1) A satellite of mass 100 kg orbits Earth at a distance of six times the Earth radius **from the Earth's surface**. The speed of this satellite is about:

a) 3.0 km/s
b) 3.4 km/s
c) 8.5 km/s
d) 2.7 km/s
e) 7.9 km/s

$$v = \sqrt{\frac{GM_E}{7R_E}} = \sqrt{\frac{2GM_E}{R_E}\left(\frac{1}{14}\right)}$$

$$= \frac{11.2\ \text{km/s}}{\sqrt{14}} \simeq 3\ \text{km/s}$$

2) A satellite of mass 100 kg orbits Earth with a speed of 6 km/s. The height of this satellite **from Earth's surface** is about:

a) 1,500 km
b) 1,800 km
c) 4,700 km
d) 4,200 km
e) 7,900 km

$$v = \sqrt{\frac{GM_E}{D}} \rightarrow 36 = \frac{GM_E}{D} = \frac{2GM_E}{R_E}\left(\frac{R_E}{2D}\right)$$

$$\rightarrow 36 = \frac{(11.2\ \text{km/s})^2}{2}\frac{R_E}{D}$$

$$\rightarrow D = \frac{(11.2)^2(6370)}{72} \rightarrow h = D - R_E \simeq 4{,}200\ \text{km}$$

A meteorite of 500 kg of mass far, far away is on a collision course with our planet. Assume that its speed is initially negligible.

3) What would the kinetic energy of the meteorite be upon impact?

a) 3×10^{10} J
b) 4×10^{10} J
c) 6×10^{10} J
d) 8×10^{10} J
e) 0 J

$$K + U = 0 + 0$$

$$\rightarrow K = -U = \frac{GM_E m}{R_E} = \frac{2GM_E}{R_E}\left(\frac{m}{2}\right)$$

$$= [11{,}200\ \text{m/s}]^2(250\ \text{kg}) = 3.14\times10^{10}\ \text{J}$$

4) What would the total energy of the meteorite be upon impact?

a) 3×10^{10} J
b) 4×10^{10} J
c) 6×10^{10} J
d) 8×10^{10} J
e) 0 J

$$E_{TOTAL} = K + U = 0$$