

## SECOND SEMESTER B.Sc. DEGREE EXAMINATION, MAY 2017

(CUCBCSS—UG)

Complementary Course

CHE 2C 02—PHYSICAL CHEMISTRY

Time : Three Hours

Maximum : 64 Marks

## Section A

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

1. The number of atoms per unit cell with BCC lattice is \_\_\_\_\_.
2. The miller indices of a plane with intercepts  $1a$ ,  $2b$ ,  $3c$  is given by \_\_\_\_\_
3. If the RMS velocity of  $\text{CH}_4$  gas is  $100 \text{ ms}^{-1}$ , the RMS velocity of  $\text{SO}_2$  gas molecules at the same temperature will be \_\_\_\_\_.
4. Name a property which is inversely proportional to critical volume.
5. What is meant by path function ?
6. A thermodynamic process without change in volume is called \_\_\_\_\_.
7. For an ideal solution, the value of  $\Delta_{\text{mix}}H$  is \_\_\_\_\_.
8. In thermodynamics, what is the relationship between  $q_p$  and  $q_v$  ?
9. Which among the metals Zn, Cu and Ag will liberate hydrogen from dil. HCl ?
10. Write the Nernst equation for the electrode  $\text{Cu} | \text{Cu}^{2+}$ .

(10 × 1 = 10 marks)

## Section B

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

11. For the reaction  $\text{A}_{2(\text{g})} + \text{B}_{2(\text{g})} \rightarrow 2\text{AB}_{(\text{g})}$ ;  $\Delta H = 80 \text{ kJ}$ ,  $\Delta S = 130 \text{ J}$  at  $300\text{K}$ . Is the reaction spontaneous ? If not predict the temperature above which the reaction is spontaneous
12. Using X-rays of wave length  $0.0576 \text{ nm}$  first order diffraction was recorded at  $6^\circ 54'$  for a single crystal. Calculate the interplanar distance.

13. What is electro chemical series ? Give any *two* of its utility.
14. Calculate the average velocity of nitrogen molecule at STP
15. Define conductivity of a conductor. How is it related to the resistance of the conductor ?
16. State and explain Kohlraush's law. Mention any *one* of its applications.
17. EMF of a galvanic cell formed by coupling hydrogen electrode with saturated calomel electrode was found to be 0.45 V. What is the  $P^H$  of the solution at the hydrogen electrode ? (Given  $E^0_{(red)} = 0.24V$ ).
18. At 298K, the ionization constant of 0.1 M acetic acid has a value of  $4.9 \times 10^{-8}$ . Calculate  $P^H$  of the solution.
19. What is meant by anisotropic property ? Give one example.
20. Define Henry's law. Mention one of its applications.

(7 × 2 = 14 marks)

### Section C

*Answer any four questions.*

*Each question carries 5 marks.*

21. Show that decrease in Gibbs free energy in a process is equal to the useful work done by the system.
22. Discuss how van der waal's equation address deviation of real gases from ideal behavior ?
23. Derive the Bragg equation.
24. At 25°C, the conductivity of 0.1M KCl is  $0.01291 \text{ ohm}^{-1} \text{ cm}^{-1}$ . Its resistance in a conductivity cell at the same temperature is found to be 192.4 ohm. A solution of another electrolyte BA with concentration 0.01M offers a resistance of 250 ohms in the same cell. Calculate the molar conductance of BA
25. What is calomel electrode ? Give the Nernst equation for the *emf* of the electrode.
26. What are liquid crystals ? Write a note on the types of liquid crystals

(4 × 5 = 20 marks)

**Section D**

*Answer any two questions.*

*Each question carries 10 marks.*

27. (a) What are liquid crystals ? How are they classified ? Give any *one* example for each type.  
(b) Write a note on Maxwell's equation for the distribution of molecular velocity.
28. (a) Define and differentiate entropy and enthalpy. Explain the entropy criteria for reversible and irreversible processes.  
(b) Write a note on the laws of crystallography.
29. (a) Define Raoult's law. Explain how the determination of elevation in boiling point can be used for the determination of molecular mass.  
(b) Write a note on the different type of defects in crystals.
30. Define Kohlrausch's law. Discuss the different applications of it.

(2 × 10 = 20 marks)