasing, and if one were decreasing, the other would be increasing then this relation is termed INVERSLY PROPORTIONAL relation.

Example:

If volume and pressure are two physical quantities. Then the relation between them is

$$V \propto 1/P$$

Graph of Inversely Proportional:

The graph of inversely proportional relation between two physical quantities is always forms a curve shape.

PROPORTIONAL CONSTANT:

To change the symbol of inversely or directly proportional between two physical quantities. We must use a symbol (K), which is called Proportional Constant. e.g.

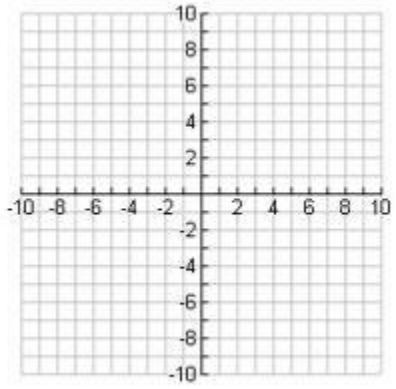
$$V \propto T$$

$$V = KT$$

Where $\propto$ is a symbol of directly proportional in this case K is proportional constant.

Q15. What is a Graph?

Ans. It the way of showing the nature of relation between two physical quantities either it is straight or in curve path.



Q16: How is Graph Construct?

Ans. **METHOD OF CONSTRUCTING GRAPH:**

i. It is always construct on paper on which there are many straight horizontal and vertical lines.

ii. First, we draw two lines, which are perpendicular to each other as shown in figure.

iii. The vertical line is called Y-axis and the horizontal line is called X-axis.

iv. Where both x and y-axis intersect each other is called origin.

v. The value of Y-axis is always positive from origin to upward direction and negative from origin to downward.

vi. The value x-axis is always negative from origin to left side and positive from origin to right.
vii. All positive and negative value constructed on graph in small points. Then these points are joined with each other and get the graph.

Q17. Write the advantages of Graph.

Ans. ADVANTAGES OF GRAPH:

i. It is denoted the reactor between two physical quantities.
ii. It also shows the change of relation between two physical quantities.
iii. A doctor diagnosis his patient, by a graph which is drawn between the patient's condition and medicines to be recommended.
iv. Businessmen can also the state of his business by drawing a graph between investment made and profit earned.

Q18. What is meant by Error?

Ans. ERROR:

The difference between the measured and the actual value of any quantity is called Error.

Q19. How many types of Errors are? Define each.

Ans. There are three types of errors, which are as follows:
i. Personal Error.
ii. Systematic Error.
iii. Random Error.

i PERSONAL ERROR:

This error occurs when the instruments are used improperly.

ii SYSTEMATIC ERROR:

If difference between actual and experimental reading is due to the fault of the measuring instrument then it is called Systematic Error.

iii. RANDOM ERROR:

If difference between actual and experimental reading is due to change in physical state then it is called Random Error.

Q20. What is meant by Correction?

Ans. CORRECTION:

If difference between actual and experiment reading is more and more minimized, then it is called Correctness. This can be done only when we use the instrument properly and remove their fault, stop the change of physical state.