

Physics 513

Gravitational Potential and Kinetic Energy Problems

Answer the following problems in full sentences or showing all work.

Gravitational Potential Energy:

- 1.) What is needed to have gravitational potential energy?
- 2.) What are the derived units of energy? What are the fundamental units?
- 3.) What is the gravitational potential energy of a 5 kg block that is 120 m above the ground?
- 4.) An object raised a given distance acquires a potential energy of 9.8 Joules. A second block with twice the mass is raised the same distance. What is the potential energy acquired by the second block?
- 5.) A book resting on shelf 10 m above the floor has a gravitational potential energy of 980 J.
 - a) What is the mass of the book?
 - b) What is the new gravitational potential energy of the book if it is moved down to a shelf 7 m above the floor?

Kinetic Energy:

- 1.) A baseball leaves a bat with a speed of 50 m/s. If the ball weights 1.25 N, what is the kinetic energy of the ball?
- 2.) A 50 g arrow is fired from a bow. If a person did 150 Joules of work to pull back the bowstring:
 - a) What is the kinetic energy of the arrow?
 - b) What is the speed of the arrow when it leaves the bow?
- 3.) A 1000-kg car traveling at 20 m/s collides with a 1500 kg truck that is at rest. The vehicles stick together and slide forward at 8 m/s.
 - a) Did the collision follow the conservation of momentum law?
 - b) What is the total kinetic energy of the vehicles before the collision?
 - c) What is the total kinetic energy of the vehicles after the collision?
 - d) Why does this not violate the law of conservation of energy?