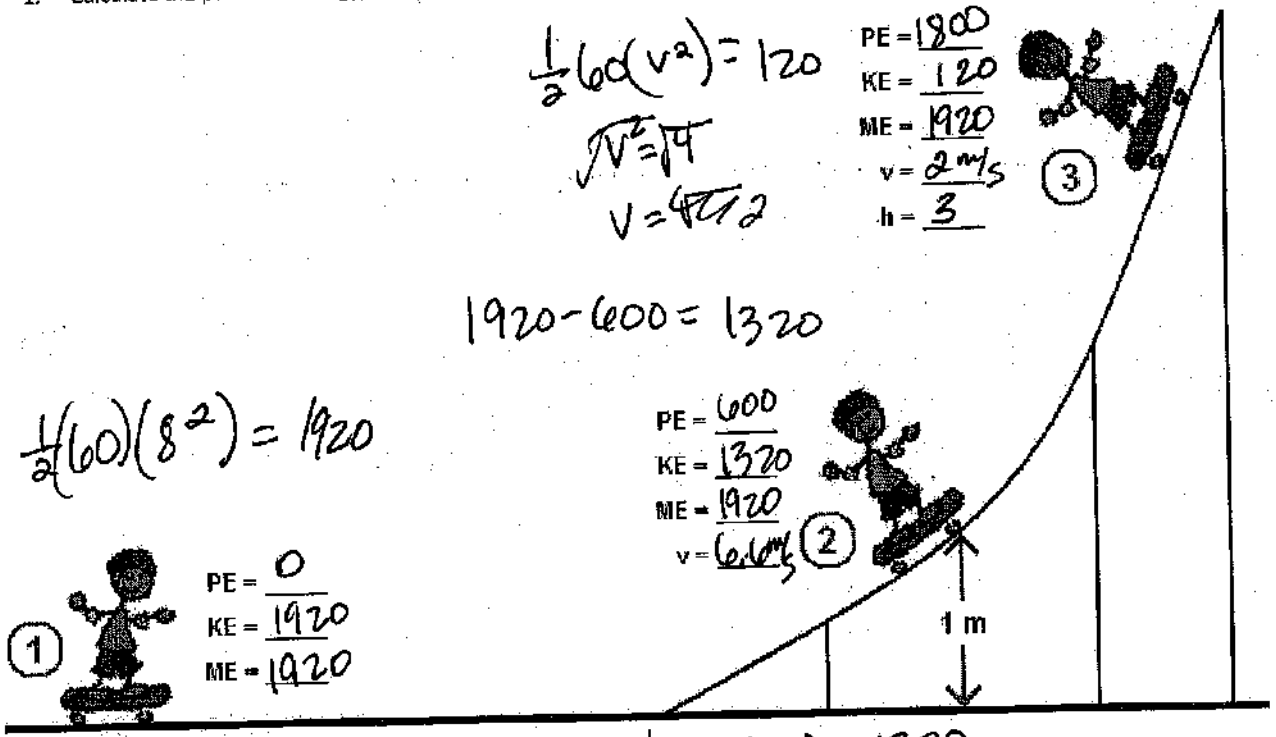
Name: KEY Date: Class:

PHYSICAL SCIENCE WORKSHEET
CONSERVATION OF ENERGY #2

$KE = \frac{1}{2}mv^2$ $GPE = mgh$ Total E $ME = KE + GPE$

1. Calculate the potential energy, kinetic energy, mechanical energy, velocity, and height of the skater at the various locations.



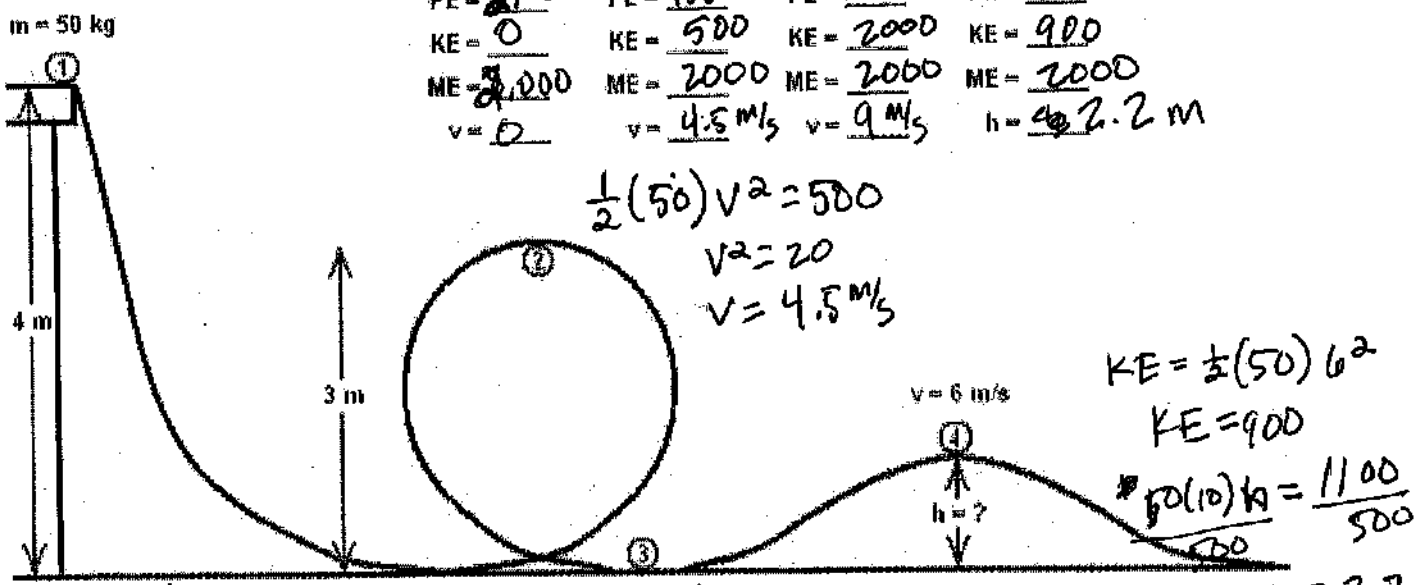
$\frac{1}{2}60(v^2) = 120$
$\sqrt{v^2} = \sqrt{4}$
$v = 2$

$1920 - 600 = 1320$

$\frac{1}{2}(60)(8^2) = 1920$

$\frac{1}{2}60(v^2) = 1320$
$\sqrt{v^2} = \sqrt{44}$
$v = 6.6\ m/s$

2. Calculate the potential energy, kinetic energy, mechanical energy, velocity, and height of the ball at the various locations.



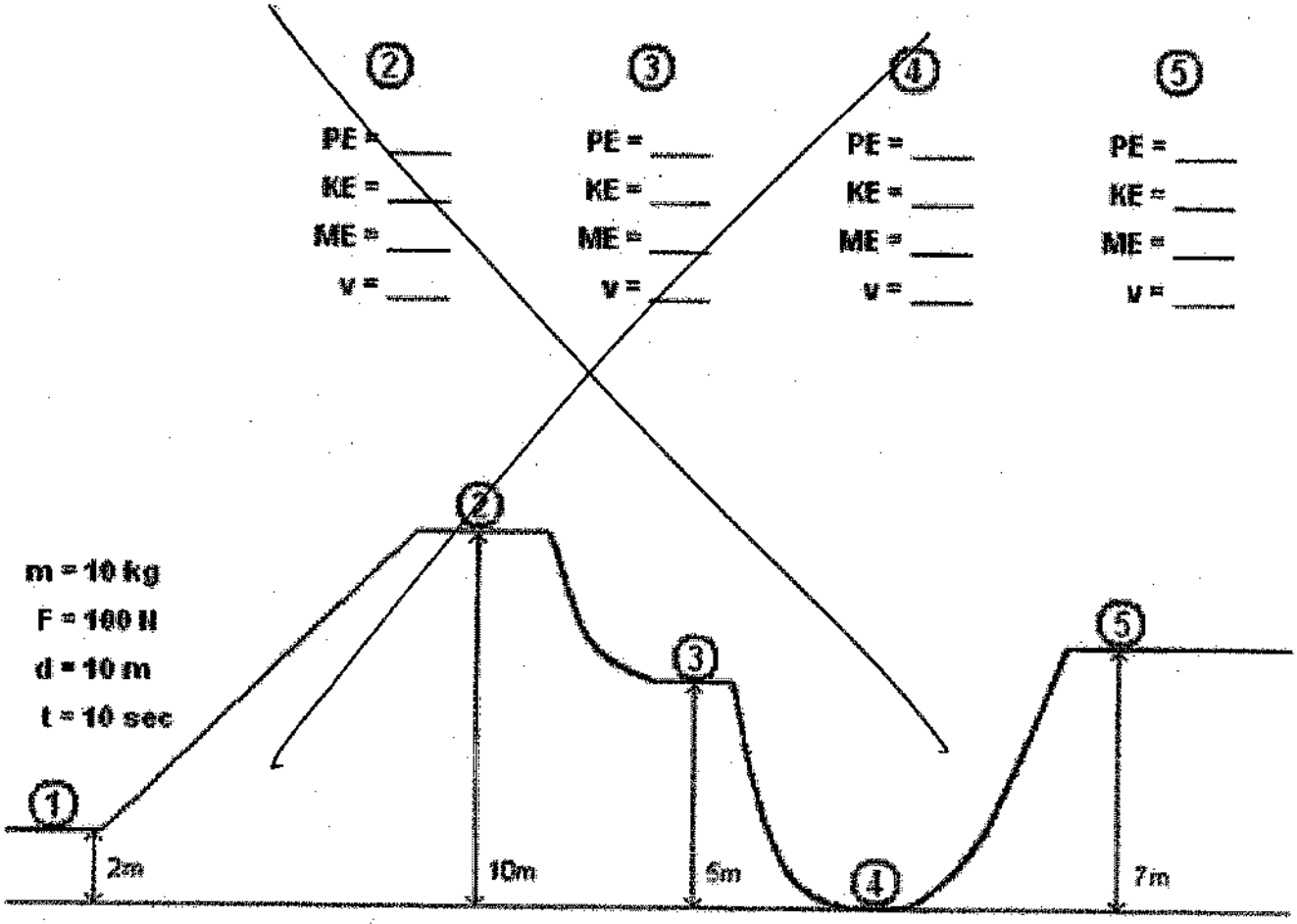
$\frac{1}{2}(50)v^2 = 500$
$v^2 = 20$
$v = 4.5\ m/s$

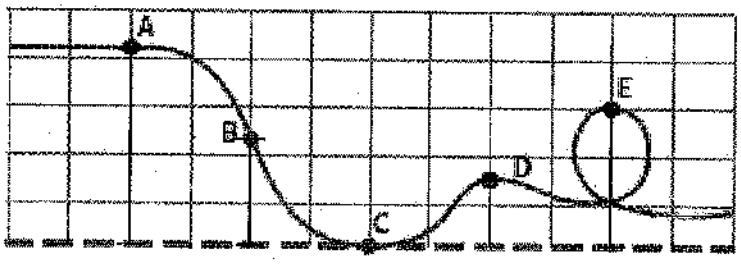
$KE = \frac{1}{2}(50)6^2$
$KE = 900$
$50(10)h = \frac{1100}{500}$
$h = 2.2$

$GPE = 50(4)10$
$= 2,000$

$\frac{1}{2}(50)v^2 = 2000$
$v^2 = 80$ $v = 9\ m/s$

3. Calculate the potential energy, kinetic energy, mechanical energy, velocity, and height of the ball at the various locations.





4. The diagram above shows five different points on a roller coaster.

   a. List the points in order from the point where the car would have the greatest potential energy to the point where it would have the least potential energy.

   A, E, B, D, C

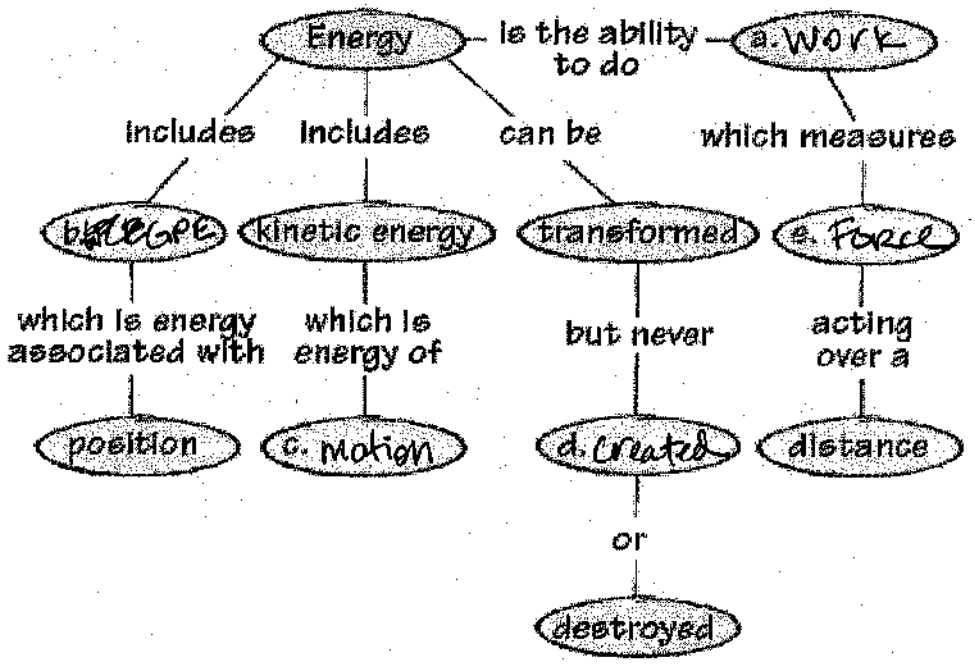
   b. Now list the points in order from the point where the car would have the greatest kinetic energy to the point where it would have the least kinetic energy.

   C, D, B, E, A

   c. Compare the 2 lists to each other. What do you notice about the lists?

   they are opposites - when GPE is ↑, KE is ↓ + vice versa

5. Complete the concept map below by writing the correct word or phrase in the lettered box.



6. An object has a mechanical energy of 1575 J and a potential energy of 1265 J.
   a. What is the kinetic energy of the object?

$1575 - 1265 = 310\ J$

   b. If the mass of the object is 12 kg, what is its speed?

$\frac{\frac{1}{2}(12)v^2}{6} = \frac{310}{6}$ $\sqrt{v^2} = \sqrt{51.7}$ $v = 7.2\ m/s$

   c. How high above ground is the object?

$\frac{1265}{120} = \frac{12(10)h}{120}$

$h = 10.5\ m$

7. A 5 kg object is moving downward at a speed of 12 m/s. If it is currently 2.6 m above the ground...
   a. What is its kinetic energy?

$KE = \frac{1}{2}mv^2 = \frac{1}{2}(5)12^2 = 2.5(144) = 360J$

   b. What is its potential energy?

$GPE = 5(10)(2.6) = 130J$

   c. What is its mechanical energy?

$ME = 360 + 130 = 490J$

8. A 59 kg man has a total mechanical energy of 150,023 J. If he is swinging downward and is currently 2.6 m above the ground, what is his speed?

$ME = 150,023$
$m = 59kg$
$h = 2.6\,m$
$v = ?$

$GPE = 59(10)(2.6) = 1534$
$KE = 150,023 - 1534 = 148,491$

$\frac{\frac{1}{2}(59)v^2}{29.5} = \frac{148,491}{29.5}$

$\sqrt{v^2} = \sqrt{5,034}$

$\boxed{v = 71\ m/s}$

9. A 74 kg student, starting from rest, slides down an 11.8 meter high water slide. How fast is he going at the bottom of the slide?

$GPE = 74(10)(11.8) = 8,732$

$\frac{\frac{1}{2}(74)v^2}{37} = \frac{8,732}{37}$ $\quad v^2 = 236$

$\boxed{v = 15.4\ m/s}$

10. Calculate the kinetic energy of a 750 kg compact car moving at 50 m/s.

$KE = \frac{1}{2}mv^2$
$= \frac{1}{2}(750)(50^2)$
$= 375(2500)$
$= \boxed{937,500\,J}$

11. Determine the mechanical energy of a 450 kg roller coaster moving at 30 m/s at the bottom of the first dip which is 15 meters above the ground.

$KE = \frac{1}{2}(450)(30^2) = 225(900) = 202,500$

$GPE = 450(10)(15) = 67,500$

$ME = 67,500 + 202,500$
$= \boxed{270,000\ J}$

12. Julie has a mass of 49 kg. What is her potential energy when standing on the 6 meter diving board? (She is 6 meters above the water.) Julie jumps off the diving board. $GPE = 49(10)(6) = 2940$

a. What is her kinetic energy just before she hits the water?

2940

b. What is Julie's speed just as she hits the water?

$\frac{\frac{1}{2}(49)v^2}{24.5} = \frac{2940}{24.5}$

$v^2 = 120$

$\boxed{v = 11\ m/s}$