C 81769 (Pages : 3) Name.....

Reg. No.....

SECOND SEMESTER (CUCBCSS—UG) DEGREE EXAMINATION APRIL 2020

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. The entropy of a perfect crystal is zero at OK, according to the ——— law of thermodynamics.
2. A 'flying bird" is an example of ——— system.
3. When the value of absolute temperature is doubled, the average velocity of a gas will become ——— times the initial value.
4. The most symmetrical crystal system is ———.
5. ——— solids are isotropic.
6. In a face centred cube, particles are present at all the corners and ——— of the unit cell.
7. The SI unit of viscosity is ———.
8. The surface tension of a liquid will ——— with increase in temperature.
9. Aqueous solution of CH_3 COONa is ——— in nature.
10. The equivalent conductance of a strong electrolyte will ——— with increase in dilution.

(10 × 1 = 10 marks)

Section B (Short Answers)

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

11. Calculate the R M S Velocity of Hz gas at 300 K.
12. Give the mathematical formulation of first law of thermodynamics and explain the terms.

Turn over

13. Calculate the entropy of vapourisation of water at its normal B. P. Given the enthalpy of vapourisation of Water at 100°C as 40.6 $kJmol^{-1}$.

14. First order diffraction of X-rays of wave length 1.54 A° takes place from the successive planes of a crystal at an angle of 11.3°. Calculate the inter-planar distance in the crystal.

15. What are the faulty assumptions in the kinetic theory of gases ?

16. Write any *two* applications of Henry's law.

17. What are colligative properties ? Give any *two* examples.

18. The resistance of a 10^{-2} molar solution of a weak acid is 5×10^{-3} ohms, when measured in a conductivity cell of cell constant 0.5 cm^{-1}. Calculate the molar conductance of the solution.

19. Write the principle of conductometric titrations.

20. Calculate the pH of one litre of a buffer solution containing 0.01 M NH_4Cl and 0.01 M NH_4OH. kb value of NH_4OH is 1×10^{-5}.

(7 × 2 = 14 marks)

Section C (Paragraph)

Answer any **four** *questions.*

Each question carries 5 *marks.*

21. (i) What is Gibb's free energy ? What is the physical significance of Gibb's free energy ?

(3 marks)

(ii) The enthalpy change and entropy change associated with the decomposition of a substance are – 210 kJ mol^{-1} and – 130 J mol^{-1} respectively at 300 K. Predict the feasibility of the process at 300 K.

(2 marks)

22. (i) The enthalpy change for the combustion of CH_4 is – 890.5 kJ mol^{-1} at 300 K. Calculate the internal energy change for the process at the same temperature.

(3 marks)

(ii) State the second law of thermodynamics based on entropy. (2 marks)

23. Write the important features of Maxwell-Boltzmann distribution curve. Explain the effect of temperature in the distribution of molecular velocities.

24. What is meant by reversis osmosis ? Write any *two* applications of reverse osmosis.

25. State and explain Kohlrausch's law. Mention any *two* applications of the law.

26. Explain the construction and working of a standard hydrogen electrode.

[4 × 5 = 20 marks]

Section D (Essays)

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

27. (i) What is meant by entropy of a system ? What is its significance ? Explain the spontaneity of a process in terms of entropy.

(6 marks)

(ii) Calculate the entropy change during the isothermal reversible expansion of 10 moles of an ideal gas from an initial volume of 10 litre to a final volume of 100 litre at 300 K.

(4 marks)

28. (i) Give a brief account of the Schottky and Frenkel defects. (4 marks)

(ii) What are liquid crystals ? How are they classified ? Write any *two* applications of liquid crystals.

(6 marks)

29. (i) From the laws of osmotic pressure, derive an equation for determining the molar mass of the dissolved solute in a solution.

(5 marks)

(ii) Discuss the construction and working of $H_2 - O_2$ fuel cell. (5 marks)

30. (i) Explain the effect of dilution in the molar conductance of both strong and weak electrolytes.

(6 marks)

(ii) Calculate the EMF of the electrochemical cell $Cu\left|\underset{(0.001m)}{Cu^{2+}}\right\|\underset{(0.1\,M)}{Ag^{+}}\left|Ag\right.$ at 298 K. Given

$E^{\circ}\, Cu^{2+} \mid Cu = .34\ V$ and $E^{\circ}\, Ag^{+} / Ag = .8\ V$.

(4 marks)

[2 × 10 = 20 marks]