**Amusement Park Physics Project**

You are an engineer contracted by a major amusement park chain to design a brand new roller coaster. You know all about the physics concepts that make a thrilling coaster ride, and now you can finally put them to work!

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You will build a 3D model of the coaster. It must have must have at least 1 vertical loop and should consist of at least 2 hills and any other twists and turns you can imagine. **The base cannot exceed a 75 centimeters in length and width. The height cannot exceed 1 meter or points will be deducted**. **You have to include a name for your coaster, your completed rubric and labels attached to the coaster**. The labels are listed below.

**Parts You Must Label on the Coaster:**

1. Label one area where the cart is experiencing a contact force with CONTACT FORCE. **Explain your choice on the rubric.**
2. Label one area where the cart is experiencing a noncontact force with NONCONTACT FORCE. **Explain your choice on the rubric.**
3. Label an area where the cart is positively accelerating with +ACCEL.
4. Label an area where the cart is negatively accelerating with -ACCEL.
5. Label an area where the cart’s momentum is increasing with + MOMENTUM.
6. Label an area where the cart’s momentum is decreasing with - MOMENTUM.
7. Label an area where the rider will feel the effect of inertia with INERTIA. **Explain your choice on the rubric.**
8. Label an area where the rider would feel weightless (or negative G-force) with WEIGHTLESS. **Explain your choice on the rubric.**
9. Label an area where the cart will be affected by centripetal force with

CENTRIPETAL FORCE. **Explain your choice on the rubric.**

1. Label an area where the forces acting on the cart are balanced with BALANCED. **Describe the motion of the cart at this point on the rubric.**
2. Label an area where the forces acting on the cart are unbalanced with UNBALANCED. **Describe the motion of the cart at this point on the rubric.**
3. Label an area where Action-Reaction forces are acting on the cart or the riders with AXN-RXN. **Explain your choice on the rubric.**
4. Label the area that has the most PE (Potential Energy).
5. Label the area that has the most KE (Kinetic Energy).

Keep in mind Newton’s Laws of Motion, Conservation of Momentum and Conservation of Energy.

**Extra Credit:**

If you can construct a 3D coaster that will keep a marble on the track from start to finish, you will receive **5 points extra credit**.

Name(s) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Section \_\_\_\_\_\_\_\_\_\_\_

Date Due \_\_\_\_\_\_\_\_\_\_\_

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**\*\*\*ATTACH THIS RUBRIC TO YOUR PROJECT!\*\***

|  |  |  |  |
| --- | --- | --- | --- |
| **Labels** | **Explanations/Descriptions** | **Possible Points** | **Earned Points** |
| Contact Force |  | 2 |  |
| Noncontact Force |  | 2 |  |
| + Acceleration | X | 1 |  |
| -Acceleration | X | 1 |  |
| + Momentum | X | 1 |  |
| -Momentum | X | 1 |  |
| Inertia |  | 2 |  |
| Weightless |  | 2 |  |
| Centripetal Force |  | 2 |  |
| Balanced |  | 2 |  |
| Unbalanced |  | 2 |  |
| Axn-Rxn |  | 2 |  |
| PE | X | 1 |  |
| KE | X | 1 |  |
| Name on Coaster/Coaster Name/Rubric | X | 3 |  |
| Meets size requirements | X | 3 |  |
| First hill is the tallest and the coaster contains vertical loop | X | 2 |  |
| The project is neat/visually appealing | X | 5 |  |
| Extra Credit | X | 5 |  |

**Total: 35+5**