

STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI 600 086  
(For candidates admitted during the academic year 2008-09)

SUBJECT CODE: CH/MC/PC44

B.Sc. DEGREE EXAMINATION, APRIL 2010  
BRANCH IV - CHEMISTRY  
FOURTH SEMESTER

Reg. No .....

COURSE : MAJOR – CORE  
PAPER : PHYSICAL CHEMISTRY-I  
TIME : 30 MINUTES

MAX. MARKS : 30

SECTION – A

TO BE ANSWERED ON THE QUESTION PAPER ITSELF.

ANSWER ALL THE QUESTIONS.

(30x1=30)

I. Choose the correct answer:

- Which one among the following is a path function?  
a) pressure      b) volume      c) temperature      d) heat capacity
- Which one among the following is true for an ideal gas during an adiabatic process?  
a)  $PV = \text{constant}$       b)  $PV^\gamma = \text{constant}$       c)  $TV^\gamma = \text{constant}$       d)  $VT^\gamma = \text{constant}$
- Which among the following gases will have the maximum value for 'a' the Vander Wall's constant?  
a)  $H_2$       b)  $He$       c)  $H_2O$       d)  $Ne$
- The heat released during the formation of 2g of  $CH_4$  is  $x$  J. Then its enthalpy of formation is (in joules) is  
a)  $8x$       b)  $x$       c)  $16x$       s)  $-8x$
- Which one among the following is the condition for spontaneity?  
a)  $\Delta S = +ve$       b)  $\Delta S = -ve$   
c)  $\Delta S_{sys} + \Delta S_{surr} = -ve$       d)  $\Delta S_{sys} + \Delta S_{surr} = +ve$

II. Fill in the blanks:

- When the  $\Delta S_{total}$  is less than 0, the process is \_\_\_\_\_.
- A system that cannot change matter & energy with the surroundings is called \_\_\_\_\_ system.

8. Mathematical expression for Joule Thompson Inversion Temperature is \_\_\_\_\_.
9. When 2 moles of an ideal gas expands adiabatically, the work done is \_\_\_\_\_.
10. Calorific value of foods can be calculated from heat of \_\_\_\_\_ values.

**III. State whether the following statements are TRUE or FLASE :**

11. Volume is an extensive property.
12.  $c_p - c_v = R$  for all gases.
13. For ideal gases,  $\Delta E = 0$  during an isothermal process.
14. Energy of the universe is a constant.
15. Zero Kelvin can be obtained by adiabatic demagnetization.
16. Activity is equal to concentration at higher concentrations.
17.  $\Delta H_f^\circ = 0$  for diamond.
18. All real gases obey Vander Wall's equation of state.
19. A process can still be spontaneous even if  $\Delta S_{sys} = -ve$ .
20. The  $\Delta n_g$  for the reaction,  $2Fe(s) + 3H_2O(g) \longrightarrow Fe_2O_3(s) + 3H_2(g)$  is zero.

**IV. Answer the following in one or two lines:**

21. What are exact differentials?
22. What is inversion temperature?
23. State Carnot theorem.

24. What is chemical potential?

25. Define activity.

26. State zeroeth law of thermodynamics.

27. State law of mass action.

28. Write Vander Wall's equation of state for two moles of a gas.

29. State Hess' law.

30. What is thermodynamic scale of temperature?



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MAX. MARKS : 70

SECTION – B

ANSWER ANY FIVE QUESTIONS: (5x6=30)

1. Derive an expression for work done during a reversible adiabatic process.
2. Derive  $c_p - c_v = R$ .
3. If the enthalpies of formation of glucose  $CO_2$  and  $H_2O$  are  $x, y$  and  $z$  KJ mol<sup>-1</sup> respectively, calculate the enthalpy of combustion of glucose.
4. Explain the calorimetric determination of integral heat of solution.
5. Explain Carnot cycle.
6. Derive an expression for entropy of mixing.
7. How are absolute entropies evaluated from thermal data using third law and mention one apparent exception to the III law.

SECTION – C

ANSWER ANY TWO QUESTIONS: (2x20=40)

8. a) Explain Joule-Thompson effect. (8)  
b) Derive an expression for work done during reversible.  
(i) isothermal (ii) adiabatic (iii) isobaric processes (12)
9. a) What are the applications of Hess' law of constant heat summation? (10)  
b) Derive Kirchoff's equation. (5)  
c) Define integral and differential heats of solution. (5)
10. a) Explain the need for 2<sup>nd</sup> law of thermodynamics. (6)  
b) Write four different statements of 2<sup>nd</sup> law of thermodynamics. (8)  
c) Derive Vant Hoff's isochore. (6)
11. a) Derive Maxwell's relations. (6)  
b) Derive Clausius Clapeyron Equation. (7)  
c) Derive Gibbs-Duhem equation and explain its applications. (7)



