

LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034



B.Sc. DEGREE EXAMINATION – CHEMISTRY

THIRD SEMESTER – NOVEMBER 2018

CH 3504 – THERMODYNAMICS

Date: 30-10-2018

Dept. No.

Max. : 100 Marks

Time: 01:00-04:00

Part-A

Answer ALL questions.

(10 × 2= 20)

1. State zeroth law of thermodynamics.
2. Calculate the efficiency of Carnot engine operating between 300 K and 400 K.
3. Define enthalpy of neutralization.
4. Mention any two differences between endothermic and exothermic processes.
5. What is the need for second law of thermodynamics?
6. Mention the necessary criterion for spontaneous process.
7. State law of mass action.
8. Write the integrated form of van't Hoff equation.
9. State Dulong and Petit's law.
10. List out the exceptions of third law of thermodynamics.

Part-B

Answer any EIGHT questions.

(8 × 5= 40)

11. State the postulates of kinetic theory of gases.
- 12a. State and explain first law of thermodynamics.
 - b. Six moles of an ideal gas expand isothermally and reversibly from a volume of 1 dm³ to a volume of 10 dm³ at 27 °C. What is the maximum work done? (2+3)
13. Define the following: a) Concept of enthalpy b) Intensive and extensive properties
14. What is heat capacity? Obtain the relationship between C_p and C_v.
15. Explain the various statements of second law of thermodynamics.
16. Derive Kirchoff's equation.
17. Define Enthalpy of combustion and enthalpy of dilution.
18. Discuss the concept of entropy.
19. Obtain the Maxwell's relationship of thermodynamic quantities.
20. Calculate the equilibrium constant of a reaction at 25 °C whose ΔG° is -20 kJ mol⁻¹.
21. Obtain the relationship between K_p and K_c.
22. State and explain Nernst heat theorem.

Part-C

Answer any FOUR questions.

(4 × 10= 40)

- 23a. Derive expressions for the quantity of heat and work done in reversible isothermal expansion.
- b. State and explain Joule-Thomson effect. (5+5)
- 24a. How would you determine the following from bond energies: (i) Resonance energy and (ii) Enthalpies of formation of compounds.
- b. In a certain process, 600 J of work is done on a system which gives off 250 J of heat. Calculate the internal energy change of the system. (7+3)
- 25a. Derive Gibb's-Helmholtz equation.
- b. Explain the thermodynamic principle of the working of refrigerator. (5+5)
- 26a. State and explain Le Chatelier's principle.
- b. Derive van't Hoff reaction isotherm. (5+5)
- 27a. Obtain the van der Waals equation of state and mention the importance of critical constants.
- b. Discuss the uses of Carnot cycle useful in obtaining the maximum convertibility of heat into work. (5+5)
28. How will you determine the absolute entropy of solids, liquids and gases?

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