

Measurement of Physical Quantities

EXERCISE [PAGE 45]

Exercise | Q 1.1 | Page 45

Write an answer to the following question in your own words.

Why is the weight of the same object different on different planets?

Solution: Weight of an object, W is given as

$$W = mg$$

where, m = mass of the object and g = acceleration due to gravity of a place

We know that acceleration due to gravity is different at different planets. Hence, the weight of same object differs on different planets.

Exercise | Q 1.2 | Page 45

Write an answer to the following question in your own words.

What precautions will you take to make accurate measurements in day-to-day affairs?

Solution: Precautions to be taken to make accurate measurements in day-to-day affairs are

- The device used for measurement should be appropriate and properly working.
- The device should be used properly.
- It should be checked that the device in use should have stamp of standardization by the department of weights and measure.
- 3-4 readings should be taken for achieving accuracy in measurement

Exercise | Q 1.3 | Page 45

Write an answer to the following question in your own words.

What is the difference between mass and weight?

Solution:

Mass	Weight
Mass is the amount of matter contained in a body.	Weight is the force exerted on a body due to the gravitational pull of another body such as Earth, the sun and the moon.
Mass is an intrinsic property of a body.	Weight is an extrinsic property of a body.

The mass of a body remains the same everywhere in the universe.	The weight of a body depends on the local acceleration due to gravity where it is placed.
The mass of a body cannot be zero.	The weight of a body can be zero.
The SI unit of mass is kilogram (kg).	Since weight is a force, its SI unit is newton (N).
The mass of a body can be measured using a beam balance and a pan balance.	The weight of a body can be measured using a spring balance and a weighing machine.

Exercise | Q 2 | Page 45

Who is my companion?

A		B	
1	Velocity	a	litre
2	Area	b	kilogram
3	Volume	c	metre/second
4	Mass	d	kilogram/cubic metre
5	Density	e	square metre

Solution:

A		B	
1	Velocity	c	metre/second
2	Area	e	square metre
3	Volume	a	litre
4	Mass	b	kilogram
5	Density	d	kilogram/cubic metre

Exercise | Q 3.1 | Page 45

Explain giving examples: Scalar quantity

Solution: A quantity which has only magnitude and no direction is known as scalar

quantity. Distance, work, speed, time, energy, etc. are all scalar quantities. These quantities can be expressed completely by their magnitude alone.

Exercise | Q 3.2 | Page 45

Explain giving examples: Vector quantity

Solution: A quantity which has magnitude as well as direction is known as vector quantity. Force, velocity, displacement, etc. are all vector quantities. These quantities are expressed completely only when their directions are defined along with their magnitude.

Exercise | Q 4 | Page 45

Explain, giving examples, the errors that occur while making measurements.

Solution: Various types of errors can occur while taking measurement. These are as follows:

- **Instrumental errors:** These errors arise when the instrument used for measurement has become faulty. For eg, ruler with rough and broken edge can cause instrumental error.
- **Observational errors:** These errors arise when the reading in the instrument is noted incorrectly. These can also arise if the instrument is used in incorrect method. For example, if the tip of pencil does not coincide with zero of the scale, then we will get error in measurement of length of pencil.
- **Theoretical errors:** These are caused by simplification of the model system. For example, a theory states that the temperature of the system surrounding will not change the readings taken when it actually does, then this factor will begin a source of error in measurement.
- **Environmental errors:** These errors arises due to the instruments working getting affected due to some environmental factors such as temperature, pressure, etc.

Exercise | Q 5.1 | Page 45

Give reasons.

It is not proper to measure quantities by using body parts as units.

Solution: It is not proper to measure quantities by using body parts as units because these are not reliable and unique. These units of measurement vary from person to person.

Exercise | Q 5.2 | Page 45

Give reasons.

It is necessary to get the weights and measures standardized at regular intervals.

Solution: Because of difference in physical conditions from place to place, the reference chosen as units for weights and measures varies. So, it becomes necessary to get the weights and measures standardized at regular intervals.

Exercise | Q 6 | Page 45

Explain the need for accurate measurement and the devices to be used for that.

Solution: We need not be very accurate every time we take a measurement. The degree of accuracy in measurements vary according to the situations. For example,

- when someone asks about the time of the day, we do not have to be specific up to the seconds of time, because there is no need to be that accurate in the given situation. On the other hand, for laboratory purposes or for scientific experiments, we have to measure the time even up to milliseconds accurately.
- while measuring mass of precious substances, such as gold, silver, etc., we need to be accurate in our measurement.
- in competitions and events, a difference of second can make you lose or win the game. Thus, accurate time measurement in such cases is very important.
- shopping in our day to day life, like for groceries, milk, flour etc. requires lot of alertness at our part so that we do not get cheated. We should always check whether the measurement is done properly or not by the vendors selling these products.

The devices used for accurate measurement are:

- For time measurement, stop watch can be an accurate device
- For mass measurement, electronic balance can be an accurate device.
- For length measurement, ruler or measuring tape can be the accurate devices.
- For temperature measurement, thermometers can be an accurate device.