(6 pages) **Reg. No. :** .....

Code No. : 7400 **Sub. Code : HCHM 33**

M.Sc. (CBCS) DEGREE EXAMINATION,
NOVEMBER 2015.

Third Semester

Chemistry

PHYSICAL CHEMISTRY – III

(For those who joined in July 2012 onwards)

Time : Three hours Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. Example of C_2h point group is

   (a) $CHCl_3$

   (b) HCl

   (c) trans-dichloro ethylene

   (d) H_2O

2. Normal modes of vibration for CH_4 molecule is

   (a) 15 (b) 9

   (c) 6 (d) 2

3. The number of unshifted reactors by each symmetry operation gives the character of operation in ———— representation.

   (a) reducible (b) irreducible

   (c) SALC (d) HMO

4. CO_2 belongs to ———— point group.

   (a) C_aV (b) D_ah

   (c) D_4h (d) D_6h

5. Units of molar conductance is

   (a) Sm^2 (b) Sm^{-1}

   (c) $Smol/m^3$ (d) Sm^2/mol

6. Differential capacitance C is given as

   (a) $(\partial M/\partial V)$ constant (b) $(-\partial M/\partial V)$ constant

   (c) $(\partial qM/\partial V)$ constant (d) $(-\partial qM/\partial V)$ constant

7. In polarography, concentration polarization produced at ———— electrode

   (a) cationic (b) supporting

   (c) micro (d) macro

8. Which reaction does not occur at electrode surface

(a) Diffusion of reactant to the electrode

(b) Desorption of products from the electrode

(c) Diffusion of products towards the surface of electrode

(d) None of the above

9. In H_2-O_2, fuel cell the graphite electrodes are impregnated with ———— catalyst.

(a) Ti (b) Cr

(c) V (d) Pt

10. Langmuir adsorption isotherm is ————.

(a) $1/Q = KPA/1 - KPA$ (b) $1/Q = KPA/1 + KPA$

(c) $Q = KPA/1 + KPA$ (d) $Q = KPA/1 - KPA$

PART B — ($5 \times 5 = 25$ marks)

Answer ALL questions, choosing either (a) or (b).
Each answer should not exceed 250 words.

11. (a) Write the properties of a group? Apply it for C_3V molecule.

Or

(b) What are the subgroups in point group D_2h sub group? What is their order?

12. (a) Group theory is useful in constructing the hybrid orbital. Discuss it by taking CH_4 molecule.

Or

(b) Discuss the electronic spectra of ethylene molecule.

13. (a) Write an account on Debye Huckel theory of interionic interaction.

Or

(b) Discuss about Debye Falkenhagen and wein effect.

14. (a) Derive Butler–volmer equation for one step electron transfer equation.

Or

(b) Write short notes on corrosion and polarization of metals.

15. (a) Derivation of Gibbs equation.

Or

(b) Write notes on recovery of oil from surfactants.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b)
Each answer should not exceed 600 words.

16. (a) (i) What are properties of irreversible representations?

(ii) Discuss the group multiplication table for H_2O molecule.

Or

(b) Construct the character table for C_{2h} molecule.

17. (a) How will you calculate the delocalization energy of 1, 3-butadiene by using group theory

C_{3v}

Or

(b) What is the hybrid orbitals involved in XeF_4 molecule?

18. (a) Discuss the Debye Huckel limiting law. What are its applications to concentrated solution?

Or

(b) Describe the electrode electrolyte interface with reference to Gouy Chapmann model.

19. (a) Derive Tafel equation. Write the significance of Io and transfer co-efficient.

Or

(b) Discuss about polarizable and non polarizable electrodes.

20. (a) Write notes on surface active agents and their classifications. Explain two methods of determining critical miscelle concentration.

Or

(b) Derive BET equations. What is its significance?

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