# RAMAKRISHNA MISSION VIDYAMANDIRA

**(Residential Autonomous College under University of Calcutta)**

**B.A./B.SC. SECOND SEMESTER EXAMINATION, MAY-JUNE 2013**

**FIRST YEAR**

Date : 20/05/2013 **Industrial Chemistry (Honours)**

Time : 11am – 3pm Paper : II Full Marks : 75

**(Use separate answer books for each group)**

## Group-A

## Unit-I

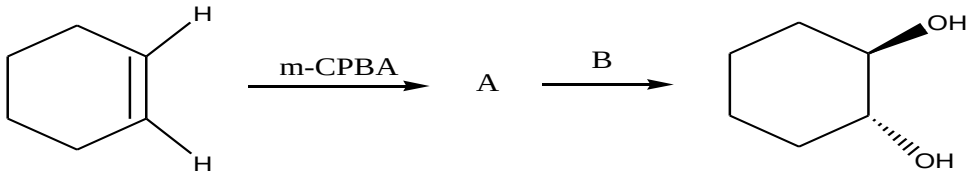
Answer any **three** questions

1. a) What products would you expect if 1,3-butadiene is treated with HBr at –80ºC? What will happen if the product mixture is heated to 40ºC in presence of HBr? Justify your answer. 3
   b) Carry out the conversion – 2
   Ethylene $\rightarrow$ Formaldehyde

2. a) Dehydrohalogenation of 3-bromohexane gives a mixture of cis and trans-2-hexene. How can this mixture be converted to pure (a) cis-2-hexene and (b) trans-2-hexene? 3
   b) Write down the mechanism of Friedel-Crafts alkylation of benzene. 2

3. a) Identify the substances (I) through (IV):– 4
   (i) $(I) + H_2 \xrightarrow{Pd/BaSO_4} Me_2CH-CHO$
   (ii) $Me_3C-\underset{\underset{O}{\|}}{C}-Me + NaOI \xrightarrow{Me_2CH-CHO} (II) + (III)$
   (iii) $(IV) + H_2O \xrightarrow{HgSO_4, H_2SO_4} CH_3CH_2-\underset{\underset{O}{\|}}{C}-Me$
   b) How would you distinguish between PhCHO and $Me_3CCHO$? 1

4. a) Identify *A* and *B* in the following reaction – 2




   b) Compare the stabilities of the three types of dienes: 3


   with reasons.

5. a) Convert:
   (i) Phenol $\longrightarrow$ Salicylaldehyde 2
   (ii) Phenol $\longrightarrow$ Picric acid 2

   b) Explain why $Me_3CCH_2-\underset{\underset{CHMe_2}{|}}{\overset{\overset{Me}{|}}{C}}-COOH$ is less acidic than the corresponding isomeric unbranched acid. 1

6. a) Prepare: (i) *n*-propanol from propene 2
(ii) RCHOHCOOH from $RCH_2COOH$. 2
(iii)  from PhOH. 1

## Unit-II

Answer any **two** questions

7. a) Give IUPAC name to each: 2
(i) $K_3[Fe(CN)_5(CO)]$ (ii) $[Pt(Py)_4][PtCl_4]$
b) What do you mean by flexidentate ligands? Give an example. 2
c) Write down the structure for different isomers of $[CO(NH_3)_3CL_3]$. 1

8. a) $Cu^{+2}$ ion can be estimated iodometrically though $E^0_{Cu^{+2}/Cu^+} = 0.15V$ and $E^0_{\frac{1}{2}I_2/I^-} = 0.54V$. Justify. 3
b) 'Gold is soluble in aquaregia' – justify it from the redox-potential data –
$E^0_{Au^{+3}/Au} = 1.52V$
$E^0_{NO_3^-/NO} = 0.95V$ 2

9. Discuss how hardness of water can be estimated using EDTA. 5

10. Discuss the principle of estimation of Fe(II) with $K_2Cr_2O_7$ solution. Explain the function of the indicator and $H_3PO_4$ used during titration. 5

## Unit-III

Answer any **three** questions

11. a) Define equivalent conductance and correlate with specific conductance. 2
b) Discuss the variation of equivalent conductance with concentration for both strong and weak electrolytes. 3

12. a) Write down the differences between thermochemical and photochemical reactions. 3
b) What is quantum yield? Give one example of high quantum yield. 2

13. a) What do you mean by transport number of an ion? 1
b) The speed ratio of silver and nitrate ions in a solution of $AgNO_3$ electrolysed between silver electrodes is 0.916. Find the transport number of the ions. 2
c) Deduce the unit of equivalent conductance. 2

14. a) Write down the Arrhenius equation related to reaction rate. Discuss the significance of activation energy involved in this equation. 2½
b) Write a short account on enzyme catalysis. 2½

15. a) What do you mean by zeta potential? In the light of this potential explain the coagulation of a colloid. 3
b) Explain why 100% purification of a lyophobic sol is not possible? 1
c) How can you prepare a ferric hydroxide sol? 1

16. a) A conductivity cell was filled with 0.05 M/Litre NaOH solution, and the resistance was 40 ohm. Find out the molar conductivity of NaOH at that concentration.
(Given cell constant is 0.4 $cm^{-1}$). 3

b) What is the potential of a half-cell consisting of Zn-electrode in 0.01 M of $ZnSO_4$ solution at 25°C? (Given $E^0_{Zn^+/Zn} = -0.76V$ ). 2

## Unit-IV

Answer any **one** question

17. a) What is the basis principle underlying the separation in chromatography? 2
    b) How many different types of $^1H$–NMR signals would you observe in (i) 2-chlorobutane and (ii) p-diethyl benzene? 2
    c) Define distribution coefficient *k*. 1

18. a) PMR-spectrum of *n*-propanol gives signals at τ 9.1; τ 8.45; τ 6.4; τ 7.7. Identify the peaks along with their multiplicies. 2
    b) Suggest a structure for a compound ($C_9H_{12}$) which shows $^1H$–NMR signals at δ values 7.1, 7.2, 1.5 and 0.9 ppm. 3

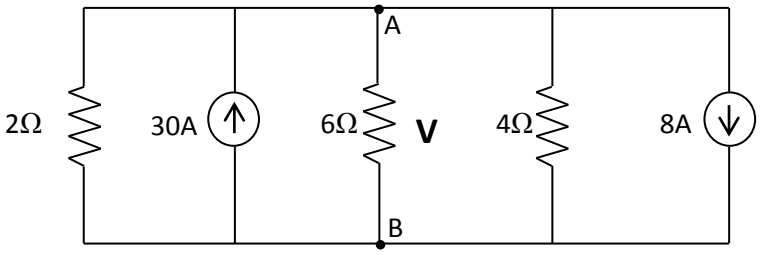
## Group-B

Answer any **three** questions

19. A 230V dc shunt motor runs at 800 rpm and takes armature current of 50A. Find the resistance that is to be added to the field circuit to increase speed to 1000 rpm at an armature current of 80A. Assume flux proportional to field current. Armature resistance = 0.15Ω and field winding resistance = 250 Ω. 5

20. An alternating current varying sinusoidally with 50 Hz, has an RMS value of 20A. Write down the equation for the instantaneous value and find the value at (a) 0.0025 seconds (b) 0.125 seconds after passing through the positive maximum value. 5

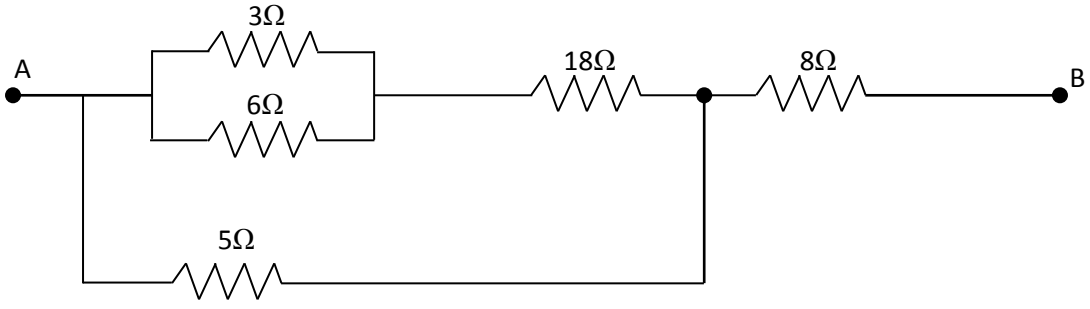
21. Using Kirchhoff current law and Ohms law find the magnitude and polarity of the voltage *V* in the figure. Direction of the two current sources are shown. Voltage *V* is across terminal *AB*. 5




22. A short shunt compound generator delivers a load current of 30A at 220V and has armature, series field and shunt field resistance of 0.05Ω, 0.30Ω and 200Ω respectively. Calculate the induced e.m.f and the armature current. Allow 1.0V per brush for contact drop. 5

23. With a labled sketch explain the working of a 3 point starter of a d.c. motor. 5

24. Calculate the effective resistance of the following combination of resistances and the voltage drop across each resistance, when a potential difference of 60V is applied between points A & B. 5



## Group-C

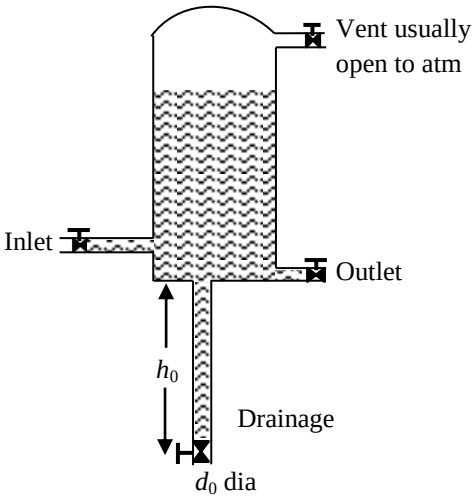
Answer any **three** questions

25. a) Name two types of panel boards. 2
    b) What is cold junction compensation of a thermo couple? 3

26. With a neat sketch explain the working of a thermal conductivity gas analyser. 5

27. What are the functions of a forque tube? Where is it used? 3+2

28. In a process plant, there is water tank situated in a somewhat inaccessible place. Its top is open to atmosphere through a venting valve, there is an inlet and an outlet and a separate drainage line, which comes from the bottom of the tank vertically down, with a height $h_0$. The schematic arrangement of the tank is shown in figure. The level indicator of this tank has gone out of order, and one young engineer suggests that opening the drainage valve fully and measuring the flow for a small amount of time may be used to measure the level inside the tank.
    You are asked to comment on this – whether it will be possible to measure level by this method and if so, what principle may be used. 5




29. (i) What is meant by sensitivity of a measuring instrument?
    (ii) What is meant by zero error of a measuring instrument?
    (iii) What is a "thermopile" and what advantage does it have?
    (iv) What is a "resistance thermometer"? State the principle in one line.
    (v) What does a venturimeter usually measure? 5

30. (i) Describe in brief the working principle of a bimetallic thermometer.
    (ii) What is meant by 'back lash' error?
    (iii) What is the principle of a thermocouple?
    (iv) Name an instrument used for measuring composition, and state the working principle in a couple of lines.
    (v) What is the difference between "accuracy" and "precision" of a measuring instrument? 5