Name Key Date__________ Partners__________

HOMEWORK FOR WORK AND ENERGY

1. An object of mass 0.550 kg is lifted from the floor to a height of 3.50 m at a constant speed.

How much work is done by the lifting force (include units)?

$W = F \cdot d$

$0.55 kg \cdot 9.8 \cdot 3.5 = 18.9 J$

How much work is done by the Earth on the object?

$-18.9 J$

What is the *net* work done on the object?

0 J since net force = 0

What is the change in kinetic energy of the object?

$W = \Delta E = 0$ since velocity was constant

Are your results consistent with the work-energy principle? Explain.

Yes!

2. If the object in Question 1 is released from rest after it is lifted, what is its kinetic energy just before it hits the floor? What is its velocity? Show your work and include units.

$PE = mgh = .55 \cdot 3.5 \cdot 9.8$

18.9 J

Answers: Kinetic energy: 18.9 J Velocity: 8.3 m/s

$KE = \frac{1}{2} m v^2$

$18.9 = \frac{1}{2} \cdot .55 \cdot v^2$

$v = 8.3 m/s$

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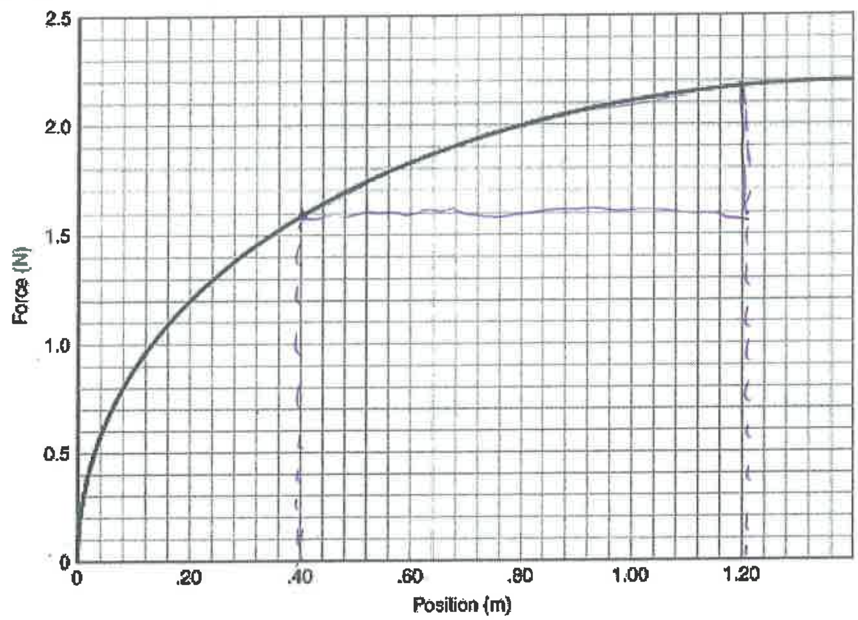
3. A force acts on an object of mass 0.425 kg. The force varies with position as shown in the graph that follows.



Find the work done by the force in moving the object from 0.40 m to 1.20 m. Explain your calculation and give units.

Answer: 1.44J

$W = F \cdot d = F \cdot 0.8m$

$1.8N \cdot 0.8m = \boxed{1.44 J}$

4. Assuming that there is no friction and that the object in Question 3 starts from rest at 0.40 m, what is the object's kinetic energy when it reaches 1.20 m? Show your calculation and give units.

Answer: 1.44J

$W = \Delta E = K_f - K_i \rightarrow K_i = 0$

$W = K_f = \boxed{1.44J}$

5. What is the velocity of the object in Question 3 when it reaches 1.20 m? Show your calculation and give units.

Answer: 2.6m/s

$1.44J = \frac{1}{2}\ 0.425kg \cdot v^2$

$v = 2.6\ m/s$

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Name Key Date Partners

HOMEWORK FOR CONSERVATION OF ENERGY

1. A ball of mass 5.0 kg is lifted off the floor a distance of 1.7 m. What is the change in the gravitational potential energy of the ball? Show your calculation.

Answer: 83.3 J

GPE = mgh = 5 · 1.7 · 9.8

2. Now the ball is released from rest and falls to the floor. What is the kinetic energy of the ball just before it hits the floor? What is its velocity? Show your calculations, and explain your answers.

Answers: kinetic energy: 83.3 J velocity: 5.8 m/s

$83.3 J = \frac{1}{2} m v^2$ (m = 5.0kg)

v = 5.8 m/s

3. Suppose that the ball is dropped from the same height as in Question 2, but is attached to a parachute. Compare the kinetic energy just before the ball hits the floor to your answer in Question 2. Is it the same, larger, or smaller? Is mechanical energy conserved in this case? Explain your answer.

It will be smaller since there will be less velocity

- ME is conserved since energy is transferred to parachute (friction)

4. A ball is tossed in the air and released. It moves up, reverses direction, falls back down again, and is caught at the same height it was released.

a. Considering the time interval after the ball is released and before it is caught, when does the gravitational potential energy of the ball have its maximum value? Minimum value? Explain.

PE Max = Highest point

PE min = when thrown & just before caught } depends on height

b. When does the kinetic energy of the ball have its maximum value? Minimum value? Explain.

KE max = just before caught & just after thrown

KE min = at highest point

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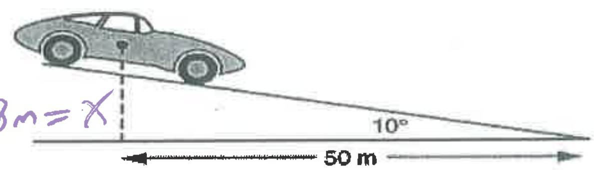
c. What about the mechanical energy of the ball? What can you say about its value at the locations described in your answers to (a) and (b)?

ME is the same throughout constant! ME = KE + PE



8.8m = x

$\tan(10°) = \frac{x}{50}$

x = 8.8 m

5. A car of mass 1000 kg is at the top of a 10° hill as shown.

a. What is its gravitational potential energy relative to the bottom of the hill?

GPE = 1000 kg · 9.8 m/s² · 8.8 m = **86,400 J**

b. If the car rolls down the hill (with the engine off) with negligible friction and air resistance, what will its kinetic energy be when it reaches the bottom?

KE = 86,400 J

c. Suppose instead that the amount of work done on the car by the frictional and air resistance forces as the car rolls down the hill is 50,000 J. What then is the kinetic energy of the car when it reaches the bottom of the hill?

$W = \Delta E = 50{,}000\ J = KE_f - KE_i$ ($KE_i \to 0$)

$KE_f = 50{,}000\ J$

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