

### U.G. 3rd Semester Examination-2020

### CHEMISTRY

### [HONOURS]

Course Code : CHEM-H-CC-T-05

Full Marks : 40

Time : 2½ Hours

*The figures in the right-hand margin indicate marks.*

*Candidates are required to give their answers in their own words as far as practicable.*

1. Answer any **five** questions from the following:

2×5=10

- i) Distinguish between viscosity and co-efficient of viscosity.
- ii) Define ionic mobility and mention its unit.
- iii) Show the nature of conductometric titration curve when H<sub>2</sub>SO<sub>4</sub> is titrated with NaOH solution conductometrically.
- iv) You have a test tube containing 10ml of 0.1(N) KCl solution. What will be the change in specific and equivalent conductance of 10ml of pure water is add to it?
- v) Define fugacity and fugacity co-efficient and mention its significance.
- vi) Find the expectation value of  $p_x^2$ .

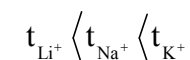
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vii) Calculate the mean ionic activity co-efficient of 0.001(M) K<sub>3</sub>Fe(CN)<sub>6</sub> solution at 25°C.

2. Answer any **two** questions from the following:

5×2=10

- i) a) Define transport number. Show with a suitable example where transport number shows negative value. Give reason behind it. 1+1+1=3
- b) Transport number of the following ions is in the order :



– Justify. 2

- ii) a) Deduce the change in entropy of a binary mixture of ideal gases.
- b) Also show that entropy increase is maximum at  $x_1=x_2=0.5$ . Show graphically also.

3+2=5

- iii) a) In the measurement of conductance of an electrolytic solution, which current (AC or DC) is used and why? 2
- b) The equivalent conductance of an infinitely dilute solution of NH<sub>4</sub>Cl is 150

and the ion conductances of  $\text{OH}^+$  and  $\text{Cl}^-$  ions are 198 and  $70 \text{ ohm}^{-1}\text{cm}^2$ . What will be the value of  $\wedge_0$  of  $\text{NH}_4\text{OH}$ ? If the equivalent conductance of 0.01(M)  $\text{NH}_4\text{OH}$  solution be 9.6, what will be its degree of dissociation? 3

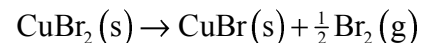
3. Answer any **two** questions from the following:

$$10 \times 2 = 20$$

- i) a) The standard heats of formation ( $\Delta H_f^0$ ) and entropies ( $S^0$ ) given are :

Substance $\rightarrow$	$\text{CuBr}_2$	$\text{CuBr}$	$\text{Br}_2(\text{g})$
$\Delta H_f^0 (\text{KCal mol}^{-1}) \rightarrow$	-33.2	-25.0	+7.4
$S^0 (\text{Cal Mol}^{-1}\text{K}^{-1}) \rightarrow$	+30	+22	+58.6

Discuss the feasibility of the reaction,



at  $200^\circ\text{C}$  and  $300^\circ\text{C}$ .

- b) Show that  $\left[ \frac{\partial(G/T)}{\partial T} \right]_p = -\frac{H}{T^2}$

where, the symbols have their usual significance.

- c) Give two important applications of viscosity measurement.  $5+3+2=10$

- ii) a) Derive a relation between specific and equivalent conductance of an electrolytic solution.

- b) A conductivity cell has electrodes 0.6cm apart and each of area is  $0.8\text{cm}^2$ . If the equivalent conductance of a saturated solution of  $\text{AgCl}$  be  $130 \text{ ohm}^{-1}\text{cm}^2$  and its solubility product is  $1.06 \times 10^{-10}$  at a given temperature. What resistance will be registered by the saturated  $\text{AgCl}$  solution when measured in the given conductivity cell at the same temperature?

- c) Which principle is used in measuring the conductance of an electrolytic solution? Show figure of the principle.

$$2\frac{1}{2} + 5 + 2\frac{1}{2} = 10$$

- iii) a) The wave function for a particle in a 1D box is given by

$$\Psi_n = D \sin \frac{n\pi}{a} x$$

where the symbols have their usual significances. Evaluate the value of D under normalized condition.

- b) What will happen if the walls of the box containing the particle are suddenly removed?

- c) Briefly explain the phenomenon of photoelectric effect.
- d) Calculate the kinetic energy of the photo electron emitted from the surface of Potassium ( $W=2.26\text{eV}$ ) when illuminated by radiation of  $4000\text{ \AA}$ .  $2+2+3+3=10$
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