Fundamental Measurements

In this Chapter you will learn about :

About physical quantities and different measuring systems.
How to express length, mass and time.
About unit and its characteristics
Conventions for writing the symbols of units
Use scientific notation to represent large and small numbers
About simple pendulum

Applications of measurements in real life :

Measurement helps innovation.
Measuring the composition energy values and quantity of gas piped to our homes
Measurement of fuel in our vehicles.

What is physics?

As per ancient Greeks Physics means "knowledge of nature". The dictionary says physics is "the study of matter, energy, and the interaction between them", but what that really means is that physics is about asking fundamental questions and trying to answer them by observing and experimenting.

Physicists ask really big questions like:

* How did the universe begin?
* How will the universe change in the future?
* How does the Sun keep on shining?
* What are the basic building blocks of matter?

If you think these questions are fascinating, then you'll like physics.

What do Physicists do?

Many physicists work in 'pure' research, trying to find answers to these types of question. The answers they come up with often lead to unexpected technological applications. For example, all of the technology we take for granted today, including games consoles, mobile phones, mp3 players, and DVDs, is based on a theoretical understanding of electrons that was developed around the turn of the 20th century.

Physics doesn't just deal with theoretical concepts. It's applied in every sphere of human activity, including:

* Development of sustainable forms of energy production
* Treating cancer, through radiotherapy, and diagnosing illness through various types of

imaging, all based on physics.

* Developing computer games
* Design and manufacture of sports equipment
* Understanding and predicting earthquakes

Introduction to measurement:

Measurement is the basis of all scientific study and experimentation. It plays an important role in our daily life. Physics is a quantitative science and physicists always deal with numbers which are the measurement of physical quantities.

Physical quantity

The quantities which are measurable are called physical quantities

Ex: length, mass, time, speed etc.

Unit : To measure a physical quantity a standard quantity of same kind is selected. This chosen standard quantity is called a unit.

Standard unit: A unit which is acceptable to majority of the people as a basic unit of measurement is called standard unit.

The chosen unit should have the following characteristics:

1. Its value must not vary with place and time.
2. It should be capable of being reproduced easily.
3. It must be well defined.
4 It should be of proper size i.e neither too large nor too small when compared to the quantities to be measured.

***Measurement of physical quantity* :**

Measurement means the comparison of an unknown physical quantity with a known and fixed quantity of similar nature (kind).

Measurement of the physical quantity involvs two steps

Step 1 : Choose the standard value as a unit of measurement (unit)

Step 2 : Find how many times that unit is contained in the given physical quanity (Numerical value)

i.e. A measurement consistis of two parts, the numerical value and the unit.

Ex: Mass of a boy = 8 kilogram. Here mass is physical quantity, 8 is numerical value and kilogram is the unit.

Note: Magnitude of a physical quantity is constant is constant (does not change with choice of unit)

Magnitude of physical quantity (P) = Numerical value (N) x Unit (U)

i.e. P = Constant (or) NU = Constant (or) $N \propto \frac{1}{U}$ (as P is constant) , $N_1U_1=N_2U_2$

(Here N_1 is numerical value in first system of measurement, U_1 is unit in first system of measurement, similary N_2 & U_2 are numerical value and unit in second system of measurement).

Ex: Height of table is 6 m = 600 cm, here $N_1 = 6$, $U_1 = m$, $N_2 = 600$, $U_2 = cm$

Measuring systems:

There are three main system of units in use to measure dimensions length, mass and time.

S.No	*Measuring system*	*Length*	*Mass*	*Time*
1	CGS (Gaussian System)	centi meter	gram	second
2	MKS (Metric System	meter	kilo gram	second
3	FPS (British System)	foot	pound	second

1. C.G.S and M.K.S Systems are known as metric systems.
2. At present M.K.S System accepted world over as international system of units, in brief called S.I units.

SI system of units :

The general conference of weights and measurements held in 1960 decided a new system of units called " System International" (SI).

This system is an improved and extended version of M.K.S system.

This system defines seven fundamental and two supplementary quantities.

Units of the International System (SI)			
S.No.	*Quantity*	*Name of Unit*	*Unit Symbol*
1	length	metre	m
2	mass	kilogram	kg
3	time	second	s
4	temperature	kelvin	K
5	amount of substance	mole	mol
6	electric current	ampere	A
7	luminous intensity	candela	cd
Supplementary quantities			
8	Plane angle	radian	rad
9	Solid angle	steradian	sr

Prefixed used in S.I units (Decimal multiples and submultiples)

Multiple	Prefix	Symbol	Common Name
10^{18}	exa	E	quintillion
10^{15}	peta	P	quadrillion
10^{12}	tera	T	trillion
10^{9}	giga	G	billion
10^{6}	mega	M	million
10^{3}	kilo	k	thousand
10^{2}	hecto	h	hundred
10^{1}	deca	da	ten

Multiple	Prefix	Symbol	Common Name
10^{-1}	deci	d	Tenth
10^{-2}	centi	c	Hundredth
10^{-3}	milli	m	Thousandth
10^{-6}	micro	*u* (Greek mu)	Millionth
10^{-9}	nano	n	Billionth
10^{-12}	pico	p	Trillionth
10^{-15}	femto	f	quadrillionth
10^{-18}	atto	a	Quintillionth

Rules for writing units and symbols:

i) The full names of the units do not begin with a capital letter. For example: newton, kelvin not newton (or) kelvin.

ii) The symbols of units named after scientists have initial capital letters. For example, J for joule, k for kelvin, N for newton.

iii) Symbols do not have plural forms. For example, 10kg not 10kgs, 7m not 7ms.

iv) A unit symbol is represented by the first letter of the unit name only. (Except Hz, Pa .....etc. No full stop, or coma (or) colon is put after the symbol.

For example 16N for sixteen newton, without any fullstop (or) coma at the end.

v) Multiplication of units is shown by leaving a spate or a raised dot. For example, Nm and not N-m (or) N x m.

vi) Division of units is indicated by solidus (/) sign (or) negative powers. For example, m/s (or) ms^{-1}.

vii) In front of a decimal number, zero should be placed.For example, 0.7kg and not. 7kg.

viii) Compound pre fixes should be avoided. For example, pf for picofarad and not μ μF

ix) A space must be left between a number and unit. For example, 7kg and not 7kg.

Types of physical quantities

(a) Fundamental physical quantity

Any physical quantity which does not depend on any other physical quantity is called a fundamental physical quantity.

Ex: Length, mass, time etc.

(b) Derived quantity

Any physical quantity which depends on fundamental quantity is called derived quantity.

Ex: Area, Volume, speed, velocity, force etc.

Types of units

1. Fundamental unit

Any standard unit which does not depend on any other unit is called a fundamental unit.

Ex: Meter, Kilogram, Second, etc.

Derived unit

The unit which is depends on fundamental unit is called derivd unit.

Ex: Area (m^2), Volume(m^3), Speed(m/s) etc.

Measurement of length:

Length is the measure of distance between two points.

Measurement of length of an object is done by various measuring devices like scale,meter scale,measuring tape etc.

Units : C.G.S - cm ; S.I - m

$$\text{Thickness of a wire} = \frac{Total\ thickness}{No:of\ turns}$$

Multiples and sub multiples:-

For measuring extremely large distances, such as

Astronomical unit (A.U):It is the average distance of the earth from sun.

1 A.U = 1.496 X 10^{11} m

Light year:It is the distance travelled by light through vaccum in one year.

1 light year = 9.46 x 10^{12}km

Some other practical units of length:

1 parasec = 3.26 light year

1 inch = 2.54 cm

1 mile = 1.62 km

1 micron (μ) = 10^{-6}m = 10^{-3}mm

1 angstrom (A) = 10^{-10}m = 10^{-7}mm

1 fermi (fm) = 10^{-15} m

1 foot (ft) = 12 inch = 30 cm

TEACHING Task

Choose the correct answer:

1. The thickness of dozen coins on a metre scale was found to be 40 cm. Then the thickness of one coin is

   A) 4 cm B) 3.33 cm C) 3.33 mm D) 3.33 m

2. Thickness of 50 turns of wire on the scale was found to be 64 cm. Calculate the thickness of wire

   A) 1.28 mm B) 1.82 cm C) 1.82 mm D) 1.28 cm

3. 16 kg/m^3 = _____ g/cm^3
   A) 16×10^{-3} B) 26×10^{-6} C) 36×10^{-3} D) 46×10^{-6}
4. If 1 g cms^{-1} = x kg m/s, then the number x is equal to
   A) 1×10^{-1} B) 3.1×10^{-3} C) 1×10^{-5} D) 6×10^{-4}
5. 1 kg m/s^2 = _____g-mm/s^2
   A) 10^5 B) 10^6 C) 10^4 D) 10^3
6. Convert 1 second into day
   A) $\frac{1}{86,400}$ Day B) 24 day C) $\frac{1}{24}$ day D) $\frac{1}{3600}$ day
7. 1 micron = ... nano meters
   A) 10^{-6} B) 10^{-10} C) 10^3 D) 10^{-3}
8. convert from 1 μm into Mm
   A) 10^5 B) 10^{-8} C) 10^{-12} D) 10^{-15}
9. If $\frac{pm}{xm} = \frac{ncm}{mm}$ then the value of x is
   A) 10^{-2} B) 10^{-4} C) 10^{-6} D) 10^{-8}
10. If the same quantities of two objects are g and kg the numerical value of first quantity is 50 then the numerical value of second quantity is
    A) 0.02 B) 0.05 C) 0.07 D) 0.08
11. If 10 mm= x x μm then the value of x is
    A) 10^4 B) 10^8 C) 10^{10} D) 10^{12}
12. Convert from 15g/cm^3 into kg/m^3
    A) 12 x 10^3 B) 15 x 10^3 C) 17 x 10^3 D) 19 x 10^3

More than one answer type question:

13. The units of length is
    a) metre b) hectare c) millimetre d) litre
    A) a,c,and d B) a and c C) a,b and c D) All
14. The length of the curved object can be measured with
    a) scale rod b) thread c) ruler d) rod
    A) only a B) b and c C) c and d D) None
15. 1 micro metre is equal to
    a) 10^{-6} m b) 10^6 m c) 10^{-3} mm d) 10^3 mm
    A) a and c B) a and d C) a,b and c D) b,c and d
16. Length can be measured with the help of
    a) measuring tape b) metre scale c) thermometre d) clock
    A) a and c B) a and b C) a,c and d D) a and d

Fill in the blanks:

17. One millimetre is equal to one ..... part of a metre.
18. 10m20cm = ...cm

19. For measurement, our senses are not always.....
20. The length of a room is 6m70cm. This is same as .....cm.
21. Monika needed 4m 6cm of cloth so, she bought .....cm of cloth.

22. The distance between two houses is 8km 20m. It is the same as .....m.
23. The thickness of sheet of cardboard is 2mm. 100 such sheets will have thickness of .....cm.

State whether the given statements are true/false and write the correct statements:

24. The value of standard unit of a physical quantity does not change with place or time.
25. Kilometre is sub multiple of metre.
26. The distance of stars from the earth is measured in light year.
27. Foot length is the standard unit for measuring length.
28. Metre scale is used for measuring weight.

Find the odd one out and give proper reason for your choice:

29. Metre, Second, Newton, Kilogram
30. Kilometre, Micron, Millimetre, Angstrom

Achievers (Level-II)

Match the following:

31.

Column A	**Column B**
i) Length of an object	a) Callipers
ii) Length of a curved object	b) Ruler
iii)Thickness	c) Thread and ruler
iv)Diametre of a solid	d) Metre scale

A) 1-d, 2-c, 3-b,4-a B) 1-c, 2-d, 3-a, 4-b C) 1-d, 2-c, 3-a, 4-b D) 1-c, 2-a, 3-d,4-b

Comprehension Type:

32. Unit is a standard which is used for the measurement of physical quantity.
    i)In C.G.S. system the unit of area is
    1) m^2 2) cm^2 3) kg^2 4) s^2
    ii) 60 kilogram in short form is written as
    1) 60 kgs 2) 60 kg 3) both (1) and (2) 4) None
    iii) Which physical quantity unit is same in all systems
    1) length 2) mass 3) time 4) temperature

Key: 1) D, 2) D, 3) A, 4) C, 5) B, 6) A, 7) C, 8) C, 9) B, 10) B, 11) A, 12) B, 13) C, 14) B , 15) A , 16) B, 17)1000^{th}, 18)1020, 19)accurate, 20)670, 21)406, 22)8020, 23)20, 24) T, 25) F, 26) T, 27) F, 28) F, 29) Newton, 30) Kilometre, 31) A, 32) i) $2x10^{-2}$km ii) $12x10^{3}$mm, iii) measuring tape

Explorers (Level-III)

Solve the following

33. The wire is wounded on a pencil such that number of turns are 20 and length of the wire is 1 cm. then find the diameter of the wire. (0.5mm)
34. Ramu went to ride on a bicycle for a distance of 2km300m from school to home.then

convert in to meter and centimeters. (2300m , 230000cm)

Researchers (Level-IV)

Higher order thinking skills (HOTS)

1. While measuring the length of a rectangular block the reading at one end is 1.0 cm and other end is 8.2 cm Then the length of the block is
   A) 5 cm B) 8.2 cm C) 7.2 cm D) 6.2 cm
2. For measuring the diameter of a molecule the most commonly used unit is
   A) centimeter B) micron C) metre D) kilometer
3. While measuring the diameter of a ball, a student noted that the inner edges of the wooden blocks at 3.4 cm and 4.7 cm on a scale calculate the diameter of a ball
   A) 4.7 cm B) 1.3 cm C) 1.3 mm D) 1.3 m
4. If 'n' number of coins are placed one upon another and their total thickness is 6.8 cm and the thickness of each coin is 4 mm Then number of coins n is .....
   A) 17 B) 170 C) 117 D) 80
5. 24 coins are placed one upon another and their total thickness is recorded by a half metre scale. The thickness is found to be 4.8 cm Then the thickness of each coin in milli meters
   A) 2 mm B) 0.2 mm C) 20 mm D) 200 mm
6. In 24 hour clock time, 3 pm can be written as _____
   A) 00:15 hours B) 15:00 hours C) 03:00 hours D) 00:03 hours

Key: 1) C, 2) B, 3) B, 4) A, 5) A, 6) B

LEARNER'S Task:

Beginners (Level - I)

Choose the correct option:

1. Standard unit of length is
   A) kilogram B) second C) metre D) quintal
2. 1 light year =
   A) 9.46×10^{15}m B) 9.46×10^{10}km C) 9.45×10^{16}km D) 9.46×10^{17}m
3. If the length of park is 200 m, then 200 is .....
   A) unit B) magnitude C) both A and B D) none
4. If the mass of a football 4 kg, then kg is
   A) magnitude B) standard unit C) both A and B D) none
5. 470 kilometers = ... meters
   A) 470 thousand meters B) 470 meters C) 470 hundred meters D) 47 m
6. 1000 kilometers = ...
   A) 10^6 m B) 10^3 m C) 10^{-4} m D) 10^{-3} m
7. The distance travelled by light in one year is called
   A) leap year B) astronomical year C) light year D) cosmic year
8. 1000 millimeters = ... meters
   A) 10 B) 1 C) 100 D) 1/100

9. The multiple of metre is
   A) kilometer B) centimeter C) millimeter D) decimeter.
10. The symbol used to represent 'angstrom' is
   A) μ B) A^0 C) m D) Ang
11. 1 million meters = ... kilometers
   A) 10^3 B) 10^6 C) 10^2 D) 10
12. The appropriate unit for measuring thickness of a coin is
   A) centimeter B) kilometer C) millimeter D) micrometer
13. unit of luminous intensity
   A) candela B) mole C) Kelvin D)ampere
14. 60 kilogram in short form is written as
   A) 60 kgs B) 60 kg C) both (1) and (2) D) None
15. Which physical quantity unit is same in all systems
   A) length B) mass C) time D) temperature

Achievers (Level-II)

Match the following:

16.

Column-I	**Column-II**
a) unit of length in F.P.S	1) metre
b) unit of mass in C.G.S	2) foot
c) unit of time	3) gram
d) unit of length in S.I	4) second

A) a-2, b-3, c-4, d-1 B) a-2, b-3, c-1, d-4 C) a-3, b-2, c-4, d-1 D) a-1, b-2, c-3, d-4

17.

Column-I	**Column-II**
a) Derived unit	1) Height
b) Fundamental unit	2) Area
c) Derived quantity	3) Newton
d) Fundamental quantity	4) Kilogram

A) a-2, b-3, c-4, d-1 B) a-2, b-3, c-1, d-4 C) a-3, b-2, c-4, d-1D)a-3, b-4, c-2, d-1

18.

Prefix	**Power**
a) Mega	1) 10^6
b) Peta	2) 10^{-9}
c) Milli	3) 10^{15}
d) Nano	4) 10^{-3}

A) a-2, b-3, c-4, d-1 B) a-2, b-3, c-1, d-4 C) a-1, b-3, c-4, d-2D) a - 1, b-2, c-3, d-4

Multi Correct Choice Type:

19. Which of the following are the examples for fundamental physical quantity

a) length b) area c) mass d) energy

A) a and d B) a and c C) a,b and c D) b and c

20. The mean distance of the earth from the sun is called

a) Mean solar day b) Astronomical unit c) Light year d) Parsec

A) a and d B) only b C) a,b and c D) only c

21. Unit used in the measurement of extremely small distances.

a) Fermi b) Angstrom c) Meter d) km

A) a and b B) a and c C) a,b and c D) b and c

22. Choose the correct statement

a) Number of fundamental quantities are limited

b) In M.K.S System there are 7 fundamental quantities

c) Number of fundamental quantities are unlimited

d) Units of fundamental quantities in M.K.S is same as in SI

A) a and d B) a and c C) a,b and d D) b and c

23. Which of the following are the fundamental basic units

a) metre b) kilogram c) seconds d) metre/second

A) a and d B) a and c C) a,b and d D)a, b and c

Comprehension type questions:

Sahiti, Neha Reddy and Sai kiran of 6th class want to mesure the length and breadth of class room.They used to measure with the help of mesuring tape.First they found the length of the class room as 7 m and breadth of the class room as 5 m.

24. What is the length of the class room in mm?

A) 7 X 10^3 mm B) 700 mm C) 7 X 10^4 m D) 70 mm

25. How they mesured the length and breadth of class room?

A) mesuring tape B) pippet C) mesuring jar D) insufficient data

26. What is the breadth of the class room in C.G.S units?

A) 5 cm B) 500 cm C) 50 cm D) 5 X 10^3cm

Find the odd one out and give proper reason for your choice:

27. metre, centimeter , kilometer, foot
28. deca, centi, kilo, tera
29. yard, arm length, foot length, metre.
30. kilometre, length, centimetre, metre
31. micron, angstrom, milligram, millimetre.
32 light year, millennium, decade, century.

State whether the given statements are true/false and write the correct statements:

33. A quantity that is represented by a number followed by a unit is called physical quantity.
34. Value of unit vary with place and time.
35. The diameter of small wires can be measured in angstrom units.
36. The multiple gram is milligram.
37. The prefix "nano" is used for the sub - multiple 10^{-6}.

Key: 1) C, 2) A , 3) B, 4) B, 5) A, 6) A, 7) C, 8) B, 9) A, 10) B, 11) A, 12) C, 13) A, 14) B, 15) C, 16) A , 17) D, 18) C, 19) B, 20) B, 21) A , 22) C, 23) D, 24) A , 25) A, 26) B, 27) kilometer, 28) centi, 29) metre, 30) length, 31)milligram, 32) lightyear, 33) T, 34) F, 35) T, 36) F, 37) F

Explorers (Level-III)

Solve the problems:

1. Manju measures the length of a black board as 6.4 m while her friend Asha measures the length of a table as 280 cm. Identify whether the length of table or length of the black board is greater? (Ans-length of black board is greater)
2. A uniform wire is wound 4 turns on a scale such that the length of the wire is 2.4 cm then find the diameter of the wire. (Ans-6 mm)

Measurement of Mass:

Mass is the amount of matter contained in a substance.

S.I unit of mass is kilogram (kg), C.G.S unit of mass is gram (g)

Common balance, Spring balance, Table balance and Beam balance are used to find the mass of a substance.

Other units of mass:

1 gram = 1000 milligrams | 1 kilogram = 1000 grams

1 quintal = 100 kilograms | 1 metric tonne = 1000 kilograms

Mass of the sun=1.99×10^{30}kg | Mass of the earth=5.98×10^{24}kg

Measurement of time:

Time is defined as a gap between two events.

The gap between two successive noons is called solar day.

The average of all solar days in which earth completes one revolution around the sun is called mean solar day.

1 mean solar day = 86,400 seconds.

The S.I unit of time is second (S).

Rules for converting 24 - hour time to 12 - hour time:-

1. 00 hours means, it is 12 0' clock at night i.e midnight.
2. 12 hours means, it is 12 0' clock at noon.
3. The time between 00 hours to 12 0' clock at noon is taken as AM.

4. In order to convert time between 12 hours to 24 hours into PM on 12 hour clock, 12 is subtracted from the given time.

Simple Pendulum:

1. A small weight suspended freely by a light thread such that it can swing freely is called pendulum.
2. The length between the point of suspension and the centre of the bob is called length of pendulum.
3. One to and fro motion of the pendulum about its mean position is called one oscillation.
4. The time take by the pendulum to completed one oscillation is called time period (T) or period time.
5. The number of oscillations made by the pendulum in one second is called frequency (n) S.I unit of frequency is hertz (or) sec^{-1}.

$$\therefore \text{frequency} = \frac{1}{\text{Timeperiod}} \quad \therefore n = \frac{1}{T}$$

6. The time period of seconds pendulum is 2 seconds.

TEACHING Task

Choose the correct answer:

1. 1 millennium = ... decades
   A) 100 B) 10 C) 9 D) 1000
2. If an aeroplane is scheduled to take off at 18 hours - 57 minutes then time in PM on 12 hour clock is
   A) 6 hours PM B) 6 hour - 57 min PM C) 6 hour - 57 min AM D) 6 hours Am
3. The time period of the pendulum whose frequency is $\frac{1}{2} Hz$
   A) 2 sec B) 0.5 sec C) 0.05 sec D) 0.2 sec
4. Quantity of m atter present in a body is called its
   A) mass B) force C) weight D) none

More than one answer type questions:

5. The terms related to simple pendulum
   a) oscillations b) mass c) time period d) frequency
   A) a,b and d B) a,b and c C) a and c D) a,c and d
6. Units of time is
   a) hour b) second c) light year d) solar day
   A) a,b and c B) a,b and d C) a and d D) a and b
7. Choose the wrong options
   a) The gap or duration between two events is called time.
   b) The standard unit of time is minute.
   c) The time gap between two successive noons is called solar day.
   d) 1/1440 part of the mean solar day is called hour.

A) a and d B) a and c C) a,b and c D) b,c and d

Fill in the blanks:

8. One milligram is equal to .....kilogram.
9. ..... quintals is equal to one tonne.
10. 1 metric tonne = ...
11. ..... watch is used to measure time in a car race.

State whether the given statements are true/false and write the correct statements:

12. Water clocks were used to find value of water.
13. Sundials were used to measure temperature.
14. Stopwatches are more accurate than clocks.
15. Pendulum is not used for measuring time.
16. A Goldsmith uses a digital or a physical balance.

Find the odd one out and give proper reason for your choice:

17. Clocks, Wristwatch, Wall clock, Stop watch
18. Day, Metric tonne, Year, Century
19. Beam balance, Stop watch, Common balance, Digital balance
20. Second, Minute, Hour, Light year

Match the following:

21.

	Column A	**Column B**
1.	Measurement of mass of Gold	a) Clock
2.	Time	b) Physical balance
3.	Measurement of mass	c) Stop watch
4.	Measurement of time in race	d) Beam balance

A) 1-b, 2-a, 3-d, 4-c B) 1-b, 2-c, 3-d, 4-a

C) 1-b, 2-c, 3-a, 4-b D) 1-d, 2-c, 3-a, 4-b

Comprehension type:

22. Neha want to go to market at 5 pm to buy 2 kg apples and 1 kg grapes. She bought and came back to home at 6:30pm.

i) Convert 5 pm into 24 hour clock?

A) 17 h B) 18 h C) 16 hD) 5 h

ii) Calculate mass of apples in grams?

A) $3x10^3$g B) $2x10^3$g C) $2x10^4$g D) $2x10^{-3}$g

iii) When she came to her home according to 24 hour clock?

A) 17 h 30 min B) 19 h 30 min C) 18 h 30 min D) 16 h 30 min

Key: 1. A , 2. B , 3. A , 4. A , 5.D , 6.B , 7.B , 8.10^{-3}, 9.10 , 10.F , 11. F , 12. T ,13 T , 14. T , 15. 10 Quintals , 16. Stop watch , 17.Stop watch , 18.Metric tonne , 19.Stop watch , 20. Light year , 21. A , 22. i) A , ii) B iii) C

LEARNER'S Task:
Beginners (Level - I)

Choose the correct answer:

1. S.I unit of mass is a
   A) gram B) kilogram C) quintol D) metric ton
2. Which of the following is not unit of mass
   A) kilogram B) milligram C) gram D) kilometer
3. The quantity of matter in a given body is called .....
   A) time B) length C) mass D) force
4. The sub multiple of gram is
   A) kilogram B) milligram C) quintal D) pound
5. The C.G.S unit of mass is
   A) gram B) milligram C) kilogram D) quintal
6. The balance used measure the mass of gold, silver is
   A) common balance B) physical balance C) beam balance D) spring balance
7. The F.P.S unit of mass is
   A) gram B) milligram C) foot D) pound
8. 1 quintal = ... kilograms
   A) 10 B) 100 C) 1000 D) 1
9. Kilogram in short form can be written as
   A) kg B) KG C) ki D) KI
10. 1 metric tonne = ... quintals
    A) 100 B) 1000 C) 10,000 D) 10
11. 1 kilogram = ... milligrams
    A) 10^5 B) 10^6 C) 10^4 D) 10^3.
12. C.G.S unit of time
    A) second B) hour C) metre D) minute
13. 1 hour = ... seconds
    A) 3600 B) 36 C) 360 D) 36000
14. The S.I unit of time is
    A) metre B) hour C) second D) minute
15. 1 mean solar day = ... minutes
    A) 24 B) 1440 C) 1418 D) 1520
16. The time on the 24 hour clock is 08 h - 37 min. Then the time of 12 hour clock
    A) 08 h - 37 min AM B) 11 h - 48 min PM C) 08 h - 37 min PM D) 11 h - 48 min AM
17. The time on 12 hour clock is 2 hours - 45 min PM then the time on 24 hour clock is
    A) 15 hours - 45 min B) 14 hours - 45 min C) 10 hours -15 min D) 10 hours - 45 min

18. $\frac{1}{86400}$ th Part of mean solar day = ...

A) 1 second B) 1 minute C) 1 hour D) 1 day

19. The time taken by the pendulum to complete one oscillation is called .....

A) time period B) frequency C) oscillation D) none

20. The time period of seconds pendulum is

A) 2 sec B) 20 sec C) 10 sec D) 1 sec.

21. The frequency of the pendulum whose time period 4 seconds is

A) 0.25 Hz B) 5 Hz C) 50 Hz D) 500 Hz

22. Prefix used for the multiple 1,000,000 is

A) mega B) giga C) kilo D) nano

23. The prefix 'milli' is used for the submultiple

A) 1/10 B) 1/100 C) 1/1000 D) 1000

24. The prefix "micro" is used for the submultiple

A) $\frac{1}{10}$ B) $\frac{1}{100}$ C) $\frac{1}{1000}$ D) $\frac{1}{10,000,00}$

25. The abbreviation used to represent the prefix "mega" is

A) m B) M C) μ D) A

Achievers (Level - II)

MCQs with more than one option is correct:

26. Which of the following are units of length

a) foot length b) arm length c) metre d) yard length

A) a and d B) a and c C) a,b and c D) all

27. 1 Angstrom =

a) 10^{-8}cm b) 10^{-10}m c) 10^{-7}mm d) 10^{-13}km

A) a and d B) a and c C) a,b and d D) all

28. Select the correct relaions\relations

a) 1km/h = $\frac{5}{18}$ m/s b) 1 quintal = 100000 grams

c) 1mm = 10^{-3}m d) kg = 10^{-6}mg

A) a and d B) a and c C) a,b and c D) b and c

29. The multiple of 'gram' is

a) kilogram b) kilometre c) quintal d) milligram

A) a and c B) a and d C) a,b and c D) b and c

30. The unit of time

a) second b) kilogram c) hour d) decade

A) a and d B) a and c C) a,c and d D) b and

Fill in the blanks:

31. ..... is the measure of distance between two points.

32. 1cm = ... mm
33. 11cm = ... mm
34. 5km = ... m
35. 1000cm = ... m
36. 2000cm = ... km
37. 10mm = ... m
38. ..... is a quick judegement about the measurement of a particular quantity.
39. ..... is an instrument to measure time taken between the beginning and the end of event.

State whether the given statements are true/false and write the correct statements:

40. The value of standard unit of a physical quantity changes with time or place.
41. One millimeter is equal to 1000 metres.
42. The time period of a pendulum depends upon its length.

Find the odd one out. Give a reason for your choice:

43. second, minute, hour, light year.
44. metre, millimetre, micron, milligram.
45. kilogram, quintol, millennium, metric tonne.
46. stop clock, sundial, water clock, beam balance.
47. kilogram, gram, micron, milligram.

Match the following:

48.

Column A	**Column B**
1. S.I unit of mass	a. Oscillation
2. Simple pendulum	b. Second
3. S.I unit of time	c. Mass
4. Metric tonne	d. Kilogram

A) 1-d, 2-c, 3-a, 4-b B) 1-d, 2-a, 3-b, 4-c
C) 1-a, 2-d, 3-b, 4-c D) 1-c, 2-d, 3-b, 4-a

Comprehension type questions:

49. An aeroplane of mass of 50 metric tonne take off at 8'0 clock and land at 14'0 clock.
    i) What is the mass of an aeroplane in kg?
    A) 500 kg B) 1500 kg C) 5 X 10^3 kg D) 5 X 10^4 kg
    ii) In 12 hour format at what time flite will land?
    A) 02:00 am B) 03:00 am C) 03:00 pm D) 02:00 pm
    iii) The mass of an aeroplane is 50 metric tonne.Here 50 stands for?
    A) unit B) magnitude C) mass D)none
50. A brass bob is suspended by a thin strong thread and allowed to oscillate, such that length of the pendulum is 1m.
    i) In how many seconds will this pendulum complete one oscillation?
    A) 20 sec B) 22 sec C) 2 sec D) 2.2 sec

ii) If a boy finishes a race when this pendulum makes 11 oscillations, how much time does the boy take in finishing the race?

A) 20 sec B) 22 sec C) 2 sec D) 2.2 sec

Key: *1.B 2.D 3.C 4.B 5.A 6.B 7.D 8. B 9. A 10. D 11. B 12.A 13.A 14.C 15.B 16.A 17.B* 18.*A 19.A 20.A 21.A 22.A, 23.C, 24.D, 25.B 26.D , 27. D , 28. C , 29. A , 30.C ,* 31. length , 32.10 , 33.110 , 34. 5000 , 35. 10 , 36. 0.02 , 37. 1/100 , 38. estimation, 39.stop watch 40. F , 41. F , 42. F , 43.light year , 44.milligram , 45.millennium , 46.beam balance , 47. micron , 48.B , 49. i) D, ii) D, iii) B 50. i) C , ii) B

Explorers (Level - III)

Solve the following

1. Pranya kept 1 kg sugar ,1.5 kg dal , 2kg flour in a basket .what is the total mass and convert in to grams. (4.5kg , 4500 g)
2. 3 ton is equal to how many grams? ($3x10^6$ grams)

Researchers (Level - IV)

Higher order thinking skills (HOTS)

1. A pendulum completes 20 oscillations in 38 seconds. What is its time period?
2. 1 kilogram is equal to how many micrograms?

Archieves

1. The length of metre is divided into 100 equal parts what will be the value of each part ? **(VI / nstse - 2010)**

   (A) 1 decimetre (B) 1 millimetre (C) 1 centimetre (D) 1 kilometre
2. Th thickness of dozen of coins on a metre scale was found to be 18cm. What is the thickness of one coin? **(VI / nstse - 2010)**

   (A) 15cm (B) 1.2cm (C) 1.8mm (D) 15mm
3. Which of these is longer? **(VI / nstse - 2010)**

   (A) kilometre (B) mile (C) yard (D) metre
4. Length of the tube is 5643mm.What would be its length when experss in metres. **(VI / nstse - 2010)**

   (A) 5m (B) 56cm (C) 5.3 m (D) 5.643m
5. Convert 4 m 2604 cm into centimeters **(JNV-2011)**

   A) 3040 B) 3400 C)3004 D) 6604
6. Three of the fundamental physical quantities in physics are **(VII / kwest - olympaid 2009)**

   (A) distance,time & weight (B) distance, time & speed

   (C)distance,time & mass (D) density,time & volume
7. Which of the following measuremnts has NOT been expressed in correct SI units? **(VI / nstse - 2009)**

   (A) 5m of cloth (B) 20seconds (C) 2 kg petrol (D) surface area of $25m^2$

8. Which one of the following is not derived unit? **(VII / kwest - olympaid 2009)**
   (A) density (B) area (C)mass (D)volume

Key: 1) C, 2) D, 3) B, 4) D, 5) C, 6) C, 7) C, 8) C

Additional Questions for practice

1. 1 km = ... cm
   A) 100 B) 100000 C) 10000 D) 10
2. The unit used to measure the distance of stars from the earth is
   A) kilometer B) micron C) light year D) angstrom
3. 1 Billion meters = ... meters
   A) 10^7 B) 10^6 C) 10^9 D) 10^{10}.
4. Every measurement consists of a
   A) constant and a unit B) unit and a variable
   C) number and a unit D) number and a variable
5. Atomic radii are measured in
   A) angstrom unit B) light year C) kilometer D) metre
6. 1dm = ...
   A) 10m B) 10cm C) 10mm D) 10km
7. We use standard units
A) to measure things accurately B) to convey measurements to other people
   C) for the sake of uniformity D) all the above
8. Symbol for metre is
   A) M B) m C) mt D) metre
9. 900 nanometers = ...
   A) 900 X 10^{-9} m B) 900 X 10^3 m C) 90X 10^{-4} m D) 9 X 10^{-3} m
10. 1000 micro meters = ...
   A) 10^4 m B) 10^3 m C) 10^{-3} m D) 10 X 10^{-3} m
11. 10000 fermi meters = ...
   A) 10^{-10} m B) 10^{13} m C) 10^{-11} m D) 10^{-3} m
12. Fundamental units
   A) can be resolved into other units B) can't be resolved into other units
   C) sometimes can be resolved sometimes cannot D) none of these
13. Unit of area is a
   A) Derived unit B) Fundamental unit C) Both 1 and 2 D) None of these
14. To measure any physical quantity _____ should be required
   A) Time B) Mass C) Unit D) Length
15. Amount of work done is 10 Joule, here 10 stands for
   A) Unit B) Numerical value
   C) Both (1) and (2) D) None of these

16. Among the following, the odd one is
    A) pound B) quintal C) ton D) angstrom
17. Which among the following is the international system of units ?
    A) S.I. B) F.P.S C) C.G.S D) M.K.S
18. Which one of the following is the 10–10th part of a metre?
    A) Micrometre B) Nanometre C) Angstrom D) Fermi

Key: 1.B 2. C 3. C 4. C 5. A 6. B 7. D 8. B 9.A 10. C 11. C
12.A 13.A 14.C 15.B 16.D 17.A 18.C