**Inquiry - Circular Motion Introduction Physics 12**

**Essential Question:**

**How can we, as scientists, arrange for someone on a playground swing to go completely over the bars and to walk away, without breaking any limbs?**

First, we need to know a bit about centripetal force and how it works.

To do this, let’s explore how things turn in a circle: Swing a rubber stopper using a circular motion apparatus (A hollow glass tube with a meter long string passing through it. On one end of the swing, is a rubber stopper, and on the other end of the string, are some weights.) Discuss some of the things happening in the turning process.

Using the inquiry process, establish the variables that can be measured whilst the others are kept the same (except one).

\*\*the goal is to establish a mathematical relationship between these variables and centripetal force. In order to best explore this, measure velocity as one variable is affected at a time.\*\*

To measure the velocity, time 10 rotations of the mass, find the period. v= circumference/T

Establish groups to test each variable. Students should set 5 different values for variable that they will be testing. Measure the velocity for each set value with 5 trials.

|  |  |  |
| --- | --- | --- |
| **Group** | **Variable to change** | **Variables that stay consistent** |
| 1 | Hanging mass | Radius of rotation  Rotating mass |
| 2 | Radius of rotation | Hanging mass  Rotating mass |
| 3 | Rotating mass | Hanging mass  Radius of rotation |
| Do students want to test anything else? |  |  |

Once the separate groups have obtained their velocity data, they need to establish the relationships between velocity and the changed variable. This can be done by graphing the ‘Velocity as a Function of the (changed variable).’ Each group must establish whether the relationship between the velocity and the changed variable is directly or indirectly proportional, squared, cubed, etc,. Each group presents its results to the class and together, we eventually derive......Fc = mv2/r

Timeline: This will take a class (and maybe some homework time) to establish the idea, test and analyze the data. Next day, pull big ideas together to establish our circular motion formula.

From here, we will revisit the essential question and examine it from the lens of what we know about circular motion. We will extend our thinking, eventually to satellites and planetary motion.

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