Chapter 6: Measurement of physical quantities

Question. 1. Fill in the blanks:
(1) A **value** and a **unit** are used to express the magnitude of a physical quantity.
(2) The **gravitational force** that acts on this mass is called its weight.
(3) The quantity 'speed' is the ratio of **distance** and **time** quantities
(4) Standard **fundamental** unit must not be variable.
(5) An international system of units based on seven fundamental units is called **System Internnational**.

Question. 2. One word in the following statements is incorrect. Correct that word and rewrite the statements:
(1) Length is a vector quantity.
Answer. Length is a scalar quantity.
(2) The amount of matter present in a substance is called volume.
Answer. The amount of matter present in a substance is called mass.
(3) Mass is a vector quantity and weight is a scalar quantity.
Answer. Mass is a scalar quantity and weight is a vector quantity
(4) In MKS system distance is measured in centimetres, mass in grams and time in seconds.
Answer. In MKS system distance is measured in metres, mass in kilograms and time in seconds.

Question. 3. Who is my companion?

[1] Group 'A'	**Answers**	**Group 'B'**
(1) Velocity	metre/second	**(a) litre**
(2) Area	square metre	**(b) kilogram**
(3) Volume	litre	**(c) metre/second**
(4) Mass	kilogram	**(d) kilogram/cubic metre**
(5) Density	kilogram/cubic metre	**(e) square metre**

[2] Group 'A'	**Answers**	**Group 'B'**
(1) MKS	Kilogram	**(a) Standardized measure**
(2) Displacement	Vector	**(b) Fundamental quantities**
(3) Hand	Inaccurate measure	**(c) Kilogram**
(4) Metre	Standardized measure	**(d) Vector**
(5) Time	Fundamental quantities	**(e) Inaccurate measure**

Question. 4. Explain giving examples:

(1) Scalar quantity:

Definition: A scalar quantity is a physical quantity that has only magnitude and no direction.

Examples: (1) Temperature: The measure of how hot or cold something is, such as 30°C, which indicates thermal energy but not direction. (2) Mass: The amount of matter in an object, such as 5 kg, representing its weight without any directional component.

(2) Vector quantity:

Definition: A vector quantity is a physical quantity that has both magnitude and direction.

Examples: (1) Velocity: The speed of an object in a specific direction, such as 50 km/h east, indicating how fast and where the object is moving. (2) Force: A push or pull exerted on an object, such as 10 N downward, which shows both the strength and the direction of the force applied.

Question. 5. Write answers to the following questions in your own words :

(1) Why is the weight of the same object different on different planets?

Answer: The weight of an object varies on different planets because weight is the force exerted by gravity on that object, which differs depending on the planet's mass and size. Since each planet has a different gravitational pull, an object will weigh more on planets with stronger gravity and less on those with weaker gravity.

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

Answer: To ensure accurate measurements, I will use calibrated measuring tools, check the tools for accuracy before use, measure at eye level to avoid parallax errors, and ensure a stable surface for weighing or measuring. Additionally, I will take multiple measurements and calculate the average to reduce errors.

(3) What is the difference between mass and weight?

Answer:

Mass	Weight
1. Mass is the amount of matter in an object.	1. Weight is the force exerted by gravity on an object.
2. It is measured in kilograms (kg) or grams (g).	2. It is measured in newtons (N) or pounds (lb).
3. It is scalar quantity (only magnitude).	3. It is vector quantity (magnitude and direction).
4. Mass is constant everywhere	4. Weight may differ in different places

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

Answer: Measurement errors can occur due to:

Parallax Error: Viewing a measurement scale from an angle can lead to incorrect readings.

Instrumental Error: Faulty tools, like a scale that isn't zeroed, can give wrong results.

Human Error: Mistakes made by the person measuring, such as misreading a gauge, can cause inaccuracies.

Environmental Error: Conditions like temperature or humidity can affect measurements, leading to incorrect readings from instruments like thermometers.

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

Answer: Accurate measurement is important for reliability in experiments, safety in engineering, and clear communication. Tools for accurate measurement include balances for weight, thermometers for temperature, calipers for length, and micrometers for thickness, all designed to minimize errors.

(6) How is 'second' standardized?

Answer: The second is defined as the time it takes for 9,192,631,770 cycles of radiation from the cesium-133 atom, which provides a precise and consistent way to measure time.

Question. 5. Give reasons:

(1) It is not proper to measure quantities by using body parts as units.
Answer: Using body parts as units can lead to inconsistencies and inaccuracies because body sizes vary among individuals, making it unreliable for precise measurements.
(2) It is necessary to get the weights and measures standardized at regular intervals.
Answer: Regular standardization of weights and measures is essential to ensure accuracy and consistency in measurements across different regions and industries, preventing errors and misunderstandings.
(3) Our mass is the same on both the moon and the earth.
Answer: Our mass remains the same on both the Moon and Earth because mass is a measure of the amount of matter in an object, which does not change regardless of location, while weight differs due to varying gravitational forces.

Question. 6. Use your brain power! (Textbook page 42)
(1) Why would the weight of an object be maximum at the poles and minimum at the equator?
Answer: Weight is maximum at the poles due to stronger gravitational pull, while it is minimum at the equator because the Earth's rotation creates centrifugal force that reduces effective weight.
(2) Why is the weight of an object at a high altitude less than its weight at sea level?
Answer: Weight is less at high altitudes because gravitational force decreases with distance from the Earth's center, making objects weigh less as they are further away.