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 $5 \times 10^{-3}$ 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 $1 \times 10^{-5}$.

(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 $Cu\left|{}^{Cu^{2+}}_{(0.001m)}\right\|Ag^{+}\,|Ag$ at 298 K. Given $(0.1\,M)$

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

(4 marks)

[2 × 10 = 20 marks]

C 62627 (Pages : 2) Name.....

Reg. No.....

# SECOND SEMESTER B.Sc. DEGREE EXAMINATION, MAY 2019

(CUCBCSS—UG)

Chemistry

CHE 2C 02—PHYSICAL CHEMISTRY

Time : Three Hours Maximum : 64 Marks

## Section A

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

1. ———— liquid crystals show the flow behavior of liquids.
2. The number of axes of symmetry in a cubic crystal are ————.
3. The net work that can be obtained from a system at constant pressure and temperature is called ————.
4. A calomel electrode is represented as ————.
5. Write down van't Hoff equation for osmotic pressure.
6. For a reversible process, the condition for entropy change is ————.
7. The cell dimension for a triclinic crystal is ————.
8. Give an example for basic buffer solution.
9. Write the Nernst equation to find out the potential of an electrode.
10. The smallest repeating units in a space lattice is called ————.

(10 × 1 = 10 marks)

## Section B

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

11. What is standard hydrogen electrode ?
12. Why drops of a liquid or bubbles of a gas are spherical in shape ?
13. Give any two applications of liquid crystals.
14. Differentiate between intrinsic and extrinsic properties.
15. State Boyle's law.

**Turn over**

16. What is Ostwald's dilution law ?
17. Explain the term absolute entropy.
18. Define reverse osmosis.
19. What are Miller indices ? How are they determined ?
20. By conductance measurements how will you find out the solubility of a sparingly soluble salt ?

(7 × 2 = 14 marks)

## Section C

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

21. Explain the relation between specific conductance, equivalence conductance and molar conductance.
22. Comment on the criteria for spontaneity of a reaction based on free energy.
23. Calculate the r.m.s. velocity, average velocity and most probable velocity of hydrogen gas at 0°C.
24. Explain the effect of temperature and pressure on viscosity.
25. Describe the defects in crystals.
26. Write a note on conductometric titrations.

(4 × 5 = 20 marks)

## Section D

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

27. (i) Give the van der Waal's equation for describing the P-V-T relationship in real gases. How the equation satisfactorily explains the deviation of real gases from ideal behavior ?

    (ii) Derive Bragg's equation.

28. (i) What are fuel cells ? Describe the functioning of $H_2$-$O_2$ fuel cell.

    (ii) Derive the degree of hydrolysis and hydrolysis constant of salt of a weak acid and strong base.

29. What are the factors influencing the solubility of gases in liquids ? Explain using Henry's law.

30. (i) What are the terms internal energy change and enthalpy change of a system ? Derive the relation between $\Delta U$ and $\Delta H$.

    (ii) Calculate the entropy change in the evaporation of one mole of water at 100°C. (Heat of vaporization of water at 100°C is 2259.4 $Jg^{-1}$)

(2 × 10 = 20 marks)