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Questions:

Case Study Questions

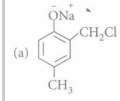
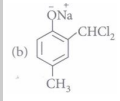
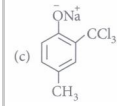
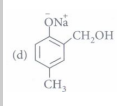
1. Read the passage given below and answer the following questions:
Reimer- Tiemann reaction introduces an aldehyde group, on aromatic ring of phenol, ortho to the hydroxyl group. This is a general method for the synthesis of substituted salicylaldehydes as depicted below.
The following questions are multiple choice questions. Choose the most appropriate answer:
(i) Reimer-Tiemann reaction is an example of

(a) nucleophilic substitution reaction	(b) electrophilic substitution reaction
(c) nucleophilic addition reaction	(d) electrophilic addition reaction

(ii) Which of the following reagents is used in the given reaction in steps I?

(a) aq. NaOH + CH_3CI	(b) aq. NaOH + CH_2Cl_2	(c) aq. NaOH + $CHCl_3$	(d) aq. NaOH + CCl_4

(iii) The structure of the intermediate [A] is

(a) 	(b) 
(c) 	(d) 

(iv) When phenol reacts with chloroform in presence of KOH, the product formed is

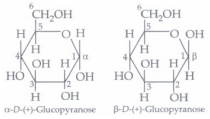
(a) salicylic acid	(b) salicylaldehyde	(c) both (a) and (b)	(d) none of these.

2. Read the passage given below and answer the following questions:
Pentose and hexose undergo intramolecular hemiacetal or hemiketal formation due to combination of the -OH group with the carbonyl group. The actual structure is either of five or six membered ring containing an oxygen atom. In the free state all pentoses and hexoses exist in pyranose form (resembling pyran). However, in the combined state some of them exist as five membered cyclic structures, called furanose (resembling furan).


Pyran


Furan

The cyclic structure of glucose is represented by Haworth structure:

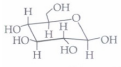

α-D-(+)-Glucopyranose

β-D-(+)-Glucopyranose

α and β -D-glucose have different configuration at anomeric (C-l) carbon atom, hence are called anomers and the C-l carbon atom is called anomeric carbon (glycosidic carbon).
The six membered cyclic structure of glucose is called pyranose structure.
The following questions are multiple choice questions. Choose the most appropriate answer:
(i) α -D(+)-glucose and β -D(+)glucose are

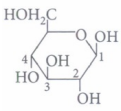
(a) enantiomers	(b) conformers	(c) epimers	(d) anomers

(ii) The following carbohydrate is



(a) a ketohexose	(b) an aldohexose
(c) an α-furanose	(d) an α-pyranose

(iii) In the following structure,



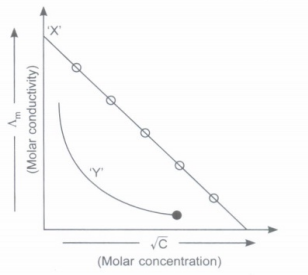
anomeric carbon is

(a) C-l	(b) C-2	(c) C-3	(d) C-4

(iv) The term anomers of glucose refers to

(a) isomers of glucose that differ in configurations at carbons one and four (C-l and C-4)
(b) a mixture of (D)-glucose and (L)-glucose
(c) enantiomers of glucose
(d) isomers of glucose that differ in configuration at carbon one (C-l).

3. Observe the graph shown in figure between Am (molar conductivity) Vs $\sqrt{C}$ (Molar concentration) and answer the questions based on graph.



(a) The curve 'V' is for KCI or CH_3 COOH?
(b) What is intercept on Λ_m axis for 'X' equal to?
(c) Give mathematical equation representing straight line.
(d) What is slope equal to?
(e) What happens to molar conductivity on dilution in case of weak electrolyte and why?

Assertion and reason

4. In the following questions. an Assertion (A) is followed by a corresponding Reason (R) Use the following keys to choose the appropriate answer.
Assertion (A) Bromination of phenol takes place even in the absence of Lewis acid.
Reason (R) In phenol, OH group attached to benzene ring has highly deactivating effect.
Codes:
(a) Both (A) and (R) are correct, (R) is the correct explanation of (A).
(b) Both (A) and (R) are correct, (R) is not the correct explanation of (A).
(c) (A) is correct; (R) is incorrect.
(d) (A) is incorrect; (R) is correct.

5. Assertion (A): Na cannot be obtained by the electrolysis of aqueous NaCl solution.
Reason (R): It is because of the high reduction potential of the Na^+ ions.
Codes:
(a) Both (A) and (R) are true, and (R) is the correct explanation of (A).
(b) Both (A) and (R) are true, and (R) is not the correct explanation of (A).
(c) (A) is true but (R) is false.
(d) (A) is false but (R) is true.

5 Marks

6. Write equations of the following reactions:
(i) Friedel-Crafts reaction - alkylation in anisole,
(ii) Nitration of anisole
(iii) Bromination of anisole in ethanoic acid medium,
(iv) Friedel- Crafts acetylation of anisole.

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7. Write the chemistry of recharging the lead storage battery, highlighting all the materials that are involved during recharging.

8. An organic compound (A) on treatment with $CHCl_3$ and KOH gives two compounds B and C.Both B and C give the same product (D) when distilled with zinc dust.Oxidation of D gives E having molecular formula $C_7H_6O_2$.The sodium salt of E on heating with soda-lime gives F which may also be obtained by distilling A with zinc dust.Identify A to F

9. On the basis of which evidences D-glucose was assigned the following structure?
CHO
|
$(CHOH)_4$
|
CH_2OH

10. Give the important applications of kohlrausch law.

3 Marks

11. The cell in which the following reaction occurs:
$2Fe^{3+}(aq) + 2I^-(aq) \rightarrow 2Fe^{2+}(aq) + I_2(s)$ has E^o_{cell} =0.236V at 298 K. Calculate the standard Gibbs energy and the equilibrium constant of the cell reaction.

12. Give the equations of reaction for the preparation of phenol from cumene.

13. What is essentially the difference between α-glucose and β-glucose? What is meant by pyranose structure of glucose?

14. The two strands in DNA are not identical but are complementary. Explain.

15. Define the following, giving one example of each:
(i) Zwitter ion
(ii) Glycosidic linkage

16. Write the equations involved in the following reactions:
(i) Reimer-Tiemann reaction
(ii) Williamson synthesis

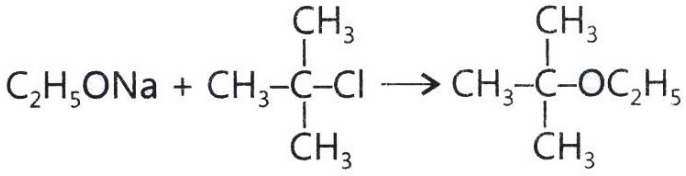
17. (i) What happens when CH_3-O-CH_3 is heated with HI?
(ii) Explain mechanism for hydration of acid catalyzed ethene:
$CH_2 = CH_2 + H_2O \xrightarrow{H^+} CH_3 - CH_2 - OH$

18. What happens when
(i) salicylic acid is treated with $(CH_3CO)_2O/H^+$?
(ii) anisole is treated with CH_3Cl/ anhyd. $AlCl_3$?
Write chemical equation in support of your answer.

2 Marks

19. How much electricity is required in coulomb for the oxidation of
(i) 1 mole of H_2O to O_2
(ii) 1 mole of FeO to Fe_2O_3?

20. The following is not an appropriate reaction for the preparation of t-butyl ethyl ether.



(i) What would be the major product of this reaction?
(ii) Write a suitable reaction for the preparation of i-butyl ethyl ether.

21. What are different types of RNA found in the cell?

22. Classify the following into monosaccharides and disaccharides.
Ribose, 2-deoxyribose, maltose, galactose, fructose and lactose.

23. Λ_m^0 for NaCl, HCl and NaAc are 126.4, 425.9, and 91.0 S cm^2 mol^{-1} respectively. Calculate Λ^0 for HAc.

24. While separating a mixture of ortho-and para-nitrophenols by steam distillation, name the isomer which will be steam volatile? Give reasons.

Multiple Choice Question

25. Phenol can be distinguished from ethanol by the following reagents except
(a) sodium (b) NaOH/I_2 (c) neutral $FeCl_3$ (d) Br_2/H_2O

26. What is the correct order of reactivity of alcohols in the following reaction?

$$R-OH+HCI \xrightarrow{ZnCl_2} R-Cl+H_2O$$

(a) $1^\circ > 2^\circ > 3^\circ$ (b) $1^\circ < 2^\circ > 3^\circ$ (c) $3^\circ > 2^\circ > 1^\circ$ (d) $3^\circ > 1^\circ > 2^\circ$

27. From amongst the following alcohols, the one that would react fastest with Conc.HCl and anhydrous $ZnCl_2$, is
(a) 2-methylpropanol (b) 1-butanol (c) 2-butanol (d) 2-methylpropan-2-ol

28. The number of chiral carbons in β -D (+)- glucose is
(a) five (b) six (c) three (d) four

29. Antibodies are
(a) Carbohydrates (b) Proteins (c) Lipids (d) Enzymes.

30. The human body does not produce
(a) enzymes (b) DNA (c) vitamins (d) hormones

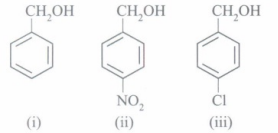
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31. In Williamson's synthesis, ethoxyethane is prepared by
(a) heating sodium ethoxide with ethyl bromide (b) passing ethanol heated alumina (c) treating ethyl alcohol with excess of cone.H_2SO_4 at 430-440K

32. Which base is present in RNA, but not in DNA ?
(a) Uracil (b) Cytosine (c) Guanine (d) Thymine

33. Which of the following polymer is stored in the liver of animals ?
(a) Amylose (b) Cellulose (c) Amylopectin (d) Glycogen

34. Mark the correct increasing order of reactivity of the following compounds with HBr/HCI.



(a) (i) < (ii) < (iii) (b) (ii) < (i) < (iii) (c) (ii) < (iii) < (i) (d) (iii) < (ii) < (i)

35. Which of the following statement is not correct about an inert electrode in a cell?
(a) It does not participate in the cell reaction. (b) It provides surface either for oxidation or for reduction reaction. (c) It provides surface for conduction of electrons.
(d) It provides surface for redox reaction.

36. Find the number of electrons transferred in the equation:
$Cu_{(g)} + 2Ag^+(aq) \rightarrow Cu^{2+}_{(aq)} + 2Ag_{(s)}$
(a) 4 (b) 3 (c) 2 (d) 1

37. Which of the following solutions will have the highest conductivity at 298 K?
(a) 0.01 M HCl solution (b) 0.1 M HCl solution (c) 0.01 M CH_3COOH solution (d) 0.1 M CH_3COOH solution

38. In the electrolysis of aqueous sodium chloride solution which of the half cell reaction will occur at anode?
(a) $Na^+_{(aq)} + e^- \rightarrow Na_{(s)}$; E^o_{cell} = 2.71 V (b) $2H_2O_{(l)} \rightarrow O_{2(g)} + 4H^+_{(aq)} + 4e^-$; E^o_{cell} = 1.23 V (c) $H^+_{(aq)} + e^- \rightarrow \frac{1}{2}H_{2(g)}$; E^o_{cell} = 0.00 V (d) $Cl^-_{(aq)} \rightarrow \frac{1}{2}Cl_{2(g)} + e^-$; E^o_{cell} = 1.36 V