LEVIATHAN - ENERGY

AUTHENTIC PROBLEM

Your design and build firm has been asked to submit a proposal to Canada's Wonderland to create a new amusement ride for the park. In this exercise you will use your basic knowledge of Grade 11 Physics to collect data, make observations, measurements and calculations on your ride. You will later use this information and your own creative ideas to design a new amusement ride for the park. This proposal will be submitted to your teacher (an "official agent" of Canada's Wonderland). The commission will go to the design/build firm that demonstrates the best application of the basic physics principles outlined.

PART A: DATA COLLECTION

Time for one complete ride _____ s
Length of one car _____ m
Length of train _____ m

Using the vertical accelerometer find the location of the maximum and minimum g forces acting on you.

Maximum g force _____ g's Location _____
Minimum g force _____ g's Location _____

Find the sign indicating the distance to the base of the first hill _____ m

Use the horizontal accelerometer to find the angle of inclination of the first hill from this same point _____ degrees

Calculate the height of the first hill _____ m

Measure the time for the entire length of the train to pass a point on the top of the first hill _____ s

Measure the time for the entire length of the train to pass a point on the bottom of the first hill _____ s

Measure the time for the train to travel from the top of the first hill to the bottom of the first hill _____ s

PART C: PROCEDURAL CALCULATIONS

Before you begin the design process you will need to use the data that you have previously collected to perform calculations which you will later need to consider in designing your amusement ride.

Use this space for calculations

1. **[B2.1]** Find the speed of the train knowing its length and the time it takes to pass a certain point on top of the first hill: _____ m/s

2. **[B2.1]** Using the same procedure as question one above, find the speed of the train at the bottom of the first hill: _____ m/s

3. **[B2.1]** Calculate the acceleration of the train down the first hill: _____ m/s^2

4. **[D2.3]** Use conservation of energy to determine the speed of the train at the bottom of the first hill. (assume a frictionless track and no gravitational potential energy at the bottom of the first hill) _____ m/s

5. **[C2.1]** Account for any differences in your answers for questions 2 and 4.

6. **[D2.2]** Calculate how much work is done in getting the train filled with passengers to the top of the first hill? Assume the mass of the train is 4320 kg and the mass of each rider is the same as yours. _____ joules

7. **[D2.5]** How much power does the chain motor have to put out in order to lift the train (with passengers) to the top of the first hill? _____ watts

8. **[D2.4]**Use the law of conservation of energy to determine the speed of the car in the high speed curve. If the given speed is 122 km/h, how much energy has been lost as heat since the beginning of the ride?

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SKYRIDER - ENERGY

AUTHENTIC PROBLEM

Your design and build firm has been asked to submit a proposal to Canada's Wonderland to create a new amusement ride for the park. In this exercise you will use your basic knowledge of Grade 11 Physics to collect data, make observations, measurements and calculations on your ride. You will later use this information and your own creative ideas to design a new amusement ride for the park. This proposal will be submitted to your teacher (an "official agent" of Canada's Wonderland). The commission will go to the design/build firm that demonstrates the best application of the basic physics principles outlined.

PART A: DATA COLLECTION

Time for one complete ride _____ s
Length of one car _____ m
Length of train _____ m

Using the vertical accelerometer find the location of the maximum and minimum g forces acting on you.

Maximum g force _____ g's Location _____
Minimum g force _____ g's Location _____

Find the sign indicating the distance to the base of the first hill _____ m

Use the horizontal accelerometer to find the angle of inclination of the first hill from this same point _____ degrees

Calculate the height of the first hill _____ m

Measure the time for the entire length of the train to pass a point on the top of the first hill _____ s

Measure the time for the entire length of the train to pass a point on the bottom of the first hill _____ s

Measure the time for the train to travel from the top of the first hill to the bottom of the first hill _____ s

PART C: PROCEDURAL CALCULATIONS

Before you begin the design process you will need to use the data that you have previously collected to perform calculations which you will later need to consider in designing your amusement ride.

Use this space for calculations

1.**[B2.1]** Find the speed of the train knowing its length and the time it takes to pass a certain point on top of the first hill: _____ m/s

2.**[B2.1]** Using the same procedure as question one above, find the speed of the train at the bottom of the first hill: _____ m/s

3.**[B2.1]** Calculate the acceleration of the train down the first hill: _____ m/s^2

4.**[D2.3]** Use conservation of energy to determine the speed of the train at the bottom of the first hill. (assume a frictionless track and no gravitational potential energy at the bottom of the first hill) _____ m/s

5.**[C2.1]** Account for any differences in your answers for questions 2 and 4.

6.**[D2.2]** Calculate how much work is done in getting the train filled with passengers to the top of the first hill? Assume the mass of the train is 4320 kg and the mass of each rider is the same as yours. _____ joules

7.**[E4]** How much power does the chain motor have to put out in order to lift the train (with passengers) to the top of the first hill? _____ watts

DRAGON FIRE - ENERGY

AUTHENTIC PROBLEM

Your design and build firm has been asked to submit a proposal to Canada's Wonderland to create a new amusement ride for the park. In this exercise you will use your basic knowledge of Grade 11 Physics to collect data, make observations, measurements and calculations on your ride. You will later use this information and your own creative ideas to design a new amusement ride for the park. This proposal will be submitted to your teacher (an "official agent" of Canada's Wonderland). The commission will go to the design/build firm that demonstrates the best application of the basic physics principles outlined.

PART A: DATA COLLECTION

Time for one complete ride: _____ s
Length of one car: _____ m
Length of train: _____ m

Using the vertical accelerometer find the location of the maximum and minimum g forces acting on you.

Maximum g force: _____ g's Location: _____
Minimum g force: _____ g's Location: _____

Find the sign indicating the distance to the base of the first hill: _____ m

Use the horizontal accelerometer to find the angle of inclination of the first hill from this same point: _____ degrees

Calculate the height of the first hill: _____ m

Measure the time for the entire length of the train to pass a point on the top of the first hill: _____ s

Measure the time for the entire length of the train to pass a point on the bottom of the first hill: _____ s

Measure the time for the train to travel from the top of the first hill to the bottom of the first hill: _____ s

PART C: PROCEDURAL CALCULATIONS

Before you begin the design process you will need to use the data that you have previously collected to perform calculations which you will later need to consider in designing your amusement ride.

Use this space for calculations

1.**[B2.1]** Find the speed of the train knowing its length and the time it takes to pass a certain point on top of the first hill: _____ m/s

2.**[B2.1]** Using the same procedure as question 1 above, find the speed of the train at the bottom of the first hill: _____ m/s

3.**[B2.1]** Calculate the acceleration of the train down the first hill: _____ m/s^2

4.**[D2.3]** Use conservation of energy to determine the speed of the train at the bottom of the first hill. (assume a frictionless track and no gravitational potential energy at the bottom of the first hill) _____ m/s

5.**[C2.1]** Account for any differences in your answers for questions 2 and 4.

6.**[D2.2]** Calculate how much work is done in getting the train filled with passengers to the top of the first hill? Assume the mass of the train is 3972 kg and the mass of each rider is the same as yours. _____ joules

7. [D2.5] How much power does the chain motor have to put out in order to lift the train (with passengers) to the top of the first hill? _____ watts

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AUTHENTIC PROBLEM

Your design and build firm has been asked to submit a proposal to Canada's Wonderland to create a new amusement ride for the park. In this exercise you will use

your basic knowledge of Grade 11 Physics to collect data, make observations, measurements and calculations on your ride. You will later use this information and your own creative ideas to design a new amusement ride for the park. This proposal will be submitted to your teacher (an "official agent" of Canada's Wonderland). The commission will go to the design/build firm that demonstrates the best application of the basic physics principles outlined.

PART A: DATA COLLECTION

Time for one complete ride: _____ s
Length of one car: _____ m
Length of train: _____ m

Using the vertical accelerometer find the location of the maximum and minimum g forces acting on you.

Maximum g force: _____ g's Location: _____
Minimum g force: _____ g's Location: _____

Find the sign indicating the distance to the base of the first hill: _____ m

Use the horizontal accelerometer to find the angle of inclination of the first hill from this same point: _____ degrees

Calculate the height of the first hill: _____ m

Measure the time for the entire length of the train to pass a point on the top of the first hill: _____ s

Measure the time for the entire length of the train to pass a point on the bottom of the first hill: _____ s

Measure the time for the train to travel from the top of the first hill to the bottom of the first hill: _____ s

PART C: PROCEDURAL CALCULATIONS

Before you begin the design process you will need to use the data that you have previously collected to perform calculations which you will later need to consider in designing your amusement ride.

Use this space for calculations

1. [**B2.1]** Find the speed of the train knowing its length and the time it takes to pass a certain point on top of the first hill: _____ m/s

2.**[B2.1]** Using the same procedure as question one above, find the speed of the train at the bottom of the first hill: _____ m/s

3.**[B2.1]** Calculate the acceleration of the train down the first hill: _____ m/s^2

4.**[D2.3]** Use conservation of energy to determine the speed of the train at the bottom of the first hill. (Assume a frictionless track and no gravitational potential energy at the bottom of the first hill) _____ m/s

5.**[C2.1]** Account for any differences in your answers for questions 2 and 4.

6.**[D2.2]** Calculate how much work is done in getting the train filled with passengers to the top of the first hill? Assume the mass of the train is 4200 kg and the mass of each rider is the same as yours. _____ joules

7.**[D2.5]** How much power does the chain motor have to put out in order to lift the train (with passengers) to the top of the first hill? _____ watts

AUTHENTIC PROBLEM

Your design and build firm has been asked to submit a proposal to Canada's Wonderland to create a new amusement ride for the park. In this exercise you will use your basic knowledge of Grade 11 Physics to collect data, make

observations, measurements and calculations on your ride.
You will later use this information and your own creative ideas
to design a new amusement ride for the park. This proposal will be submitted to your teacher (an "official agent" of Canada's Wonderland). The commission will go to the design/build firm that demonstrates the best application of the basic physics principles outlined.

PART A: DATA COLLECTION

Time for one complete ride: _____ s
Length of one car: _____ m
Length of train: _____ m

Using the vertical accelerometer find the location of the maximum and minimum g forces acting on you.

Maximum g force: _____ g's Location: _____
Minimum g force: _____ g's Location: _____

Find the sign indicating the distance to the base of the first hill: _____ m

Use the horizontal accelerometer to find the angle of inclination of the first hill from this same point: _____ degrees

Calculate the height of the first hill: _____ m

Measure the time for the entire length of the train to pass a point on the top of the first hill: _____ s

Measure the time for the entire length of the train to pass a point on the bottom of the first hill: _____ s

Measure the time for the train to travel from the top of the first hill to the bottom of the first hill: _____ s

PART C: PROCEDURAL CALCULATIONS

Before you begin the design process you will need to use the data that you have previously collected to perform calculations which you will later need to consider in designing your amusement ride.

Use this space for calculations

1. **B2.1]** Find the speed of the train knowing its length and the time it takes to pass a certain point on top of the first hill: _____ m/s

2.**[B2.1]** Using the same procedure as question one above, find the speed of the train at the bottom of the first hill: _____ m/s

3.**[B2.1]** Calculate the acceleration of the train down the first hill: _____ m/s^2

4.**[D2.3]** Use conservation of energy to determine the speed of the train at the bottom of the first hill. (assume a frictionless track and no gravitational potential energy at the bottom of the first hill) _____ m/s

5. **[C2.1]** Account for any differences in your answers for questions 2 and 4.

6.**[D2.2]** Calculate how much work is done in getting the train filled with passengers to the top of the first hill? Assume the mass of the train is 2500 kg and the mass of each rider is the same as yours. _____ joules

7. **[D2.5]** How much power does the chain motor have to put out in order to lift the train (with passengers) to the top of the first hill? _____ watts

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AUTHENTIC PROBLEM

Your design and build firm has been asked to submit a proposal to Canada's Wonderland to create a new amusement ride for the

park. In this exercise you will use your basic knowledge of Grade 11 Physics to collect data, make observations, measurements and calculations on your ride. You will later use this information and your own creative ideas to design a new amusement ride for the park. This proposal will be submitted to your teacher (an "official agent" of Canada's Wonderland). The commission will go to the design/build firm that demonstrates the best application of the basic physics principles outlined.

PART A: DATA COLLECTION

Time for one complete ride: _____ s
Length of one car: _____ m
Length of train: _____ m

Using the vertical accelerometer find the location of the maximum and minimum g forces acting on you.

Maximum g force: _____ g's Location: _____
Minimum g force: _____ g's Location: _____

Find the sign indicating the distance to the base of the first hill: _____ m

Use the horizontal accelerometer to find the angle of inclination of the first hill from this same point: _____ degrees

Calculate the height of the first hill: _____ m

Measure the time for the entire length of the train to pass a point on the top of the first hill: _____ s

Measure the time for the entire length of the train to pass a point on the bottom of the first hill: _____ s

Measure the time for the train to travel from the top of the first hill to the bottom of the first hill: _____ s

PART C: PROCEDURAL CALCULATIONS

Before you begin the design process you will need to use the data that you have previously collected to perform calculations which you will later need to consider in designing your amusement ride.

Use this space for calculations

1.**[B2.1]** Find the speed of the train knowing its length and the time it takes to pass a certain point on top of the first hill: _____ m/s

2. **[B2.1]** Using the same procedure as question one above, find the speed of the train at the bottom of the first hill: _____ m/s

3.**[B2.1]** Calculate the acceleration of the train down the first hill: _____ m/s^2

4.**[D2.3]** Use conservation of energy to determine the speed of the train at the bottom of the first hill. (assume a frictionless track and no gravitational potential energy at the bottom of the first hill) _____ m/s

5.**[C2.1]** Account for any differences in your answers for questions 2 and 4.

6.**[D2.2]** Calculate how much work is done in getting the train filled with passengers to the top of the first hill? Assume the mass of the train is 3660 kg and the mass of each rider is the same as yours. _____ joules

7.**[D2.5]** How much power does the chain motor have to put out in order to lift the train (with passengers) to the top of the first hill? _____ watts

FLIGHT DECK - ENERGY

AUTHENTIC PROBLEM

Your design and build firm has been asked to submit a proposal to Canada's Wonderland to create a new amusement ride for the Park. In this exercise you will use your basic knowledge of Grade 11 Physics to collect data, make observations, measurements and calculations on your ride. You will later use this information and your own creative ideas to design a new amusement ride for the park. This proposal will be submitted to your teacher (an "official agent" of Canada's Wonderland). The commission will go to the design/build firm that demonstrates the best application of the basic physics principles outlined.

PART A: DATA COLLECTION

Time for one complete ride: _____ s
Length of one car: _____ m
Length of train: _____ m

Using the vertical accelerometer find the location of the maximum and minimum g forces acting on you.

Maximum g force: _____ g's Location: _____
Minimum g force: _____ g's Location: _____

Find the sign indicating the distance to the base of the first hill: _____ m

Use the horizontal accelerometer to find the angle of inclination of the first hill from this same point: _____ degrees

Calculate the height of the first hill: _____ m

Measure the time for the entire length of the train to pass a point on the top of the first hill: _____ s

Measure the time for the entire length of the train to pass a point on the bottom of the first hill: _____ s

Measure the time for the train to travel from the top of the first hill to the bottom of the first hill: _____ s

PART C: PROCEDURAL CALCULATIONS

Before you begin the design process you will need to use the data that you have previously collected to perform calculations which you will later need to consider in designing your amusement ride.

Use this space for calculations

1. **[B2.1]** Find the speed of the train knowing its length and the time it takes to pass a certain point on top of the first hill: _____ m/s

2.**[B2.1]** Using the same procedure as question one above, find the speed of the train at the bottom of the first hill: _____ m/s

3.**[B2.1]** Calculate the acceleration of the train down the first hill: _____ m/s^2

4.**[D2.3]** Use conservation of energy to determine the speed of the train at the bottom of the first hill. (assume a frictionless track and no gravitational potential energy at the bottom of the first hill) _____ m/s

5.**[C2.1]** Account for any differences in your answers for questions 2 and 4.

6.**[D2.2]** Calculate how much work is done in getting the train filled with passengers to the top of the first hill? Assume the mass of the train is 4100 kg and the mass of each rider is the same as yours. _____ joules

7.**[D2.5]** How much power does the chain motor have to put out in order to lift the train (with passengers) to the top of the first hill? _____ watts