



**2022/TDC(CBCS)/EVEN/SEM/
CHMHCC-202T/337**

TDC (CBCS) Even Semester Exam., 2022

CHEMISTRY

(Honours)

(2nd Semester)

Course No. : CHMHCC-202T

(Physical Chemistry—II)

Full Marks : 50

Pass Marks : 20

Time : 3 hours

*The figures in the margin indicate full marks
for the questions*

SECTION—A

Answer any *ten* questions : $2 \times 10 = 20$

1. Write the importance of thermodynamics.
2. Explain extensive properties with example.
3. What is adiabatic flame temperature?
4. State the third law of thermodynamics.

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5. What is residual entropy?
6. What is Debye T^3 law?
7. What is law of mass action?
8. Explain spontaneous reaction with example.
9. Distinguish between ΔG and ΔG° .
10. State the law of chemical equilibrium.
11. Show the variation of chemical potential with temperature graphically.
12. Show that $\left(\frac{\partial \mu_i}{\partial T}\right)_{P,N} = -\bar{S}_i$.
13. Mention two differences between osmosis and diffusion.
14. State Henry's law and its one application.
15. Define ideal and non-ideal solutions.

SECTION—B

Answer any five questions : $6 \times 5 = 30$

16. (a) Prove thermodynamically $C_p - C_v = R$. 3
- (b) Show that $\left(\frac{\partial A}{\partial V}\right)_T = -P$. 3

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17. (a) Deduce Kirchhoff's equation. 3
- (b) Explain Hess' law of constant heat summation and write one application of Hess' law. $2+1=3$
18. (a) Explain Nernst heat theorem. How does it lead to the enunciation of the third law of thermodynamics? $2+2=4$
- (b) Show that the entropy of any substance at low temperature ($0 < T < 20$ K) where Debye's relation for heat capacities of crystals is valid, is one-third of the molar heat capacity. 2
19. (a) Deduce Gibbs-Helmholtz equation. 4
- (b) Show that Joule-Thomson effect is isoenthalpic. 2
20. (a) Deduce Gibbs-Dühem equation. 4
- (b) Mention one important conclusion that can be drawn from Gibbs-Dühem equation. 2
21. (a) What do you mean by partial molar quantities? 3
- (b) Discuss the variation of chemical potential with pressure. 3

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22. (a) What do you mean by fugacity? Discuss the variation of fugacity with pressure. 2+2=4
- (b) Explain the coupling of exoergic and endoergic reactions. 2
23. (a) Derive thermodynamically the relation between Gibbs free energy of reaction and reaction quotient. 3
- (b) Derive Henderson-Hasselbalch equation. 3
24. (a) Define van't Hoff factor. Find a relation between van't Hoff factor and degree of dissociation taking one mole of a uni-univalent electrolyte as an example. 2+2=4
- (b) State and explain Rault's law. 2
25. (a) Apply thermodynamics to derive a relationship between osmotic pressure and elevation of boiling point of an ideal solution. 4
- (b) What do you mean by colligative properties and abnormal colligative properties? 2
