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6. Tarzan has a mass of 75 kg and swings from vine to vine. As Tarzan grabs a new vine, both vines make an angle of 30° with the vertical. In such a condition of static equilibrium, what is the net force on the vine?



7. A car with a weight of 3000. N is accelerated across a level surface at 8.5 m/s^2 . What is the net force acting on the car? $\Sigma F = ma = \left(\frac{3000}{9.8}\right)(8.5) = 2600 \text{ N}$

Chapter 5-6: Momentum & Energy

8. A 150g baseball reaches a batter with a speed of 25 m/s. After it has been struck, it leaves the bat at 35 m/s in the opposite direction. If the ball was in contact with the bat for .001 s, find the average force exerted on it during this period.

$$F = \frac{\Delta p}{\Delta t} = \frac{m(V_f - V_i)}{\Delta t} = \frac{(0.150 \text{ kg})(35 \text{ m/s} - (-25 \text{ m/s}))}{0.001} = 9,000 \text{ N}$$

9. A 30 kg girl who is running at 3 m/s jumps on a stationary 10 kg sled on a frozen lake. How fast does the sled then move?

$$m_1 v_1 + m_2 v_2 = (m_1 + m_2) v_f$$

$$(30)(3) + 0 = (40) v_f$$

$$v_f = 2.25 \text{ m/s} \approx 2 \text{ m/s}$$

10. A 0.500kg bullet traveling at 300 m/s hits a 5 kg block of wood and becomes imbedded in the block. The block then slides without friction into a spring. If the spring is compressed .25 m, calculate its spring constant.

$$P_i = P_f$$

$$(0.5)(300) + 0 = (5.5) v_f$$

$$v_f = 27.3 \text{ m/s}$$

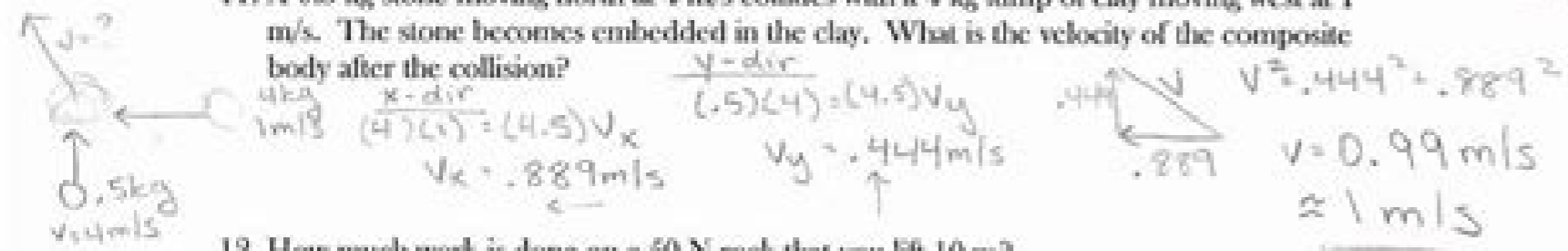
$$KE = PE_s$$

$$\frac{1}{2} m v^2 = \frac{1}{2} k x^2$$

$$\frac{1}{2} (5.5) (27.3)^2 = \frac{1}{2} k (.25)^2$$

$$k = 65455 \approx 70,000 \text{ N/m}$$

11. A 0.5 kg stone moving north at 4 m/s collides with a 4 kg lump of clay moving west at 1 m/s. The stone becomes embedded in the clay. What is the velocity of the composite body after the collision?



12. How much work is done on a 50 N rock that you lift 10 m?

$$W = F \cdot d = 50(10) = 500 \text{ J}$$

13. A diver who weighs 500 N steps off a diving board that is 10 m above the water. The diver hits the water with kinetic energy equal to

$$PE_g = KE$$

$$mgy = KE$$

$$500(10) = KE = 5,000$$

Conservation of Energy

PE = mgh KE = $\frac{1}{2}mv^2$ ME = PE + KE
Round answers to 1 decimal place when needed

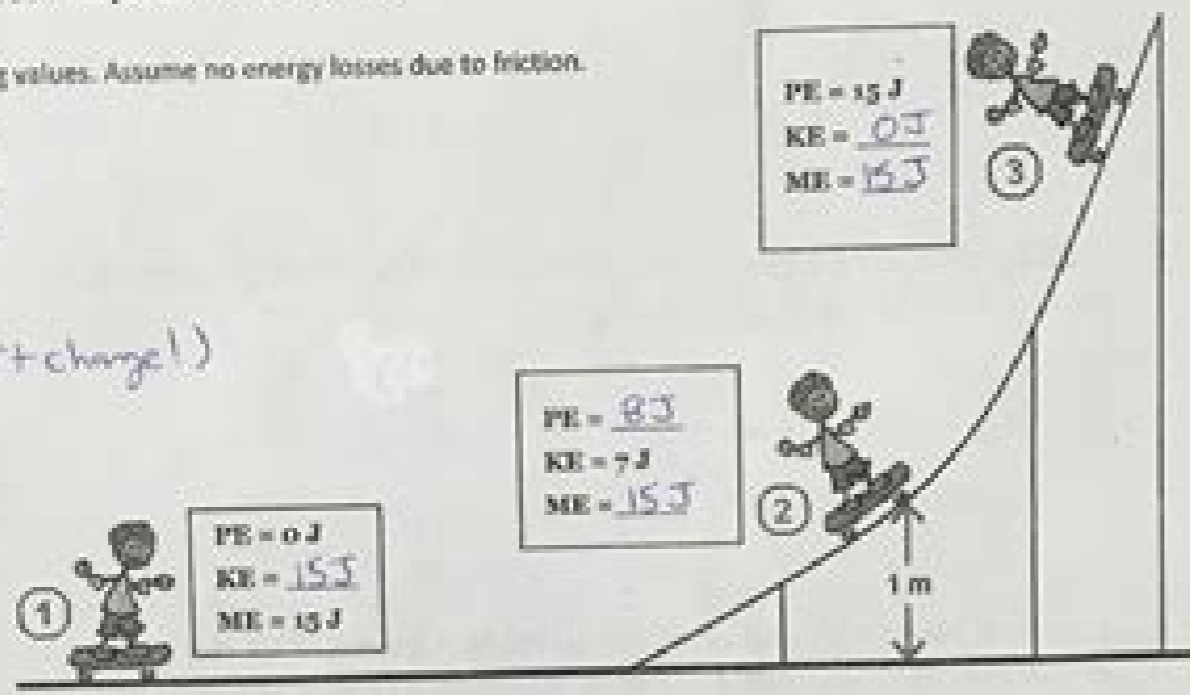
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1. Fill in the missing values. Assume no energy losses due to friction.

① ME = PE + KE
 $15 \text{ J} = 0 \text{ J} + \text{KE}$
 $15 \text{ J} = \text{KE}$

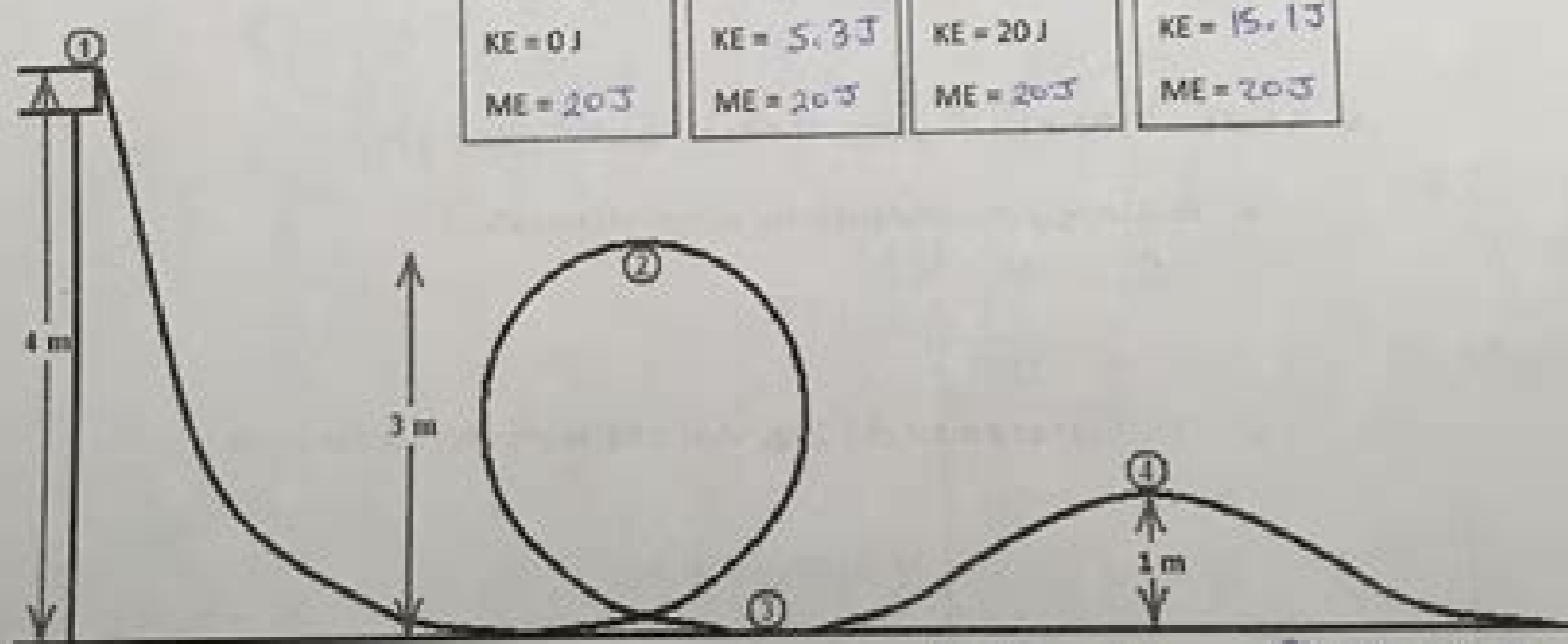
② ME = 15 J (doesn't change!)
 $PE = ME - KE$
 $15 \text{ J} - 7 \text{ J}$
 $= 8 \text{ J}$

③ ME = 15 J
 $KE = ME - PE$
 $= 15 \text{ J} - 15 \text{ J}$
 $= 0 \text{ J}$



2. Fill in the missing values. Assume no energy losses due to friction. The data relates to a 0.5 kg object at each position.

①	②	③	④
PE = 20 J	PE = 14.7 J	PE = 0 J	PE = 4.9 J
KE = 0 J	KE = 5.3 J	KE = 20 J	KE = 15.1 J
ME = 20 J	ME = 20 J	ME = 20 J	ME = 20 J



① ME = PE + KE
 $= 20 + 0$
 $= 20 \text{ J}$

② ME = 20 J (doesn't change!)
 $PE = mgh$
 $= 0.5(9.8 \text{ m/s}^2)(3 \text{ m})$
 $= 14.7 \text{ J}$
 $KE = ME - PE$
 $= 20 - 14.7$
 $= 5.3 \text{ J}$

③ ME = 20 J
at
 $PE = ME - KE$
 $= 20 - 0$
 $= 20 \text{ J}$

④ ME = 20 J
 $PE = mgh$
 $= 0.5 \text{ kg}(9.8)(1 \text{ m})$
 $= 4.9 \text{ J}$
 $KE = ME - PE$
 $= 20 - 4.9$
 $= 15.1 \text{ J}$

Use of Conservation of Energy Worksheet
1. This worksheet is designed to be used with the Conservation of Energy worksheet.
2. A student is required to show all work and to round answers to 1 decimal place when needed.
3. A student is required to show all work and to round answers to 1 decimal place when needed.
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