

CHAPTER: 01

Physical Quantities and Measurements

Numericals

Question 1: Write the following numbers in scientific notation

(a) 1234 m

Given Data:

Length = 1234 m

To Find:

Scientific notation of length

Solution:

Move the decimal point 3 places to the left to make the number between 1 and 10.

$$1234 \text{ m} = 1.234 \times 10^3 \text{ m}$$

(b) 0.000023 s

Given Data:

Time = 0.000023 s

To Find:

Scientific notation of time

Solution:

Move the decimal point 5 places to the right.

$$0.000023 \text{ s} = 2.3 \times 10^{-5} \text{ s}$$

(c) $469.3 \times 10^5 \text{ m}$

Given Data:

Length = $469.3 \times 10^5 \text{ m}$

To Find:

Scientific notation

Solution:

First convert 469.3 into standard form:

$$469.3 = 4.693 \times 10^2$$

Now multiply powers of ten:

$$4.693 \times 10^2 \times 10^5 = 4.693 \times 10^7 \text{ m}$$

(d) $0.00985 \times 10^7 \text{ s}$

Given Data:

$$\text{Time} = 0.00985 \times 10^7 \text{ s}$$

To Find:

Scientific notation

Solution:

Convert 0.00985 into standard form:

$$0.00985 = 9.85 \times 10^{-3}$$

Now multiply powers of ten:

$$9.85 \times 10^{-3} \times 10^7 = 9.85 \times 10^4 \text{ s}$$

Question 2: Express the following measurements using prefixes

(a) $27.5 \times 10^{-10} \text{ m}$

Given Data:

$$\text{Length} = 27.5 \times 10^{-10} \text{ m}$$

To Find:

Length using SI prefix

Solution:

$$27.5 \times 10^{-10} \text{ m} = 2.75 \times 10^{-9} \text{ m}$$

10^{-9} m represents nanometer (nm).

Answer:

2.75 nm

(b) $0.00023 \times 10^{-2} \text{ s}$

Given Data:

Time = 0.00023×10^{-2} s

To Find:

Time using SI prefix

Solution:

$$0.00023 \times 10^{-2} \text{ s} = 2.3 \times 10^{-6} \text{ s}$$

10^{-6} s represents microsecond (μs).

Answer:

2.3 μs

Question 3: If a boy has an age of 15 years, 2 months, and 10 days, convert his age into seconds, milliseconds, and megaseconds

Step 1: Convert age into days

Given Data:

1 year = 365 days

1 month = 30 days

1 day = 86400 s

15 years = $15 \times 365 = 5475$ days

2 months = $2 \times 30 = 60$ days

Extra days = 10 days

Total days = $5475 + 60 + 10 = 5545$ days

(a) Age in seconds

To Find:

Age in seconds

Solution:

1 day = 86400 s

Age = 5545×86400

Age = 4.79×10^8 s

(b) Age in milliseconds

To Find:

Age in milliseconds

Solution:

1 second = 1000 milliseconds

$$4.79 \times 10^8 \times 1000 = 4.79 \times 10^{11} \text{ ms}$$

(c) Age in megaseconds

To Find:

Age in megaseconds

Solution:

1 megasecond = 10^6 seconds

$$4.79 \times 10^8 \div 10^6 = 479 \text{ megaseconds}$$

Question 4: How many kilometers are there in 25 micrometers?

Given Data:

1 micrometer = 10^{-6} m

1 kilometer = 10^3 m

To Find:

Distance in kilometers

Solution:

25 micrometers = 25×10^{-6} m

Convert meters into kilometers:

$$25 \times 10^{-6} \div 10^3 = 25 \times 10^{-9} \text{ km}$$

Answer:

$$25 \times 10^{-9} \text{ km}$$

Question 5(a): Vernier calipers — find pitch and least count

Given Data:

Smallest division on main scale = 1 mm

Total divisions on vernier scale = 20

To Find:

Least count of vernier calipers

Solution:

Least Count = (Smallest division on main scale) \div (Total vernier divisions)

Least Count = 1 mm \div 20

Least Count = **0.05 mm**

Question 5(b): Screw gauge — find pitch and least count

Given Data:

Smallest division on main scale = 0.5 mm

Total divisions on circular scale = 50

To Find:

Least count of screw gauge

Solution:

Least Count = Pitch \div Number of divisions

Least Count = 0.5 mm \div 50

Least Count = **0.01 mm**
