

NORTHERN ILLINOIS UNIVERSITY

PHYSICS DEPARTMENT

Physics 210 – Mechanics & Heat

Spring 2022

Problem Set #11

Problem Set Due: Tues., April 26, 2022

Read OpenStax: Chapter 14.1-14.3, Lecture Notes #11

Show explicitly all your work for full credit.

Staple solutions to Problems #1-5 together

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|------------------------------|-----------------------------|
| 1. Expert TA: 20.2.2 | show calculation and figure |
| 2. Expert TA: 20.2.22 | show calculation and figure |
| 3. Expert TA: 20.3.1 | show calculation and figure |
| 4. Expert TA: 20.3.2 | show calculation and figure |
| 5. Expert TA: 20.3.7 | show calculation and figure |

Problem #6 & #7 are on the next pages

Staple Problems #1-5 together separately from “My Problems” below.

6. An NIU student is playing around with a movable piston that can compress the gas inside a cylindrical chamber. He decides to compress the gas to $1/10^{\text{th}}$ its initial volume to a pressure that is 30 times its initial pressure. If the initial volume was 0.055 m^3 and the initial temperature of the gas was 25°C , what will be the final temperature of the gas?

7. A NIU student is playing around with a calorimeter and wishes to determine the latent heat of fusion of water for her chemistry class. She places 30 g of ice (at an initial temperature of 0°C) into 200 g of water at 30°C . Assume the calorimeter and water were in thermal equilibrium before the ice was added. The mass of the calorimeter is 300 g and its specific heat is $0.380 \text{ J/(g }^\circ\text{K)}$. Using $4.186 \text{ J/(g }^\circ\text{K)}$ for the specific heat capacity of water, find the latent heat of fusion for the chemistry student if the final equilibrium temperature of the calorimeter was 8.5°C .