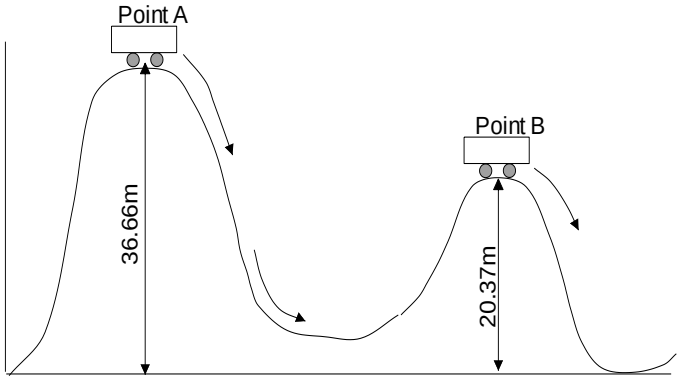
Mechanical Energy Review Problems

Maximum Velocity / Maximum Height Problems

1. Calculate the velocity an object would hit the ground with if it fell from a height of 1.28m. **[5 m/s]**
2. Calculate the velocity an object would hit the ground with if it fell from a height of 4.6m. **[9.5 m/s]**
3. A ball of mass 2.0 kg falls 40cm. What velocity does it strike the ground with? **[2.8 m/s]**
4. Another bigger ball with mass 4.0kg also falls 40cm. What velocity does it hit the ground with? Which ball hits the ground with greater kinetic energy? **[2.8 m/s, larger ball has higher E_k]**
5. A ball is thrown straight up with a velocity of 10.8 m/s. What is its' maximum height? **[5.95m]**
6. A ball is thrown straight up with a velocity of 5.24 m/s. What is its' maximum height? **[1.40m]**
7. A 20 kg rock is launched straight up with an V_i = 5.24 m/s. How high up does it go? **[1.40m]**

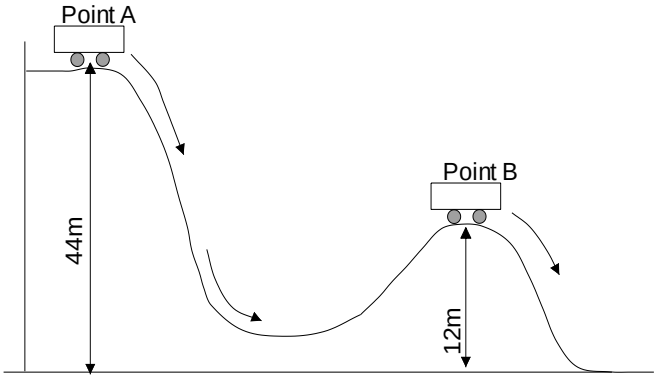
Roller Coaster Problems

8. A 501 kg roller coaster is on a frictionless track 36.66m above the ground. The height of the track at Point B is 20.37m.



   a. Find the potential energy of the coaster at point A. **[1.80×10^5J]**
   b. Find the potential energy at point B. **[1.00×10^5J]**
   c. Determine the kinetic energy of the coaster at B.**[8.00×10^4J]**
   d. Calculate the velocity of the coaster at B. **[17.9 m/s]**
   e. Use the difference in height between Point A and Point B and the equation from the first part of this assignment to redetermine the velocity at B. **[17.9 m/s]**
   f. Five 75kg passengers climb into the coaster at and glide down the track to B. What velocity are they going when they are at B? **[17.9 m/s]**

9. This roller coaster has a 2.0×10^3 kg cart on a frictionless track 44m above the ground. The bump at point B is 12 m above the ground.



   a. Calculate the velocity of the cart when it gets to point B.**[25 m/s]**
   b. Convert your answer in part a. to km/hr. **[90 km/hr]**
   c. Determine the velocity the cart would have when it finally gets down to ground level (in both m/s and km/hr). **[29 m/s, 110 km/hr]**