Gravitational Homework (from Nelson 11)

1. A 300g textbook is sitting on a desk that is 78 cm high. Calculate the book’s gravitational potential energy relative to
   1. The top of the desk
   2. The floor of the room
2. The equation for gravitational potential energy is Eg = mgh. Rearrange the equation to isolate for
   1. m
   2. g
   3. h
3. A fully dressed astronaut weighs 1.20 x 103 N on earth is about to jump down from the space capsule on a mystery planet. The drop to the surface is 5.60 m and the astronauts gravitational potential energy is 1.50 x 103 J
   1. What is the mass of the man and his equipment?
   2. What is the magnitude of the gravitational field strength (g) on the mystery planet?
   3. How long will it take the man to hit the ground?
   4. What is the astronauts maximum speed?
4. A crane on earth lifts a box giving it 6.2 x 105 J of gravitational potential energy and raising the crate 4.2 m from the ground. What is the total mass of the grain moved?
5. A man (60kg) is pole vaulting in the Olympics. He raises his centre of mass from 1.1 m to 4.6 m to clear the bar. What is his gravitational potential energy as he clears the bar?
   1. Relative to the ground
   2. Relative to where his usual centre of mass is

Answers

1. a.) 0 J b.) 2.3 J
2. m = Eg/gh, g = Eg/mh, h = Eg/mg
3. a.) 122 kg b.) 2.19 m/s2 c.) 2.26 s d.) 4.95 m/s
4. 1.5 x 104 kg
5. a.) 2.7 x 103 J b.)2.1 x 103 J