University of Technology
Department of Applied Sciences
Final Examination
2016 -2017

Branch: Applied Physics
Subject: Thermodynamic
Examiner: Dr. Mukhlis M. Ismail

Class : 2nd year
Time : 3 hours
Date :

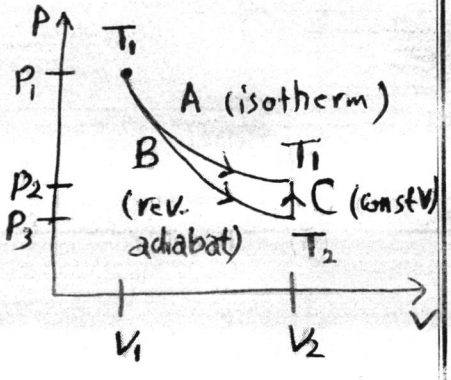
Note: Answer 5 questions only. (10 points for each question)

Q1/ Define the zero, first, second and third laws of thermodynamic.

Q2/ A) 1 mol of N2(g) at 25.0 °C and a pressure of 1.0 bar undergoes an isothermal expansion to a pressure of 0.132 bar. Calculate the work done.

B) A particular engine has a power output of 5000 W and an efficiency of 25%. If the engine expels 8000 J of heat in each cycle, find: (a) the heat absorbed in each cycle and (b) the time for each cycle.

Q3/ Find ΔU, ΔH, q, w, and ΔS for a reversible ideal gas of curve A, B and C shown in figure, then prove that ΔU, ΔH, and ΔS are state function while q and w are not.



Q4/ Prove that: a) $\Delta S = C_p \ln(T_2/T_1) - R \ln(P_2/P_1)$ for an ideal gas

b) $\Delta A = \Delta U - T\Delta S$, c) $\varepsilon = 1 - T_2/T_1$ for Carnot cycle of an ideal gas,

d) $\int dq_{rev}/T = 0$ for Carnot cycle of an ideal gas. e) $C_p = (\partial H/\partial T)_p$.

Q5/ A) A glass rod is heated and then blown by a glassblower. When it is at 185°C it is brought outside to cool. 3200 J of heat are transferred from the glass to the air, which is at 18°C. Find the change in entropy of the universe.

B) Using Joule free expansion to prove that the internal energy of an ideal gas depends only on temperature.

Q6/ A) Is the following reaction spontaneous? $CO(NH_2)_{2(aq)} + H_2O_{(l)} \longrightarrow CO_{2(g)} + 2NH_{3(g)}$, if you know ΔH=119kJ, ΔS=354.8 j/K and T=25°C.

B) The work output is 900 kJ and heat rejection is 150 kJ of Carnot heat engine. Find T_{Hot} if you know that T_{Cold}=27°C.