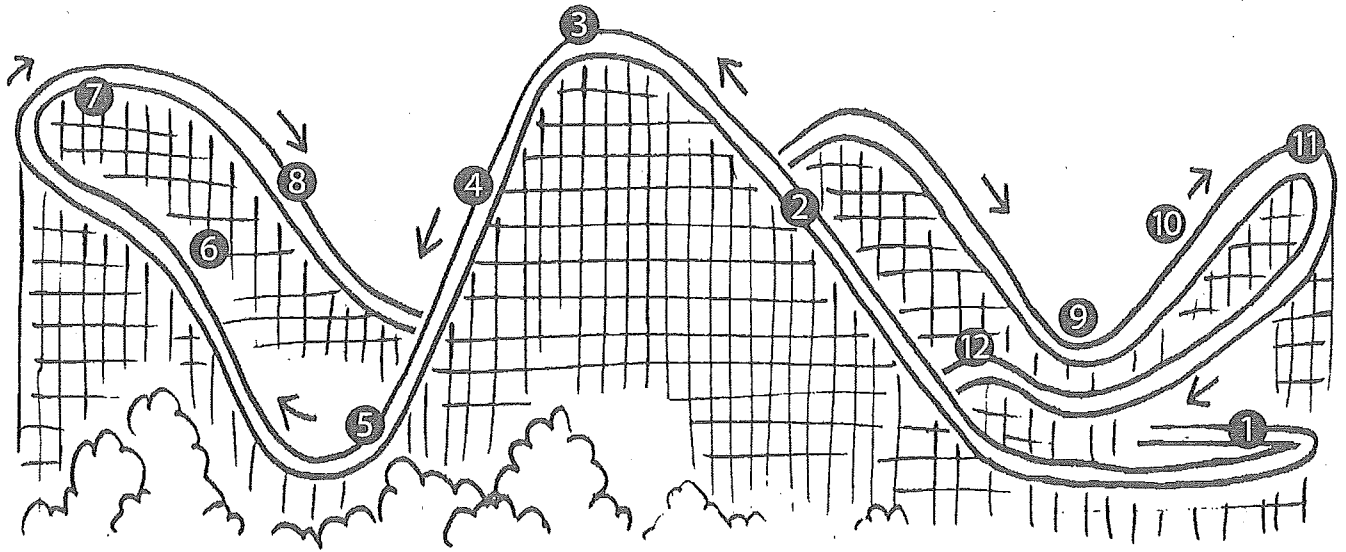


Physics II Quiz



Playland Wooden Roller Coaster

List the number (or numbers) on the Coaster that best match the phrases below:

- _____ freefall area
- _____ weightless zone
- _____ where a machine makes the ride go instead of gravity
- _____ where car moves because of momentum roll
- _____ banked curve
- _____ parabolic arc
- _____ centripetal force at work
- _____ greatest gravitational potential energy
- _____ where the Coaster's velocity increases
- _____ high g-force zone
- _____ where car moves the slowest assuming a frictionless track
- _____ where riders decelerate
- _____ greatest kinetic energy

On the Coaster, positive g 's are felt for very short time periods. Periods of 0 to $1g$ are maximized to minimize rolling friction with the track. Negative g 's are avoided as much as possible for obvious safety reasons.

Recall your own Coaster experiences and combine them with your understanding of Physics.

a. When would you expect to pull the most g 's on the Coaster?

b. When would you expect to be nearly weightless?

c. When would you expect to pull negative g 's? Which seat would be most likely to provide this experience?

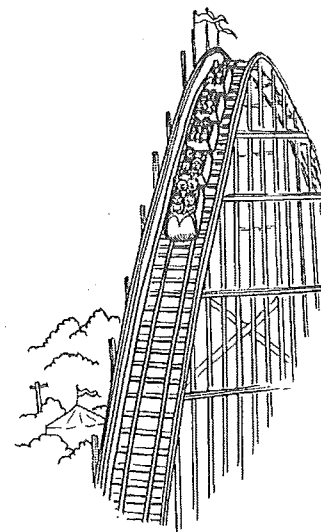
d. Where would you expect to pull lateral g 's (to the sides of the Coaster)?

e. Where would you expect to pull longitudinal g 's (forward or backward)?

Coaster Calculations

The following data pertains to the **American Eagle** coaster near Chicago, Illinois. Use the data table to work the problems listed below.

Data	Track length	= 1417 m
	Train mass	= 4536 kg
	Greatest height	= 38.7 m (first incline)
	Length of 1st vertical drop	= 44.8 m
	Angle of 1st drop	= 55°
	Length of 1st lift	= 100 m (chain speed: 2.7 m/s)
	Maximum speed	= 106.7 km/h
	Length of ride	= 2 min, 23 s
	Gravity forces	= Up to 1.65 g's in the dips (1 g = 9.8 m/s ²)



- ① How long does it take for the coaster to climb the first hill?
- ② What is the climbing angle of the first incline?
- ③ What is the maximum gravitational potential energy for the coaster as measured above the lowest point in the ride?
- ④ What is the average speed of the entire ride?
- ⑤ What is the maximum kinetic energy for the coaster?

$$E_k = \frac{1}{2}mv^2$$
- ⑥ Assume a speed at the top of the 1st hill of 2.7 m/s and a vertical drop of 44.8 m. What should be the speed at the bottom of the hill with no friction or air resistance losses?
- ⑦ How large are the actual friction and air resistance losses in km/h?
- ⑧ How long is the track down the first drop?
- ⑨ What is the friction and air resistance loss per metre during the drop?
- ⑩ If the coaster had the same frictional and air resistance losses for the whole trip, would it reach the station?
- ⑪ Do you expect friction/air resistance losses to be greater or less in the latter part of the ride? Explain.