ROLLER COASTER PHYSICS

Name _____

The car on this roller coaster has a mass of 1.00×10^3kg. It started at ground level, 0.00m, and has been raised to the top of the highest hill, Point A. After Point A, there is no additional energy added to the roller coaster car. For this assignment, assume that the car travels on a frictionless track. Use the diagram on the last page to answer the question

1.   Calculate the PE at Point A.

   3,234,000 J   or 3.2×10^6J

2.   How much work was done by the motor to lift the car to Point A? How do you know?

   3.2×10^6J, same as PE = W=ΔPE

3.   Calculate the PE at Point B.

   2,450,000J   or 2.5×10^6J

4.   How much KE does the car have at Point B? How do you know?

   3.2×10^6J − 2.5×10^6J = 750,000 J

5.   Calculate the PE at Point C.

   1,470,000 J   or 1.5×10^6J

6.   Calculate the PE at point D.

   2,254,000 J   or 2.3×10^6J

7.   How much work was done to lift the car from Point C to Point D? How do you know?

   0 J: no additional energy added to the roller coaster

8.   How much PE will the car have when it returns to Point C after having gone through the loop? How do you know?

   1,470,000J: same height

9. How much KE will the car have at Point C? How do you know?

$3.2 \times 10^6 \text{ J} - 1.5 \times 10^6 \text{ J} = 1.7 \times 10^6 \text{ J}$

Total energy $-$ PE $=$ KE

10. Calculate the velocity that the car will have at Point C.

$KE = \frac{1}{2}mv^2$

$1.7 \times 10^6 \text{ J} = \frac{1}{2}(1000)(v^2)$

$v = 58.3 \text{ m/s}$

11. Where on this diagram would the car have the highest PE? Why?

A: highest point

12. Where on this diagram would the car have the lowest PE? Why?

E: lowest point

13. Where on this diagram would the car have the highest KE? Why?

E: lowest point

14. Where on this diagram would the car have the lowest KE? Why?

A: highest point