**Weeks 6 - 8 Physical Science Project 1**

**Start Date: Monday (09-14-20) Due Date: Friday (09-28-20)**

**Topic: Designing a WildRide**

**This project helps you determine for yourself how well you understand the physics of how roller coasters work, which we covered in lessons 2 – 4. The project can be done individually or in groups (not more than 4 persons).**

**Project Description**

**The Columbia Chamber of Commerce has decided that the time has come for Columbia, South Carolina, to have an amusement park to generate tourist dollars for the city. WildRide Specialist, an engineering company awarded the contract invites STEM students to submit roller coaster designs they think would provide most exciting and safe wildride. Your design must have at least four hills, one exit path, and two loops, and capable of holding single cars (800 kg each) with up to four large adults (90 kg each).**

**You decide on the size and shape of the hills, loops, and exit path. You also decide on the size and shape of the car and its wheels. Your design must show the free-body diagram of the car and passengers at the top, midway, and bottom of the hills and loops, the forces doing work on the car and passengers to keep it in motion and on the track, the energies of the car in those locations (as shown in fig. 1 below), and the speed of the car in those locations. You should show how the size of the wheels of the cars affects the speed of the car, based on the theory of rolling motion. You must first show the equation that is involved and then the calculation necessary. Also, the locations along the track where riders experience g-force, and the amount of g-force they experience.**

**Write (typed paragraphs) a narrative of how the roller coaster works, starting from the movement of the car to the highest hill and release, using all the physics concepts involved in the operation (e.g., velocity/speed, linear and centripetal acceleration, Newton’s laws of motion and Gravitation, types of forces involved, g-force, potential energy, kinetic energy, work, power, momentum, rolling motion, etc.) Carefully explain how the coasting motion of the cars is enabled by energy transferred to the cars through the work done by the net forces acting on them, and by continuous energy transform from one form to another through work done by the net force acting on the system. Paste your operational native, equations, and calculations of your wildride, on your poster, where they apply.**

**Figure 1 below is a simple model of a roller coaster track with three hills, two loops, and exit ramp. The dots represent a roller coaster car moving on the track. To begin your design, get help on the shape of hill and type of loop that works, from this website**:

 

Fig. 1

<https://www.physicsclassroom.com/Physics-Interactives/Work-and-Energy/Roller-Coaster-Model/Roller-Coaster-Model-Interactive>

<https://www.physicsclassroom.com/Physics-Interactives/Circular-and-Satellite-Motion/Roller-Coaster-Design/RollerCoaster-Design-Interactive>

<http://www.hk-phy.org/articles/roller_coaster/roller_coaster_e.html>