____/100

Name: _____

Date: _____

Galaxyland Rubric

Science

1. Identify 3 frame, 3 shell, 3 mass structures and explain which of these structures qualify as composite structures. 4 3 2 1 0 (10 minutes)

2. Find 2 different structures that have a similar function *(Ex. A rollercoaster track vs a space shot track)* **and evaluate the similarities and differences in their design. 4 3 2 1 (x2) (10 minutes)**

3. Find points of weaknesses of 3 different load-bearing structures (rides preferred). Then explain how each of these structures could fail and cause serious injury. You must use as many of the following words as possible: Shear force, tension, compression, torsion, materials, bending, quality, joints**. Spend some time analyzing the way each ride is built. This section is worth 12 marks. 4 3 2 1 (x3) (20 minutes)**

4. Identify 3 different examples of friction on various amusement park rides. Identify the role that friction plays in each situation. 4 3 2 1 (5 minutes)

5. For 3 different rides find areas in its design that will experience tension, torsion, compression, and bending. You should provide examples from a variety of rides. 4 3 2 1 (10-15 minutes)

6. Choose 1 ride and inspect it closely to find as many different joints as possible. Explain why engineers chose those specific joints. 4 3 2 1 (5 minutes)

7. Describe the *properties of the materials* that engineers decided to use on 3 different structures around the mall (at least 1 ride). Compare the properties of these selected materials with *inferior* alternatives, and superior *alternatives*. Explain why engineers chose the materials that you see and not the inferior and/or superior one? (Ex. Why is a roller coaster track made of steel and not wood or titanium?)

You must mention different forces (Ex. Shear, torsion, tension, compression) in specific detail in your explanation. 4 3 2 1 (x2) (20 minutes)

8. Imagine you are part of the engineering team designing 1 movable structure (eg. Escalator), 1 static structure (eg. 1 bench) and 1 ride (eg. Roller coaster). What are some specific questions your team would have had to ask amongst yourselves *before* building each structure? Your questions must cover the following categories: *safety*, *cost*, *function*, *aesthetics*, and *environmental impact*. In your discussion, you may relate back to your knowledge of *expansion and contraction*, *particles*, *friction*, *joints*, and *forces*. 4 3 2 1 (x2) (20 minutes)

9. Now it is time to ride. Choose 1 ride and ride it *3 times*. The first time you ride, *you must close your eyes* for the entire duration. Focus on the forces that are applied onto your body and how these forces are affecting your weight. Record your observations before you go back onto the ride for a second time. Be very detailed in your description. The next 2 times, you will open your eyes and focus on experiencing every detail of the forces that are exerted onto your body. *(Ex. What kind of forces is my body feeling on the first drop of the roller coaster compared to the first sharp turn? How does all of this compare to travelling through the upside down loops?)* **Document your experiences with great detail for each part of the ride. 4 3 2 1 (x3)**

(20 minutes. You must spend significant time discussing the forces with one another. You may choose to go onto the ride more than 3 times)

Math

- **Measure the circumference of the merry go round. C=pi x d**
  Draw and label the dimensions of each of these rides. Then go on the ride and count how many times around you went. Use this information to calculate how far you travelled in total. 4 3 2 1 (x2) (15 minutes)

- **Use your illustration from the previous step to calculate the area of each circle. A=pi x r x r 4 3 2 1 (5 minutes)**

- **Find a menu and use your decimal addition skills to calculate the price of a few items. The total must be less than $30. 4 3 2 1 (5 minutes)**

- **Calculate the total amount of tax that you would have to pay on these items if you lived in Vancouver. In Vancouver, the GST tax is 5% and the PST tax is 7%. No calculators are allowed. Show all of your work using a T-chart. 4 3 2 1 (5 minutes)**

- **Estimate the maximum height of the roller coaster. Explain your strategy. 4 3 2 1 (15 minutes)**

Punctuality

-Your group made it within 5 minutes to each meeting point as announced by Miss Diep and/or Mr. Melhem through your group leader. 4 or 0

-Your group was not too early and not too late for lunch. You showed up at the food court at exactly 11:30am. 4 or 0

Collaboration

Your group shared ideas in a cooperative manner amongst yourselves as well as with other teams in the attempt to make each other smarter. (To be evaluated by your team leader) 4 3 2 1 (x 2)