

42. With  $T = 27.3(86400) = 2.36 \times 10^6$  s, Kepler's law of periods becomes

$$T^2 = \left( \frac{4\pi^2}{GM_E} \right) r^3 \implies M_E = \frac{4\pi^2 (3.82 \times 10^8)^3}{(6.67 \times 10^{-11}) (2.36 \times 10^6)^2}$$

which yields  $M_E = 5.93 \times 10^{24}$  kg for the mass of Earth.