NAME: _____

# Energy Worksheet

1. How much work must be done to stop a 1 800 kg vehicle travelling at 30 m/s?

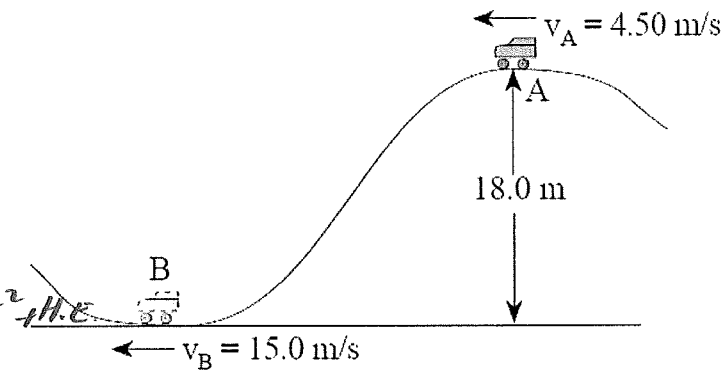
$W = \Delta E$

$= E_f - E_0$

$= 0 - \frac{1}{2}(1800\,kg)(30\,m/s)^2$

stopping $\rightarrow$ $= 8.1 \times 10^5\ J$

2. A 250 kg roller coaster car travels past points A and B with speeds shown in the diagram below. How much heat energy is produced between these points?




$E_B = E_A$

$P.E._1 + K.E_1 = K.E_2 + H.E.$

$mgh + \frac{1}{2}mv_0^2 = \frac{1}{2}mv_f^2 + H.E.$

$(250)(9.8)(18) + \frac{1}{2}(250)(4.5)^2 = \frac{1}{2}(250)15^2 + H.E.$

$H.E. = 18500\ J = 18.5\ kJ$

3. A 3.5 kg projectile was launched vertically at 75 m/s. The projectile reached a maximum height of 180 m. How much energy was lost to heat while the projectile was rising?

$E_B = E_A$

$K.E. = P.E + E_{lost}$

$\frac{1}{2}mv^2 = mgh + E_{lost}$

$\frac{1}{2}(3.5)(75)^2 = (3.5)(9.8)(180) + E_{lost}$

$E_{lost} = 3700\ J$

4. Two carts collide while travelling on a smooth surface. It is found that the sum of the kinetic energies of the carts after the collision is the same as before the collision. This collision **must** be

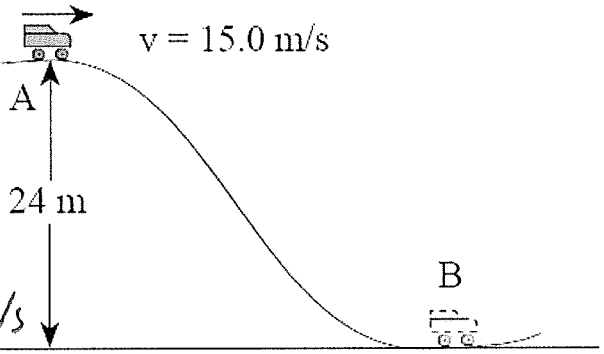
(A) elastic. $K.E_b = KE_A$

B. inelastic.

C. between carts of identical mass.

D. between carts that stick together.

5. A 150 kg roller coaster car passes the crest of a hill at 15.0 m/s.
   a) What is the speed of the car at point **B** at the bottom of the hill?




$E_B = E_A$

$P.E. + K.E. = K.E.$

$mgh + \frac{1}{2}mv_0^2 = \frac{1}{2}mv_f^2$

$(150)(9.8)(24) + \frac{1}{2}(150)(15)^2 = KE_f$

$KE_f = 52155\,J$

$\frac{1}{2}mv^2 = 52155\,J$

$v^2 = 695$

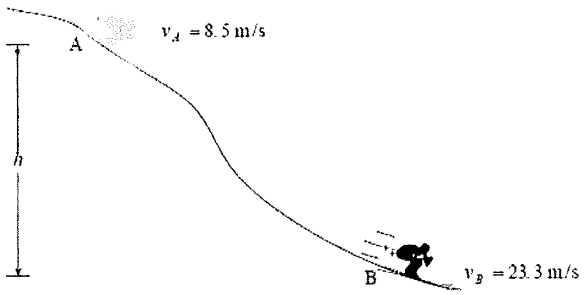
$v_f = 26.4\,m/s$

   b) If the mass of the roller coaster car is increased by adding a passenger, how will the speed at **B** now compare to your answer for part a)? (Circle one.)

   (A.) equal to
   B. less than
   C. greater than

mass doesn't affect v, it cancels in the equation.

6. As a 62 kg skier descends from **A** to **B** her velocity increases from 8.5 m/s to 23.3 m/s. Friction between **A** and **B** generates 8 700 J of heat energy. Through what vertical height, ***h***, did the skier descend?




$E_B = E_A$

$P.E. + K.E. = K.E. + H.E.$

$mgh + \frac{1}{2}(62)(8.5)^2 = \frac{1}{2}(62)(23.3)^2 + 8700\,J$

$P.E. = 23300\,J$

$mgh = 23300\,J$

$h = 38.3\,m$

7. As a skier descends a slope, her kinetic energy increases from 600 J to 3 200 J while her gravitational potential energy decreases by 5 900 J. How much heat energy is created due to friction?

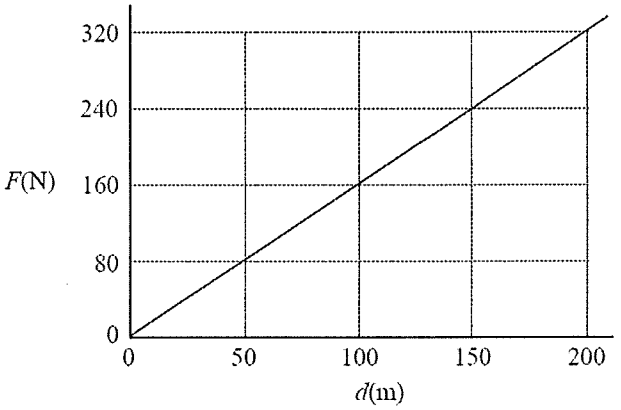
$E_B = E_A$

$P.E. + K.E. = K.E. + H.E.$

$5900\,J + 600\,J = 3200\,J + H.E.$

$H.E. = 3300\,J$

8. A 24 kg rocket car is initially at rest on a frictionless horizontal surface. The engine is ignited and the graph below shows thrust force, ***F***, versus distance travelled, ***d***, for the rocket car. Find the rocket car's speed after it has travelled 200 m.



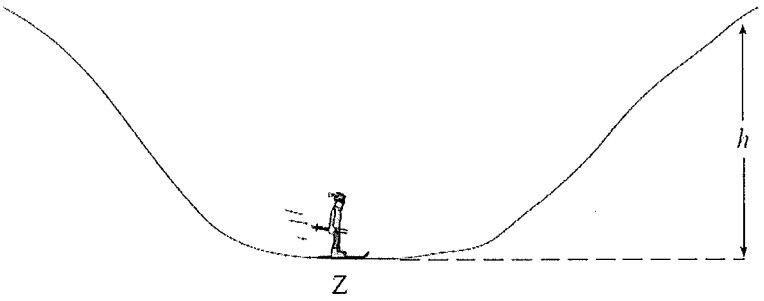

Area = W = ΔE  V = 51.6 m/s

$\frac{1}{2}(200)(320) = \Delta E$

32000 J = ΔE = K.E.

$\frac{1}{2}(24)v^2 = 32000\ J$

9. René, whose mass is 85 kg, skis down the hill, passing Z with a kinetic energy of 9 700 J. If friction is ignored, to what maximum height, *h*, can René ski?

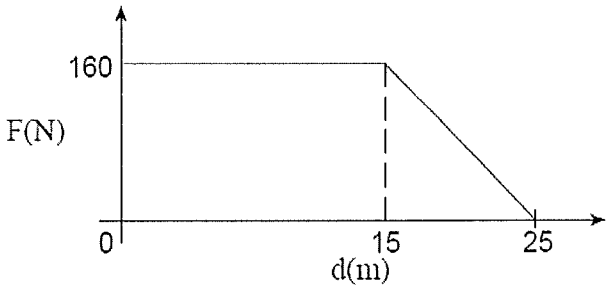



$E_B = E_A$

K.E = P.E

9700 = (85)(9.8)h  h = 11.6 m

10. A cyclist travelling at 10 m/s applies her brakes and stops in 25 m. The graph shows the magnitude of the braking force versus the distance travelled. What is the total mass of bike and cyclist?

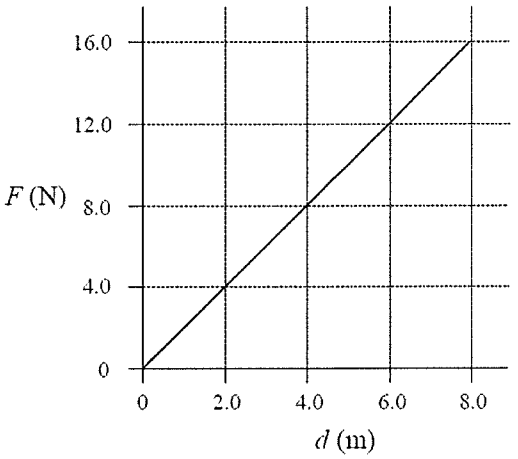



Area = W = ΔE

$(160)(15)+\frac{1}{2}(160)(10) = 3200\ J = \frac{1}{2}mv_f^2 - \frac{1}{2}mv_0^2$ ($v_f = 0$)

m = 64 kg.

11. The graph below shows the relationship between the force applied and the distance moved for a 3.5 kg object on a frictionless horizontal surface. If the object was initially at rest, what is its kinetic energy after travelling 8.0 m?




Area = W = ΔE

$\frac{1}{2}(8)(16) = 64\ J$