CHEM-1105 SIG FIGS & DENSITY

SOLUTIONS

1. 3, 3, 3, 3, 2, 3

2. 44, 5.3×10^{2}, 3.0×10^{2}, 2.3×10^{-3}, 6.0×10^{3}, 0.30

3. 3.21×10^{5}, 3.210×10^{5}, 3×10^{5}, 3.2×10^{5}

4. $25\ \text{km}\times\frac{10^{3}\ \text{m}}{1\ \text{km}}\times\frac{10^{9}\ \text{nm}}{1\ \text{m}} = 2.5\times10^{13}\ \text{nm}$

$2.3\ \text{mg}\times\frac{1\ \text{g}}{10^{3}\ \text{mg}}\times\frac{1\ \text{kg}}{10^{3}\ \text{g}} = 2.3\times10^{-6}\ \text{kg}$

$365\ \text{y}\times\frac{3\ \text{ft}}{1\ \text{y}}\times\frac{12\ \text{in}}{1\ \text{ft}}\times\frac{2.54\ \text{cm}}{1\ \text{in}}\times\frac{1\ \text{m}}{10^{2}\ \text{cm}} = 334\ \text{m}$

$6.85\ \text{m}^{3}\times\frac{10^{6}\ \text{cm}^{3}}{1\ \text{m}^{3}}\times\frac{1\ \text{L}}{10^{3}\ \text{cm}^{3}} = 6.85\times10^{3}\ \text{L}$

$225\ \text{lb}\times\frac{454\ \text{g}}{1\ \text{lb}}\times\frac{1\ \text{kg}}{10^{3}\ \text{g}} = 102\ \text{kg}$

$565\ \text{in}^{2}\times\frac{(10^{2})^{2}\ \text{cm}^{2}}{1\ \text{m}^{2}}\times\frac{1\ \text{in}^{2}}{(2.54)^{2}\ \text{cm}^{2}}\times\frac{1\ \text{ft}^{2}}{(12)^{2}\ \text{in}^{2}} = 6.08\times10^{3}\ \text{ft}^{2}$

5. $35.69\ \text{g}\times\frac{1\ \text{cm}^{3}}{8.908\ \text{g}} = 4.006\ \text{cm}^{3} = 4.006\ \text{mL}$

FINAL VOLUME = 50.0 + 4.006 = 54.0 mL

6. $\text{VOLUME} = \frac{4}{3}\pi r^{3} = \frac{4}{3}\pi\left(\frac{1.90\ \text{cm}}{2}\right)^{3}$

$= \frac{28.\overline{730912}\ \text{cm}^{3}}{8} = 3.5\overline{91364}\ \text{cm}^{3}$

$d = \frac{16.19\ \text{g}}{3.591364\ \text{cm}^{3}} = 4.51\ \text{g/cm}^{3}$

7. (a) $10.5 \frac{g}{cm^2} \times \frac{1\ kg}{10^3 g} \times \frac{10^6\ cm^3}{1\ m^3} = 1.05 \times 10^4\ kg/m^3$

(b) $10.5 \frac{g}{cm^3} \times \frac{10^3\ cm^3}{1\ dm^3} = 1.05 \times 10^4\ g/dm^3$

8. Vol of the coin = (AREA × THICKNESS)

$= \pi r^2 \times \text{THICKNESS}$

$= \pi \left(\frac{0.866\ in \times \frac{2.54\ cm}{1\ in}}{2} \right)^2 \times 0.300\ cm$

$= 1.1400249\ cm^3$

$d = 1.93 \times 10^4 \frac{kg}{m^3} = 19.3\ g/cm^3$

$\therefore$ mass $= 1.1400249\ cm^3 \times \frac{19.3\ g}{1\ cm^3} = 22.0\ g$

9. VOL OF Cu $= 57 \times 10^3\ g \times \frac{1\ cm^3}{8.94\ g} = 6375.8389\ cm^3$ — (1)

ALSO VOL $= \pi r^2 \times L = \pi \times \left(\frac{0.950\ cm}{2} \right)^2 \times L$ — (2).

VOL 1 = VOL 2

$\therefore \quad L = \frac{6375.8389\ cm^3}{\pi \times \left(\frac{0.950\ cm}{2} \right)^2} = 8999.5432\ cm = 90\ m$

10. $500.\ mL \times \frac{1.285\ g}{1\ mL} \times \frac{38.08\ g\ H_2SO_4}{100\ g} = 245\ g\ H_2SO_4$

11. $1.50 \times 10^3\ g\ HCl \times \frac{100\ g\ SOLN}{36.0\ g\ HCl} \times \frac{1\ mL\ SOLN}{1.130\ g\ SOLN} \times \frac{1\ L}{10^3\ mL} = 5.11\ L$

12. VOL OF OIL = 5 mL = $5 cm^3$ — (1)

VOL OF SPILL = $\pi r^2 \times$ thickness of oil spill = AREA × THICKNESS

$$\text{AREA} = 0.5 \text{ acres} \times \frac{1.0\times10^4 \text{ m}^2}{2.47 \text{ acres}} \times \frac{(100)^2 \text{ cm}^2}{1 \text{ m}^2}$$

$$= 2.024291 \times 10^7 \text{ cm}^2$$

$$\text{VOL} = (2.024291\times10^7 \text{ cm}^2) \times \text{Thickness} \quad — (2)$$

VOL (1) = VOL (2)

$$\therefore \text{THICKNESS} = \frac{5 \text{ cm}^3}{2.024291\times10^7 \text{ cm}^2} = 2.47\times10^{-7} \text{ cm}$$

$$2.47\times10^{-7} \text{ cm} \times \frac{1 \text{ m}}{10^2 \text{ cm}} \times \frac{10^9 \text{ nm}}{1 \text{ m}} = 2.47 \text{ nm}$$

13. VOL OF Al = (12×28.4) g $\times \frac{1 \text{ cm}^3}{2.70 \text{ g}} = 126.22222 \text{ cm}^3$ — (1)

$$\text{VOL} = \left[75 \text{ ft}^2 \times \frac{(12)^2 \text{ in}^2}{1 \text{ ft}^2} \times \frac{(2.54)^2 \text{ cm}^2}{1 \text{ in}^2}\right] \times \text{THICKNESS}$$

$$= (69677.28 \text{ cm}^2) \times \text{THICKNESS} \quad — (2)$$

VOL (1) = VOL (2)

$$\therefore \text{THICKNESS} = \frac{126.22222 \text{ cm}^3}{69677.28 \text{ cm}^2} = 1.8\times10^{-3} \text{ cm}$$

$$= 1.8\times10^{-2} \text{ mm}$$

14. VOL OF TEFLON = (AREA OF THE PAN) × THICKNESS

$$\text{AREA} = 36\ \text{in}^2 \times \frac{(2.54)^2\ \text{cm}^2}{1\ \text{in}^2} = 36\times(2.54)^2\ \text{cm}^2 \quad \text{---(4)}$$

$$\therefore \text{VOL} = 36\times(2.54)^2\ \text{cm}^2 \times \text{THICKNESS}$$

$$= 36\times(2.54)^2\ \text{cm}^2 \times (0.100\ \text{cm}) = 23.22576\ \text{cm}^3$$

$$\text{mass for one PAN} = 23,22576\ \text{cm}^3 \times \frac{2.20\ \text{g}}{1\ \text{cm}^3} = 51.096672\ \text{g}$$

$$\text{MASS for one million pans} = 51.096672\times10^6\ \text{g}$$

$$\text{mass in POUNDS} = 51.096672\times10^6\ \text{g} \times \frac{1\ \text{lb}}{454\ \text{g}} = 1.1\times10^5\ \text{lbs}$$

15. mass of pyc = 20.455 g ---(1)

" " " + H_2O = 31.486 g ....(2)

" " " + alloy = 28,695 g ---(3)

" " " + alloy + H_2O = 38.689 g ---(4)

mass of alloy = (3) − (1) = 8,240 g

VOL of pyc = [(2) − (1)] g ÷ 1.00 g/mL = 11.031 mL.

VOL of alloy = (38.689 − 28.695) g ÷ 1 g/mL = 9.994 mL.

H_2O WHEN ALLOY IS IN THE PYC.

$$\therefore \text{VOL OF ALLOY} = (11.031 - 9.994)\ \text{mL} = 1.037\ \text{mL}$$

$$d = \frac{8.240\ \text{g}}{1.037\ \text{mL}} = 7.946\ \text{g/mL} = 7.946\ \text{g/cm}^3.$$