

Fayoum University
Faculty of Science
Chemistry Department
First term
January 2012

physical Chemistry
Thermodynamics
Time allowed 2 hours
Total Mark (45)
Chem. / Phys 2nd year student

Answer the following questions:

Question (1)

[15 marks]

a) Prove that, the efficiency of Carnot engine, the ideal imaginary engine, is limited by the operating temperature of the engine

b) Two moles of an ideal gas initially at 27°C and one atm are compressed reversibly to half its initial volume. Calculate q, w, ΔE and ΔH when the process is carried on isothermally.

Question (2)

[15 marks]

a) Define each of the following:

Intensive properties – Isochoric process- Hess's law – Standard heat of formation- heat engine – cyclic process- heat capacity

b) The boiling point of water at 50 atm is 265°C. Compare theoretical efficiencies of a steam engine operating between 550°C and i) boiling point of water at 1 atm

ii) Boiling point of water at 50 atm

Question (4)

[15 marks]

a) For an adiabatic reversible ideal gas expansion prove that

$$P_1 V_1^\gamma = P_2 V_2^\gamma$$

b) Calculate ΔS for the reversible isothermal expansion of 2.00 moles of an ideal gas from 10.0 to 12.0 liters at 30°C.

R= 1.987 cal /deg. mol Atomic weight for H=1, O=16, C=12