

C 4120

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Name.....

Reg. No.....

SECOND SEMESTER (CUCBCSS-UG) DEGREE EXAMINATION, APRIL 2021

Chemistry

CHE 2C 02—PHYSICAL CHEMISTRY

Time : Three Hours

Maximum : 64 Marks

Section A (One word)

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

1. Thermodynamic system, which can exchange neither energy nor matter with the surroundings is called _____ system.
2. According to third law of thermodynamics, the entropy of a perfect crystal is zero at _____.
3. The deviation of a gas from ideal behaviour is maximum at high pressure and _____.
4. The edge lengths and interfacial angles of the unit cell of a crystal are given as $a = b = c$ and $\alpha = \beta = \gamma \neq 90^\circ$. The crystal system is _____.
5. The maximum number of Bravais lattices is _____.
6. The vapour pressure of a liquid becomes equal to one atmosphere at its normal _____.
7. Properties of solutions which depend on the number of particles dissolved and not on their nature are called _____.
8. The conductance of a column of electrolyte of unit volume is called _____.
9. For an aqueous solution of $\text{Al}_2(\text{SO}_4)_3$, the equivalent conductance λ_{eq} and molar conductance λ_m are related as _____.
10. The relation between the hydronium ion concentration $[\text{H}_3\text{O}^+]$, dissociation constant of the acid K_a and concentration of the acid 'C' is given as $[\text{H}_3\text{O}^+] =$ _____.

(10 × 1 = 10 marks)

Section B (Short Answer)

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

11. State the second law of thermodynamics in terms of entropy.
12. A gas contained in cylinder expands from a volume of 10 L to 20 L against a constant external pressure of one atmosphere. For this the gas absorbs 800 J heat from the surroundings. Calculate the change in internal energy of the gas, during the process.

Turn over

13. Amorphous solids are isotropic while crystalline solids are anisotropic. Explain.
14. Write the van der Waal's equation for 'n' moles of a gas and explain the terms.
15. Find the Miller indices of a plane whose intercepts are $2a$, $3b$ and $3c$.
16. Mention any two applications of Henry's law.
17. What is the reason for surface tension of a liquid ?
18. What is the nature of NH_4Cl in water ? Give reason.
19. Write any two limitations of a Standard Hydrogen Electrode.
20. Calculate the osmotic pressure of an aqueous solution containing 6 gram glucose in one litre solution, at 300 K.

(7 × 2 = 14 marks)

Section C (Paragraph)

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

21. The heat of combustion of $\text{CH}_4(\text{g})$ is -855 kJ mol^{-1} at 300 K, under constant volume condition. Calculate the heat of combustion of $\text{CH}_4(\text{g})$ at constant pressure.
22. What is meant by the term 'entropy' ? How will you explain the spontaneity of a process in terms of entropy ?
23. With the help of a diagram, explain the effect of temperature in the distribution of velocities among different molecules in a gas.
24. Write briefly on the classification and applications of liquid crystals.
25. Compare the effect of dilution on the molar conductance of a strong electrolyte with that of a weak electrolyte.
26. Discuss the conductometric titration curves of :
 - (i) Strong acid – strong base titration.
 - (ii) Strong acid – weak base titration.

(4 × 5 = 20 marks)

Section D (Essay)

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

27. (i) What is meant by Gibb's free energy ? How is it physically significant ? (4 marks)
- (ii) Explain the effect of temperature in the spontaneity of a process in terms of ΔG , ΔS and ΔH . (4 marks)
- (iii) The enthalpy change associated with the fusion of 18 gram ice at 273 K is 6000 J. Calculate the molar entropy of fusion of ice, at 0°C . (2 marks)

28. Give a brief account of the different types of imperfections in solids.
29. (i) From the laws of osmotic pressure derive the general solution equation. (4 marks)
- (ii) Explain reverse osmosis. (3 marks)
- (iii) What are reference electrodes ? Give example. (3 marks)
30. (i) What are buffer solutions ? How are they classified ? (4 marks)
- (ii) In a buffer solution of CH_3COOH and CH_3COONa , the concentrations of the acid and salt are in the ratio 1 : 10. If the pK_a value of CH_3COOH is 4.74, calculate the pH of the buffer. (3 marks)
- (iii) The equivalent conductance at infinite dilution of NaCl , HCl and CH_3COONa are 126.5, 426 and $91 \text{ Ohm}^{-1}\text{cm}^2\text{eq}^{-1}$ respectively. Calculate the equivalent conductance at infinite dilution of CH_3COOH . (3 marks)
- [2 × 10 = 20 marks]