Class 7th physics
Chapter 1- physical quantities and measurements
Numerical type questions-

C. Numericals

Question 1.

The length, breadth and height of a water tank are 5 m, 2.5 m and 1.25 m respectively. Calculate the capacity of the water tank in (a) m^3 (b) litre.

Answer:

Given,

Length (l) = 5m

Breadth (b) = 2.5 m and

Height (h) = 1.25 m

(a) Volume of water tank in m^3 $= l \times b \times h$

$= 5m \times 2.5\ m \times 1.25\ m$

$= 15.625\ m^3$

(b) Volume of water tank in litre $= 15.625 \times 1000$

$= 15625$ litre

Question 2.

A solid silver piece is immersed in water contained in a measuring cylinder. The level of water rises from 50 ml to 62 ml. Find the volume of silver piece.

Answer:

Given, initial level of water .v_1 = 50 ml

Final level of water v_2 = 62 ml

Volume of silver piece V = $v_2 - v_1$

= 62 ml – 50 ml

= 12 ml or $12cm^3$

Question 3.

Find the volume of a liquid present in a dish of dimensions 10 cm x 10 cm x 5 cm.

Answer:

Volume of water = Length × breadth × height = 10 cm × 10 cm × 5 cm = 500 cm^3 or 500 ml.

Question 4.

A rectangular field is of length 60 m and breadth 35 m. Find the area of the field.

Answer:

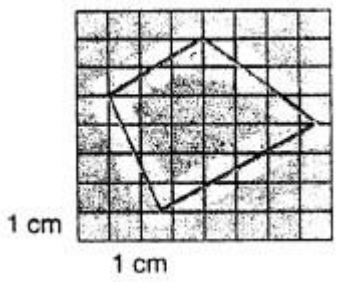
Length of a rectangular field = 60 m

Breadth of rectangular field = 35 m ∴ Area = 60 m × 35 m

= 2100 m^2

Question 5.

Find the approximate area of an irregular lamina of which boundary line is drawn on the graph paper shown in fig. 1.16. below.



Answer:

From figure, the number of complete squares = 11

The number of squares more than half = 9 ∴ Total number of squares = 11 + 9 = 20

∴ Area of the 1 square = 1 cm × 1cm = 1 cm^2

∴ Area of 20 squares = 20 × 1 cm^2 = 20 cm^2

∴ Approximate area of irregular lamina = 20 cm^2

Question 6.

A piece of brass of volume 30 cm^3 has a mass of 252 g. Find the density of brass in (i) g cm^{-3}, (ii) kg m^{-3}.

Answer:

Ans. Given, Mass M = 252 g

Volume V = 30 cm^3

(i) Density $d = \frac{M}{V} = \frac{252}{30\ cm^3}$

$= 8.4\ g\ cm^{-3}$

(ii) Since, M = 252 g = 0.252 kg

V = 30 cm^3 = 30 × 10^{-6} m^3

$$\text{Density } d = \frac{0.252\ kg}{30 \times 10^{-6}\ m^3} = \frac{0.252\ kg}{30 \times \frac{1}{1000000}\ m^3}$$

$$= \frac{0.252 \times 1000000\ kg}{30\ m^3} = \frac{25200}{3}\ kg\ m^{-3}$$

$= 8400\ kg\ m^{-3}$

Question 7.

The mass of an iron ball is 312 g. The density of iron is 7.8 g cm^{-3}. Find the volume of the ball.

Answer:

Given, Mass M = 312 g

Density d = 7.8 g cm^{-3}

$$\text{Since, } d = \frac{M}{V} \Rightarrow V = \frac{M}{d}$$

$$\text{Hence, volume of an iron ball } V = \frac{312}{7.8} = 40\ cm^3$$

Question 8.

A cork has a volume 25 cm^3. The density of cork is 0.25 g cm^{-3}. Find the mass of cork.

Answer:

Given, density $d = 0.25\ g\ cm^{-3}$

$V = 25\ cm^3$

From relation $d = \frac{M}{V} \Rightarrow M = d \times V$

$= 0.25 \times 25$

$= 6.25\ g$

Question 9.

The mass of 5 litre of water is 5 kg. Find the density of water in g cm^{-3}.

Answer:

Given, Mass M = 5 kg = 5000 g

Volume V = 5 litre = 5000 cm^3

Density of water $d = \frac{M}{V}$

$= \frac{5000\ g}{5000\ cm^3} = 1\ g\ cm^{-3}$

Question 10.

A cubical tank of side 1 m is filled with 800 kg of a liquid. Find: (i) the volume of tank, (ii) the density of liquid in kg m^{-3}.

Answer:

(i) Volume of a cube = side × side × side

side = 1 m

$\therefore$ volume = 1 m × 1 m × 1 m = 1 m^3

(ii) Density of liquid in kg $m^{-3} = \frac{\text{Mass (M)}}{\text{Volume (V)}}$

Mass = 800 kg

Volume = 1 m^3

$\therefore$ Density $= \frac{800}{1\ m^3}\ kg = 800\ kg\ m^{-3}$

Question 11.

A block of iron has dimensions 2 m × 0.5 m × 0.25 m. The density of iron is 7.8 g cm^{-3}. Find the mass of block.

Answer:

Given, l = 2m b = 0.5 m

$h = 0.25$ m

Density of iron $= 7.8$ g cm$^{-3} = 7.8 \times 1000$ kg m$^{-3} = 7800$ kg m^{-3}

Volume of block $= l \times b \times h$

$= 2 \times 0.5 \times 0.25 = 0.25$ m^3

From relation $d = \frac{M}{V}$

$\therefore$ Mass of iron block $M = V \times d$

$= 0.25 \times 7800$ kg m^{-3}

$= 1950$ kg

Question 12.

The mass of a lead piece is 115 g. When it is immersed into a measuring cylinder, the water level rises from 20 ml mark to 30 ml mark.

Find:

(i) the volume of the lead piece, (ii) the density of the lead in kg m^{-3}.

Answer:

Ans. Given, $M = 115$ g

$V_1 = 20$ ml, $V_2 = 30$ ml

(i) Volume of lead piece $V = V_2 - V_1$

$= 30$ ml $- 20$ ml

$= 10$ ml or 10 cm^3 [$\because$ 1 ml = 1 cm^3]

(ii) Density of lead piece $d = \frac{M}{V}$

$= \frac{115}{10 \text{ cm}^3} = 11.5$ g cm^{-3}

(since, 1 g cm^{-3} = 1000 kg^{-3})

$= 11.5 \times 1000 = 11500$ kg m^{-3}

Question 13.

The density of copper is 8.9 g cm^{-3}. What will be its density in kg m^{-3} ?

Answer:

Density of copper $d = 8.9$ g cm^{-3}

$= 8.9 \times 1000$ kg m^{-3}

[$\because$ 1 g cm^{-3} = 1000 kg m^{-3}]

$= 8900$ kg m^{-3}

Question 14.

A car travels a distance of 15 km in 20 minute. Find the speed of the car in (i) km h^{-1}, (ii) m s^{-1}.

Answer:

Distance travelled by car =15 km

Time taken = 20 minutes

(i) Speed of car in km h^{-1}

Convert 20 minutes to hour

$$1 \text{ minute} = \frac{1}{60} \text{ hour}$$

$$\therefore \quad 20 \text{ minutes} = \frac{1 \times 20}{60} = \frac{1}{3} \text{ hour}$$

$$\text{Speed of car} = \frac{\text{Distance}}{\text{Time taken}}$$

$$= \frac{15 \text{ km}}{\frac{1}{3} \text{ h}}$$

$$= 15 \text{ km} \times 3 \text{ h}^{-1} = 45 \text{ km h}^{-1} = 45 \text{ km h}^{-1}$$

(ii) Speed of car in m s^{-1}

Convert 15 km into metres

1 km = 1000 m

15 km = 1000 × 15 = 15000 m ...(i)

Convert minutes into seconds

1 minutes = 60 sec.

20 minutes = 60 × 20 = 1200 sec ...(ii)

$$\text{Speed of car} = \frac{15000 \text{ m}}{1200 \text{ sec}}$$

$$= 12.5 \text{ m s}^{-1}$$

Question 15.

How long a train will take to travel a distance of 200 km with a speed of 60 km h^{-1} ?

Answer:

Distance covered by train = 200 km

Speed of train = 60 km h^{-1}

$$\text{We know speed} = \frac{\text{Distance}}{\text{Time}}$$

$$\Rightarrow \qquad 60 = \frac{200}{\text{Time}}$$

$$\text{Time} = \frac{200}{60} = \frac{20}{6} = \frac{10}{3} \text{ hours}$$

$$= 3\frac{1}{3} \text{ hours} = 3 \text{ h} + \frac{1}{3} \text{ hours}$$

$$= 3 \text{ h} + \frac{1}{3} \times 60 \text{ min}$$

$$= 3 \text{ h} + 20 \text{ min}$$

$$= 3\text{h } 20 \text{ min}$$

Question 16.

A boy travels with a speed of 10 m s^{-1} for 30 minute. How much distance does he travel ?

Answer:

Speed of boy = 10 m s^{-1} Time taken = 30 minutes speed = distance travelled / time taken

Distance travelled = Speed × Time taken

Convert 30 minutes to seconds

1 minute = 60 sec

30 minute 60 × 30 = 1800 seconds

Putting the value of speed and time we get Distance travelled = 10 ms^{-1} × (1800 sec) = 18000 m = 18000 metre or 18 km Ans.

Question 17.

Express 36 km h^{-1} in m s^{-1}

Answer:

$$36 \text{ km h}^{-1} = \frac{36 \times 1000 \text{ m}}{60 \times 60}$$

$$= 10 \text{ m s}^{-1}$$

Question 18.

Express 15 m s^{-1} in km h^{-1}.

Answer:

$$1 \text{ metre} = \frac{1}{1000} \text{ km}$$

$$15 \text{ metre} = \frac{15}{1000} \text{ km}$$

$$1 \text{ second} = \frac{1}{3600} \text{ hr}$$

Here, Distance $= \frac{15}{1000}$ km

Time taken $= \frac{1}{3600}$ hr.

$$\text{Speed} = \frac{\text{Distance}}{\text{Time taken}}$$

$$= \frac{\frac{15}{1000}}{\frac{1}{3600}} = \frac{15}{1000} \times \frac{3600}{1}$$

$$= 54 \text{ km h}^{-1}$$