

$$1L = 1000mL \quad 1cm^3 = 1mL$$

$$1kg = 1000g$$

$$D = M/V$$

M - grams (g)  
V - Volume (mL or cm<sup>3</sup>)

12. A chemist needs 25.0 g of bromine for an experiment. What volume should she use?  
(density of bromine = 3.12 g/cm<sup>3</sup>)

$$\frac{25.0g}{3.12g/cm^3} = 8.01282... \rightarrow 8.01mL$$

Data Table: Density values of common substances at 20°C in g/cm<sup>3</sup>

| Substance  | Density | Substance | Density |
|------------|---------|-----------|---------|
| Ethanol    | 0.790   | Aluminum  | 2.70    |
| Water      | 1.000   | Iron      | 7.87    |
| Lead       | 11.35   | Gold      | 19.32   |
| Chloroform | 1.49    | Copper    | 8.96    |
| Mercury    | 13.55   | Silver    | 10.50   |

13. A piece of lead has a mass of 22.7 g. It occupies a volume of 2.00 mL. Calculate the density of the lead. Does this value agree with the data table above?

$$\frac{22.7g}{2.00mL} = 11.35 \rightarrow 11.4g/cm^3$$

14. What is the mass of a piece of lead that occupies a volume of 4.00 cm<sup>3</sup>?

$$\frac{4.00cm^3}{1cm^3} \times 11.35g/cm^3 = 45.4g$$

15. What would be the volume occupied by a piece of lead that has a mass of 0.200 kg?

$$\frac{0.200kg}{1kg} \times \frac{1000g}{1kg} \times \frac{1cm^3}{11.35g} = 17.6214537 \rightarrow 17.6cm^3$$

16. A sample of lead and a sample of aluminum have equal volumes. How would the mass of the lead sample compare with the mass of the aluminum sample?

① pick a volume like 1cm<sup>3</sup>

$$\text{Lead: } \frac{1cm^3}{1cm^3} \times 11.35g/cm^3 = 11.35g$$

$$\text{Aluminum: } \frac{1cm^3}{1cm^3} \times 2.70g/cm^3 = 2.7g$$

17. A sample of metal occupies a volume of 0.500 L and has a mass of 1350.9 g. Calculate the density of the metal. What type of metal is the sample?

$$\frac{1350.9g}{0.500L} \times \frac{1L}{1000mL} \times \frac{1mL}{1cm^3} = 2.7018 \rightarrow 2.70g/cm^3 \text{ Aluminum}$$

18. Calculate the volume of a piece of silver that has a mass of 31.5 g.

$$\frac{31.5g}{10.50g/cm^3} = 3.00cm^3$$

19. An iron block is measured and its dimensions are 34.6 cm long, 28.9 cm wide, and 12.0 cm thick. Calculate the mass of the block.

$$V = 34.6cm \times 12.0cm \times 28.9cm = 1.20 \times 10^4 cm^3$$

$$\frac{1.20 \times 10^4 cm^3}{1cm^3} \times 7.87g/cm^3 = 9.44 \times 10^4 g$$

20. The density of carbon tetrachloride (CCl<sub>4</sub>) is 1.49 g/mL. What will 100.0 mL of this substance weigh in ounces?

$$\frac{100.0mL}{1mL} \times 1.49g/mL \times \frac{1oz}{28.3g} = 5.2650 \rightarrow 5.27oz$$

21. On your lab table are three graduated cylinders containing unknown liquids. The volume of each liquid is 150.0 mL. If the mass of the liquids are:

a. Liquid A = 2032.5 g    b. Liquid B = 118.5 g    c. Liquid C = 223.5 g

What are the identities of the three liquids?

① A

$$\frac{2032.5g}{150.0mL} = 13.55g/cm^3$$

Mercury

② B

$$\frac{118.5g}{150.0mL} = 0.790g/cm^3$$

Ethanol

③ C

$$\frac{223.5g}{150.0mL} = 1.490g/cm^3$$

Chloroform