QUIZ: GREAT AMERICA PHYSICS

SECTION ONE | RIDE ANALYSIS

Questions 1-2 are based on **The Grizzly**. Use the following data in your calculations, even though values may differ from the actual ride.

Number of cars in train: 6
Length of car: 2 meters
Time for train to pass bottom of first hill: 0.60 s

1. The speed at the bottom of the first hill is CLOSEST to:
   a. 10 m/s b. 15 m/s c. 20 m/s d. 30 m/s e. 60 m/s

2. Your body feels pressed into your seat at the bottom of the hill, since your body tends to continue its downward motion while the train starts to move upward. The tendency of your body to continue its downward motion is known as:
   a. resonance b. angular momentum c. superposition d. inertia e. torque

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Questions 3-5 are based on **Drop Tower**. Use the following data in your calculations, even though values may differ from the actual ride.

Distance of true free fall: 23 m
Distance from loading area to top of tower: 40 m
Mass of single rider: 80 kg
Time for rider to ascend tower: 6.0 s

3. The time for the free fall period is CLOSEST to:
   a. 1.3 s b. 1.6 s c. 1.9 s d. 2.2 s e. 2.5 s

4. The work done in lifting a single person to the top of the tower is CLOSEST to:
   a. 2 J b. 3,000 J c. 20,000 J d. 30,000 J

5. The power expended in lifting the person in the previous question is CLOSEST to:
   a. 5 W b. 150 W c. 5,000 W d. 150,000 W

Questions 6-9 are based on **Orbit**. Use the following data in your calculations, even though values may differ from the actual ride.

Radius of ride: 8 m
Time for one full revolution: 4.0 s

6. The circumference of the ride is CLOSEST to:
   a. 8 m b. 24 m c. 36 m d. 48 m e. 96 m

7. The speed of the ride is CLOSEST to:
   a. 2 m/s b. 6 m/s c. 9 m/s d. 12 m/s e. 24 m/s

8. The centripetal acceleration of the ride is CLOSEST to:
   a. 0.5 m/s^2 b. 4.5 m/s^2 c. 10 m/s^2 d. 18 m/s^2 e. 72 m/s^2

9. When the ride is in its most vertical position, the greatest g-force would be experienced at the:
   a. top b. side c. bottom

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10. A rider sitting in a stationary roller coaster at the loading station experiences:
    a. 0 g vertically and 0 g horizontally
    b. 1 g vertically and 1 g horizontally
    c. 1 g vertically and 0 g horizontally
    d. 0 g vertically and 1 g horizontally

11. A hill on a roller coaster is 25 m high. Ignoring friction, the speed of the coaster at the bottom of the hill would be CLOSEST to:
    a. 22 m/s b. 26 m/s c. 30 m/s d. 34 m/s e. 38 m/s

12. A "dual axis" ride that gives two simultaneous rotations is most closely associated with which of the following rides?
    a. Centrifuge b. Drop Tower c. The Grizzly d. Demon

13. As a rider travels UPWARD into a Klothoid loop, the radius of the loop:
    a. increases b. decreases c. remains constant

14. The centripetal force experienced as a rider travels UPWARD into a Klothoid loop is:
    a. decreased by change in speed and increased by change in radius
    b. increased by change in speed and decreased by change in radius
    c. increased by both change in speed and change in radius
    d. decreased by both change in speed and change in radius

SECTION TWO | QUANTITATIVE PROBLEMS

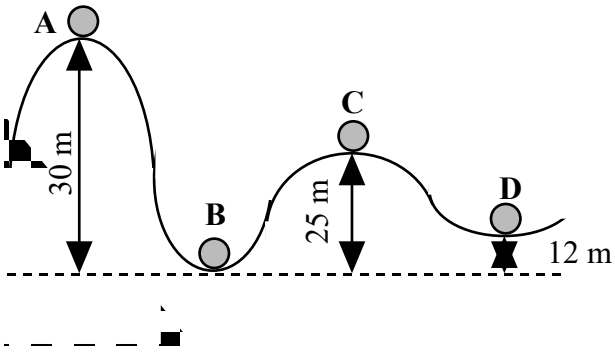
1. A roller coaster reaches the top of the steepest hill with a speed of 5.0 km/h. It then descends the hill, which is at an average angle of 45° and is 50 m long. What will its speed be when it reaches the bottom, neglecting friction?

2. A child moves with a speed of 1.80 m/s when 12.4 m from the center of **Carousel Columbia**. Calculate the centripetal acceleration acting on the child.

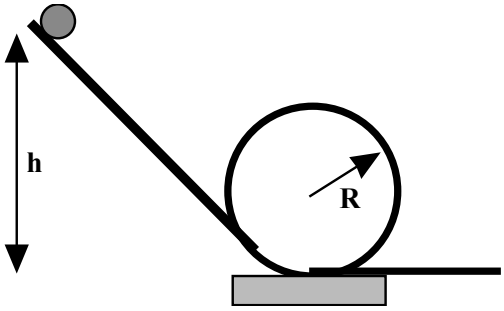
3. What minimum speed must a roller coaster be traveling when upside down at the top of a vertical loop if the passengers are not to fall out? Assume a radius of curvature of 8.0 m.

4. How much work must be done to stop a 1000 kg roller coaster vehicle traveling at 30 m/s?

5. A roller coaster is shown to the right. Assuming no friction, calculate the speed at points B, C and D, if it has a speed of 2.10 m/s at point A.



6. A small mass *m* slides without friction along the looped apparatus shown to the right. If the object is to remain on the track, even at the top of the circle (whose radius is *r*), from what minimum height *h* must it be released?



SECTION THREE | QUALITATIVE PROBLEMS

1. Explain why most roller coaster enthusiasts prefer to ride roller coasters in the front-most or back-most seat of a coaster.

2. When a roller coaster train zooms over a hilltop and begins to drop, you tend to feel like you are lighter (or perhaps just your stomach feels lighter). This effect is particularly noticeable on rides like **Drop Tower** and **RailBlazer**. Why do you feel this way?

3. What is the advantage of using a Klothoid loop rather than a circular loop on rides such as **Demon**, **Patriot** and **Flight Deck**?

SECTION FOUR | VOCABULARY

Match each word with the appropriate description from the lettered column. Each description is used only once.

_____ 1.	Mass	A.	A push or pull
_____ 2.	Acceleration	B.	Mass times velocity
_____ 3.	Friction	C.	Defined by Newton's First Law
_____ 4.	Velocity	D.	What causes objects to have inertia
_____ 5.	Inertia	E.	Shape of a roller coaster hill
_____ 6.	Momentum	F.	Energy of motion
_____ 7.	Kinetic Energy	G.	Resistance to motion caused by rubbing
_____ 8.	Parabola	H.	Energy of position
_____ 9.	Potential Energy	I.	An object's speed in a given direction
_____ 10.	Force	J.	A change in speed or direction