



SPRING END SEMESTER EXAMINATION-2013

2nd Semester B.Tech & B.Tech Dual (M.Tech/MBA)

CHEMISTRY CH-201

[Regular-2012 & Back-2011, 2010 Admitted Batch]

Full Marks: 60

Time: 3 Hours

Answer any SIX questions including Question No.1 which is compulsory.

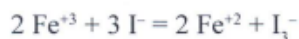
The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable and all parts of a question should be answered at one place only.

1. (a) What do you understand by 'regioselectivity'? Explain with $[2 \times 10]$ suitable examples.
- (b) A reaction proceeds 3 times faster at 310 K as it does at 300K. What is the energy of activation?
- (c) What are nano-materials? Give structures, characteristics and uses of fullerenes.
- (d) Explain with mechanism, what happens when sodium bisulphite is treated with propanal ?
- (e) If a complex appears yellow, what colour and wave length of light it has absorbed? Whether it is low spin or high spin complex?
- (f) What are promoters and catalytic poisons? Explain with suitable examples.

(1)

- (g) CO molecule shows IR absorption at 2143 cm^{-1} . What is the value of stretching force constant?
- (h) Write down the molecular orbital diagrams for N_2 and O_2 and compare their magnetic behavior.
- (i) A sub-atomic particle is moving with a K.E. of $5 \times 10^{-27}\text{ J}$. Find its wavelength.
- (j) Calculate the equilibrium constant for a cell reaction involving one electron transfer with standard potential of 0.196 V at 25°C .
2. (a) What do you understand by LCAO principle? With the help of this, explain how bonding and anti-bonding molecular orbitals are formed involving p-orbitals. [4]
- (b) Calculate the voltage required to accelerate an electron to have velocity of $1.87 \times 10^9\text{ ms}^{-1}$. What will be de Broglie wave length? [4]
3. (a) The magnetic moment of $[\text{Mn}(\text{CN})_6]^{3-}$ is nearly 2.8 BM . Predict the type of hybridization and the geometry of the complex ion. [4]
- (b) Calculate the CFSE and magnetic moment of the complex $[\text{Cu}(\text{NH}_3)_4]^{2+}$. [4]
4. (a) Discuss how the pH of one unknown solution can be determined by using quinhydrone electrode. [4]
- (b) Calculate the equilibrium constant for the following reaction, [4]

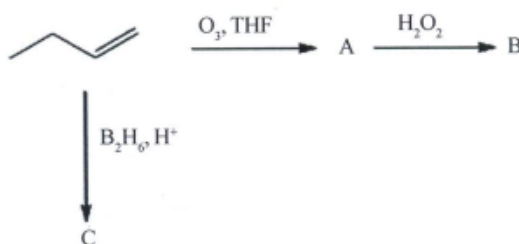


Given that the standard reduction potentials for $\text{Fe}^{+3}/\text{Fe}^{+2}$ and I_3^-/I^- are 0.77 V and 0.54 V respectively.

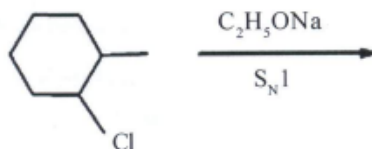
5. (a) What are enzymes? Discuss the Michaelis-Menten mechanism of enzyme catalysis reactions and how Michaelis constant (K_m) can be evaluated graphically. [4]

- (b) In a 1st order reaction, the concentration of reactant after 10 and 20 minutes from the start was found to be 14 and 8.5 units respectively. Calculate the initial concentration and rate constant. [4]

6. (a) Identify the products A, B & C and provide the mechanism involved in their formation. [4]



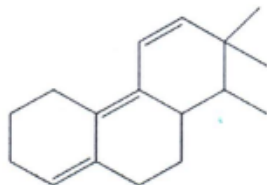
- (b) Write the product and mechanism involved in it. [4]



7. (a) Discuss different types of bending and stretching vibrations in IR spectroscopy with suitable diagrams. [4]

(3)

- (b) Find the λ_{max} value for the following compound. [4]



Basic values for hetero-annular diene = 215 nm, homo-annular diene = 253nm, increment for ring residue / alkyl substituent = 5nm, Exo-cyclic double bond = 5nm, Double bond extended conjugation = 30nm.

8. (a) What are secondary cells? How they differ from primary cells? [4]
Discuss the construction and working principle of Lead- acid storage battery and the reactions involved in it.
- (b) What are pitting corrosion and oxidation corrosion? Discuss [4]
with suitable examples.

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