D 43229 **(Pages : 3)** **Name..................................**

Reg. No...............................

SECOND SEMESTER B.Sc. DEGREE EXAMINATION, MAY 2018

(CUCBCSS–UG)

Complementary Course

CHE 2C 02—PHYSICAL CHEMISTRY

Time : Three Hours Maximum : 64 Marks

Section A (One Word/Sentence)

Answer **all** *questions.*
Each question carries 1 *mark.*

1. For a chemical reaction to proceed in a particular direction, the value of ΔG should be ———.
2. The most probable velocity of a gas varies inversely as the square root of ———.
3. The deviation of a gas from ideal behaviour is maximum at low temperature and ———.
4. There are ——— Bravais lattices possible in crystals.
5. Name the unit cell, which resembled a match box in its shape.
6. Liquid drops are spherical in shape due to ———.
7. The SI unit of viscosity is ———.
8. The specific conductance K and specific resistance ρ of a conductor are related as ———.
9. Name a salt, which will not undergo hydrolysis, when dissolved in water.
10. In a SHE, the concentration of H^+ ions is ———.

($10 \times 1 = 10$ marks)

Section B (Short Answers)

Answer any **seven** *questions.*
Each question carries 2 *marks.*

11. State the third law of thermodynamics.
12. What is an open system ? Give one example.
13. Write the Bragg's equation and explain the terms.
14. Calculate the average velocity of O_2 molecules at 273 K.
15. Differentiate between extrinsic and intrinsic imperfections in crystals.
16. Explain reverse osmosis.
17. What are the factors that affect the V.P. of a liquid ?
18. Mention any four advantages of conductometric titrations.

Turn over

19. 0.5 N solution of a salt placed between two Pt electrodes 20 cm. apart and area of cross-section 4 cm^2, has a resistance of 20 ohms. Calculate the equivalent conductance of the solution.

20. Aqueous solution of Na_2CO_3 is basic in nature. Why ?

(7 × 2 = 14 marks)

Section C (Paragraphs)

Answer any **four** *questions.*
Each question carries 5 *marks.*

21. (a) Explain the physical significance of Gibb's free energy.

(b) For the hypothetical reaction $A_2 + B_2 \rightleftharpoons 2AB$, the ΔH and ΔS values are 52.8 kJ $mol.^{-1}$ and 132 J $mol.^{-1}$ respectively. Calculate the temperature at which the reaction attains equilibrium.

22. (a) State and formulate the first law of thermodynamics.

(b) One mole of water changes to steam at 100° C., by absorbing 41 kJ of heat. The work done by the system during the process is 3.5 kJ. Calculate the increase in internal energy associated with the change.

23. Explain Maxwell's distribution of molecular velocities. What is the effect of temperature in the distribution ?

24. State and explain Henry's law. Mention any two applications of the law.

25. Explain the construction and working of a standard hydrogen electrode. Write any two limitations of the electrode.

26. State and explain Kohlrausch's law. Give any three applications of the law.

(4 × 5 = 20 marks)

Section D (Essays)

Answer any **two** *questions.*
Each question carries 10 *marks.*

27. (a) State the Second law of thermodynamics in terms of entropy. Explain how the spontaneity of a process is related to entropy change.

(4 marks)

(b) Derive an equation to related the internal energy change of a reaction with the enthalpy change.

(3 marks)

(c) The enthalpy of formation of CH_4, according to the equation $C_{(s)} + 2H_{2(g)} \rightarrow CH_{4(g)}$ is – 76 kJ at 300 K. Calculate the value of ΔE for the reaction at 300 K.

(3 marks)

28. (a) What are liquid crystals ? How are they classified ? Mention any *four* applications of liquid crystals.

(7 marks)

(b) Write briefly on the symmetry elements in crystal systems. (3 marks)

29. (a) From the laws of osmotic pressure, derive an equation to related the osmotic pressure of a solution with temperature and molecular mass of the dissolved solute.

(b) What are fuel cells ? Explain the working of H_2–O_2 fuel cell.

30. (a) What are buffer solutions ? Explain the buffer action of CH_3COOH—CH_3COONa buffer.

(4 marks)

(b) Derive the Henderson equation for an audio buffer. (3 marks)

(c) Calculate the EMF of the cell $Zn\left|Zn^{2+}_{(0.01m)}\right|\left|Cu^{2+}_{(1m)}\right|Cu$ at 25° C. Given E° $Zn^{2+}/Zn = -0.76$ V and E° $Cu^{2+}/Cu = 0.34$ V.

(3 marks)

[2 × 10 = 20 marks]