Sub.Code : 3021'H'

NEB-GRADE XII

2079 (2022)

Chemistry

New course

For regular students ***(except technical stream)***

Candidates are required to give their answers in their own words as far as practicable. The figures in the margin indicate full marks.

Time: 3 hrs. **Full Marks: 75**

Attempt **all** the questions.

Group 'A' 11×1=11

Rewrite the correct options of each questions in your answer sheet.

1. $2R\text{-}OH + 2Na \rightarrow 2RONa + H_2$, is an example of
   A) acidic nature of alcohol B) basic nature of alcohol
   C) electrophilic substitution reaction D) nucleophilic substitution reaction
2. $C_6H_5CH_2\text{-}CHO$ and C_6H_5CHO can be distinguished by;
   A) Iodoform test B) Tollen's test
   C) 2,4 -DNP test D) Fehling test
3. An organic compound (X) undergoes reduction with $LiAlH_4$ to yield (Y). When vapour of y are passed over freshly reduced copper at 300°C (X) is formed. The Compound Y is,
   A) CH_3CHO B) $CH_3CH_2\text{-}OH$
   C) $CH_3\text{-}CO\text{-}CH_3$ D) $CH_3\text{-}O\text{-}CH_3$
4. The number of possible structural isomers of 1° amines of molecular formula $C_4H_{11}N$ give
   A) 1 B) 2 C) 3 D) 4
5. Acetic anhydride is obtained from acetyl chloride by the reaction of
   A) Conc.H_2SO_4 B) P_2O_5
   C) CH_3COONa D) CH_3COOH
6. A metal (M) forms thiosulphate with molecular formula $M_2S_2O_3$. The valency of Metal is
   A) 1 B) 2 C) 3 D) 4
7. The P^H of 10^{-8} M aqueous solution of *HCl* is
   A) less than 7 B) 7 C) 8 D) more than 8

Contd...

8. A catalyst accelerates the reaction because
   A) it brings reactants closer B) it lowers the activation energy
   C) it increases the activation energy
   D) it forms complex with the reaction
9. What is the concentration of nitrate ions if equal volume of 1M $NaNO_3$ and 1M KCl are mixed
   A) 0.25M B) 0.5M C) 1M D) 2M
10. Tailing of mercury is due to the formation of
    A) HgO B) Hg_2O C) HgO_2 D) Hg_2O_2
11. Bell metal is an alloy of
    A) Cu, Pb and Sn B) Sn and Cu C) Zn and Pb D) Zn, Cu and Sn

Group 'B' 8×5=40

12. An electrochemical cell is constructed by using aluminum and silver electrodes whose electrodes potential values are;

$$E^\circ Al^{3+}/Al = -1.67V$$

$$E^\circ Ag^{+}/Ag = 0.80V$$

    i) What is meant by electrochemical cell ?
    ii) Represent an electrochemical cell using above electrodes
    iii) Write down complete cell reactions
    iv) Calculate the emf of the cell (1+1+2+1)

    Or

    Hess's law is applied to calculate the different types of enthalpy of reactions
    i) Define Hess's law of constant heat summation.
    ii) What is meant by enthalpy of reaction ?
    iii) Standard enthalpy of formation of H_2O_2 *(l)* and are H_2O *(l)* are -188 KJ/mol and 286 KJ/mol respectively. What will be the enthalpy change of the following reaction:
    $2H_2O_2(l) \rightarrow 2H_2O(l) + O_2(g)$ (1+1+3)

13. Ionic product of water at 25° C is 1×10^{-14} and water is regarded as very weak electrolyte.
    i) Define ionic product of water.
    ii) Deduce the relation $Kw = [H^+]$ [OH]
    iii) Calculate the $[OH^-]$ concentration of 0.01M *HCl* at 25°C

Contd...

iv) What is the effect of temperature on ionic product of water? (1+1+2+1)

14. Ethyl alcohol is common alcohol and is used to manufacture alcoholic beverage. It can be prepared from sugar containing materials like molassess by fermentation process. (1+1+1+1+1)

i) Define fermentation ii) What is meant by molassess ?

iii) Mention the function of yeast in the fermentation of ethyl alcohol.

iv) Write chemical reaction for the conversion of cane-sugar into ethyl alcohol.

v) Give a difference between absolute alcohol and denaturated alcohol.

15. A carbonyl compound (M) contains three carbon atoms and it undergoes iodoform test. (5×1)

i) identify the compound (M)

ii) write down a chemical reaction for the preparation of (M)

iii) How is (M) converted into propane ?

iv) Predict the final product obtained when (M) is treated with CH_3MgI in presence of dry ether and followed by hydrolysis ?

v) Give a laboratory test reaction of carbonyl compound.

Or

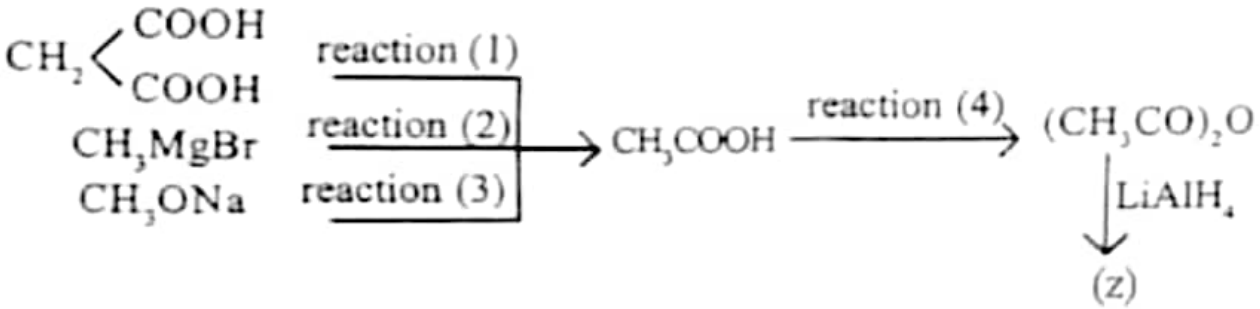
Convert ethoxy ethane from a halo alkane C_2H_5Br by using Williamson's reaction.

i) What product is obtained when ethoxyethane is heated with excess HI ?

ii) Why are old sample of ether not distilled to dryness in air ?

iii) Convert phenol into anisole. (1+2+2)

16. For the following reaction sequence.



i) Write down reagents and conditions for reaction (1), reaction (2), reaction (3) and reaction (4).

ii) Identify the compound (z) giving IUPAC name. (4+1)

17. How would you apply Hoffmann's method for the separation of 1°, 2° and 3° amine from their mixture ? 5

Contd...

18. An important compound non typical transition metal zinc which is used as eye lotion and is also called white vitriol. (5×1)
i) Write down a method of preparation of white vitriol.
ii) What happens when white vitriol is heated to 800°C ?
iii) Define double salt giving an example of it
iv) How is Lithopone obtained from white vitriol.
v) Why is zinc considered as non typical transition metal.

19. Steel manufactured by Open Hearth process. (1+2+1+1)
i) What is open Hearth process ?
ii) Write down the chemical reactions occurring in Open-Hearth furnace.
iii) Why is Speigeleisen added in the Open-Hearth furnace ?
iv) Write down the composition of stainless steel.

Group 'C' 3×8=24

20. a) Write an example of each of the following reactions.
i) Hydroboration oxidation
ii) Decarbonylation
iii) Sandmeyer's reaction
iv) Iodoform reaction
v) Elimination reaction
vi) Cannizzaro's reaction
vii) Reimer-Tiemann reaction
viii) Fridel Craft alkylation (8×1=8)

Or

An unsaturated hydrocarbon (C_3H_6) undergoes Markovikov's rule to give (A). Compound (A) is hydrolysed with aqueous alkali to yield (B). When (B) is treated with PBr_3, compound (C) is produced. (C) reacts with AgCN (alc.) to give another compound (D). The compound (D) if reduced with $LiAlH_4$, produce (E).
i) Define Markovikov's rule.
ii) Identify (A), (B), (C), (D) and (E) with chemical reaction.
iii) How does E react with nitrous acid ?
iv) How would you convert (B) into C_3H_8 ? (1+5+1+1)

21. a) For a hypothetical chemical reaction mP + n Q→ z; the rate Law is, rate = K $[P]^m$ $[Q]^n$. Where K is rate constant of the reaction (m + n) are overall order. (4×1)
i) Define rate law.
ii) Why is rate law experimental parameter ?

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iii) What is meant by rate constant ?
iv) Mention a difference between order and molecularity of a reaction.

b) For the above reaction, the order of reaction with respect to P and Q are first order and zero order respectively. Experimental data obtained from the reactions are; as below.

Expt.	[P]M	[Q]M	initial rate ($M\text{-}sec^{-1}$)
I	0.1	0.1	2×10^{-2}
II	(A)	0.2	4×10^{-2}
III	0.4	0.4	(C)
IV	(B)	0.2	2×10^{-2}

i) Identify the value of A, B and C
ii) Calculate rate constant [k]. (3+1)

Or

a) Crystal of oxalic acid is generally used to prepare primary standard solution. (1+1+1+1)
i) Define primary standard solution.
ii) Which chemical indicator is used in the titration of $KMnO_4$ solution verses oxalic acid solution ?
iii) Why is oxalic acid solution warmed adding dilute H_2SO_4 before titrating With $KMnO_4$?
iv) Mention a major application of titration in quality control laboratory.

b) An aqueous solution of a dibasic acid containing 17.7 gm of acid per-litre of the solution, has density 1.0077gm/litre (molar mass of the acid =118gm/mol) Calculate; i) molarity ii) molality (2+2)

22. a)
i) What is Portland cement ?
ii) Name the major components present in Portland cement.
iii) Why is gypsom used in clinker during cement production process ?
iv) Give any two instruments used for the quality control of cement. (1+1+1+1)

b) i) Differentiate between homo-polymer and co-polymer giving an example of each.
ii) Name the monomers of the following polymer and also write their molecular formula. (2+2)
a) Polystyrene b) Bakelite

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