Name: DISC: Score: / 20

Instructions:

|  |  |  |  |
| --- | --- | --- | --- |
| Q1 | Q2 | Q3 | Q4 |
|  |  |  |  |
| 10 | 10 | 5 | 5 |

* Do your own work.
* Answer the questions below in the space provided.
* Make sure you show all your work and any equations that you use.
* Please place a box around your answers.
* Remember to give the correct units with all numerical answers

|  |  |  |  |
| --- | --- | --- | --- |
| **R (disk-to-block)** | **M (block)** | **I** |  |
|  |  |  |  |

1. Consider a block tied to a string which rotates with constant speed on a frictionless surface as shown in the diagram.

Figure 1: Top View of Rotating Block

Table 1: Properties of the System

* 1. There are external torques acting on this system?
     1. No, the table is frictionless.

External Torques (2 pts):

* + 1. Yes, the string has tension pulling on the block.
  1. Like translational momentum, angular momentum is a conserved quantity. In your own words, explain the conditions under which angular momentum is conserved.

Explanation of Conservation (3 pts):

* 1. Remember, angular momentum is What is the angular momentum of the block?

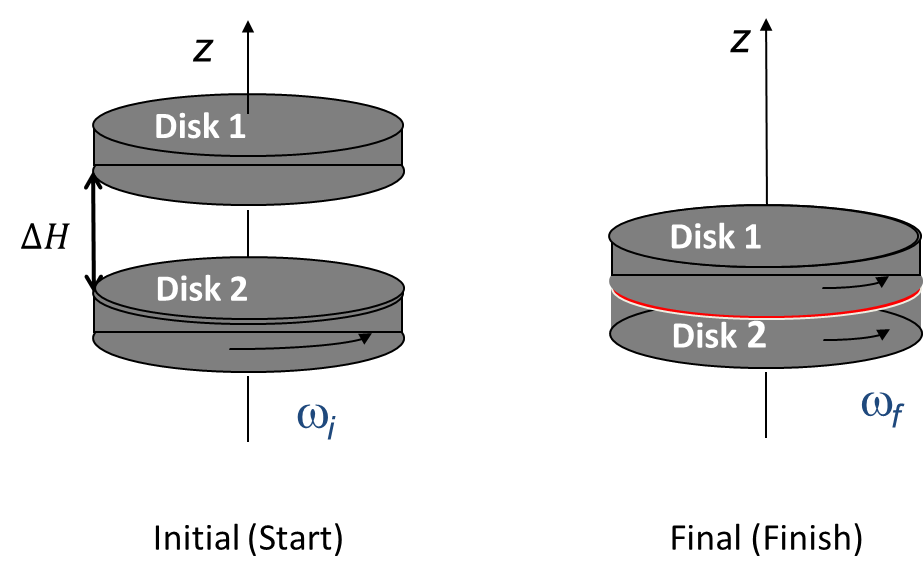
Angular Momentum (2 pts):

* 1. You pull on the string, reducing the radius of the rotation by Calculate the new rotational velocity

New speed (3 pts):

1. Consider the system of two disks as shown in the diagram. The important parameters are given in the table:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **DISK** | **MASS** | **RADIUS** | **MOMENT OF INERTIA** | **INITIAL** |
| 1 |  |  |  |  |
| 2 |  |  |  |  |



* 1. Disk 1 is initially stationary and Disk 2 is initially rotating as shown in the *Initial* diagram. Disk 1 suddenly falls resulting in the situation in the *Final* diagram. Explain in your own words what you expect to happen.

Explaination (3 pts):

* 1. Calculate the angular momentum for the *Initial* system:

Angular Momentum (2 pts):

* 1. What is the final angular momentum of the system?

Angular Momentum (2 pts):

* 1. Find the final rotational speed of the system of disks in the *Final* diagram.

Final speed (3 pts):