ASTR201 HW 4 Solutions

Ch 7) 32) a) Using masses from Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, & Neptune (excluding dwarf planets):

$M_{tot} = 0.055 + 0.815 + 1.000 + 0.107 + 317.8 + 95.164 + 14.540 + 17.148$

$M_{tot} = 446.625\, M_E \approx \boxed{447 M_E}$

b) $M_J = 317.8 M_E$

$\frac{M_J}{M_{tot}} = \frac{317.8 M_E}{446.625 M_E} \approx \boxed{0.71}$

c) $\frac{1 M_E}{446.625 M_E} \approx 0.0022$

37) a) $d = 530\,km \rightarrow r = 265 = 265{,}000\,m$; $m = 2.7 \times 10^{20}\,kg$

density $= \rho = \frac{m}{V} = \frac{m}{\frac{4}{3}\pi r^3}$

$= \frac{2.7 \times 10^{20}}{\frac{4}{3}\pi (265{,}000)^3} \approx \boxed{3464\ kg/m^3}$

b) This density is higher than that of rock;

Ch 8) 36) $K = \frac{1}{2} m v^2$ $\quad m_{ice} = 1g = 0.001\,kg$; $v_{SUV} = 90\,km/h = 25\,m/s$

$v_{ice} = 50\,km/s = 50{,}000\,m/s$; $m_{SUV} = 2000\,kg$

SUV: $K = \frac{1}{2}(2000)(25)^2 = 0.625 \times 10^6\,J$

ice: $K = \frac{1}{2}(0.001)(50{,}000)^2 = 1.25 \times 10^6\,J$

The ice has twice as much kinetic energy as the SUV