

Gravitational Potential Energy Problems

Name: _____ Date: _____

“Potentially” useful equations:

$$E_g = mgh$$

$$W = \Delta E_g = mgh_2 - mgh_1$$

** you must show all work, full equations and units in order to get full marks.

1. Calculate the amount of gravitational potential energy, , a 3 kg mass would have if it were placed on a shelf
 - a) 0 m high
 - b) 1.2 m high
 - c) 3.5 m high
2. A person is sitting in a tree. What is their mass if they possess 4410 J of gravitational potential energy when they are 6 m above the ground?
3. A 65 kg woman is diving from a very high cliff. At the top of the cliff the woman has 19000 J of gravitational potential energy. What is the height of the cliff?
4. A 50 kg person decides to climb the floors of an apartment building. If the floors are 4.2 m apart, how much gravitational potential energy would the man have relative to the ground floor if he made it to
 - a) the fifth floor
 - b) the tenth floor
 - c) the first basement level?
5. A 450 g book is resting on top of a table that is 2.3 m above the ground.
 - a) calculate the gravitational potential energy of the book relative to the ground
 - b) calculate the gravitational potential energy of the book relative to the table
6. A cliff at the Elora Gorge is 19.6 m above the surface of the Grand River, which is 5.34 m deep. What is a 70.0 kg cliff diver’s gravitational potential energy from the top of the cliff with respect to (relative to) the water’s surface and with respect to the bottom of the river?
7. A 1300 kg car is lifted from the ground to a height of 2.6 m. From this point it is further lifted to a height of 5.7 m. What is the change in gravitational potential energy from 2.6 m to 5.7 m? (i.e. this is how much work is done).
8. How much work is done a 14 kg cat to lift it from the ground to a table that is 89 cm high?

9. A 2.00 kg book falls 0.75 m from a desk to the floor. How much potential energy did the book lose? What type of energy did it gain as it fell? Could you calculate the speed from the kinetic energy equation (if yes, try it)?

Numerical Answers:

1. a) 0 b) 35J c) 103J 2. 75kg 3. 29.8m 4. a) 10290J b) 20580J c) -2058J 5. a) 10J b) 0J 6. a) 13446J b) 17109J 7. 39494J 8. 122J 9. a) 14.7J b) Kinetic energy; Yes; 3.8 m/s