RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College under University of Calcutta)

FIRST YEAR

B.A./B.Sc. SECOND SEMESTER (January – June) 2015

Mid-Semester Examination, March 2015

Date : 18/03/2015 **INDUSTRIAL CHEMISTRY (Honours)**

Time : 11 am – 1 pm Paper : II Full Marks : 50

[Use a separate answer book for each group]

Group – A

Answer <u>any two</u> questions : [2×5]

1. a) Calculate the energy of one photon of light of wavelength 2500Å. Will it be able to dissociate a bond in diatomic molecule which absorbs this photon and have bond energy equal to 95 kcal per mole. [3]
   b) Why chain inhibition step is occurred in HBr chain reaction? [2]

2. a) A certain system absorbs 3×10^8 quanta of light/sec. On irradiation for 20 min, 0·03 mole of the reactant was found to have reacted. Calculate the quantum yield for the process. Comment on the result. [2·5]
   b) Explain : HCl and HBr chain reactions are occurred but HI not. [2·5]

3. Draw the Jablonski diagram showing each state and processes. State Franck-Condon principle and explain its role in Jablonski diagram. [5]

4. $Cl_2 \xrightarrow{h\nu} 2Cl$; $CO + Cl \xrightarrow{k_2} COCl$; $COCl \xrightarrow{k_3} CO + Cl$

   $COCl + Cl_2 \xrightarrow{k_4} COCl_2 + Cl$; $COCl + Cl \xrightarrow{k_5} CO + Cl_2$

   Applying steady state approximations calculate the concentration of Cl. [5]

Group – B

Answer <u>any three</u> questions : [3×5]

5. a) Write down the IUPAC names for the following compounds :
      i) $K_4[Ni(CN)_4]$
      ii) $[CoCl(NO_2)(NH_3)_4]Cl$ [2]
   b) Write down the structures for all the isomers of $[Co(en)_2Cl_2]^+$ ion. [2]
   c) What do you mean by fac– and mer– isomers? [1]

6. a) Only Cds is precipitated when H_2S is passed through an ammoniacal solution containing Cu^{2+}, Cd^{2+} and excess CN^- ions. Explain why? [3]
   b) N_2H_4 cannot behave as a didentate ligand to a single metal ion. Explain. [2]

7. a) Indicate the donor points of the hexadentate ligand $edta^{4-}$ ion. Can it behave as a flexidentate ligand? Give such an example. [2]
   b) What do you mean by linkage isomerism? Illustrate the phenomenon using examples of metallic complexes. [3]

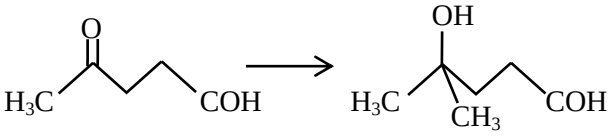
8. a) What do you mean by sequestering agent? Give an example. [2]
   b) Chelated compounds are found to be more stable. Explain why? [3]

9. a) What do you mean by innermetallic complex of first order? [2]
   b) State how hardness of water can be estimated using edta salt. [3]

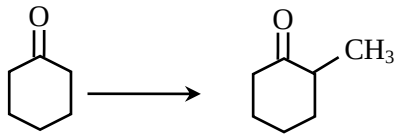
Group – C

Answer <u>any two</u> questions : [2×5]

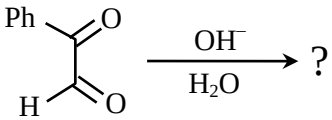
15. a) Chloral shows unexpectedly high rate of hydration —explain. [2]
    b) Carry out the following conversion with proper mechnaism. [3]



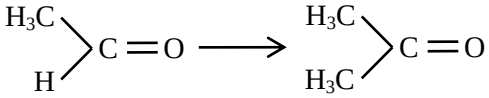
16. a) Thio-acetals are quite stable in aqueous acidic solution compared to acetals. —Explain. [2]
    b) How will you do the following reaction? (Give mechanism) [3]



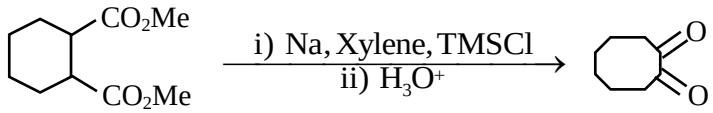
17. a) Why acetaldehyde does not response to Cannizzaro reaction? [2]
    b) Write down the product with proper mechanism. [3]



18. Carry out the following conversions with proper mechanisms.

a) 

[2]

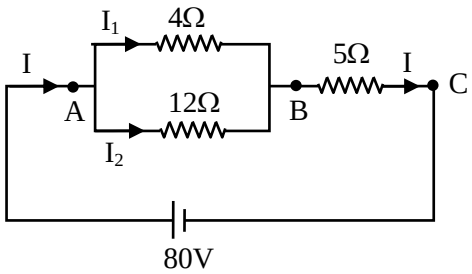
b) 

[3]

Group – D

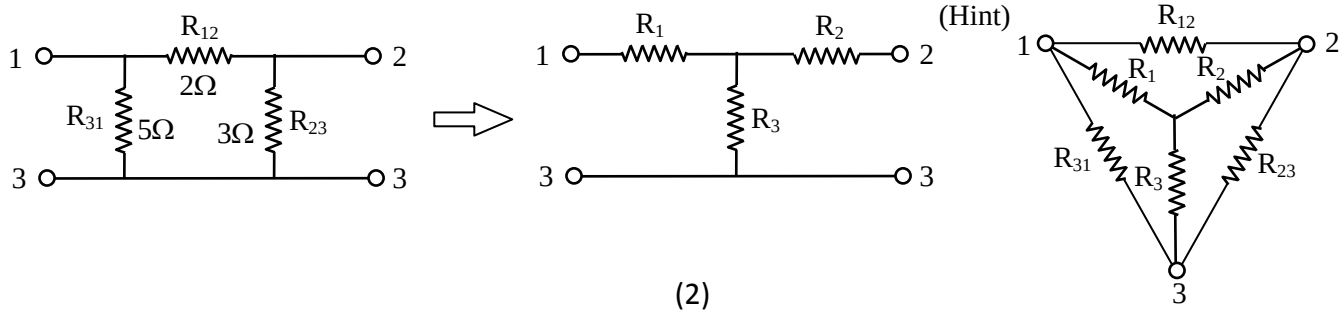
Answer <u>any three</u> questions : [3×5]

10. In the figure shown below find
    a) The voltage drop in each resistor
    b) The current in each resistor



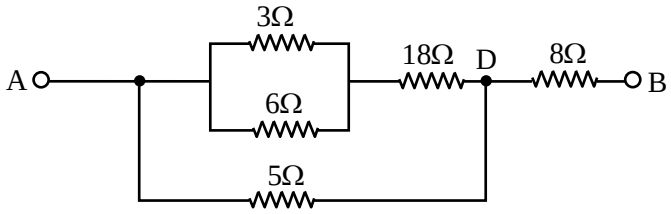
11. Using Δ to Y Transformations, convert the 'π' network (Δ network) to its 'T' equivalent

(Y network)

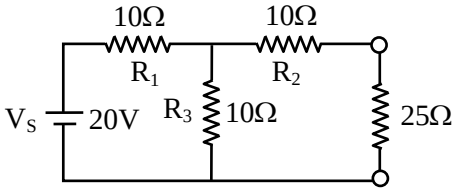


12. State **any five** of the following :
    a) Super position Theorem
    b) Kirchhoff's Current Law
    c) Kirchhoff's voltage Law
    d) Norton's Theorem
    e) Maximum Power Transfer Theorem
    f) Thevenin's Theorem

13. Calculate the effective resistance of the following combination of resistance and voltage drop across each resistance when a voltage of 60V –d.c is connected across points A & B.



14. Use Thevenin's theorem to determine the current through and the voltage across the 25Ω resistor in the figure below :



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