RAMANUJAN SENIOR SECONDARY SCHOOL
PRE FINAL 1 EXAMINATION 2024
HS SECOND YEAR
SUB: CHEMISTRY

Time: 3 Hours **Full Marks: 70**

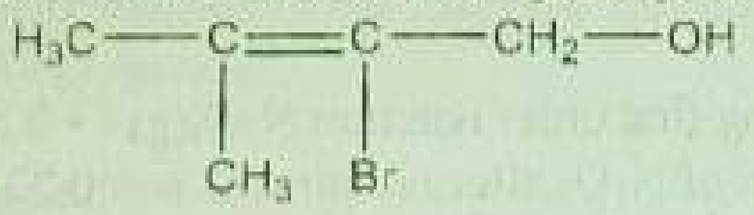
1. Define azeotropes. **1**

2. Mention the products of electrolysis of aqueous NaCl. **1**

3. What is the order of a reaction when the half-life period is directly proportional to the initial concentration of the reactant? **1**

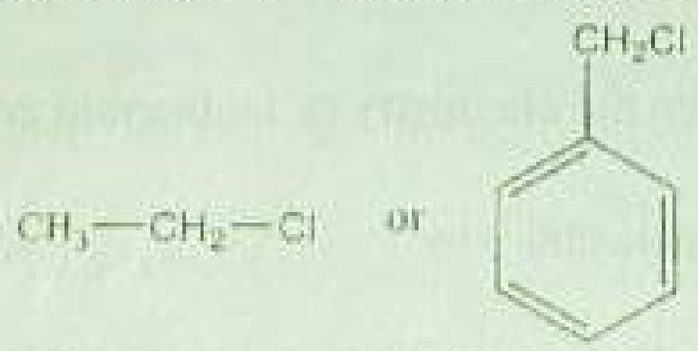
4. Define homoleptic complex with an example. **1**

5. Write the IUPAC name of the following compound: **1**



6. What will be the order of the reaction when rate of a reaction is equal to rate constant of the reaction? **1**

7. Which of the compounds will react faster in S_N1 reaction with the OH^- ion and why? **1**



8. Why cannot vitamin C be stored in our body? **1**

9. Arrange the following: **2×1=2**

(a) In increasing order of basic strength:

Aniline, p-nitroaniline and p-toluidine

(b) In increasing order of acidic strength

Phenol, p-nitro phenol, o-nitro phenol and m-nitro phenol, propanol

10. State Raoult's law for the solution containing volatile components. What is the similarity between Raoult's law and Henry's law? **1+1=2**

11. Calculate the equilibrium constant of the following cell reaction at 298K **2**

$Cu(s) + 2\,Ag^+(aq) \rightarrow Cu^{2+}(aq) + 2\,Ag(s)$

(Given $E^0_{cell} = 0.46V$)

Or

How do you explain with the help of graph, the increase in the value of molar conductivity with dilution in case of strong and weak electrolyte? **2**

12. When a coordination compound $CrCl_3.6H_2O$ is mixed with $AgNO_3$, 2 moles of AgCl are precipitated per mole of the compound. Write down the structural formula & IUPAC name of the complex. **1+1=2**

13. Write the IUPAC name of the following complex: *(any two)* 2

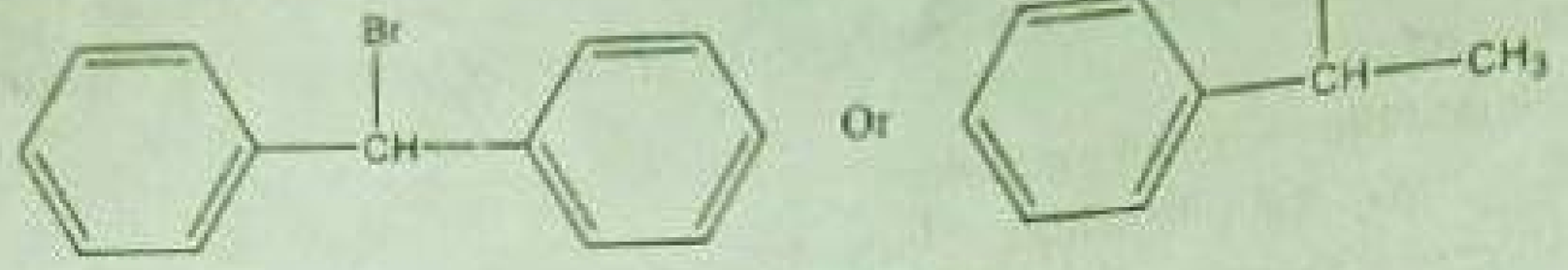
(i) $K_3[Al(C_2O_4)_3]$ (ii) $[CoCl_2(en)_2]^+$

(iii) $[Co(NH_3)_4(H_2O)Cl](NO_3)_2$ (iv) $Na[Au(CN)_2]$

14. Discuss the stereochemistry of S_N1 reaction.

Or

Which of the following undergoes faster S_N1 reaction and why?



15. The initial concentration of N_2O_5 in the following first order reaction $N_2O_5(g) \rightarrow 2\,NO_2(g) + 1/2\,O_2(g)$ was 1.24×10^{-2} mol L^{-1} at 318 K. The concentration of N_2O_5 after 60 minutes was 0.20×10^{-2} mol L^{-1}. Calculate the rate constant of the reaction at 318 K. 2

16. **(a)** Zn^{2+} salts are colourless while Cu^{2+} salts are coloured. Give reason. 1

(b) What are interstitial compounds? 1

17. Write one similarity and one difference between the chemistry of lanthanoid and Actinoid elements.

Or

Which out of $Lu(OH)_3$ and $La(OH)_3$ is more basic and why ? 2

18. In the following pairs of organic compounds, which compound is more soluble in water and why?

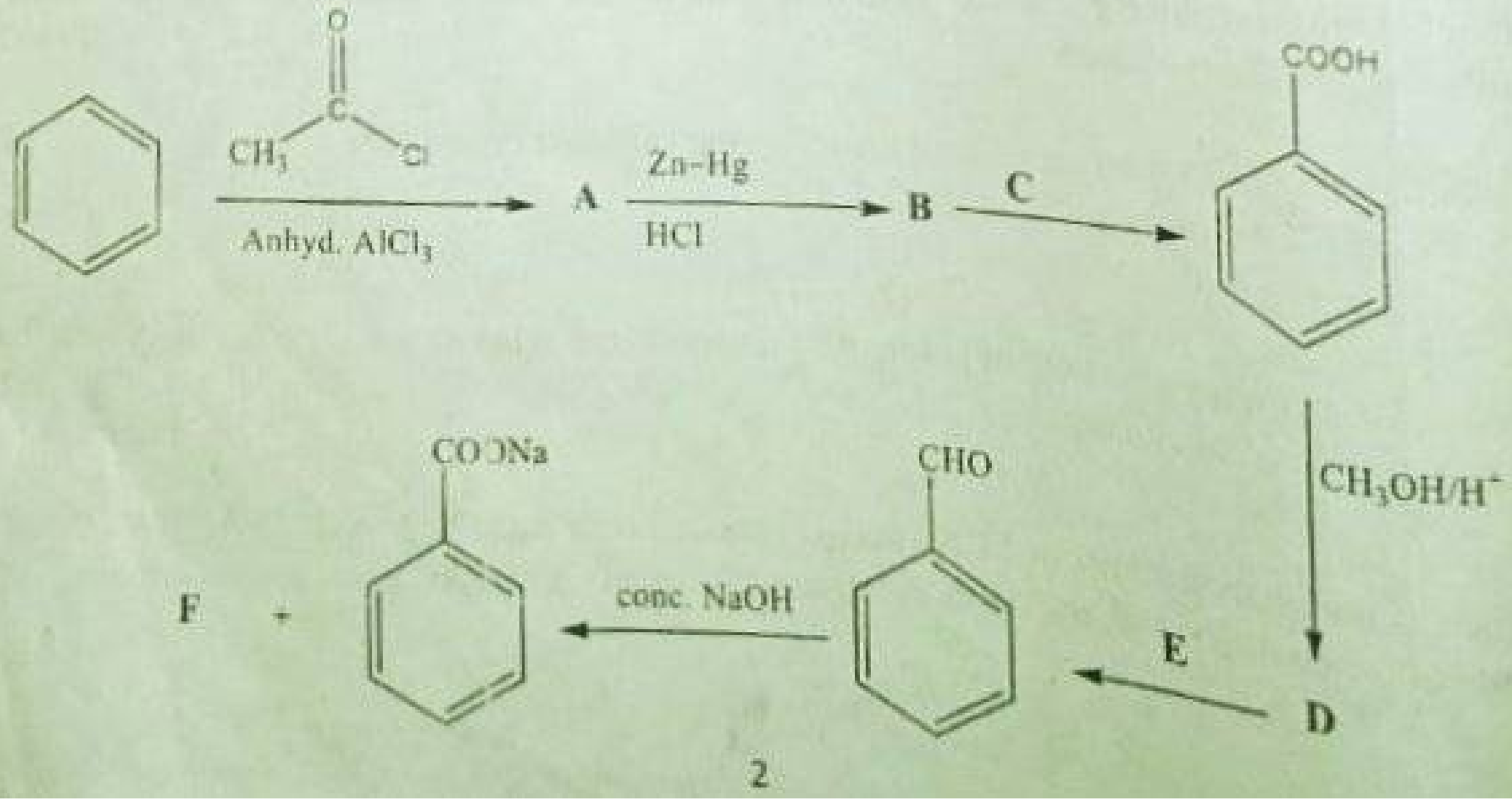
(a) Butan-1-ol or Butan-1-amine **(b)** Alkyl halide or Alcohol 1×2=

Or

In the following pairs of organic compounds, which compound has more boiling point and why?

(a) Butan-1-ol or Butan-1-amine **(b)** o-nitrophenol or p-nitro phenol

19. Predict the reagent or the product in the following reaction sequence 6× ½ =



Or

Explain why 1×3= 3

(a) It is necessary to avoid even traces of moisture during the use of a Grignard reagent.

(b) Carboxylic acids are more acidic than alcohols or phenols although all of them have hydrogen atom attached to an oxygen atom (-O-H).

(c) Why is NH_2 group of aniline acetylated before carrying out nitration in the preparation of p- nitro aniline

20. (a) $[Cr(NH_3)_6]^{3+}$ is paramagnetic while $[Ni(CN)_4]^{2-}$ is diamagnetic. Explain why? 1

(b) $[Fe(CN)_6]^{4-}$ and $[Fe(H_2O)_6]^{2+}$ are of different colours in dilute solutions. Why? 1

(c) Why do gases always tend to be less soluble in liquids as the temperature is raised? 1

21. For a first order reaction, show that time required for 99% completion is twice the time required for completion of 90% reaction. **3**

22. Conductivity of 2.5×10^{-4} M methanoic acid is 5.25×10^{-5} S cm^{-1}. Calculate its molar conductivity and degree of dissociation. Given: $\lambda^0(H^+) = 349.5$ S cm^2 mol^{-1} and $\lambda^0(HCOO^-) = 50.65$ S cm^2 mol^{-1}. **3**

23. (a) State Kohlrausch law of independent migration of ions. Write an expression for the molar conductivity of acetic acid at infinite dilution according to Kohlrausch law. ½ + ½ =1

(b) What type of a battery is the lead storage battery? Write the anode and the cathode reactions and the overall reaction occurring in a lead storage battery. ½ +2 ½ =2

Or

What is corrosion? Give two measures for the protection of corrosion of metals. 1+2=3

24. (a) Out of 1 M glucose and 2 M glucose, which one has a higher boiling point and why? 1

(b) 3.9 g of benzoic acid dissolved in 49 g of benzene shows a depression in freezing point of 1.62 K. Calculate the van't Hoff factor and predict the nature of solute(associated or dissociated). (Given: Molar mass of benzoic acid= 122 gmol^{-1}, K_f for benzene = 4.9 K kg mol^{-1}) **2**

25. Give reasons for the following: 1x3=3

(a) Transition elements and their compounds acts as catalysts.

(b) Manganese has lower melting point even though it has a higher number of unpaired electrons for bonding.

(c) Zn, Cd and Hg are soft metals.

26. (a) What is the basic structural difference between starch and cellulose? 1

(b) State the difference between Nucleoside and Nucleotides. 1

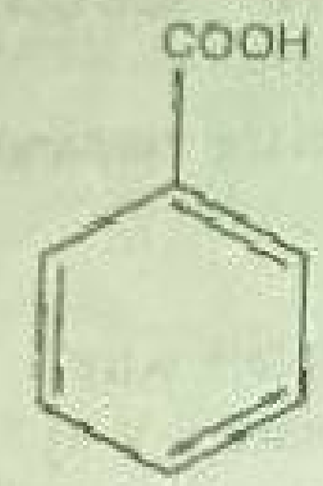
(c) Write one difference between α–helix and β–pleated structures of proteins. 1

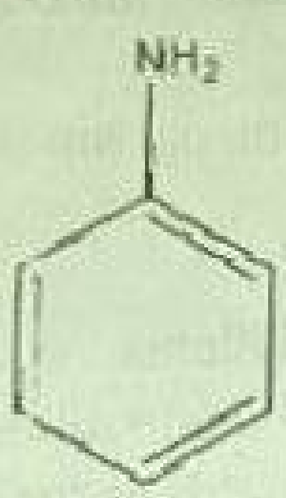
27. (a) What happens when starch is hydrolysed by boiling it with dilute H_2SO_4 at 393 K under pressure? 1

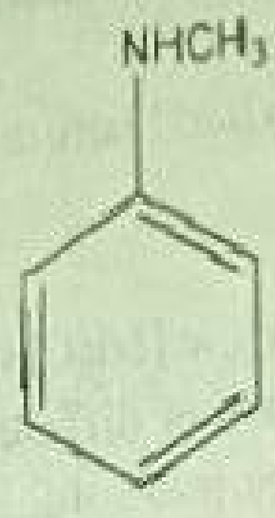
(b) What are the expected products of hydrolysis of lactose? 1

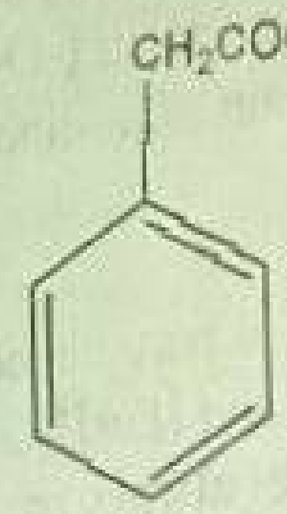
(c) What products would be formed when a nucleotide from DNA containing thymine is hydrolysed? 1

28. (I) Which of the following compounds would undergo carbylamine reaction and which the Hell- 1+1=2
volhard -Zelinsky reactions? Write the structures of the expected products.









1x3=

(II) Complete the following reactions ***(any three)***

a) Phenol to aspirin

b) Ethanal to but-2-enoic acid

c) Ethanoic acid to propanoic acid

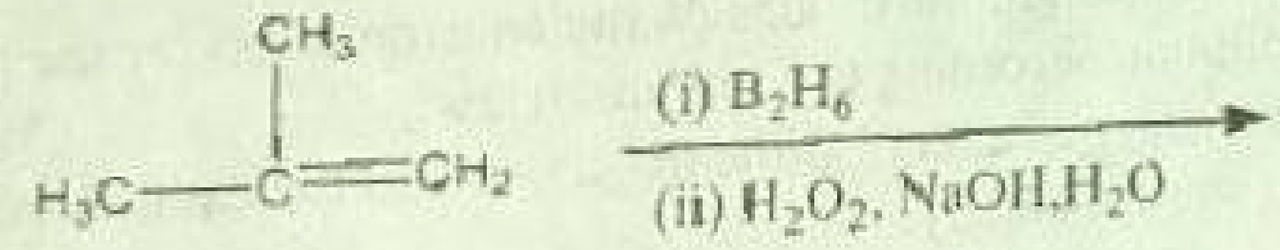
d) Ethanamine to methanamine

e) Methyl magnesium bromide to 2- methyl propan-2- ol

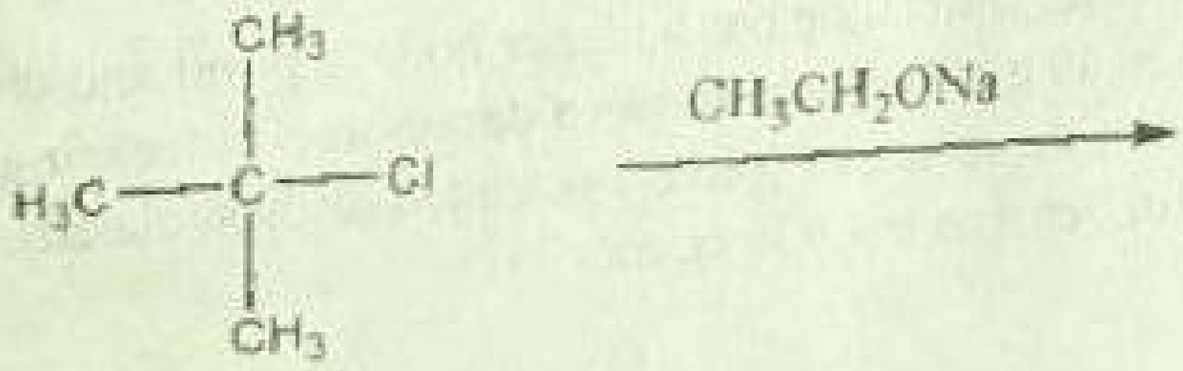
4× ½ =

29. (I) Complete the following reactions

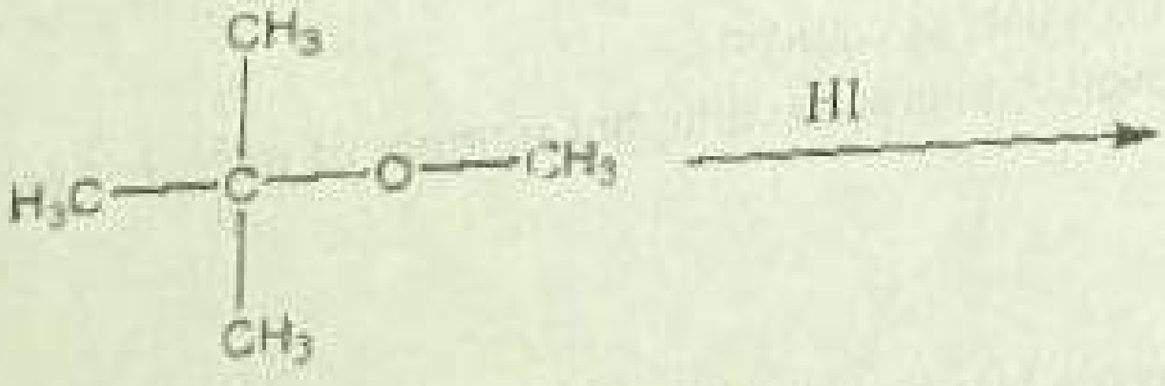
(a)



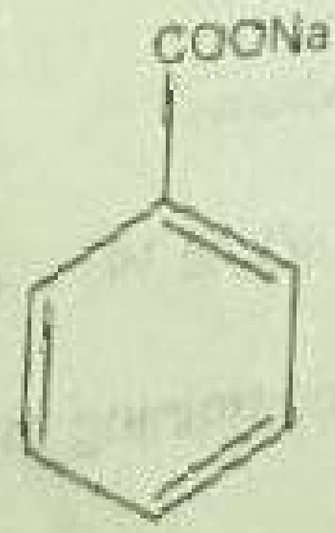
(b)



(c)



(d)



Or

(ii) Give simple chemical tests to distinguish between the pairs of compounds. (*any three*) 1x3=3

(a) Pentan-2-ol and pentan-3-ol

(b) Formic acid and acetic acid

(c) Aniline and benzyl amine

(d) Sec-butyl alcohol and tert-butyl alcohol

(e) Propanal and propanone

30. An alkene 'A' of Molecular formula C_5H_{10} on ozonolysis gives a mixture of two compounds 'B' and 'C'. Compound 'B' gives positive Fehling's test and also forms iodoform on treatment with I_2 and NaOH. Compound 'C' does not give Fehling's test but forms iodoform. Identify the compounds A, B and C. Write the reaction for ozonolysis and formation of iodoform from B and C. 5

Or

A colourless substance 'A' (C_6H_7N) is sparingly soluble in water and gives a water soluble compound 'B' on treating with mineral acid. On reacting with $CHCl_3$ and alcoholic potash 'A' produces an obnoxious smell due to the formation of compound 'C'. Reaction of 'A' with benzenesulphonyl chloride gives compound 'D' which is soluble in alkali. With $NaNO_2$ and HCl, 'A' forms compound 'E' which reacts with phenol in alkaline medium to give an orange dye 'F'. Identify compounds 'A' to 'F'. 5