DEPARTMENT OF CHEMISTRY
NATIONAL INSTITUTE OF TECHNOLOGY SRINAGAR

MID TERM Examination
18-09-2017

Semester: B. Tech. Ist
Session: Autumn-2017
Maximum Marks: 30
Batch: 2017
Subject: Chemistry
Time Allowed : 01and half Hour

- ***Pl attempt all questions***

Q1 (a) Prove that heat (q) is a path dependent function . (2.5)

(b) Show that volume is a state function for a gas obeying the equation: (2.5)
$P=RTV^{-1} - aV^{-2}$

(c) Discuss Spontaneous process. From this discussion how can you reach at the need of 2nd Law of Thermodynamics. What is the relevance of this Law? Define it in different forms. What are its limitations? (5)

Q 2 (a) Explain Entropy. Give Mathematical treatment to the concept of entropy. Show 'S' is a state function and '*ds*' is an exact differential. (5)

(b) Calculate the entropy change when $10m^3$ of an ideal gas ($C_{p,m}=2.5\,R$) at 27°C and 1.01×10^5 Nm^{-2} pressure are heated at constant pressure to 127°C. (5)

Q 3 (a) A coal has the following composition by weight: C=90%, O=3.0%, S = 0.5%, N = 0.5% and ash = 2.5%.Net calorific of the coal was found to be 8,490.5 kcal/kg. Calculate the percentage of hydrogen and high calorific value of coal. (3.5)

(b) Discuss Ultimate analysis of coal. Give the significance of its determination. (3)

(c) A sample of coal was analyzed as follows: Exactly 3 g was weighed into a silica crucible. After heating for an hour at 110°C, the residue left weighed 2.415g. The crucible next was covered with a vented lid and strongly heated for exactly 7 minutes at 950°C. The residue weighed 1.528g. The crucible was then heated without cover, until a constant weight was obtained. The last weigh was found as 1 g. Calculate the percentage results of this analysis. (3.5)