

**INTERNATIONAL INDIAN SCHOOL - DAMMAM**  
**FIRST TERMINAL EXAMINATION 2012-2013**  
**CHEMISTRY – XII SET A**

**TIME: 3 hours**

**Max marks: 70**

**General Instructions:**

1. All questions are compulsory.
2. Question nos. 1 to 8 are very short answer questions and carry 1 mark each.
3. Question nos. 9 to 18 are short answer questions and carry 2 marks each.
4. Question nos. 19 to 27 are also short answer questions and carry 3 marks each.
5. Question nos. 28 to 30 are long answer questions and carry 5 marks each.

1. Write the equation of Friedel-Crafts alkylation of anisole. 1
2. What is the role of cryolite in the metallurgy of aluminium? 1
3. Crystalline solids are anisotropic in nature. What does this statement mean? 1
4. State Raoult's law for a solution of volatile liquids. 1
5. Does the hydrolysis of  $\text{XeF}_4$  lead to a disproportionation reaction? Justify. 1
6. Identify the hydrocarbon  $\text{C}_5\text{H}_{10}$  which does not react with chlorine in the dark, but forms a single monochloro compound  $\text{C}_5\text{H}_9\text{Cl}$  in bright sunlight. 1
7. Draw the structure of the 2,4-DNP derivative of benzaldehyde. 1
8. Write the equation of the reaction of hydrogen iodide with benzyl ethyl ether. 1
9. Calculate the packing efficiency in case of a metal crystal having body centred cubic structures. 2
10. a) Although electron gain enthalpy of fluorine is less negative as compared to chlorine, fluorine is a stronger oxidising agent than chlorine. Why? 2  
b) Why are pentahalides more covalent than trihalides?
11. The vapour pressure of water is 12.3 kPa at 300 K. Calculate vapour pressure of 1 molal solution of a non-volatile solute in it. 2
12. Explain the extraction of gold or silver by leaching with NaCN. 2  
OR  
Describe a method for refining nickel.
13. Distinguish between the following: 2  
a) hexagonal close packing and cubic close packing.

- b) tetrahedral void and octahedral void.
14. Write equations for the following: 2  
 a) methyl bromide is treated with sodium in the presence of dry ether.  
 b) tert-butyl chloride is treated with alcoholic KOH
15. Draw the structure of white phosphorus and red phosphorus and write the differences between the two types of phosphorus. 2
16. a) Why do gases always tend to be less soluble in liquids as the temperature is raised?  
 b) Define cryoscopic constant and give its mathematical expression. 2
17. a) p-dichloro benzene has higher melting point than its ortho and meta isomers, explain.  
 b) Predict all the alkenes that would be formed by dehydrohalogenation of 2-Chloro-2-methylbutane with sodium ethoxide in ethanol and identify the major alkene. 2
18. The composition of a sample of wustite is  $\text{Fe}_{0.93}\text{O}_{1.00}$ . Calculate the percentage of  $\text{Fe}^{2+}$  and  $\text{Fe}^{3+}$  in wustite. 2
19. a) Suggest a quantitative method for the estimation of the gas which protects us from UV rays of the sun. 1  
 b) Draw the structures of the following:  $\text{XeOF}_4$ ,  $\text{H}_2\text{S}_2\text{O}_7$  2
20. Give reasons:  
 a) Although phenoxide ion has more number of resonating structures than carboxylate ion carboxylic acid is a stronger acid than phenol. Why? 3  
 b) The  $\alpha$ -hydrogen atoms of carbonyl compounds are acidic.  
 c) Aldehydes are more reactive than ketones in nucleophilic addition reactions.
21. a) Write the reactions of Williamson synthesis of 2-ethoxy-3-methylpentane starting from ethanol and 3-methylpentan-2-ol. 2  
 b) How can you separate a mixture of ortho and para nitro phenol? Give reason. 1  
 OR  
 a) Write the mechanism of nucleophilic addition of Grignard reagent to carbonyl group. 1  
 b) How can you synthesise 1-phenylethanol from a suitable alkene. 1  
 c) Ortho nitro phenol is more acidic than ortho methoxy phenol. Give reason. 1
22. a) An element crystallizes in bcc structure. The edge length of its unit cell is 288 pm. If the density of the crystal is  $7.2 \text{ g cm}^{-3}$ . What is the atomic mass of the element? 2  
 b) Excess of potassium makes KCl crystals violet, Why? 1
23. a) Predict the major product of the following reactions:  

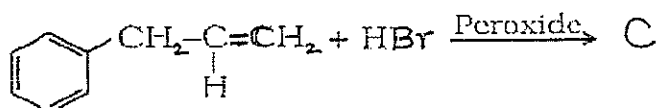
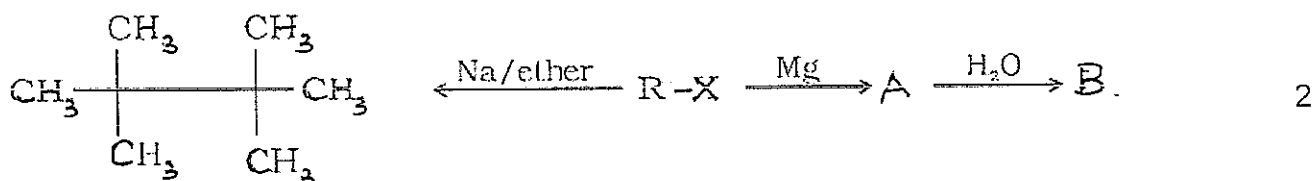
$$\text{R-CH=CH-CHO} + \text{H}_2\text{NCONHNH}_2 \xrightarrow{\text{H}^+}$$
 2  

$$\text{C}_6\text{H}_5\text{CHO} + \text{CH}_3\text{CH}_2\text{CHO} \xrightarrow[\Delta]{\text{dil. NaOH}}$$
 1  
 b) Give a chemical test to distinguish between ethanal and propanal

24. a) Illustrate Reimer-Tiemann reaction with a suitable equation. 1  
 b) Give a chemical test to distinguish between propan-2-ol and 2-methyl propan-2-ol. 1  
 c) Arrange the following in order of their increasing boiling points: 1  
 Pentan-1-ol, butan-1-ol, butan-2-ol, ethanol, propan-1-ol, methanol.

25. a) Predict the order of reactivity of the following compounds towards  $S_N2$  reaction: 1  
 1-Bromobutane, 1-Bromo-2,2-dimethylpropane, 1-Bromo-2-methylbutane, 1-Bromo-3-methylbutane.

b) Identify R, A, B and C in the following equations:



26. Arrange the following in the order of property indicated for each set: 3  
 (i)  $\text{Br}_2$ ,  $\text{Cl}_2$ ,  $\text{I}_2$ ,  $\text{F}_2$  - increasing bond dissociation enthalpy.  
 (ii)  $\text{HClO}_3$ ,  $\text{HClO}$ ,  $\text{HClO}_4$ ,  $\text{HClO}_2$  - increasing  $\text{pK}_a$  values  
 (iii)  $\text{AsH}_3$ ,  $\text{BiH}_3$ ,  $\text{NH}_3$ ,  $\text{SbH}_3$ ,  $\text{PH}_3$  - increasing reducing character.

27. State the principles involved in the following methods:

- a) Froth floatation method 3  
 b) Zone refining  
 c) Electrolytic refining

28. An organic compound (A) with molecular formula  $\text{C}_7\text{H}_6\text{O}$  has a characteristic odour. (A) on reaction with conc.  $\text{NaOH}$  undergoes disproportionation and forms (B) and (C). (A) reacts with  $\text{Zn-Hg}$  and conc  $\text{HCl}$  to give (D) which changes to (A) by  $\text{CrO}_2\text{Cl}_2$  followed by hydrolysis. (B) on heating with soda lime gives an aromatic hydrocarbon (E). Identify (A) to (E) and write all equations. 5

OR

- a) How can you convert the following: 3  
 (i) propanenitrile to propiophenone  
 (ii) 3-Nitrobromobenzene to 3-nitrobenzoic acid  
 (iii) Ethanol to 3-Hydroxybutanal  
 b) Arrange the following in the increasing order of the property indicated: 1  
 Acetaldehyde, Acetone, Di-tert-butyl ketone, Methyl tert-butyl ketone (reactivity to  $\text{HCN}$ )  
 c) Describe Hell-Volhard-Zelinsky reaction. 1

29. a) Calculate the boiling point of a solution containing 0.61g of benzoic acid (molar mass:  $122 \text{ g mol}^{-1}$ ) in 50 g carbon disulphide assuming 84% dimerisation of acid has taken place. The boiling point and  $K_b$  of  $\text{CS}_2$  are  $46.2^\circ\text{C}$  and  $2.3 \text{ K kg mol}^{-1}$  respectively. 3
- b) Define Azeotropes and explain briefly minimum boiling azeotrope by taking a suitable example. 2

OR

- a) An aqueous solution containing 8.5 g of  $\text{NaNO}_3$  dissolved in 1 L water, is apparently 90% dissociated at  $27^\circ\text{C}$ . Calculate its osmotic pressure. ( $R=0.083 \text{ L bar mol}^{-1} \text{ K}^{-1}$ , atomic mass of Na=23, N=14, O=16). 3
- b) What role does the molecular interaction play in a solution of alcohol and water? 1
- c) Explain the term anoxia. 1
30. a) Substance (A) is a colourless pungent smelling gas. It's aqueous solution turns red litmus to blue and Nessler's reagent turns brown. (A) on oxidation at high temperature with Platinum catalyst gave a colourless gas (B). (B) is further oxidized to a brown coloured gas (C). (C) undergoes dimerisation on cooling to give (D) which is colourless and diamagnetic. Identify A, B, C, D and write equations for the conversion of A to B, B to C and C to D. 4
- b) Which form of sulphur exhibits paramagnetism and why? 1

OR

- a) Complete the following equations: 3
- (i)  $\text{P}_4 + \text{SOCl}_2 \rightarrow$
- (ii)  $\text{NH}_3 (\text{excess}) + \text{Cl}_2 \rightarrow$
- (iii)  $\text{XeF}_2 + \text{PF}_5 \rightarrow$  1
- b) What are the conditions to maximize the yield of sulphuric acid by contact process? 1
- c) Explain the shape of  $\text{BrF}_3$  molecule on the basis of VSEPR theory.

3 sets

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CHEMISTRY – XII SET B

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  - Question nos. 19 to 27 are also short answer questions and carry 3 marks each.
  - Question nos. 28 to 30 are long answer questions and carry 5 marks each.
- 
- Identify the isomeric alkane of molecular formula  $C_5H_{12}$  that on photochemical chlorination yields a single monochloro compound. 1
  - What are intrinsic semiconductors? Explain with a suitable example. 1
  - Draw the structure of the 2,4-DNP derivative of acetophenone. 1
  - Write the equation of Friedel-Crafts acylation of anisole. 1
  - Write the equation of the reaction of hydrogen iodide with 2-methoxy butane. 1
  - What is the role of flux in the metallurgy of elements, explain with a suitable example. 1
  - Does the complete hydrolysis of  $XeF_6$  lead to a redox reaction? Justify. 1
  - State Henry's law for a solution of a gas in liquid 1
  - a) Grignard reagents should be prepared under anhydrous conditions. Why? 1  
b) Predict all the alkenes that would be formed by dehydrohalogenation of 2,2,3-Trimethyl-3-bromopentane with sodium ethoxide in ethanol and identify the major alkene. 1
  - Analysis shows that a metal oxide has the formula  $M_{0.96}O_{1.00}$ . Calculate the percentage of  $M^{2+}$  and  $M^{3+}$  in this sample of metal oxide. 2
  - a) Why do solutions have lower vapour pressure than the pure solvent? 2  
b) Define ebullioscopic constant and give its mathematical expression. 2
  - a) Although electron gain enthalpy of fluorine is less negative as compared to chlorine, fluorine is a stronger oxidising agent than chlorine. Why? 2  
b) Why does nitrogen show catenation properties less than phosphorus? 2
  - Calculate the packing efficiency in case of a metal crystal having face centred cubic structures. 2

14. An aqueous solution of 2% non-volatile solute exerts a pressure of 1.004 bar at the normal boiling point of the solvent. What is the molar mass of the solute? (vapour pressure of pure water at its normal boiling point is 1.013 bar). 2

15. Explain the extraction of gold or silver by leaching with NaCN. 2

OR

Describe a method for refining nickel.

16. Write equations for the following: 2

a) ethyl bromide is treated with sodium in the presence of dry ether.

b) n-butyl chloride is treated with alcoholic KOH.

17. Draw the structure of white phosphorus and red phosphorus and write the differences between the two types of phosphorus. 2

18. Distinguish between the following: 2

a) hexagonal close packing and cubic close packing.

b) tetrahedral void and octahedral void.

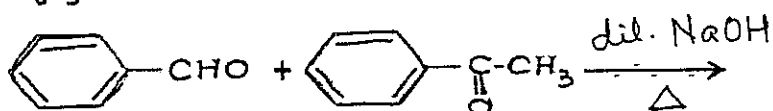
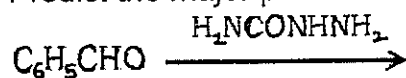
19. a) Illustrate Kolbe's reaction with a suitable equation. 1

b) Give a chemical test to distinguish between phenol and propan-1-ol. 1

c) Arrange the following in order of their increasing boiling points: 1

Pentan-1-ol, n-butane, pentanal, ethoxyethane.

20. a) Predict the major product of the following reactions: 2

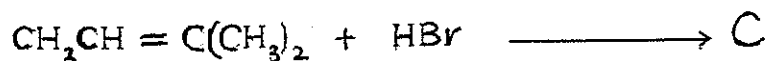
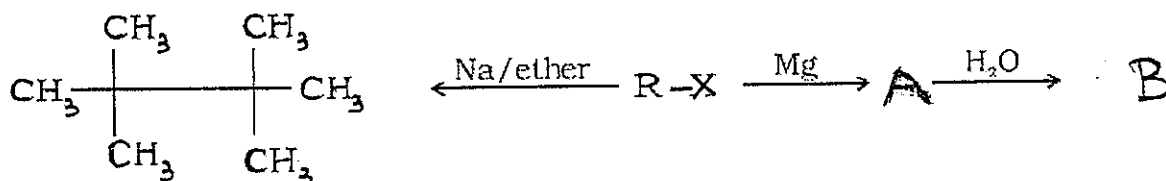


b) Give a chemical test to distinguish between Benzoic acid and Ethyl benzoate 1

21. a) Predict the order of reactivity of the following compounds in  $\text{S}_{\text{N}}1$  reaction: 1

$\text{C}_6\text{H}_5\text{CH}_2\text{Br}$ ,  $\text{C}_6\text{H}_5\text{CH}(\text{C}_6\text{H}_5)\text{Br}$ ,  $\text{C}_6\text{H}_5\text{CH}(\text{CH}_3)\text{Br}$ ,  $\text{C}_6\text{H}_5\text{C}(\text{CH}_3)(\text{C}_6\text{H}_5)\text{Br}$

b) Identify R, A, B and C in the following equations: 2



22. Arrange the following in the order of property indicated for each set:
- $\text{H}_2\text{Se}$ ,  $\text{H}_2\text{O}$ ,  $\text{H}_2\text{Te}$ ,  $\text{H}_2\text{S}$  - increasing boiling point.
  - $\text{HClO}_3$ ,  $\text{HClO}$ ,  $\text{HClO}_4$ ,  $\text{HClO}_2$  - increasing  $K_a$  values
  - $\text{AsH}_3$ ,  $\text{BiH}_3$ ,  $\text{NH}_3$ ,  $\text{SbH}_3$ ,  $\text{PH}_3$  - increasing basic character.
23. Give reasons:
- Although phenoxide ion has more number of resonating structures than carboxylate ion carboxylic acid is a stronger acid than phenol. Why?
  - The  $\alpha$ -hydrogen atoms of carbonyl compounds are acidic.
  - Carboxylic acids do not undergo nucleophilic addition reactions readily.
24. a) An element crystallizes in fcc structure. The edge length of its unit cell is 362 pm. If the density of the crystal is  $8.9 \text{ g cm}^{-3}$ . What is the atomic mass of the element?  
 b) Zinc oxide appears yellow on heating. Why?
25. State the principles involved in the following methods:
- Froth floatation method
  - Zone refining
  - Electrolytic refining
26. a) Suggest a quantitative method for the estimation of the gas which protects us from UV rays of the sun.  
 b) Draw the structures of the following:  $\text{XeF}_6$ ,  $\text{H}_2\text{S}_2\text{O}_8$ .
27. a) Write the reactions of Williamson synthesis of 2-ethoxy-3-methylpentane starting from ethanol and 3-methylpentan-2-ol.  
 b) How can you separate a mixture of ortho and para nitro phenol? Give reason.
- OR
- Write the mechanism of nucleophilic addition of Grignard reagent to carbonyl group.
  - How can you synthesise cyclohexylmethanol using an alkyl halide by an  $\text{S}_{\text{N}}2$  reaction.
  - Ortho nitro phenol is more acidic than ortho methoxy phenol. Give reason.
28. a) Calculate the boiling point of a solution containing 0.61g of benzoic acid (molar mass:  $122 \text{ g mol}^{-1}$ ) in 50 g carbon disulphide assuming 84% dimerisation of acid has taken place. The boiling point and  $K_b$  of  $\text{CS}_2$  are  $46.2 \text{ }^\circ\text{C}$  and  $2.3 \text{ K kg mol}^{-1}$  respectively.  
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  - What role does the molecular interaction play in a solution of alcohol and water?
  - Explain the term edema.

29. a) Substance (A) is a colourless pungent smelling gas. It's aqueous solution turns red litmus to blue and Nessler's reagent turns brown. (A) on oxidation at high temperature with Platinum catalyst gave a colourless gas (B). (B) is further oxidized to a brown coloured gas (C). (C) undergoes dimerisation on cooling to give (D) which is colourless and diamagnetic. Identify A, B, C, D and write equations for the conversion of A to B, B to C and C to D. 4
- b) Which form of sulphur exhibits paramagnetism and why? 1

OR

- a) Complete the following equations: 3
- (i)  $P_4 + SO_2Cl_2 \rightarrow$
- (ii)  $NH_3 + Cl_2 \text{ (excess)} \rightarrow$
- (iii)  $XeF_4 + SbF_5 \rightarrow$
- b) What are the conditions to maximize the yield of ammonia by Haber's process? 1
- c) Explain the shape of  $BrF_3$  molecule on the basis of VSEPR theory. 1
30. An organic compound (A) with molecular formula  $C_7H_6O$  has a characteristic odour. (A) on reaction with conc. NaOH undergoes disproportionation and forms (B) and (C). (A) reacts with Zn-Hg and conc HCl to give (D) which changes to (A) by  $CrO_2Cl_2$  followed by hydrolysis. (B) on heating with soda lime gives an aromatic hydrocarbon (E). Identify (A) to (E) and write all equations. 5

OR

- a) How can you convert the following: 3
- (i) Benzyl alcohol to Phenyl ethanoic acid
- (ii) Benzene to m-Nitroacetophenone
- (iii) propanenitrile to propiophenone
- b) Arrange the following in the increasing order of the property indicated: 1
- Benzaldehyde, p-Tolualdehyde, p-Nitrobenzaldehyde, Acetophenone. (reactivity to HCN)
- c) Describe Wolff-Kishner reduction. 1