(6 pages) **Reg. No. :**.....

Code No. : 40284 E **Sub. Code : JMCH 52/ SMCH 52**

B.Sc. (CBCS) DEGREE EXAMINATION, NOVEMBER 2019.

Fifth Semester

Chemistry — Main

PHYSICAL CHEMISTRY – III

(For those who joined in July 2016 onwards)

Time : Three hours Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer.

1. Which of the following is Van't Hoff isochore?

(a) $\frac{d\ln kp}{dt} = \frac{\Delta H}{Rt^2}$ (b) $\frac{d\ln p}{dT} = \frac{\Delta H}{RT^2}$

(c) $\frac{dT}{dP} = \frac{T(V_L - V_S)}{\Delta H_f}$ (d) $G = H + T\left(\frac{\partial G}{\partial T}\right)_p$

2. "Entropy of the universe is ever increasing". This is the statement of _____ thermodynamics.

(a) I law (b) II law

(c) Zeroth law (d) III law

3. Which of the following is not a reference electrode?

(a) Hydrogen electrode

(b) Calomel electrode

(c) Silver–Silver chloride electrode

(d) Platinum electrode

4. The liquid junction potential is eliminated by _____

(a) Membrane

(b) Filter paper

(c) Salt bridge

(d) Adding *Kcl* to the electrolyte

5. Which of the following is Freundlich adsorption isotherm?

(a) $\frac{w}{m} = kp^n$ (b) $\frac{w}{m} = \frac{k^n}{p}$

(c) $y = mp$ (d) $y = mx + c$

6. Which of the following statement is not true?
   (a) A catalyst changes the rate of reaction
   (b) A catalyst does not change the equilibrium
   (c) A catalyst decreases the activation energy of a reaction.
   (d) A catalyst does not initiate the reaction

7. The symmetry elements present in H_2O molecule is ————————.
   (a) E (b) C_2
   (c) σ_v (d) All the above

8. E, C_2, σ_h, i belongs to ———————— point group.
   (a) C_2v (b) C_3v
   (c) C_2h (d) C_3h

9. The changes taking place in molecules at UV–Visible frequency is ————————
   (a) Rotation alone
   (b) Vibration alone
   (c) Rotation and vibration
   (d) None of these

10. Which one of the following is used as a solvent in IR spectroscopy?
   (a) H_2O (b) Kcl
   (c) KBr (d) TMS

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 250 words.

11. (a) Explain any two application of Nernst distribution law.

Or

(b) Derive the integrated form of the Clausius–Clapeyron equation.

12. (a) Derive an expression for liquid junction potential.

Or

(b) Explain potentiometric redox titration with an example.

13. (a) Derive Michaelis – Menton equation.

Or

(b) Write about the applications of adsorption.

14. (a) Explain:
   (i) Plant of symmetry
   (ii) Identity element

Or

(b) Explain point group present in NH_3 molecule.

15. (a) Describe the applications of rotational spectra for the determination of bond length in diatomic molecules.

Or

(b) State and explain Franck–Condon principle.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (a) State and explain third law of thermodynamics. Give a brief study of molecules which do not obey the third law of thermodynamics.

Or

(b) Derive on expression for the variation of chemical potential with temperature and pressure.

17. (a) What is meant by hydrogen over voltage? Explain any three applications of it.

Or

(b) Give one example each for concentration cell with transfer and without transfer. Derive an expression for emf of a concentration cell with transference.

18. (a) Discuss in detail about adsorption indicators.

Or

(b) Give an account of phase transfer catalysis.

19. (a) List the symmetry elements for the following molecules.

(i) H_2O

(ii) BF_3

(iii) NH_3

Or

(b) Explain

(i) Abelian group

(ii) Point group

(iii) Non–Abelian group

(iv) Cyclic group

20. (a) Discuss the applications of IR spectroscopy.

Or

(b) Explain about the theory of UV and visible spectra.

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