

Chapter 13Problem 26

$$D_{\text{merc}} = 4.88 \times 10^6 \text{ m}$$

$$g_{\text{merc}} = 3.78 \text{ m/s}^2$$

What is the mass of mercury?

$$r_{\text{merc}} = \frac{4.88 \times 10^6 \text{ m}}{2} = 2.44 \times 10^6 \text{ m}$$

$$F = mg = \frac{GMm}{r^2} \rightarrow g = \frac{GM}{r^2}$$

Solving for mass gives

$$M_{\text{merc}} = \frac{g r^2}{G} = \frac{(3.78 \text{ m/s}^2)(2.44 \times 10^6 \text{ m})^2}{6.67 \times 10^{-11} \text{ N m}^2/\text{kg}^2}$$

$$M_{\text{merc}} = 3.37 \times 10^{23} \text{ kg}$$

This 4.6 x that of the moon's mass