C 83005 **(Pages : 3)** **Name**

Reg. No. . . . . .

SECOND SEMESTER B.Sc. DEGREE EXAMINATION, MAY 2015

(CUCBCSS–UG)

Complementary Course – Chemistry

CHE 2C 02 – Complementary Course II – PHYSICAL CHEMISTRY

Time : Three Hours Maximum : 64 Marks

Section A (One Word/Sentence)

Answer **all** *questions.*

Each question carries 1 mark.

1. According to the third law of thermodynamics, the entropy of a perfect crystal is zero at _____
2. The average velocity of a gas varies directly as the square root of _____
3. Name the most unsymmetrical crystal system.
4. _____ solids are anisotropic.
5. The maximum number of Bravai's lattices possible for crystals is _____
6. Write the S.I. unit of surface tension.
7. Viscosity of a liquid _____ with increase in temperature.
8. Specific conductance is the reciprocal of _____
9. When Na_2CO_3 is dissolved in water the pH of the solution will _____
10. For $Al_2(SO_4)_3$ solution, the equivalent conductance λeq and molar conductance λm are related as _____

(10 x **1** = 10 marks)

Section B (Short Answer)

Answer any **seven** *questions.*

Each question carries 2 marks.

11. State the first law of thermodynamics.
12. What are open and closed systems? Give *one* example each.
13. Write the vander Waal's equation for 'n' moles of a gas and explain the terms.
14. Calculate the RMS velocity of hydrogen molecule at 300 K.
15. Calculate the Miller indices of a plane whose intercepts are 2a, 3b and 2C.
16. State Henry's law.

Turn over

17. Write any *two* factors that affect the vapourisation of a liquid.

18. Write any *four* advantages of conductometric titrations.

19. The molar conductance of infinite dilution of CH_3COONa, HCl and NaCl in S cm^2 mol^{-1}, are 91,426.2 and 126.5 respectively. Calculate the λm^{∞} value of CH_3COOH.

20. The resistance of a 10^{-2} N solution of a weak acid is 5 x 10^3 ohms, in a conductivity cell of cell constant 0.5 cm^{-1}. Calculate the equivalent conductance of the solution at this concentration.

(7 x 2 = 14 marks)

Section C (Paragraph)

Answer any **four** *questions.*

Each question carries 5 *marks.*

21. (i) Derive an equation to relate the enthalpy change and internal energy change of a reaction.

(ii) The enthalpy change for the reaction $CH_{4(g)} + 2O_{2(g)} \rightarrow Co_{2(g)} + 2H_2O_{(l)}$ is – 890.5 kJ at 300 K. Calculate the value of internal energy change at the same temperature.

22. (i) State the second law of thermodynamics based on entropy.

(ii) The enthalpy of vapourisation of water is 40.6 kJ mol^{-1} at 100° C. Calculate the entropy of vapourisation at 100° C.

23. What are the features of Maxwell's distribution curve? Explain the effect of temperature on the distribution.

24. Explain reverse osmosis. Write any *two* applications of reverse osmosis.

25. What are reference electrodes? Explain the construction and working of a standard Hydrogen Electrode.

26. Explain the effect of dilution in the specific conductance and molar conductance of a strong electrolyte.

(**4 x 5** = 20 marks)

Section D (Essay)

Answer any **two** *questions.*

Each question carries 10 marks.

27. (i) What is the physical significance of Gibb's free energy? Explain the effect of temperature in the spontaneity of a reaction.

(ii) The enthalpy change and entropy change for the decomposition of H_2O_2, are – 212 kJ mol^{-1} and 132 J mol^{-1} respectively. Predict the feasibility of the process at 300 K.

(6 + 4 = 10 marks)

28. (i) What are liquid crystals? Name the different types of liquid crystals. Mention any *four* applications of liquid crystals.

(ii) Explain the different types of stoichiometric defects.

(6 +.4 = 10 marks)

29. (i) From the laws of osmotic pressure, derive an equation for the molecular mass of a solute.

(ii) Write the cell reaction taking place in the electrochemical cell Zn/Zn^{+} (10^{-3} m) Ag^{+} ($1O^{-1}$ m) Ag and calculate the EMF of the cell at 25° C. Given $E^{0}Zn^{+}/Zn$ – 0.76 V and $E^{0}Ag^{+}/Ag$ = 0.80 V.

30. (i) What are buffer solutions? How are they classified? Derive an equation for the pH for a buffer.

(ii) Explain the working of a H_2–O_2 fuel cell.

(6 + 4 = 10 marks)

[2 x 10 = 20 marks]