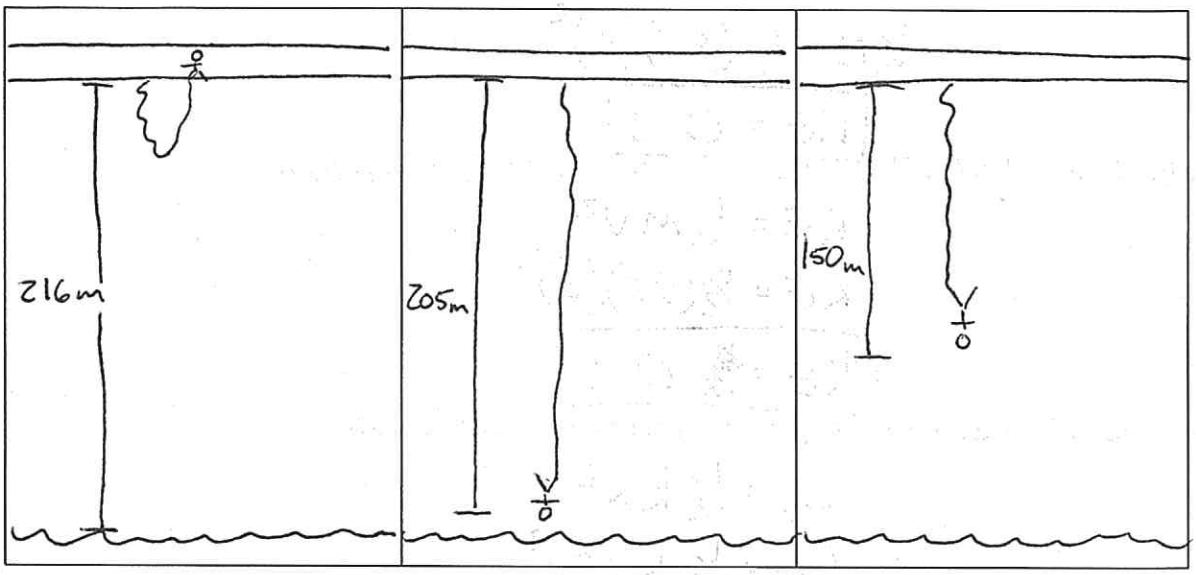
Name: _____ Period: _____

Conservation of Energy Practice Problem

2001, Mr. Miller bungeed jumped off of the Bloukrans Bridge along the Garden Route in South Africa. The bridge is 216 meters above the Bloukrans River. When the bungee cord was fully stretched it reached a distance of 205 meters. When Mr. Miller was done bouncing up and down he hung from the bridge at a distance of 150 meters. Mr. Miller had a mass of 85 kg.

1. Draw a sketch of the situation above. Include a picture of Mr. Miller before the jump, during the fully stretched bungee, and hanging out after the bouncing up and down. Be sure to include the river below.



2. Based on the information above, how far did Mr. Miller's Bungee stretch (x) in meters?

$205 - 150 = \boxed{55\text{ m}}$

3. Based on the information above, how high above the river was Mr. Miller when his bungee was fully stretched?

$216 - 205 = \boxed{11\text{ m}}$

4. What was Mr. Miller's Gravitational Potential Energy (U_g) **before** he jumped?

$U_g = mgh$

$U_g = (85)(9.8)(216)$

$\boxed{U_g = 179{,}928\text{ J}}$

5. What was Mr. Miller's Gravitational Potential Energy (U_g) when the bungee is **fully stretched**? (hint: it is not zero)

$$U_g = mgh$$
$$U_g = (8.5)(9.8)(11)$$
$$\boxed{U_g = 9163\ J}$$

6. What was Mr. Miller's Kinetic Energy (KE) **before** he jumped?

$$KE = \tfrac{1}{2}mv^2$$
$$KE = \tfrac{1}{2}(85)(0)^2$$
$$\boxed{KE = 0\ J}$$

7. What was Mr. Miller's Kinetic Energy (KE) when the bungee is **fully stretched**?

$$KE = \tfrac{1}{2}mv^2$$
$$KE = \tfrac{1}{2}(85)(0)^2$$
$$\boxed{KE = 0\ J}$$

8. What is the Elastic Potential Energy (U_s) of the bungee **before** he jumped?

$$U_s = \tfrac{1}{2}kx^2$$
$$U_s = \tfrac{1}{2}k(0)^2$$
$$\boxed{U_s = 0\ J}$$

9. What is the Elastic Potential Energy (U_s) when the bungee is **fully stretched**? (hint: Use the big equation for conservation of energy.)

$$U_{g_{top}} + KE_{top} + U_{s_{top}} = U_{g_{bot}} + KE_{bot} + U_{s_{bot}}$$
$$179{,}928 + 0 + 0 = 9163 + 0 + U_{s_{bot}}$$
$$\boxed{170{,}765\ J = U_{s_{bot}}}$$

10. What is the spring constant (k) of Mr. Miller's Bungee cord in N/m? (hint: Use your answers from questions 2 and 9 to determine your answer.)

$$U_s = \tfrac{1}{2}kx^2$$
$$170{,}765 = \tfrac{1}{2}k(55)^2$$
$$170{,}765 = \tfrac{1}{2}k(3025)$$
$$170{,}765 = 1512.5(k)$$
$$\boxed{112.9\ N/m = k}$$