

NORTHERN ILLINOIS UNIVERSITY
PHYSICS DEPARTMENT

Physics 210 – Mechanics & Heat

Fall 2022

Problem Set #7

Problem Set Due: Thurs., Oct. 20, 2022

Read OpenStax: Chapter 7.1-7.6, Lecture Notes #7

Show explicitly all your work for full credit.

- | | |
|------------------------------|-----------------------------------|
| 1. Expert TA: c7.1.1 | <i>conceptual problem—explain</i> |
| 2. Expert TA: c7.1.2 | <i>conceptual problem—explain</i> |
| 3. Expert TA: c7.1.3 | <i>conceptual problem—explain</i> |
| 4. Expert TA: 7.1.1 | show calculation and figure |
| 5. Expert TA: 7.1.13 | show calculation and figure |
| 6. Expert TA: 7.3.2 | show calculation and figure |
| 7. Expert TA: 7.4.2 | show calculation and figure |
| 8. Expert TA: 7.4.3 | show calculation and figure |
| 9. Expert TA: 7.4.8 | show calculation and figure |
| 10. Expert TA: 7.4.39 | show calculation and figure |

Staple Expert TA problems separately from Problem 11 below

11. A uniform sphere of mass $m = 0.85$ kg and radius $r = 4.2$ cm is held in place by a massless rope attached to a frictionless wall a distance $L = 8.0$ cm above the center of the sphere.

- (a) Draw the *free body force diagram* for the sphere, and write down Newton's 2nd law (*forces*) for translations along the x and y -directions.
- (b) Draw the *free body torque diagram* and write down Newton's 2nd law (*torques*) for rotations where the origin of the polar coordinate system is
- at the center of the sphere (A).
 - at the point of contact with the wall (B)
 - where the string is attached to the wall (C)

- (c) Find the force on the sphere from the wall.

