2023/06 SET

B.Sc. CHEMISTRY FOURTH SEMESTER PHYSICAL CHEMISTRY IV BSC - 403|SPECIAL REPEAT| [USE OMR FOR OBJECTIVE PART]

Duration: 3 hrs.

Full Marks: 70

Objective

Time: 30 min.

Marks: 20

Choose the correct answer from the following:

1X20 = 20

Which of the following is the correct form of Faraday's first law of electrolysis?

a. Z = WIt

b. I = ZWt

c. W = ZIt

- d. WZ = It
- In case of Galvanic cell, which of the following statement is true?

a. Associated with non-spontaneous

b. Oxidation takes place at the anode

- redox reaction
- c. The cathode is the negative electrode.
- d. The anode is the positive electrode
- In which of the following methods Calcium chloride (CaCl₂) is added? 3.

a. Extraction of Sodium

b. Extraction of Aluminium

c. Extraction of Copper

- d. Extraction of Silver
- The Chlor-alkali plants use salt and electricity to produce

a. backing potash and hydrogen gas

b. caustic potash and chlorine gas

c. backing soda and chlorine gas

- d. caustic soda and chlorine gas
- 5. Which one of the following is the strongest Oxidizing agent?

a. H₂

4.

b. F₂

c. Li

d. Cs

The units of ionic mobility in SI system is

a. m-1 s-1 v-1

b. m2 s-1 v-1

c. m-2 s-1 v-1

d. m-1 s-1 v

The molar conductance of a solution of lectrolyte is measured in

a. Ohm cm mol-1

b. Ohm 1 cm2 mol 1

c. Ohm 1 cm 1 mol 1

- d. Ohm cm 1 mol 1
- If v+ and v_be the speed of cation and anion respectively then the transport number of cation is

a. v_/(v+- v_)

b. V+/(v+-v)

c. V+/(v++ v_)

d. V_/(v++ v_)

9.	Kohlrausch law can be expressed as a. $\Lambda^{\circ}_{m} = \lambda^{\circ}_{+} \lambda^{\circ}_{-}$	b 40 - 10 30	
	a. $\Lambda^{\circ}_{m} = \lambda^{\circ}_{+} \lambda^{\circ}_{-}$ c. $\Lambda^{\circ}_{m} = \lambda^{\circ}_{+} - \lambda^{\circ}_{-}$	b. $\Lambda^{\circ}_{m} = \lambda^{\circ}_{-} - \lambda^{\circ}_{+}$ d. $\Lambda^{\circ}_{m} = \lambda^{\circ}_{+} + \lambda^{\circ}_{-}$	
		at 11 m	
10.	The unit of cell constant is	b. m	
	c. Sm	d. Sm ⁻¹	
11.	For the Daniel cell involving the cell reaction $Zn(s) + Cu^{2+}(aq) \Rightarrow Zn^{2+}(aq) + Cu(s)$	tion	
	The standard free energies of formation of Zn(s), Cu(s), Cu ²⁺ (aq) and Zn ²⁺ (aq) are 0, 0, 64.4 KJ mol ⁻¹ and -154.0 KJ/ mole ⁻¹ respectively. Calculate the standard EMF of th cell?		
	a. 1.13 C	b. 1.13 joule/C	
	c. 1.13 C. mol ⁻¹	d. None of the above	
2		sh the electrons enter the solution is calle	ad.
12.	In an electrolytic cell the electrode at which the electrons enter the solution is called the; the chemical change that occurs at this electrode is called		
	a. Anode, oxidation	b. Anode, reduction	
	c. Cathode, oxidation	d. Cathode, reduction	
3.	The difference between the electrode poter	entials of two electrodes when no current	is
	drawn through the cell is called		
	a. Cell potential	b. Cell emf	
	c. Potential difference	d. Cell voltage	
14.	Which of the following statement is not correct about an inert electrode in a cell?		
	a. It does not participate in the cell	 b. It provides surface either for 	
	reaction.	oxidation or for reduction reaction	٦.
	 It provides surface for conduction of electrons. 	d. It participates in electrolysis	
_			
15.	Which condition is true for Standard reducta. 1M concentration of each ion	b. Temperature is 25 °C	
	participating in the reaction.	b. Temperature is 25 °C	
	c. Pressure of hydrogen is 1	d. All of the above	
	atmosphere.		
6.	Which of the following equation and paras	umeter pair is correct?	
	a. Clausius-Mosotti and molar	b. Lorentz-lorenz and molar refracti	or
	polarization		
	c. Neither A nor B	d. Both A and B	
17.	Which of the following has permanent dipole moment		
	a. Cis 1,2-dichloroethene	b. Methane	
	c. Benzene	d. Sulfur hexafluoride	

18. Which of the following is correct with respect to magnetic susceptibility, X

a. X > for diamagnetic

c. X >>> 1 for ferromagnetic

b. X < 1 for paramagnetic d. All of them

Molecular oxygen is

a. Ferromagnetic

c. Diamagnetic

b. Ferrimagneticd. None of them

20. Which of the pairing is correct

a. ferromagnetism & Curie Temperature b. Antiferromagnetism & Neel

c. Both A & B

temperature

d. None of them

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Descriptive

Time: 2 hrs. 30 mins. Marks: 50

[Answer question no.1 & any four (4) from the rest]

1. a.In a cell containing a solution of AgNO₃, a certain amount of current was passed for 3 hours. The amount of silver deposited was found to be 60.8 g. Calculate the current strength.

b. Define Standard Hydrogen Electrode (SHE). What are the strong reductant and strong oxidant with reference to SHE and why?

- c. What do you mean by Electroplating? Describe the process of electroplating of iron spoon with copper.
- 2. a. Write down the difference between Galvanic and Electrolytic cells.

b. What is brine? Name the products obtained by electrolyzing brine. Write down all the reactions associated with the process.

- c. What are reversible and irreversible cells? Elaborate with example.
- 3. a. State and explain Kohlrausch's law of independent migration of 5+5=10 ions with example.
 - b. Λ°_{m} for NaCl, HCl and NaAc are 126.4, 425.9, and 91.0 Scm² mol⁻¹ respectively. Calculate Λ°_{m} for HAc.
- 4. a. Explain the mechanism of high mobility of H* ion. Mention the factors on which conductance of an ion depends.
 - b. Define degree of ionization. How can you measure degree of ionization and ionization constant for acetic acid from conductance measurement?

4

USTM/COE/R-01

5+5=10

2+3+5 =10

2+3+5

5. a. Derive the Nernst Equation.

5+5=10

1+1+3+

5=10

- b. A zinc rod is placed in 0.1M solution of Zinc sulphate at 25 °C. Assuming that the salt is dissociated to the extent of 95 percent at this dilution, calculate the potential of the electrode at this temperature? $E^{\circ}(Zn^{2+}, Zn) = -0.76V$
- 6. a. What is concentration cell? What is difference between concentration cell with transference and without transference?

 Derive the expression for the EMF of concentration cells without transference.
 - b. What is meant by activity coefficient of an electrolyte? Determine the mean ionic activity coefficient of HCl in a given solution of the acid.
- 7. a. Derive the Clausius Mosotti equation for describing molar polarization in terms of relative permittivity of the medium and distortion polarizability of a molecule.
 - State and explain Lorentz Lorenz equation correlating molar polarization with refractive index of a material.
 - c. Estimate the refractive index of acetic acid for yellow sodium light (589 nm) given that at this wavelength the Rm values of C-H, C-C, C-O, C=O and O-H bonds are 1.65, 1.20, 1.41, 3.34 and 1.85 cm³ mol⁻¹ respectively. For acetic acid M = 60.05 g/mol and ρ = 1.046 g cm⁻³.
- 8. a. Explain the term molar paramagnetic susceptibility. Briefly explain how it can be determined experimentally. 4+3+3
 - b. What do you understand by diamagnetic and paramagnetic substances? How would you account for ferromagnetism and antiferromagnetism?

c. The Gouy balance results showed that a sample of water in a tube of 0.1 cm² cross section that was partly in a magnetic flux density of 1 T was pushed out of the field by a force equal to the weight of 36 mg. Calculate the magnetic susceptibility χ and the molar magnetic susceptibility of the sample (μ 0 = 4 π X 10-7 J C-2 m-1 s²).

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