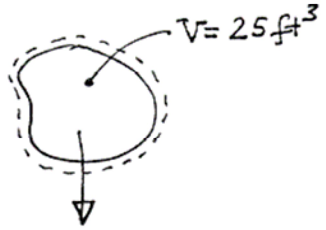
PROBLEM 1.8



$F_{grav} = 3.5\,lbf$

$g_{moon} = 5.47\,ft/s^2$

$g_{mars} = 12.86\,ft/s^2$

In general, $F_{grav} = m\,g$. So,

$$m = \frac{F_{grav}}{g} \qquad (*)$$

Since the mass is the same on mars as on the moon,

$$\left(\frac{F_{grav}}{g}\right)_{mars} = \left(\frac{F_{grav}}{g}\right)_{moon}$$

Accordingly

$$(F_{grav})_{mars} = \left(\frac{g_{mars}}{g_{moon}}\right)(F_{grav})_{moon}$$

$$= \left(\frac{12.86\,ft/s^2}{5.47\,ft/s^2}\right)(3.5\,lbf) = 8.23\,lbf \longleftarrow F_{grav,mars}$$

The density is $\rho = m/V$. Applying Eq. (*) with data on mars

$$m = \left(\frac{8.23\,lbf}{12.86\,ft/s^2}\right)\left|\frac{32.2\,lb\cdot ft/s^2}{1\,lbf}\right| = 20.61\,lb$$

(rounded)

Then

$$\rho = \frac{20.61\,lb}{25\,ft^3} = 0.824\,\frac{lb}{ft^3} \longleftarrow \rho$$

PROBLEM 1.9

$$F = ma = m(60g) = 60\,mg$$

$$= 60\,(50\,\text{lb})\left(32.2\,\frac{\text{ft}}{\text{s}^2}\right)\left|\frac{1\ \text{lbf}}{32.2\ \text{lb}\cdot\text{ft/s}^2}\right| = 3000\ \text{lbf} \longleftarrow F$$

(rounded)

PROBLEM 1.10.

Eq. 1.8 is used in both parts: $n = m/M$, where M is from Tables A-1.

(a) $m = M n$, $n = 10$ kmol

Air: $m = (28.97 \text{ kg/kmol})(10 \text{ kmol}) = 289.7 \text{ kg}$

H_2O: $m = (18.02 \text{ kg/kmol})(10 \text{ kmol}) = 180.2 \text{ kg}$

Cu: $m = (63.54 \text{ kg/kmol})(10 \text{ kmol}) = 635.4 \text{ kg}$

SO_2: $m = (64.06 \text{ kg/kmol})(10 \text{ kmol}) = 640.6 \text{ kg}$

(b) $n = m/M$, $m = 20$ lb

Ar: $n = (20 \text{ lb})/(39.94 \text{ lb/lbmol}) = 0.501 \text{ lbmol}$

H_2: $n = (20 \text{ lb})/(2.016 \text{ lb/lbmol}) = 9.921 \text{ lbmol}$

N_2: $n = (20 \text{ lb})/(28.01 \text{ lb/lbmol}) = 0.714 \text{ lbmol}$

C: $n = (20 \text{ lb})/(12.01 \text{ lb/lbmol}) = 1.665 \text{ lbmol}$