KEY

Work, Energy, Power, Momentum practice W.S.

①

Work, Energy, and Hooke's Law Review

1. How much work is done in lifting a very cute little 6.5 kg puppy (with floppy ears) to a height of 1.5 m? $W = F \times \Delta d = mgh = (6.5 kg)(9.8 N/kg)(1.5 m)$

$\boxed{W = 96 J}$ done by lift force

2. A suitcase is dragged 30.0 m along a floor by a 7.0 N force. How much work against friction is done on the suitcase? "at a constant speed"

oops! not quite enough info) should be $\therefore F_f = F_{pull}$ $\therefore W = (7N)(30m) = \boxed{2.1 \times 10^2 J}$

3. It is estimated that 5.0×10^8 kg of water flows over Niagara Falls each minute. The average height of the falls is 65.0 m.

(a) What is the total amount of gravitational potential energy of the water that flows over the falls in one minute? $E_p = mgh = \boxed{3.2 \times 10^{11} J}$

(b) Calculate the power of the water that flows in one minute.

$P = \frac{W}{\Delta t} = \frac{\Delta E_p}{\Delta t} = \frac{3.185 \times 10^{11}}{60 s} = \boxed{5.3 \times 10^9 W = 5.3 \times 10^3 MW}$

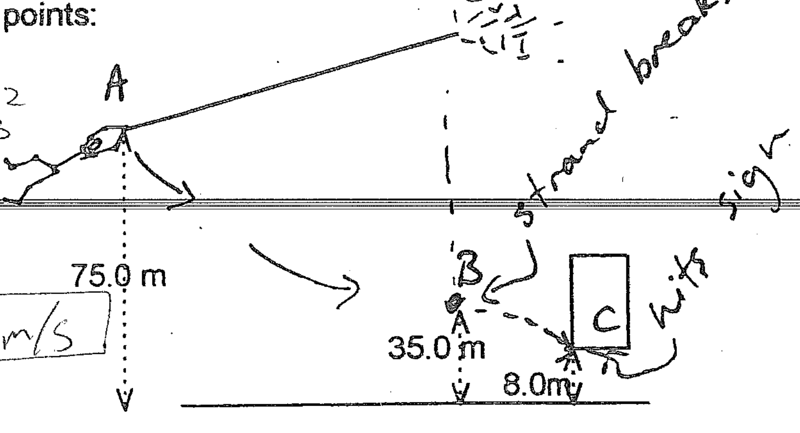
ok to omit

4. A 200.0 kg satellite is lifted from the Earth's surface to an orbit around the Earth of radius 7.5×10^3 km. What is the satellites potential energy relative to the Earth's surface? $GPE = -\frac{GmM_E}{R} = \frac{-(6.67 \times 10^{-11})(200) M_E}{[illegible](7.5 \times 10^6 m)} = \boxed{}$

5. What is the kinetic energy of an oxygen molecule of mass 2.66×10^{-26} kg moving at 555 m/s? $E_k = \frac{1}{2}mv^2 = \frac{1}{2}(2.66 \times 10^{-26} kg)(555 m/s)^2 = \boxed{4.10 \times 10^{-21} J}$

6. What is the speed of a 1.5 kg brick if its kinetic energy is 20.0J?

7. Spiderman starts from rest at point "A" and swings on his strand to point "B" when the strand breaks. He continues along the path shown until he hits a signpost at "C". If his mass is 78.0 kg and there is no significant loss of energy, calculate his speed at the following points:



(a) B: $E_A = mgh_A$

$E_B = mgh_B + \frac{1}{2}mv_B^2$

$\therefore mgh_A = mgh_B + \frac{1}{2}mv_B^2$

$V_B = \sqrt{2g(h_A - h_B)}$

$V_B = \sqrt{2(9.8)(75 - 35)} = \boxed{28 m/s}$

(b) C:

$E_A = E_C$

$mgh_A = mgh_c + \frac{1}{2}mv_c^2$

$\therefore V_c = \sqrt{2g(h_A - h_c)} = \sqrt{2(9.8)(75 - 8)}$

$\boxed{V_c = 36 m/s}$

②

8. A 5.0 kg cannon ball is fired vertically with a speed of 30.0 m/s.

(a) Using energy methods, calculate how high the ball will fly.

(b) What will the speed of the cannon ball be when it has reached half of its maximum height?

9. (a) How much energy would a 60.0 Watt fluorescent lamp use in seven days if it were left on for the whole time?

(b) If the lamp is 25% efficient, how much light energy is given off during that time?

10. A 1.2×10^3 Watt kettle takes 5.0 minutes to bring 0.78 kg of water to a boil (100 °C) from 15.0 °C.

(a) How much electrical energy is used in 5.0 minutes?

$E = P \times t = (1.2\times10^3 W)(300 s)$

$\boxed{E = 3.6\times10^5 J}$

(b) Calculate the efficiency of the kettle.

omit

energy into $H_2O = mC\Delta T$ efficiency $= \frac{mC\Delta T}{elect. E}$

omit 11. A force of 15.8 N is needed to stretch a rubber band from a length or 8.0 cm to 15.0 cm. Calculate the spring constant of the rubber band.

$F = -k\Delta x$

$\therefore k = -\frac{F}{\Delta x} = \frac{-15.8 N}{(0.15 m - 0.08 m)} = \boxed{2.3\times10^2 N/m}$

8. (a)
$v_C = 0 m/s$
h B (h/2) $v_B = ?$
$v_A = 30 m/s^2$

$E_A = E_C$

$\frac{1}{2}\cancel{m}v_A^2 = \cancel{m}gh_C$

$\therefore h_C = \frac{v_A^2}{2g} = \frac{(30)^2}{2(9.8)} = \boxed{46 m}$

(b) $\frac{1}{2}\cancel{m}v_A^2 = \frac{1}{2}\cancel{m}v_B^2 + \cancel{m}gh_B$

$\frac{1}{2}v_B^2 = \frac{1}{2}v_A^2 - g\left(\frac{h_C}{2}\right)$

$\therefore v_B = \sqrt{v_A^2 - gh_C} =$

$v_B = \sqrt{v_A^2 - g\left[\frac{v_A^2}{2g}\right]} = \sqrt{\frac{v_A^2}{2}} = \frac{v_A}{\sqrt{2}}$

$\therefore v_B = \frac{30 m/s}{\sqrt{2}} = \boxed{21 m/s}$

9. (a) $E = P \cdot t = (60.0 W)(7 days \times 24 h/day \times 3600 s/h)$

$\boxed{E = 3.63\times10^7 J}$

(b) 25% efficient, ∴ 25% of Energy is used toward creating light energy (the rest is dissipated as waste heat energy)

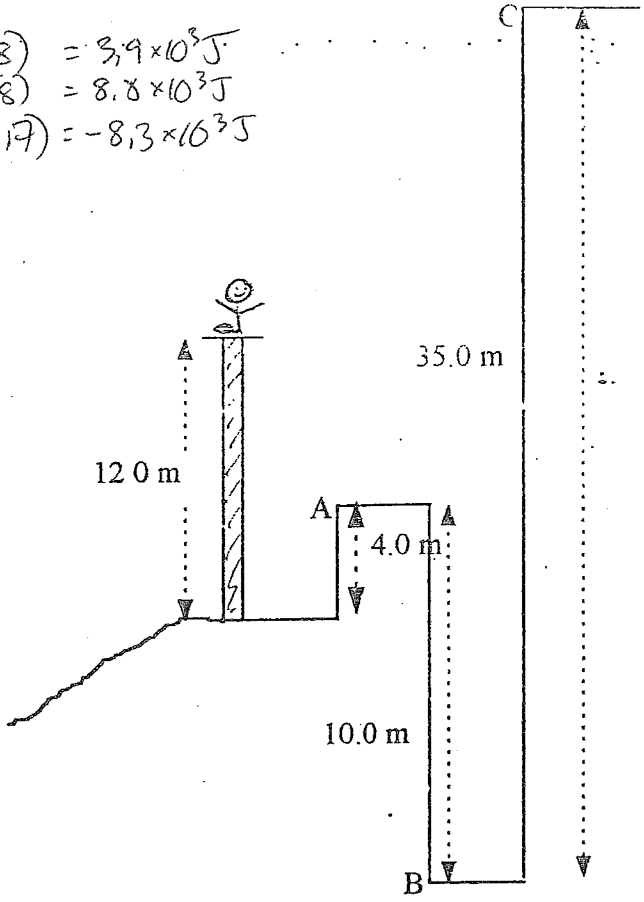
∴ Light $E = 0.025 \times (3.6288\times10^7 J)$

$\boxed{= 9.07\times10^6 J}$

WORK-ENERGY WORKSHEET - PHYSICS 11

1. A Lithuanian flagpole sitter has a mass of 50.0 kg. What is her relative E_p in each of the following cases if we consider zero to be at the level of the following points?

(a) Zero at point "A" $mg(8) = 3.9\times10^3 J$
(b) Zero at point "B" $mg(18) = 8.8\times10^3 J$
(c) Zero at point "C" $mg(-17) = -8.3\times10^3 J$



2. (a) An electron has a mass of 9.11×10^{-31} kg. If it moves across a television picture tube at a speed of 5.00×10^5 m/s, calculate its kinetic energy. $KE = 1/2 mv^2 = 1.14\times10^{-19} J$
(b) How many such electrons would transfer 1.0 J of energy to the screen? 8.78×10^{18} elect.

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3. A pendulum bob (a bob is a small hanging ball) of mass 2.0 kg is suspended by a string 0.80 m long. The bob is pulled sideways until the cord is horizontal and then is released. Assuming mechanical energy is conserved, calculate the maximum speed of the bob during its swing. $mgh = 1/2 mv^2$ $v = \sqrt{2gh}$ 4.0 m/s

4. An archer exerts an average force of 100.0 N as he draws the arrow back 0.60 m preparing to shoot.
(a) What is the potential energy in the bow and arrow system just before the archer releases the arrow? $PE = 60 J$
(b) What will be the kinetic energy of the arrow as it is released from the bow? KE 60 J
(c) If the arrow has a mass of 0.020 kg, what would its maximum speed be?

$1/2 mv^2 = KE$
$v = \sqrt{\frac{2KE}{m}}$
$v = 77 m/s$

④

5. (a) Two identical balls are thrown straight up in the air. Ball A is thrown with twice as much **energy** as ball B. Compare their maximum heights. $h_A = 2h_B$

(b) Two identical balls are thrown straight up in the air, ball C with twice the speed of ball D. Compare their maximum heights. $h_C = 4h_D$

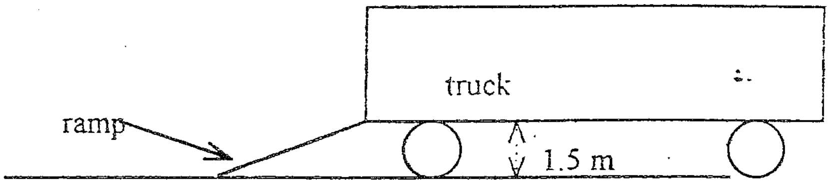
C

6. A 100.0 kg case must be loaded into a truck whose floor is 1.5 m above the ground.

(a) What force would be required to lift it straight up from the ground to the truck? $\boxed{9.8\times10^{2}N}$

(b) Calculate the work done in lifting the case directly (straight up) into the truck. $\boxed{1.5\times10^{3}J}$

(c) The same work is done if the case is pushed up a ramp, assuming that the friction on the ramp can be reduced to a negligible value. The advantage gained is that the same job can be done with less force than that required by a direct lift. Calculate the force required if the ramp is 3.0 m long. $F = \frac{W}{d}$ $\boxed{F = 4.9\times10^{2}N}$



(d) If the force of friction cannot be made small, then a force of about 700.0 N might be required to pull the case up the 3.0 m long ramp.

(i) Calculate the work done by the force in this circumstance. $W = F\times d = \boxed{2.1\times10^{3}J}$

(ii) How much of this work would remain as potential energy of the case at the top of the ramp (1.5 m high)? $\boxed{1.5\times10^{3}J}$ C

(iii) What happens to the rest of the energy that is put into the system by pulling? $\boxed{heat}$

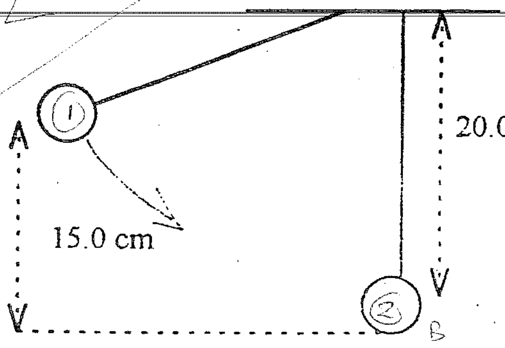
oops! There is a problem
this is logic!! Omit this sentence

7. A 15.0 g pendulum bob on a 20.0 cm long string is dropped from rest from a height of 15.0 cm. When the bob reaches the bottom of its awing it collides with an identical pendulum bob. ~~The first bob comes to a stop after the impact~~, and the second bob moves away after it was hit. During the collision 5.22×10^{-3} J of the mechanical energy was lost to heat and sound during the collision.

(a) What was the gravitational potential energy of the first bob before it was dropped? $\boxed{2.2\times10^{-2}J}$

(b) What is the speed of the first bob the instant before it hits the second bob? $\boxed{1.7 m/s}$

(c) With what speed does the second bob bounce away immediately after the collision?



$\frac{1}{2}\cancel{m}v^2 = \cancel{m}gh$

$v = \sqrt{2gh}$

$KE = 2.2\times10^{-2}J - 5.22\times10^{-3}J$

$= 1.68\times10^{-2}J$

$v = \sqrt{\frac{2KE}{m}} = \boxed{1.5 m/s}$

D $\boxed{\text{Cons of } \vec{p}}$ $p = p'$

$\cancel{m_1}v_1 + \cancel{m_2}\overset{0}{v_2} = \cancel{m_1}v_1' + \cancel{m_2}v_2'$

$\therefore v_1' = v_1 - v_2' = 1.7 m/s - 1.5 m/s$

$\boxed{v_1' = 0.2 m/s \text{ to right}}$

0 kg·m/s
200 kg·m/s

·m/s

m/s, according to the ually, the players will oever can push the iiring momentum by pposite direction.

8000 kg tank car at down the track. How (2.0 m/s)
een a 4000 kg railway ig is released and the s. If the heavier car move? (−3.6 m/s)
watermelon of 10 kg ks in it. How fast does (1.6 m/s)

iven by

ilogram metres per

by

wton seconds.
rms of momentum

es: "In any interac- al force acts on the ant."

7.6 Review

1. An object is pushed with a force of 6.0 N for 0.5 s. What impulse is given to it?
2. What impulse produces a velocity change of 4.00 m/s in a 12.5 kg mass?
3. A 15 kg wagon is accelerated by a constant force of 60 N from 5.0 m/s to 13.0 m/s.
   (a) What impulse does the wagon receive?
   (b) For how long was the force acting on the wagon?
4. A freight car with a mass of 6.0×10^4 kg is rolling along a level track at 0.40 m/s, dragging a chain behind it.
   (a) If the largest force that could be applied to the chain is 320 N, how long would it take to stop the car?
   (b) How far would the car move before it could be stopped?
5. What average force will stop a hammer with a momentum of 48 N·s in 0.030 s?
6. A stone of mass 10 kg slides along the ice in a straight line with a constant velocity of 8.0 m/s. A constant force then acts on the stone for 2.5 s, changing its velocity to 2.0 m/s.
   (a) What is the momentum of the stone before and after the force acts?
   (b) Calculate the impulse acting on the stone.
   (c) What is the magnitude and direction of the force that is acting?
7. Two frictionless discs on an air table, initially at rest, are driven apart by an explosion with velocities of 9.0 m/s and 5.0 m/s. What is the ratio of their masses?
8. In an experiment similar to Investigation 6.6, two dynamics carts are at rest with a compressed spring between them. When the spring is allowed to expand, the carts move apart. Both hit bricks at either end of the table, simultaneously, but cart A moves 0.60 m while cart B moves 0.90 m.
   What is the ratio of:
   (a) the speed of A to the speed of B after the explosion?
   (b) their masses?
   (c) the impulses applied to the carts?
   (d) the accelerations of the carts while the spring was pushing them apart?
9. A proton of mass 1.67×10^{-27} kg, travelling with a speed of 1.0×10^7 m/s, collides with a helium nucleus at rest. The proton rebounds straight back with a speed of 6.0×10^6 m/s while the helium nucleus moves forward with a speed of 4.0×10^6 m/s.
   (a) What was the total momentum before the collision?

Numerical Answers to Review Questions

1. 3.0 N·s
2. 50.0 N·s
3. (a) 1.2×10^2 N·s (b) 2.0 s
4. (a) 75 s (b) 15 m
5. 1.6×10^3 N
6. (a) 80 kg·m/s, 20 kg·m/s (b) 60 N·s
   (c) 24 N
7. 0.56
8. (a) 0.67 (b) 1.5 (c) 1.0 (d) 0.67
9. (a) 1.67×10^{20} kg·m/s
   (b) -1.0×10^{-20} kg·m/s
   (c) 2.67×10^{20} kg·m/s (d) 6.68×10^{27} kg
10. 2.7 m/s
11. (a) 10 kg·m/s (b) 7.5 kg·m/s
    (c) 1.0 m/s (d) 4.0 m/s
12. 0.60 m/s
13. 0.22 m/s
15. −1.5 m/s

(b) What was the momentum of the proton after the collision?
(c) What was the momentum of the helium nucleus after the collision?
(d) Determine the mass of the helium nucleus.

10. A stationary flatcar of mass 4.0 × 10^4 kg is rammed by a locomotive with a mass of 6.0 × 10^4 kg and a velocity of 4.5 m/s. If they stick together, with what velocity will they continue to move?

11. Two 2.5 kg carts are moving along together with a velocity of 2.0 m/s when a spring compressed between them expands rapidly. The front cart continues with a velocity of 3.0 m/s, in the same direction.
    (a) What was the momentum of the two carts before the explosion?
    (b) What was the momentum of the front cart after the explosion?
    (c) What was the velocity of the second cart after the explosion?
    (d) What velocity would the front cart have had to acquire for the second cart to remain stationary after the explosion?

12. A 1.5 kg brick is dropped vertically onto a 2.5 kg toy truck, which is moving across a level floor at 0.80 m/s. With what velocity do the truck and brick continue to move, after the brick has landed on the truck?

13. Explain how an astronaut who is stranded in free space a short distance from his spacecraft might employ his knowledge of momentum to return safely to the craft. Why must he be very careful about his momentum?

14. A sandbag is mounted on a cart that is at rest on a horizontal frictionless surface, and their total mass is 4.5 kg. What will be the velocity of the cart and sandbag if a bullet of mass 2.0 g is fired into the sandbag with a horizontal velocity of 500 m/s?

15. Two boys of mass 45 kg and 60 kg, respectively, are sitting on 15 kg wagons, facing each other and holding a rope taut between them. The lighter boy pulls on the rope and acquires a velocity of 2.0 m/s. What is the velocity of the other boy?

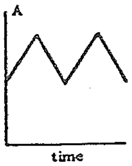
7.7 Learning Objec

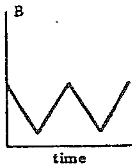
1. Given any two of mass,
the third.
2. Given any two of force
impulse exerted, to calc
3. To state Newton's Secon
tum.
4. Given any four of force
final velocity, to calculat
5. To state the Law of Cons
systems of interacting o
6. For interactions betwee
masses, their initial velo
culate the sixth.

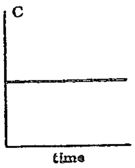
Two steel balls collide elastically.

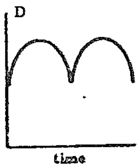
A. Momentum is the same before and after the collision, but kinetic energy is not.
[✓ B. Momentum and kinetic energy are the same before and after the collision.]
The temperature of both balls will increase.
The balls will be permanently deformed.
E. The balls will stick together.

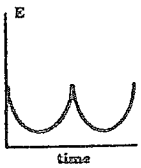
The following graphs refer to questions 14 and 15.











At time t = zero a pendulum is set into motion by releasing the pendulum bob at a certain height.

14. Which of the graphs best represents the variation of the bob's kinetic energy with time? D

15. Which of the graphs best represents the variation of potential energy with time? E

Two spheres of the same diameter, one of mass 5 kilograms and the other of mass 10 kilograms, are dropped at the same time from the top of a tower. When they are 1 meter above the ground, the two spheres have the same

A. momentum.
B. kinetic energy.
C. potential energy.
total mechanical energy.
[✓ acceleration.]

The unit "horsepower" is a measure of

A. force.
B. work.
C. work per bushel of coal.
[✓ D. work per unit time.] (Power)
E. work per steam engine.

The first law of thermodynamics is a statement of (omit)

[✓ A. the law of conservation of energy.]
B. the law of conservation of momentum.
C. the law of conservation of mass.
D. Newton's law of action and reaction.
E. Galileo's law of motion.

12. The prediction of a "heat death" is based on the principle which states that omit

A. the law of conservation of energy applies only to closed systems.
B. at some time in the future, the energy of the universe will become zero.
C. all bodies in the universe will eventually reach the same temperature by exchanging heat with each other.
mpossible to think of a system in which energy is completely conserved.

ULTIPLE CHOICE.

1. Work depends on what two factors?

A. force and energy
[✓ B. force and distance]
C. distance and energy
D. energy and momentum

2. If the mass of a moving object is doubled without
ging its speed, its kinetic energy is:

A. decreased by 1/4
B. decreased by 1/2
C. the same
[✓ C. doubled]
E. increased fourfold

$E_k = \frac{1}{2}mv^2$
$E_k' = \frac{1}{2}(2m)v^2$
$= 2(E_k)$

3. When a bird's speed is doubled, its kinetic energy is

A. half as large
B. the same
~~C. twice as large~~
[✓ D. four times as large]

$E_k' = \frac{1}{2}m(2v)^2$
$E_k' = 4E_k$

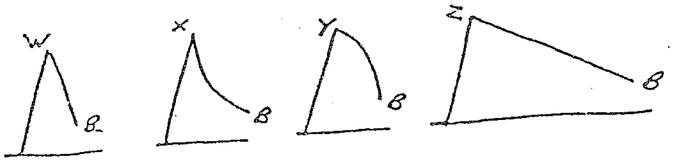
4. Energy is

A. only associated with motion of molecules
~~B. a form of momentum~~
[✓ C. always conserved]
D. lost if heat is produced ← only mechanical energy is 'lost', transforming to heat
E. not convertible from one form to another

5. A "superball" is dropped from a height of 1.5 m above
loor. It will rebound to a height of

[✓ A. less than 1.5 m]
B. 1.5 m
C. more than 1.5 m
D. more than 1. km but less than 1.5 km

6. Mr. Mammone wants to slide down a playground slide so
he will have the greatest possible speed when he reaches the
m (point B). Which of the following frictionless slides
d he choose? (Points W, X, Y, Z are all two metres above
round, and point B is 0.5 m above the ground.)

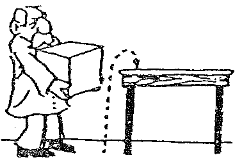


A. slide W B. slide X D. slide Z
[✓ E. The speed at B will be the same for each]

Example Problem

A man lifts a box with a weight of 100 N from the floor to a table top 1.2 m above the floor. How much work did he do on the box?

Force required to just lift a weight of 100 N = 100N
Distance moved in direction of force = 1,2m



∴ work done = F×d
= mgh
= (100N)(1,2m
= $\boxed{1,2\times10^2 J}$

Fig. 11.3

Q1 Define 1 J of work.
Q2 In what conditions can a force act on a body and yet do no work on it?
Q3 Determine the work done by the force on the body in the following circumstances.
a) A 5 N force applied to a body moves it 3.0 m.

b) A baby with mass 15 kg is lifted 1.5 m from the floor.
c) A 10 kg model rocket is accelerated upward through 100 m by an average thrusting force of 2000 N.
d) A 1000 N hammer blow drives a nail 6 mm into a board.
e) A man supports a 10 kg mass 1 m above the floor for 30 min.
Q4 A body moves 3 m while 30 J of work is done on it. What is the average force exerted during this time?
See also Problem 11.1 on page 43.

Section A

11.1 A 10 N force is applied to a body in its direction of motion, and a 3 N frictional force acts opposite to its direction of motion. Calculate the work done by the applied force while the body moves 4 m.

Q1: Energy required to move a 1N object through a distance of 1m

Q2: if the Force is perpendicular to the displacement, or if the displacement is zero, no work is done,

Q3: (a) $\boxed{W = 15 J}$
(b) $\boxed{W = 2,2\times10^2 J}$
(c) Work by thrust force = $2,0\times10^5 J$
Net work = $(2000N - 10\times9,8)\ 100$
$\boxed{= 1,9\times10^5 J}$
(d) $W = F\times\Delta d = 1000N \times 0,06m$
$\boxed{W = 60 J}$
(e) $\boxed{W = 0 J}$ $(\Delta d = 0 m)$

Q4: $W = F\times\Delta d$
$F = \frac{W}{\Delta d} = \frac{30J}{3m} = \boxed{10N}$

See pg 3/4?

11.5 a) An electron has a mass of 9.11 × 10^{-31} kg. If it moves across a television picture tube at a speed of 5.00 × 10^5 m/s, calculate its kinetic energy.
b) How many such electrons would transfer 1 J of energy to the screen?

11.11 A pendulum bob of mass 2.0 kg is suspended from a hook by a string 0.80 m long. The bob is pulled until the cord is horizontal and then is released. Assuming mechanical energy is conserved, calculate the maximum speed of the bob during its swing.

11.12 An archer exerts an average force of 100 N as he draws the arrow back 0.6 m preparing to shoot.
a) What is the potential energy in the bow and arrow system just before the archer releases the arrow?
b) What will be the kinetic energy of the arrow in flight? State any assumptions you make.
c) If the arrow has a mass of 0.02 kg what would its maximum speed be?

11.17 a) Two balls are thrown straight up in the air, ball *A* with twice as much energy as ball *B*. Compare their maximum heights.
b) Two balls are thrown straight up in the air, ball *C* with twice the speed of ball *D*. Compare their maximum heights.

11.22 A 100 kg case must be loaded into a truck whose floor is 1.5 m above the ground.
a) What force would be required to lift it directly up from the ground to the truck?
b) Calculate the work done in lifting the case directly into the truck.
c) The same work is done if the case is pushed up a ramp, providing friction can be reduced to a negligible value. The advantage gained is that the same job can be done with less force than that required by a direct lift. Calculate the force required if the ramp is 3.0 m long.
d) If the force of friction cannot be made small, then a force of perhaps 700 N might be required to pull the case up the 3.0 m ramp. i) Calculate the work done by the force in this circumstance. ii) How much of this would remain as potential energy of the case? iii) What happens to the rest of the energy?

5. Knockout Candice of mass 55.0 kg is walking from A to B when she sees Freddie Kruger behind her. She runs from B to C in a time of 5.0 seconds.

A. How much work does she do?

(3)

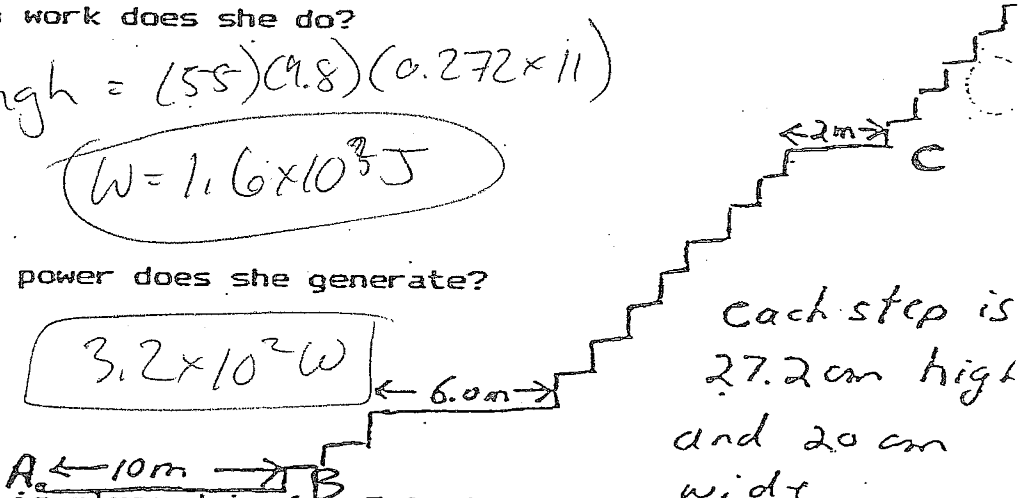
$W = mgh = (55)(9.8)(0.272 \times 11)$

$\boxed{W = 1.6 \times 10^3 J}$

B. How much power does she generate?

(2)

$\boxed{3.2 \times 10^2 W}$



each step is 27.2 cm high and 20 cm wide

6. A 1 200 Watt kettle is plugged in for 5.0 minutes.

A. What is the input electrical Energy?

$E = P \times t = \boxed{3.6 \times 10^5 J}$

B. If the kettle is 75% efficient how much water can it heat from 10.0 °C to 90.0 °C during this 5.0 minute interval?

$Q = 0.75 \times 3.6 \times 10^5 J = 2.7 \times 10^5 J$

$Q = mC\Delta T$

$m = \frac{Q}{(4180)(80)} \boxed{= 0.81 kg}$

omit

9. What is the specific heat capacity of Bubble Gum if it requires a transfer of 4.00 Joules of chewing converted to heat to raise the temperature of 50.0 grams of Bubble Gum from 20.9 °C to 21.1 °C?

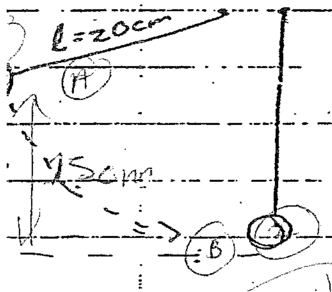
$$Q = mC\Delta T$$

$$C = \frac{Q}{m\Delta T} = \frac{4}{(0.05)(21.1-20.9)}$$

(4)

$$\boxed{C = 400\,J/kg\cdot K}$$

10. A PENDULUM BOB ON A STRING OF LENGTH 20 cm IS DROPPED FROM REST FROM A HEIGHT OF 15 cm. WHEN THE BOB REACHES THE BOTTOM OF ITS SWING IT COLLIDES WITH AN IDENTICAL PENDULUM BOB, ~~AFTER~~ THE FIRST BOB COMES TO A STOP AND THE SECOND BOB MOVES AWAY AFTER THE IMPACT. THE ~~BOTH~~ BOBS HAVE A MASS OF 15.0 g EACH, AND 5.22×10⁻³ J OF ENERGY WAS LOST DURING THE COLLISION.



oops! the q doesn't make sense

(a) What is the gravitational potential energy of the first bob ~~fr~~ before it was dropped?

$E_p = mgh = (0.015\,kg)(9.8\,N/kg)(0.15\,m) = \boxed{2.2\times10^{-2}\,J}$

(b) What is its speed just before hitting the second bob? $E_{pA} = E_{kB}$

$mgh_A = \frac{1}{2}mv_B^2$ $\quad v_B = \sqrt{2g(0.15)}$

$\boxed{v_B = 1.7\,m/s}$

(c) With what speed ~~the~~ does the second bob move immediately after the collision?

use cons. of $\vec{p}$ $\quad p' = p$

$\cancel{m_1 v_1'}^{0} + m_2 v_2' = m_1 v_1 + \cancel{m_2 v_2}^{0}$

$\therefore v_2' = \frac{m_1 v_1}{m_2} \rightarrow \boxed{v_2' = v_1 = 1.7\,m/s}$

(but, $m_1 = m_2$) $\therefore$

BUT the prob with the question is that if m_1 stops, and $\vec{p}$ is conserved and E must also be conserved