Chapter 7 Roller Coaster Project

Due:

Roller coasters are proof that physics is fun! Every Coaster ever designed depends upon Newton's Laws of Motion, and the Law of the Conservation of Energy, along with a little work and power. Choose one of the following: Design your own Coaster or Research a Coaster

Design a Roller Coaster Poster

Please design a roller coaster that works on paper at least.

Your design should include:

1. Vectors showing the direction and strength (hint: length = strength) of the FORCES acting on the coaster car at 5 points along the ride. (reminder: unbalanced forces cause motion)
2. Appropriate labels for 2 points along the ride where potential energy is changing into kinetic energy.
3. Appropriate label for 2 points along the ride where work is being done. Please indicate what the work is doing, e.g. storing potential energy in the car by pulling it up a hill.
4. Neat sketches (easy to follow the coaster's path) and writing made attractive by neat coloring.

Poster paper will be provided in class along with limited coloring supplies. Have fun! Be creative!

Rubric:

1. 5 places showing correct forces – 4 points each or 20 total
2. 2 places for GPE to KE: - 5 points each or 10 total
3. 2 places showing work and what it's doing: 5 points each or 10 total
4. Colored/Attractive: 10 points

Total: 50 points

See back for Research a Roller Coaster Directions

Research a Roller Coaster

Please research a real roller coaster to investigate the kinds of thrills that physics can produce. Your finished project will be a small poster or fact sheet about the ride. Your poster should include:

1. General background information including:
    a. Name: _____
    b. Location: _____
    c. Year it was built
    d. Description of the style of the coaster (traditional, inverted or suspended, looping, standup, etc.)
    e. Description of the coaster's theme, if it has one
    f. Any records set by the coaster, even if another newer coaster has broken the record.

2. The Basic Physics Information – all information needs to be in **METRIC** units, you may need to convert (I will be happy to help)!
    a. Maximum height
    b. Maximum speed
    c. Maximum weight capacity – riders and the "train"
    d. Duration of the ride (how long time-wise)

3. What to do with the Physics Information (**You may want to have me check your work!!**):
    a. Using the maximum weight and the maximum height find the maximum gravitational potential energy.
    b. Using the maximum speed and the maximum weight (you have to convert this into mass) find the maximum kinetic energy.
    c. Using the average of the potential and kinetic energy, as well as the duration of the ride, find the power putout by the ride.

4. Photographs of the ride, if possible.

Rubric:

1. Correct and complete background information – 10 points
2. Correct Physics information – 10 points
3. Completed and correct energy calculations – 15 points
4. Information presented attractively and neatly – 10 points
5. Sources of information and pictures cited – 5 points

Total points: 50

Research Worksheet

Basic Physics Information

2. a. h= (_____ ft.)(0.3048 m/ft) = _____ m

   b. v = (_____mi/hr)(1609.344 meters/mile)/3600 s/hr = _____m/s

   c. m = (# of people)(200 lbs.)/2.205 lbs/kg = _____ kg

   d. t = _____ seconds (only!) There are 60 seconds in one minute.

Energy Calculations:

3. A. GPE = mgh = (_____kg from 2c)(9.8 m/s/s)(_____m from 2a) = _____J

   b. KE = $1/2mv^2$

   = (0.5)(_____ kg from 2c)(_____ m/s from 2b) (_____ m/s from 2b)

   = _____J

   c. Power = Average energy/time

   Average energy = GPE from 3a + KE from 3b both divided by 2.

   Divide your answer above by the seconds from 2d.

   P = _____ J/_____ s

Information for citing sources:

Measurement website: _____

Picture websites: (remember Google is a SEARCH ENGINE not a website!)

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