

Problems of the 9th International Physics Olympiads (Budapest, Hungary, 1976)

Theoretical problems

Problem 1

A hollow sphere of radius $R = 0.5$ m rotates about a vertical axis through its centre with an angular velocity of $\omega = 5$ s⁻¹. Inside the sphere a small block is moving together with the sphere at the height of $R/2$ (Fig. 6). ($g = 10$ m/s².)

- What should be at least the coefficient of friction to fulfill this condition?
- Find the minimal coefficient of friction also for the case of $\omega = 8$ s⁻¹.
- Investigate the problem of stability in both cases,
 - for a small change of the position of the block,
 - for a small change of the angular velocity of the sphere.

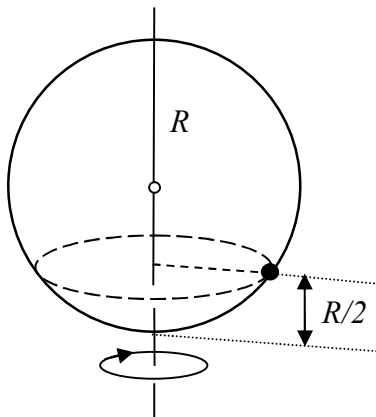


Figure 6

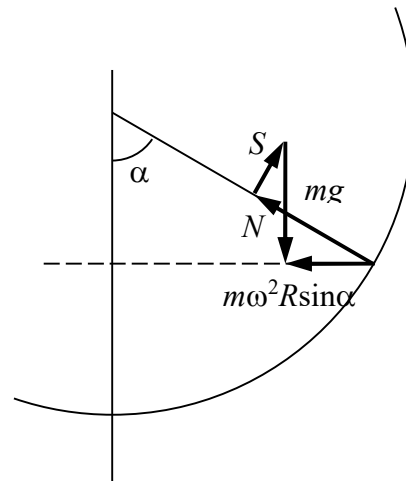


Figure 7