UNIT 1

Measurement

TEXTBOOK EXERCISES

I. Choose the correct answer.

1. Choose the correct one.

   a. mm< cm < m < km

   b. mm > cm > m > km

   c. km < m < cm < mm

   d. mm > m> cm> km

   Ans: a) mm< cm < m < km

2. Rulers, measuring tapes and metre scales are used to measure

   a. mass   b. weight

   c. time   d. length

   Ans: d) length

3. 1 metric ton is equal to

   a. 100 quintals   b. 10 quintals

   c. 1/10 quintals   d. 1/100 quintals

   Ans: b) 10 quintals

4. Which among the following is not a device to measure mass?

   a. Spring balance   b. Beam balance

   c. Physical balance   d. Digital balance

   Ans: a) Spring balance

II. Fill in the blanks.

1. Metre is the unit of _____

   Ans: length

2. 1 kg of rice is weighed by _____

   Ans: comman beam balance

3. Thickness of a cricket ball is measured by _____

   Ans: Vernier caliper

4. Radius of a thin wire is measured by _____

   Ans: screw guage

5. A physical balance measures small differences in mass up to _____

   Ans:1mg

III. State whether true or false. If false, correct the statement.

1. The SI unit of electric current is kilogram.

   Ans: False,The SI unit of electric current is Ampere.

2. Kilometre is one of the SI units of measurement.

   Ans: False, Metre is one of the SI units of measurement.

3. In everyday life, we use the term weight instead of mass.

   Ans: True

4. A physical balance is more sensitive than a beam balance.

   Ans: True

5. One Celsius degree is an interval of 1K and zero degree Celsius is 273.15 K.

   Ans: Ans: True

6. With the help of vernier caliper we can have an accuracy of 0.1 mm and with screw gauge we can have an accuracy of 0.01 mm.

Ans: True

IV. Match the following.

1.
Length	kelvin
Mass	metre
Time	kilogram
Temperature	second

Ans:

1.
Length	**metre**
Mass	**kilogram**
Time	**second**
Temperature	**kelvin**

2.
Screw gauge	Vegetables
Vernier caliper	Coins
Beam balance	Gold ornaments
Digital balance	Cricket ball

Ans:

2.
Screw gauge	**Coins**
Vernier caliper	**Cricket ball**
Beam balance	**Vegetables**
Digital balance	**Gold ornaments**

V. Assertion and reason type.

Mark the correct answer as:

a. Both A and R are true but R is not the correct reason.

b. Both A and R are true and R is the correct reason.

c. A is true but R is false.

d. A is false but R is true.

1. Assertion(A): The scientifically correct expression is " The mass of the bag is 10 kg"

Reason (R): In everyday life, we use the term weight instead of mass.

Ans: b. Both A and R are true and R is the correct reason.

2. Assertion (A): 0 °C = 273.16 K. For our convenience we take it as 273 K after rounding off he decimal.

Reason (R): To convert a temperature on the Celsius scale we have to add 273 to the given temperature.

Ans: b. Both A and R are true and R is the correct reason.

3. Assertion (A): Distance between two celestial bodies is measured in terms of light year.

Reason (R): The distance travelled by the light in one year is one light year.

Ans: b. Both A and R are true and R is the correct reason.

VI. Answer very briefly.

1. Define measurement.

Measurement is about assigning a number to a characteristic of an object or event which can be compared with other objects or events. **It is defined as the determination of the size or magnitude of a quantity.**

2. Define standard unit.

A unit is a standard quantity with which the unknown quantities are compared. **It is defined as a specific magnitude of a physical quantity that has been adopted by law or convention.**

3. What is the full form of SI system?

International System of Units

4. Define least count of any device.

The smallest length which can be measured by metre scale is called least count. Usually the **least count of a scale is 1 mm.**

5. What do you know about pitch of screw gauge?

The pitch of the screw is the distance between two successive screw threads. It is also equal to the distance travelled by the tip of the screw for one complete rotation of the head. It is equal to 1 mm in typical screw gauges

6. Can you find the diameter of a thin wire of length 2 m using the ruler from your instrument box?

No. we can find only with the help of screw gauges.

VII. Answer briefly.

1. Write the rules that are followed in writing the symbols of units in SI system.

1. The units named after scientists are not written with a capital initial letter. **E.g. newton, henry, ampere and watt.**

2. The symbols of the units named after scientists should be written by the initial capital letter. **E.g. N for newton, H for henry, A for ampere and W for watt.**

3. Small letters are used as symbols for units not derived from a proper noun. **E.g. m for metre, kg for kilogram.**

2. Write the need of a standard unit.

∗ Many of the ancient systems of measurement were based on the dimensions of human body.

∗ As a result, unit of measurement varied from person to person and also from location to location.

∗ In earlier time, different unit systems were used by people from different countries.

∗so we need of a standard unit.

3. Differentiate mass and weight.

Mass	Weight
1. It is a fundamental quantity.	It is a derived quantity.
2. It has magnitude alone – scalar quantity.	It has magnitude and direction – vector quantity.
3. It is the amount of matter contained in a body.	It is the normal force exerted by the surface on the object against gravitational pull.
4. Remains the same everywhere.	Varies from place to place.
5. It is measured using physical balance.	It is measured using spring balance.
6. Its unit is kilogram.	Its unit is newton.

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4. How will you measure the least count of vernier caliper?

Least count of the instrument (L.C)

$$= \frac{\text{Value of one smallest main scale division}}{\text{Total number of vernier scale division}}$$

The main scale division will be in centimeter, further divided into millimetre. The value of the smallest main scale division is 1 mm. In the Vernier scale there will be 10 divisions.

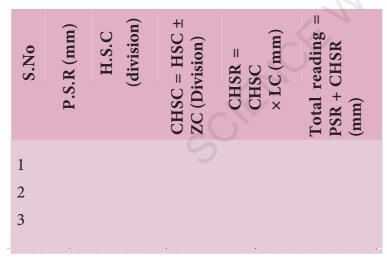$$\therefore \quad L.C = \frac{1mm}{10} = 0.1mm = 0.01cm$$

VIII. Answer in detail.

1. Explain a method to find the thickness of a hollow tea cup.

✦ The thickness of a hollow tea cup can be measured using vernier caliper.

✦ Determine the pitch, the least count and the zero error of the vernier caliper.

✦ Place the wall of the tea cup between the lower jaws.

✦ The cup can be held firmly with the help of the screw.

✦ Note the main scale reading **(MSR)**

✦ Note the vernier scale coincidence by observing vernier division that coincides with main scale division.

✦ Find the vernier scale reading **(VSR)** using the formula. **VSR = VSC x L.C**

✦ The thickness of the cup can be found out by using the formula **Thickness = (MSR + VSR) + ZCmm**

✦ Repeat the experiment for diffrent positions of the wall of the cup.

S.NO	Main Scale Reading MSR × 10^{-2} m	Vernier Scale coincidence	Observed reading OR = MSR + (LC × VC)	Corrected reading = OR ± ZC
1				
2				
3				
4				

Average (D)

✦ Tabulate the reading.

✦ The average of the readings taken is the thickness of the hollow tea cup.

2. How will you find the thickness of a one rupee coin?

● Determine the pitch, the least count and the zero error of the screw gauge

● Place the coin between the two studs

● Rotate the head until the coin is held firmly but not tightly, with the help of the ratchat

● Note the reading of the pitch scale crossed by the head scale (PSR) and the head scale division that coincides with the pitch scale axis (HSC)

● The width of the coin is given by PSR + CHSR (Corrected HSR). Repeat the experiment for different positions of the coin

● Tabulate the readings

● The average of the last column readings gives the width of the coin

S.No	P.S.R (mm)	H.S.C (division)	CHSC = HSC ± ZC (Division)	CHSR = CHSC × LC (mm)	Total reading = PSR + CHSR (mm)
1					
2					
3					

Width of the coin =   mm   mean =   mm

IX. Numerical Problems.

1. Inian and Ezhilan argue about the light year. Inian tells that it is 9.46×10^{15} m and Ezhilan argues that it is 9.46×10^{12} km. Who is right? Justify your answer.

✦Inian and Ezhilan argu is Right.

1 light year = $\mathbf{9.46 \times 10^{15}}$**m**

$\mathbf{9.46 \times 10^{12} \times 10^3}$ **m = 9.46 x 10 km**

so both of them argue is correct.

$$= 9.46 \times 10^{15} \text{ m.}$$

2. The main scale reading while measuring the thickness of a rubber ball using Vernier caliper is 7 cm and the Vernier scale coincidence is 6. Find the radius of the ball.

Considering that the least count of the Vernier Caliper is **0.01 mm.**

The Diameter of the ball is = **(Main scale reading + least count x Coincident scale reading) - ZE**

$$=(7cm + (6 \times 0.01cm)-0$$
$$= 7 + 0.06$$
$$= 7.06/2$$
Radius =3.503 cm

Therefore,

The Radius of the ball is **3.503 cm.** We get the radius by dividing the diameter by two.

3. Find the thickness of a five rupee coin with the screw gauge, if the pitch scale reading is 1 mm and its head scale coincidence is 68.

Considering that the least count of the Screw Gauge is **0.01 mm.** Now we find the thickness of the coin by using the formula,

The thickness of the coin is = **(Pitch scale reading + least count x Coincident head scale reading)**

$$= (0.1 \text{ mm} + (0.01 \text{ mm} \times 68)$$
$$=1.68 \text{ mm}$$

4. Find the mass of an object weighing 98 N.

1kg mass = 9.8 N weight

W =m x g   (W = mass x g)

98 = mass x 9.8

mass =98/9.8   = **10kg**

Thus an object having a weight of **98 N has a mass of 10 kg.**