

South Dakota School of Mines and Technology
Department of Materials and Metallurgical Engineering

MET 320

HQ 1

MI 220 - 9:00 AM Sept 29, 2004

CLOSED BOOK & NOTES - NO CALCULATORS. SHOW ALL WORK ON THIS SHEET.
Turn in only this sheets with the problems on them. Keep or discard all other paper.

1. Two moles of ideal gas at 500 K and 10 L are isothermally compressed to 500 K and 1 L. Find the q , w , ΔU , ΔH , and ΔS for the process.
2. One mole of ideal monatomic gas performs 400 J of work while receiving 100 Joules of heat. What is its temperature change?
3. Ideal diatomic gas in a diesel engine at 300 K is adiabatically compressed to $1/23^{\text{th}}$ of its original volume. Show how to determine the final T , P and q , w , ΔU , ΔH , and ΔS for the process.
4. a) A Carnot-cycle heat engine is operating between two heat sinks at 1027°C and 527°C . What is the maximum theoretical work that can be produced from 100 Joules of heat?

b) How much work would be required to move 100 Joules of heat from a refrigerator at 275 K into a room at 300 K assuming theoretical efficiency?