**Energy**

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| 27 m | 1. A 1250 Kg car going 23 m/s can gain how much elevation on a very tall hill if it loses no energy to friction? |
| 15 m | 2. How much elevation will the car in the previous problem gain on the hill if it loses 150,000 J of energy to friction on the way up? |
| 16 m/s | 3. An 873 Kg car going 12 m/s at the top of a 6.2 m tall hill is going how fast at the bottom? (No loss to friction) |
| 10. m/s | 4. A 312 Kg rocket ship in deep space fires an engine that produces 516 N of thrust, for a distance of 32 m. If the rocket ship was initially at rest, what is its final velocity? |
| 10.7 m/s | 5. What is the final velocity of a .452 Kg object initially at rest if you exert a force of 6.50 N on it vertically upward for a distance of 12.5 m (upward)? |
| 12 m/s | 6. A 100. Kg rollercoaster has a speed of 8.0 m/s on the top of a hill that is 6.4 m tall. What is its speed on the top of a 2.4 m tall hill? |
| 29,000 N29.6 m/s/s or 3.02 "g"s | 7. A coasting 980 Kg car going 21 m/s at the top of a 15 m tall hill is brought to rest by a crash barrier at the bottom of the hill in a distance of 12.4 m. What force did the barrier exert on the car, and what acceleration did the car undergo in stopping? |
| 5.05 m/s | 8. A 120. Kg bicyclist going 5.60 m/s at the bottom of a 2.00 m tall hill exerts a forward force of 200. N for 10.0 m as they climb the hill. What is their speed at the top of the hill? |
| 2.4 m | 9. A 150 Kg rollercoaster car is going 12 m/s at the top of a 12 m tall hill, and then rolls into the station at a height of 3.0 m where it is brought down to a speed of 6 m/s with a braking force of 8900 N. Over what distance must the force be exerted? |
| 5200 N | 10. A coasting 1150 Kg car going 21 m/s hits a puddle that is 13 m long. It leaves the puddle going 18 m/s. What force did the puddle exert on the car? |
| 14 m/s35 m | 11. The engines on a 45 Kg rocket fired vertically upward burn for a distance of 25 m generating a force of 620 N. (Assume for this problem that the rocket's mass remains constant) What is the rocket's speed just after the engines quit burning? To what height does the rocket rise in the air before falling back to earth? |
| 1.63 J.66 J | 12. A spring with a constant of 124 N/m is compressed 16.2 cm. How much potential energy does it store? How much is released if the spring is allowed to expand only from 16.2 cm to 12.5 cm? |
| 10. cm | 13. A 2.0 g penny is pushed down on a vertical spring, compressing the spring by 1.0 cm. The force constant of the spring is 40. N/m. How far above this original position will the penny fly if it is released? |
| 5.4 x 104 N/m | 14. A 745 kg rollercoaster car is traveling at a speed of 3.50 m/s at an elevation of 11.25 m is stopped in the station at an elevation of 10.21 m by a spring over a distance of 67 cm. What is the spring constant of the spring?  |
| 1.6 cm | 15. A spring loaded marble gun shoots 12.5 gram marbles off of a (Frictionless!) horizontal table that is 91 cm high. The spring in the gun has a spring constant of 52 N/m. By how much do you need to compress the spring to land a marble on the floor 45 cm horizontally from the edge of the table? |