

Boys' High School & College

Subject: Physics

Physical quantities and measurement

15 April-15th May

Class VI

Some important terms:

Explanation of the term Physics

a) Physics is the branch of science that deals with the study of matter and energy. The subject matter of physics includes heat, light and other radiation, sound, electricity, magnetism, and the structure of atoms.

b) Study of Physics is based on measurement. In Physics we learn how to measure quantities that are involved in it.

Explanation of the term Physical Quantity

In physics, a **physical quantity** is any **physical** property that can be quantified, that is, can be measured using numbers. Examples of **physical quantities** are mass, amount of substance, length, mass, time, temperature, electric current, light and many others.

Explanation of the term Measurement

Measurement is the act of determining a target's weight, length, capacity, size, or other physical dimensions. Each and every measurement consists of two parts:

i) A number called numerical value.

ii) A symbol or alphabet that denotes the unit associated with it.

Example: When we say length of a rod is 5m (meter), then 5 is the numerical value and 'm' is the unit of length.

There are two types of measurement systems: direct measurement and indirect measurement.

Explanation of the term Standard Unit

A **standard unit** is a **standard** measure that remains the same whenever, wherever and by whoever it is used. The standard units of length, mass, time and temperature are meter, kilogram, second and kelvin respectively.

Following two links can be used to get the better understanding of Standard units:

<https://www.youtube.com/watch?v=ggtKECO7-m8>

<https://www.youtube.com/watch?v=nE8AAU50YQ0>

Conversion of units

a) Relationship between 12-hour clock time and 24-hour clock time

i) When time is given in a.m.

For example: 4a.m. then it is simply written as 04:00 hours

ii) When time is given in p.m.

For example: 1 p.m. then you will add 12 to the hour i.e. $1+12=13$ while seconds and minutes remain unchanged.

Similarly to convert 10:45 p.m. in hour format you will add 12 to 10 i.e. $10+12=22$,

Therefore 10:45p.m. =22:45 hours

Following link can be used to get the better understanding of conversion of units:

<https://www.youtube.com/watch?v=dW-2FmmVPiw>

WORKSHEET 1

Note: To be done in a notebook

Theme 2:Physical Quantities and measurement

A. Fill in the blanks :

a) One kilometer is equal to 1000 m.

b) The lower fixed temperature in Celsius thermometer is the melting point of ice.

c) The thermometer used to measure the temperature of human body is called Clinical thermometer.

d) 2000 cm is equal to 20 m.

(Explanation: Since $1 \text{ cm} = \frac{1}{100} \text{ m}$

Therefore $2000 \text{ cm} = \frac{1}{100} \times 2000 = 20 \text{ m}$)

e) 25 l = 25000 ml

(Explanation: Since $1 \text{ l} = 1000 \text{ ml}$ therefore $25 \text{ l} = 25 \times 1000 = 25000 \text{ ml}$)

B. Define the following terms:

a) Fundamental unit - The fundamental units are the units of the fundamental quantities, as defined by the International System of Units. For example: the meter (symbol: m), is used to measure length.

b) Mass- The mass of a body is the quantity of matter contained in it.

c) Derived unit-The units which are obtained with the help of fundamental units are called derived units. For example- unit of volume is m^3 .

d) Temperature-Temperature is defined as the degree of hotness or the coldness of the body.

e) Surface area-The total area of the surface of 3-D object is called surface area.

f) Time-The interval between the two events is called time. We measure time with the help of mean solar day.

C. Differentiate between the following:

a) Stop watch and wrist watch

Stop Watch	Wrist watch
A stop watch is held in hand and is used to time the duration of an event.	A wrist watch is usually attached to a strap or is a band worn around the wrist which tells time.

b) Beam balance and physical balance

Beam balance	Physical balance
It is used by the vendors to measure the mass.	It is used in laboratory to get the more accurate measurement of mass.

D. Answer the following questions:

a) What is measurement?

Ans. Measurement can be defined as the comparison of an unknown quantity with a known standard quantity. Each and every measurement consists of two parts:

i) A number called numerical value.

ii) A symbol or alphabet that denotes the unit associated with it.

b) Define the term length. What is its SI unit?

Ans. The measurement of something from end to end is called length. The SI unit of length is meter (m).

c) What do you understand by the term unit? Write its characteristics.

Ans. Measurement requires the comparison of an unknown quantity with some known fixed quantity of the same kind. This known fixed quantity is called the unit. The unit of the physical quantity should have following characteristics:

- i) The unit should have convenient size.
- ii) Its value should not change with respect to place and time.
- iii) The system of the units should be acceptable everywhere.
- iv) It should be well defined.

d) Describe the precautions required while measuring the length.

Ans. The precautions required while measuring the length are:

1. Care should be taken to keep the ruler along the length of the object.
2. If the edge of the ruler is worn out or broken, the measurement should be started from any other mark that is fully clear. For example: If you measure 2cm mark to 7cm mark, the length is 5cm ($7\text{cm} - 2\text{cm} = 5\text{cm}$).
3. Eyes should be exactly above the point where the measurement is to be taken. If your eyes are at different positions, you might get wrong readings.

E) Solve the numerical problem:

i) Find the area of a rectangular field whose length is 20m and breadth is 15m.

Sol. Length=20 m breadth=15m

Area of a rectangular field =length X breadth

$$=20 \times 15$$

$$=300\text{m}^2$$

ii) Find the area of a square whose one side is 25 cm.

Sol. Length=25cm

Area of a square=length \times length

$$=25 \times 25$$

$$=625 \text{ cm}^2$$

Area of square is 625 cm^2

iii) How many centuries are there in a $\frac{1}{2}$ millennium?

Sol. 1 millennium=10 centuries

$$\frac{1}{2} \text{ Millennium} = \frac{1}{2} \times 10 = 5 \text{ centuries}$$

5 centuries are there in $\frac{1}{2}$ millennium

iv) Convert 5 hours in seconds.

Sol. 1 hour=3600 seconds

$$5 \text{ hours} = 5 \times 3600$$

$$=18000 \text{ seconds}$$

F) Neatly draw the following tables given below on the blank side of your notebook:

i) The base quantities of the SI system of units. (Page 18)

ii) Multiple and sub-multiples of units-factors, prefixes and symbols. (Page 19)

Worksheet 2

Note: Exercises to be done in a notebook.

1) Fill in the blanks:

- a) The three fundamental units are _____, _____ and _____.
- b) The area of an irregular surface can be measured with the help of a _____ paper.
- c) 1hour20minutes=_____minutes=_____seconds.
- d) 5:30a.m.=_____hours
- e) 10:30p.m.=_____hours

2) Write True or False for the following statements:

- a) The standard unit of mass is litre .
- b) The quantity of matter possessed by a body is called its mass.
- c) The SI unit of temperature is Fahrenheit.
- d) The amount of space occupied by a body is called its mass.
- e) Kilometer is the unit of length.
- f) Distance between Kolkata and Delhi is measured in mm.

3) Match the following:

Column A	Column B
a)Mass	i)meter
b)Area	ii)Physical balance
c)Temperature	iii)Graph paper
d)Time	iv)Stop-watch
e)Length	v)Thermometer

4) Answer the following questions:

- a) What is mass? Name the instruments used to measure the mass.
- b) How will you measure the area of an irregular surface by using a graph paper? Explain with diagram.
- c) What is simple pendulum? Explain with diagram.
- d) Give SI units of (i) Mass ;(ii) Length;(iii) Time;(iv) Temperature.
- e) Draw a neat diagram of a clinical thermometer.

5) Solve the following numerical problems:

- a) Express the length 200 centimeter in metres.
- b) The length of a rectangular field is 55m and breadth is 30 m. Find the area.
- c) Convert 5 hours into seconds.
