

# NEW STANDARD ACADEMY

Marks: 60

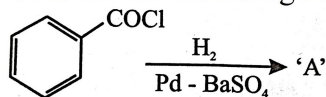
Date : 17-11-25

CLASS : 12<sup>TH</sup>

Time: 3 hours.

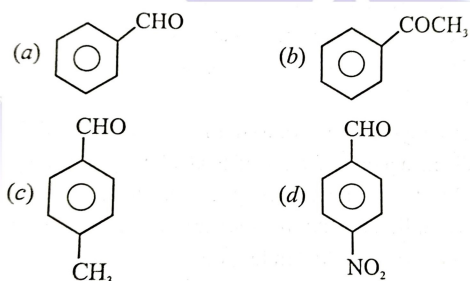
## SECTION-A

1. Consider the following reaction

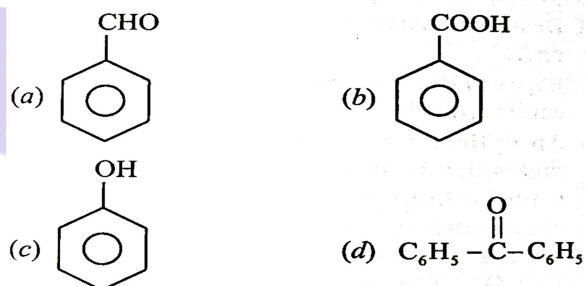
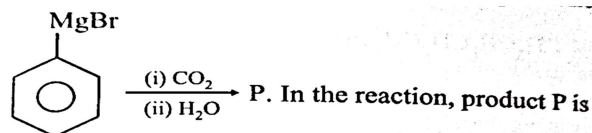


The product 'A' is:

- (a)  $\text{C}_6\text{H}_5\text{Cl}$  (b)  $\text{C}_6\text{H}_5\text{CHO}$   
 (c)  $\text{C}_6\text{H}_5\text{OH}$  (d)  $\text{C}_6\text{H}_5\text{COCH}_3$
2. Which of the following is the correct order of acidic strength?  
 (a)  $\text{Cl}_3\text{CCOOH} > \text{Cl}_2\text{CHCOOH} > \text{ClCH}_2\text{COOH} > \text{CH}_3\text{COOH}$   
 (b)  $\text{CH}_3\text{COOH} > \text{ClCH}_2\text{COOH} > \text{Cl}_2\text{CHCOOH} > \text{Cl}_3\text{CCOOH}$   
 (c)  $\text{CH}_3\text{COOH} > \text{Cl}_3\text{CCOOH} > \text{Cl}_2\text{CHCOOH} > \text{ClCH}_2\text{COOH}$   
 (d)  $\text{CH}_3\text{COOH} > \text{ClCH}_2\text{COOH} > \text{Cl}_2\text{CHCOOH} > \text{Cl}_3\text{CCOOH}$
3. Which of the following compounds is obtained when  $\text{CH}_2=\text{CH}-\text{COOH}$  is reduced by  $\text{LiAlH}_4$ ?  
 (a)  $\text{CH}_3\text{CH}_2\text{COOH}$  (b)  $\text{CH}_2=\text{CHCH}_2\text{OH}$   
 (c)  $\text{CH}_3\text{OH}$  (d)  $\text{CH}_3\text{CH}_2\text{CHO}$
4. Among the given, which one is most reactive towards nucleophilic addition reaction?



5. Which of the following is more acidic?  
 (a)  $\text{H}_2\text{NCH}_2\text{COOH}$  (b)  $\text{H}_3\text{N}^+$   
 $\text{CH}_2\text{COOH}$   
 (c)  $\text{CH}_3\text{COOH}$  (d) All have equal acidic strength
- 6.



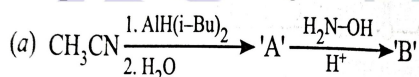
7. If a student accidentally mixes oil with water while preparing a homogenous solution for an experiment, what problem will they encounter and why?  
 (a) The solution will be homogenous because oil dissolves in water.  
 (b) The solution will be heterogeneous because oil does not dissolve in water.  
 (c) The solution will turn into a solid solution due to the density of oil.  
 (d) No problem will be encountered as all liquids mix uniformly.
8. A glycerine solution, at 293 K, has a molality of 3.89 molal and molarity of 5.33 M. Which of these would be CORRECT for molarity and molality of the same glycerine solution at 450K?  
 (a) Molarity < 5.33 M; Molality = 3.89 molal  
 (b) Molarity < 5.33 M; Molality < 3.89 molal  
 (c) Molarity > 5.33 M; Molality = 3.89 molal  
 (d) Molarity = 5.33 M; Molality = 3.89 molal
9. 4L of 0.02 M aqueous solution of NaCl was diluted by adding one litre of water. The molality of the resultant solution is  
 (a) 0.004 (b) 0.008

- (c) 0.012 (d) 0.016

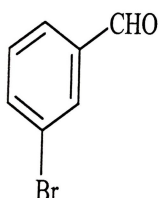
10. The value of Henry's constant  $K_H$
- greater for gases with higher solubility
  - greater for gases with lower solubility
  - constant for all gases.
  - not related to the solubility of gases

### SECTION-B

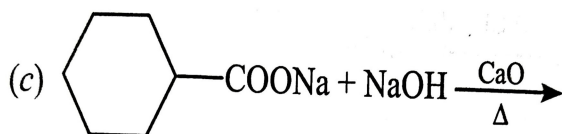
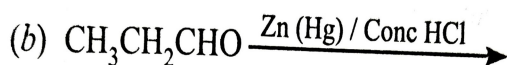
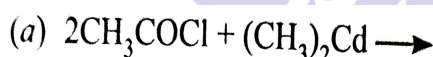
11. Account for the following:
- Aromatic carboxylic acids do not undergo Friedel-Crafts reaction.
  - A and B are two functional isomers of compound  $C_2H_2O$ . On heating with NaOH and  $I_2$ , isomer B forms yellow precipitate of iodoform whereas isomer A does not form any precipitate. Write the formula of A and B.
12. Complete the following:



- (b) Write IUPAC name of the following compound:



- (c) Write chemical test to distinguish between the following compounds: Phenol and Benzoic acid
13. Convert the following:
- Propan-1-ol to 2-Bromopropanoic acid
  - Acetaldehyde to But-2-enal
14. Write the main product in the following reactions



15. (a) Which acid of the following pair would you expect to be stronger?  
F- $CH_2$ -COOH or  $CH_3$ -COOH
- (b) Arrange the following compounds in increasing order of their boiling points:  
 $CH_3CH_2OH$ ,  $CH_3CHO$ ,  $CH_3COOH$
- (c) Give a simple chemical test to distinguish between Benzaldehyde and Acetophenone

16. The air is a mixture of a number of gases. The major components are oxygen and nitrogen with approximate proportion of 20% is to 79% by volume at 298 K. The water is in equilibrium with air at a pressure of 10 atm. At 298 K, if the Henry's law constants for oxygen and nitrogen are  $3.3 \times 10^7$  mm and  $6.51 \times 10^7$  mm respectively, calculate the composition of these gases in water.

17. The freezing point of a solution containing 5 g of benzoic acid ( $M = 122 \text{ g mol}^{-1}$ ) in 35 g of benzene is depressed by 2.94 K. What is the percentage association of benzoic acid if it forms a dimer in solution? ( $K_f$  for benzene =  $4.9 \text{ K kg mol}^{-1}$ )

18. A 0.01 m aqueous solution of  $AlCl_3$ , freezes at  $-0.068^\circ C$ . Calculate the percentage of dissociation. [Given:  $K_f$  for Water  $1.86 \text{ K kg mol}^{-1}$ ]

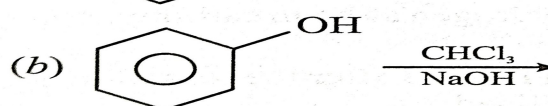
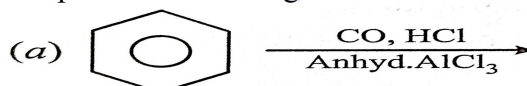
19. Answer the following questions:

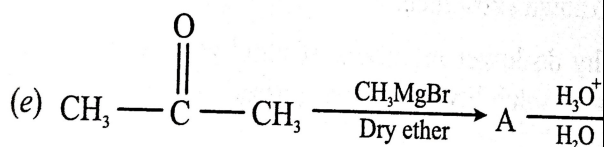
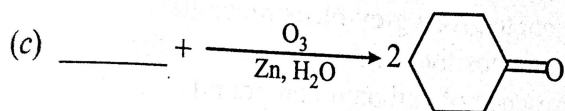
- Give an example of the liquids which when mixed result in an endothermic process. What will be the change in volume when the liquids are mixed?
- At 300K, what is the relation between the osmotic pressure of two equimolar solutions, one whose Van't Hoff factor is 2 and for the other is  $\frac{1}{2}$ ?
- Which of the two aqueous solutions has a higher melting point: 2molal glucose solution or 3 molal sucrose solution? Why?

20. A solution of glucose in water is labelled as 10% w/w, what would be the molality and mole fraction of each component in the solution? If the density of solution is  $1.2 \text{ g mL}^{-1}$  then what shall be the molarity of the solution?

### SECTION-C

21. Complete the following reaction:

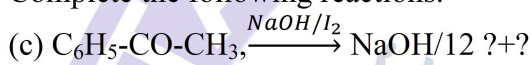




22. Write short notes on

- Aldol condensation reaction
- What is the difference between aldol condensation reaction and cannizzaro's reaction?

Complete the following reactions.



Distinguish between

- Formic acid and acetic acid

23. (a) Write the reaction involved in Cannizzaro's reaction.

- Why are the boiling point of aldehydes and ketones lower than that of corresponding carboxylic acids?

(c) An organic compound 'A' with molecular formula  $\text{C}_2\text{H}_2\text{O}_2$  is reduced to n-pentane with hydrazine followed by heating with NaOH and Glycol. 'A' forms a dioxime with hydroxylamine and gives a positive Iodoform and Tollen's test. Identify 'A' and give its reaction for Iodoform and Tollen's test.

24. (a) Give a chemical test to distinguish between ethanal and ethanoic acid.

- Why is the  $\alpha$ -hydrogens of aldehydes and ketones acidic in nature?

(c) An organic compound 'A' with molecular formula  $\text{C}_4\text{H}_8\text{O}_2$  undergoes acid hydrolysis to form two compounds 'B' and 'C'. Oxidation of 'C' with acidified potassium permanganate also produces 'B'. Sodium salt of 'B' on heating with soda lime gives methane.

- Identify 'A', 'B' and 'C'.

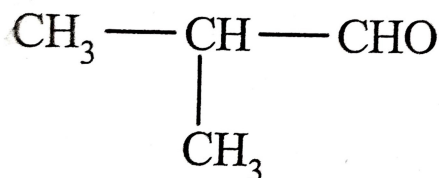
- Out of 'B' and 'C', which will have a higher boiling point?

Give a reason.

25. (a) An alkene 'A' (Mol. formula  $\text{CH}_{10}$ ) 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, 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.

(b) State if the compound given below will produce chloroform ( $\text{CHCl}_3$ ) on reaction with sodium hypochlorite. Justify your answer.



26. (a) Depict the elevation in boiling point colligative property using a diagram.

- Calculate the osmotic pressure of a 0.5L solution made of 18g glucose, 6g urea and 34.2g sucrose at 300 K?

- Differentiate between osmosis and reverse osmosis.

27. (a) The vapour pressure of pure water at a certain temperature is 23.80 mm Hg. If 1 mole of a non-volatile non-electrolytic solute is dissolved in 100g water, Calculate the resultant vapour pressure of the solution.

- 30 g of urea is dissolved in 846 g of water. Calculate the vapour pressure of water for this solution if vapour pressure of pure water at 298 K is 23.8 mm Hg

(c) On addition of solute to solvent during dissolution, some solute particles separate out from the solution due to crystallisation. At equilibrium, what happens to the concentration of solute in the solution at a given temperature and pressure?

28. (a) Define the term solution. How many types of solutions are formed? Write briefly about each type with an example.

- Give an example of a solid solution in which the solute is a gas.

29. This question contains four parts. Answer all of them.

- A solution is prepared by mixing 250 mL of a 2 M hydrochloric acid (HCl) solution with 500 mL of a 4 M HCl solution. Calculate the molarity of the final solution.

(b) How many moles of solute are present in 250 mL of a 0.5 M solution?

(c) Calculate molality of 3.5 g of ethanoic acid in 80 g benzene.

(d) Calculate the mole fraction of ethylene glycol ( $C_2H_6O$ ) in a solution containing 40%  $C_2H_6O_2$  by mass.

30. (a) The partial pressure of ethane over a solution containing  $6.56 \times 10^{-3}$  g of ethane is 1 bar. If the solution contains  $5 \times 10^{-2}$  g of ethane, then what shall be the partial pressure of the gas?

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

(c) What is the significance of Henry's Law constant  $K$ ?

(d) Explain why climbers experience symptoms of anoxia at high altitudes.

