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Questions:

Case Study Questions

1. Read the passage given below and answer the following questions:

Although chlorobenzene is inert to nucleophilic substitution, however it gives quantitative yield of phenol when heated with aq. NaOH at high temperature and under high pressure. As far as electrophilic substitution in phenol is concerned the - OH group is an activating group, hence, its presence enhances the electrophilic substitution at o- and p-positions.

The following questions are multiple choice questions. Choose the most appropriate answer:

(i) Conversion of chlorobenzene into phenol involves

(a) modified S_N1 mechanism	(b) modified S_N2 mechanism
(c) both (a) and (b)	(d) elimination-addition mechanism.

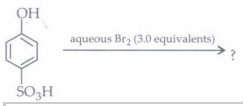
(ii) Phenol undergoes electrophilic substitution more readily than benzene because

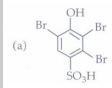
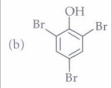
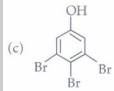
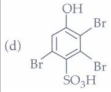
(a) the intermediate carbo cation is a resonance hybrid of more resonating structures than that from benzene
(b) the intermediate is more stable as it has positive charge on oxygen, which can be better accommodated than on carbon
(c) in one of the canonical structures, every atom (except hydrogen) has complete octet
(d) the -OH group is o, p-directing which like all other o, p-directing group, is activating.

(iii) Phenol on treatment with excess of conc. HNO_3 gives

(a) o-nitrophenol	(b) p-nitrophenol
(c) o-and p-nitrophenol	(d) 2, 4, 6-trinitrophenol

(iv) The major product of the following reaction is



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

2. Read the passage given below and answer the following questions:

Glucose is known as dextrose because it occurs in nature as the optically active dextrorotatory isomer. It is essential constituent of human blood. The blood normally contains 65 to 110 mg of glucose per 100 mL (hence named Blood sugar). The level may be much higher in diabetic persons. The urine of diabetic persons also contain considerable amount of glucose. In combined form, it occurs in cane sugar and polysaccharides such as starch and cellulose.

Glucose has an aldehyde group (-CHO), one primary alcoholic group ($-CH_2OH$) and four secondary alcoholic groups (-CHOH) in their structure. Due to the presence five hydroxyl groups (-OH), glucose acetylation. Glucose also undergoes oxidation with mild oxidising agents like bromine water as well as with strong oxidising agents like nitric acid. Since glucose is readily oxidised, it acts as a strong reducing agent and reduces Tollen's reagent and Fehling solution. Glucose exists in two crystalline forms: α -D-glucose and β -Dglucose undergoes If either of the two forms is dissolved in water and allowed to stand, the specific rotation of the solution changes gradually, until a constant value is obtained. This change is called mutarotation.

In these questions (i-iv), a statement of assertion followed by a statement of reason is given. Choose the correct answer out of the following choices.

(a) Assertion and reason both are correct statements and reason is correct explanation for assertion.

(b) Assertion and reason both are correct statements but reason is not correct explanation for assertion.

(c) Assertion is correct statement but reason is wrong statement.

(d) Assertion is wrong statement but reason is correct statement.

(i) Assertion: A diabetic person carries a packet of glucose with him always.

Reason: Glucose increases the blood sugar level almost instantaneously.

(ii) Assertion: On oxidation with nitric acid, glucose as well as gluconic acid both yield saccharic acid.

Reason: The pentaacetate of glucose does not react with hydroxylamine indicating the absence of free -CHO group.

(iii) Assertion: Glucose reacts with acetyl chloride to form pentaacetyl glucose.

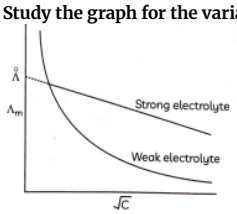
Reason: The formation of pentaacetyl derivative confirms the presence of five -OH groups in glucose.

(iv) Assertion: A certain compound gives negative test with ninhydrin and positive test with Benedict's solution, the compound is an amino acid.

Reason: Glucose is a monosaccharide.

3. Strong and weak electrolytes behave differently in solution because of the difference in their degree of ionisation. The conductance behaviour and effect of concentration on conductance is different for both strong and weak electrolytes. Molar conductivity is the product of specific conductance of the electrolyte and the volume of the solution containing one gram mole of the electrolyte.

Study the graph for the variation of molar conductivity with concentration for strong and weak electrolytes and answer the questions that follow:



(A) What is limiting molar conductivity?

(B) Conductivit decreases with decrease in concentration. Give reason.

(C) Explain why conductivity of an electrolyte decreases with decrease in concentration.

Assertion and reason

4. Assertion (A): Molar conductivity of an electrolyte increases with decrease in concentration.
Reason (R): The mobility of ions decrease with increase in concentration.
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

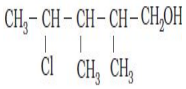
5. How do you explain the absence of aldehyde group in the pentaacetate of D-glucose ?

6. Write the structure of alanine at pH = 2 and pH = 10.

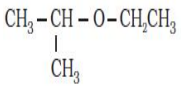
7. How is 1-propoxy propane synthesised from propan-1-ol ? Write the mechanism of this reaction.

3 Marks

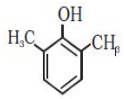
8. Give IUPAC names of the following compounds:
(i)



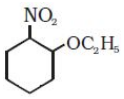
(ii)



(iii)



(iv)



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9. How many grams of chlorine can be produced by the electrolysis of molten NaCl with a current of 1.00 A for 15 min? Also calculate the number of chlorine molecules liberated.

10. Define the following as related to proteins.
(i) Peptide linkage
(ii) Primary structure
(iii) Denaturation.

11. Write the major products in the following equations:
(i) $CH_3CH_2OH \xrightarrow{PCl_5} ?$
(ii) $CH_3 - C1 + CH_3CH_2 - ONa \longrightarrow ?$

12. The melting points and solubility of amino acids in water are generally higher than that of the corresponding halo acids. Explain.

13. (i) Name the branched chain component of starch.
(ii) Ribose in RNA and deoxyribose in DNA differ in the structure around which carbon atom?
(iii) How many peptide linkages are present in a tripeptide?

14. (A) Calculate the current and the thickness of the coating if the current was passed for 1hr. to deposit 2g silver on metal object of area 1 cm^2.(Ag = 108, 1 Faraday = 96500 coulombs, density of silver = 10.5g/cc).
(B) Calculate the electrode potential of Cr^{3+}/Cr electrode at $[Cr^{3+}]$ = 0.001 M. Given: $Cr^{3+} + 3e^- \rightarrow Cr$, E° = -0.74 V

15. (A) The cell in which the following reaction occurs:
$2Fe^{3+}_{(aq)} + 2I^-_{(aq)} \rightarrow 2Fe^{2+}_{(aq)} + I_{2(s)}$ has E^o_{cell} = 0.236 V at 298K. Calculate the standard Gibbs energy of the cell reaction. (Given: 1 F = 96500C mol^{-1})
(B) How many electrons flow through a metallic wire if a current of 0.5 A is passed for 2 hours?
(Given: 1F = 96500 C mol^{-1})

2 Marks

16. What are ambident nucleophiles? Explain with an example.

17. How will you bring about the following conversions?
(a) Bromoethane to cis-hex-3-ene
(b) Benzyl alcohol to phenylethanenitrile
(c) Cyclopentene to cyclopenta-1, 3-diene
(d) Aniline to phenyl isocyanide.

18. The treatment of alkyl chlorides with aqueous KOH lead to the formation of alcohols but in presence of alcoholic KOH alkenes are major products. Explain.

19. What is meant by tertiary structure o proteins?

20. Dipole moment of phenol is smaller than that of methanol. Why?

21. What is meant by Faraday constant?

22. Alcohols are comparatively more soluble in water than hydrocarbons of compounds of comparable molecular masses. Explain this fact.

23. What are the hydrolysis products of
    (i) sucrose
    (ii) lactose ?

24. Draw the structure of the following compound: 4-bromo-3-methylpent-2-ene.

25. The conductivity of 0.20 M solution of KCl at 298 K is 0.0248 S cm^{-1}. Calculate its molar conductivity.

Multiple Choice Question

26. The standard emf of a galvanic cell involving 3 moles of electrons in a redox reaction is 0.59 V. The equilibrium constant for the reaction of the cell is
    (a) 10^{25} (b) 10^{20} (c) 10^{15} (d) 10^{30}

27. How many alcohols with molecular formula $C_4H_{10}O$ are chiral in nature?
    (a) 1 (b) 2 (c) 3 (d) 4

28. Propene on hydroboration-oxidation produces
    (a) $CH_3CH_2CH_2OH$ (b) $CH_3CHOHCH_3$ (c) $CH_3CHOHCH_2OH$ (d) CH_3CH_2CHO

29. Biotin is an organic compound present in yeast. Its deficiency in diet causes dermatitis and paralysis. It is also known as
    (a) vitamin H (b) vitamin B_1 (c) vitamin B_{12} (d) vitamin D

30. Purine and pyrimidine bases present in both DNA and RNA are
    (a) Uracil (b) Thymine (c) Cytosine (d) Adenine

31. What will be the weight of silver deposited, if 96.5 A of current is passed into aqueous solution of $AgNO_3$ for 100 s?
    (a) 1.08g (b) 10.8g (c) 108g (d) 1080g

32. An α-helix is a structural feature of
    (a) sucrose (b) polypeptides (c) nucleotides (d) starch

33. Which of the following statement is correct?
    (a) Fibrous proteins are generally soluble in water. (b) Albumin is an example of fibrous proteins.
    (c) In fibrous proteins, the structure is stabilised by hydrogen bonds and disulphide bonds. (d) pH does not affect the primary structure of protein.

34. Which of the following solutions of KCL will have the highest value of molar conductivity?
    (a) 0.01 M (b) 1 M (c) 0.5 M (d) 0.1M

35. The role of platinum or palladium metal used in fuel cells is:
    (a) to increase the rate of electrode reaction. (b) used as cathode. (c) used as an electrolyte. (d) used as anode

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