



Reg NO:

Date: 02-12-2020

ST. JOSEPH'S COLLEGE (AUTONOMOUS), BANGALORE - 27

B.Sc. CHEMISTRY - V SEMESTER

END-SEMESTER EXAMINATION - November 2020

CH 5218 - CHEMISTRY V

Time: 2 1/2 hours

Maximum marks: 70

Physical constants: $R=8.314\text{JK}^{-1}\text{mol}^{-1}$, $F=96500\text{Cmol}^{-1}$, $h=6.626\times 10^{-34}\text{Js}$, $c=3\times 10^8\text{m s}^{-1}$, $N=6.023\times 10^{23}\text{mol}^{-1}$

Note: This question paper has three parts and 21 questions. All parts are compulsory.

Part A

Answer anySIX questions from the following.

(2 x 6 = 12 marks)

1. Define the term: single electrode potential.
2. Represent graphically the variation of molar conductance of weak and strong electrolytes with respect to concentration.
3. Account for the abnormal ionic mobility of alkali metal ions in water.
4. Write any two applications of determining emf of concentration cells.
5. What are interfacial angles? How are they represented in two dimensions?
6. Define the term: 'number of degrees of freedom'. Write an equation for calculating it.
7. State the laws of photochemistry.
8. Explain Latimer diagram with a suitable example.

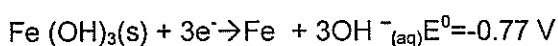
Part B

Answer anyEIGHT questions from the following.

(6 x 8 = 48 marks)

9. Discuss the Debye-Huckel-Onsager theory for aqueous solutions of 1:1 electrolyte. Write its mathematical expression and explain the terms.
10. (a) Discuss the factors affecting transport numbers with suitable illustrations.
(b) Calculate the area of cross section of identical electrodes of a conductivity cell separated by a distance of 0.935 cm, if a decimolar solution of KCl (specific conductance = 1.12 Sm^{-1}) offered a resistance of $55\ \Omega$ at 26°C [3 + 3]

11.(a) Calculate the solubility product of ferric hydroxide at 25 °C from following data:



(b) What is a salt bridge? What type of electrolyte is used in it? (3+3)

12.(a) How do you setup a saturated calomel electrode? Write the half cell reaction.

(b) Calculate the equilibrium constant for the reaction in Daniel cell with emf of 1.10V.

(3+3)

13.(a) Explain photostationary state with a suitable example.

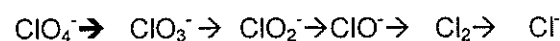
(b) Calculate Miller indices for the plane which makes intercept of 2, 2 and 2 units along x, y and z axes and represent it diagrammatically. (3+3)

14. Write briefly the principle, procedure and data analysis involved in the experimental determination of crystal parameters by rotating crystal method.

15. Draw and explain the phase diagram of lead –silver system. Illustrate its industrial application for desilverisation of lead.

16) What is Frost diagram? Construct Frost diagram of chlorine from the following data in volts (V) at 25°C. (Without the help of graph sheet, draw the Frost diagram).

+0.37 +0.30 +0.68+0.42 +1.36



17. Explain the origin of radiative and non-radiative transitions using Jablonski diagram.

What are the differences between fluorescence and phosphorescence?

18.(a) What is Pourbaix diagram? Mention its advantages.

(b) Draw the phase diagram of water and calculate the degrees of freedom for

(i) areas and (ii) the point of intersection of lines. (3+3)

Part C

Answer any **TWO** questions from the following. (5 x 2 = 10 marks)

19. A conductivity cell filled with pure water, 0.1 M KCl and 6×10^{-5} M NH_4OH solutions offers resistances of 1.3, 55.0 and $1 \times 10^5 \Omega$ respectively. The specific conductance of given KCl solution is $1.288 \Omega^{-1}\text{m}^{-1}$. At infinite dilution, molar conductance of ammonium ions and hydroxide ions are 73.4×10^{-4} and $198 \times 10^{-4} \Omega^{-1} \text{m}^2 \text{mol}^{-1}$ respectively. Calculate the dissociation constant of NH_4OH .

20. You are provided with pure iron and aluminium foils and two beakers containing 0.2 M ferrous sulphate and 0.2 M aluminium sulphate solutions.

Given $E^{\circ}_{\text{Fe}^{2+}/\text{Fe}} = -0.40\text{V}$ and $E^{\circ}_{\text{Al}^{3+}/\text{Al}} = -1.66\text{V}$, construct a galvanic cell

(i) Write its notation.

(ii) Identify the anode and the cathode and justify.

(iii) Calculate E°_{Cell} .

21. The photochemical reaction between hydrogen and chlorine has a quantum yield of 10^5 at a wave length of 600nm of incident radiation. Calculate the amount of energy (in joules) per second to be absorbed to form one mole of the product.

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