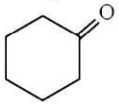
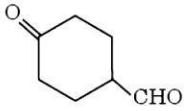
Unit Practice Test

for Board Examination

Time Allowed : 2 Hrs. Maximum Marks : 35

1. What type of hybridisation is involved for carbon in a carbonyl group? (1)
2. Arrange the following compounds in the increasing order of boiling points :
   $C_2H_5OC_2H_5$, C_4H_9COOH, C_4H_9OH (1)
3. What is the name of the following reaction?
   $RCOCl + H_2 \xrightarrow{\text{anhyd. } AlCl_3} RCHO + HCl$ (1)
4. Complete the reaction :
   
   $+ HCN \longrightarrow ?$ (1)
5. Draw the structures of hex-2-en-4-ynoic acid. (1)
6. How will you convert the following to benzoic acid?
   (*i*) Ethylbenzene (*ii*) Bromobenzene. (2)
7. Write the structures of the products formed by the aldol condensation of the following :
   (*i*) 2-Methylpentanal (*ii*) Phenyl acetaldehyde. (2)
8. Explain the following :
   (*i*) Benzoic acid is stronger acid than acetic acid.
   (*ii*) Chloroacetic acid is stronger acid than acetic acid. (2)
9. Write the names of the reagents to bring about the following conversions:
   (*i*) Ethane nitrile to ethanal (*ii*) *p*-Fluorotoluene to *p*-fluorobenzaldehyde (2)
10. There are two $—NH_2$ groups in semicarbazide. However, only one is involved in the formation of semicarbazone. Give reason. (2)
11. Explain the following reactions by giving one example :
    (*i*) Reosenmund reduction (*ii*) Cannizzaro's reaction (*iii*) Wolff Kishner reduction. (3)
12. Complete the following reactions :
    (*i*) 
    $\xrightarrow[\text{Hydrolysis}]{H_2O, \text{ boil}}$
    (*ii*) $C_6H_5CHO \xrightarrow{H_2NCONHNH_2}$
    (*iii*) $CH_3COCH_2COOC_2H_5 \xrightarrow[H^+]{NaBH_4}$ (3)
13. Give one chemical test to distinguish between the following :
    (*i*) Pentan-2-one and pentan-3-one (*ii*) Phenol and benzoic acid
    (*iii*) Acetophenone and benzophenone (3)
14. An organic compound (A) (molecular formula $C_8H_{16}O_2$) was hydrolysed with dilute sulphuric acid to give carboxylic acid (B) and an alcohol (C). Oxidation of (C) with chromic acid produced (B). (C) on dehydration gives but-1-ene. Write equations for the reactions involved. (3)
15. How will you convert acetic acid into :
    (*i*) acetamide (*ii*) acetyl chloride (*iii*) ethyl acetate. (3)
16. (*a*) An organic compound with the molecular formula $C_9H_{10}O$ forms 2, 4-DNP derivative, reduces Tollen's reagent and undergoes Cannizzaro reaction. On vigorous oxidation, it gives 1,2-benzenedicarboxylic acid. Identify the compound.
    (*b*) Arrange the following compounds in the increasing order of their reactivity in nucleophilic addition reaction :
    Ethanal, propanal, propanone, butanone.
    (*c*) Although p-hydroxybenzoic acid is less acidic than benzoic acid, *ortho* hydroxybenzoic acid is about 15 times more acidic than benzoic acid. Explain. (2,1,2)

▶ To check your performance, see HINTS AND SOLUTIONS TO SOME QUESTIONS at the end of Part II of the book.

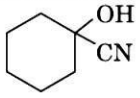
UNIT 12 : ALDEHYDES, KETONES AND CARBOXYLIC ACIDS

1. sp^2

2. $C_2H_5OC_2H_5 < C_4H_9OH < C_4H_9COOH$

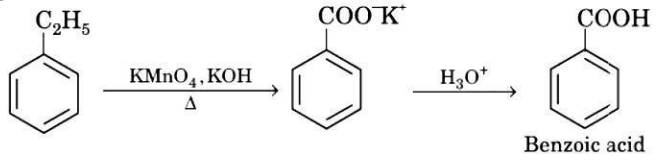
3. Rosenmund's reaction

4.



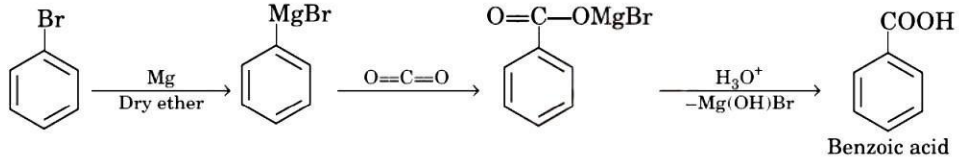
5. $CH_3—C\equiv C—CH=CH—COOH$

6. (*i*)



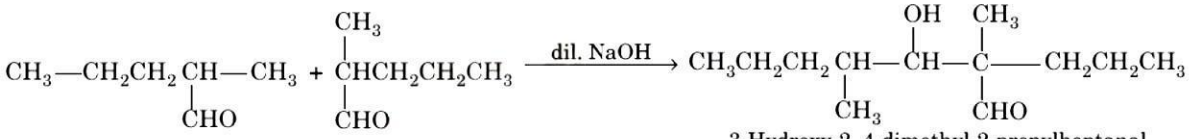
Benzoic acid

(*ii*)



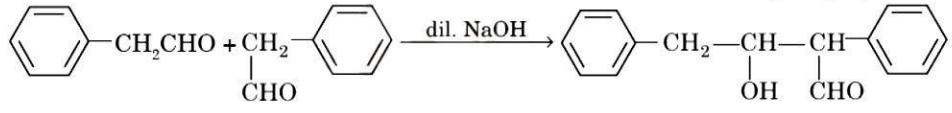
Benzoic acid

7. (*i*)



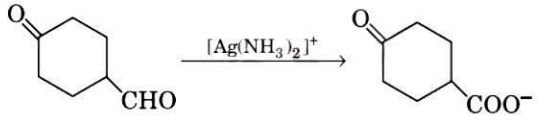
3-Hydroxy-2, 4-dimethyl-2-propylheptanal

(*ii*)



3-Hydroxy-2, 4-diphenylbutanal

12. (*i*)



(*ii*) $C_6H_5CHO \xrightarrow{H_2NCONHNH_2} C_6H_5CH=NNHCONH_2 + H_2O$

(*iii*) $CH_3COCH_2COOC_2H_5 \xrightarrow[H^+]{NaBH_4} CH_3—\underset{\displaystyle OH}{\underset{|}{CH}}—CH_2COOC_2H_5$

14. (*i*) Since the given compound on hydrolysis with dil. HSO_4 gives carboxylic acid (B) and an alcohol (C), it must be an ester.

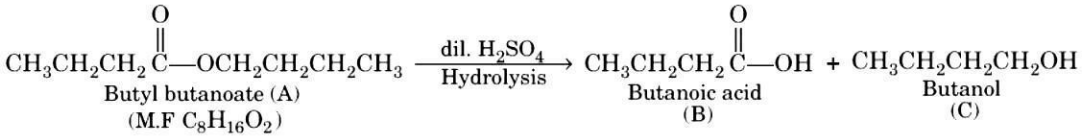
(*ii*) Since the oxidation of alcohol (C) gives the acid B, therefore, both the carboxylic acid B and alcohol C must contain same number of C atoms.

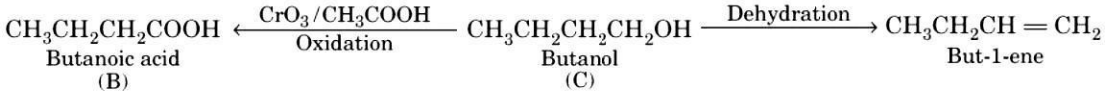
(*iii*) Since ester (A) contains 8 carbon atoms, therefore, both carboxylic acid (B) and the alcohol (C) must contain 4 C atoms each.

(*iv*) Alcohol (C) on dehydration gives but-1-ene and therefore, C must be a straight chain alcohol i.e., butan-1-ol.

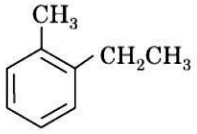
(*v*) (B) is obtained by the oxidation of (C) and therefore, B must be butanoic acid.

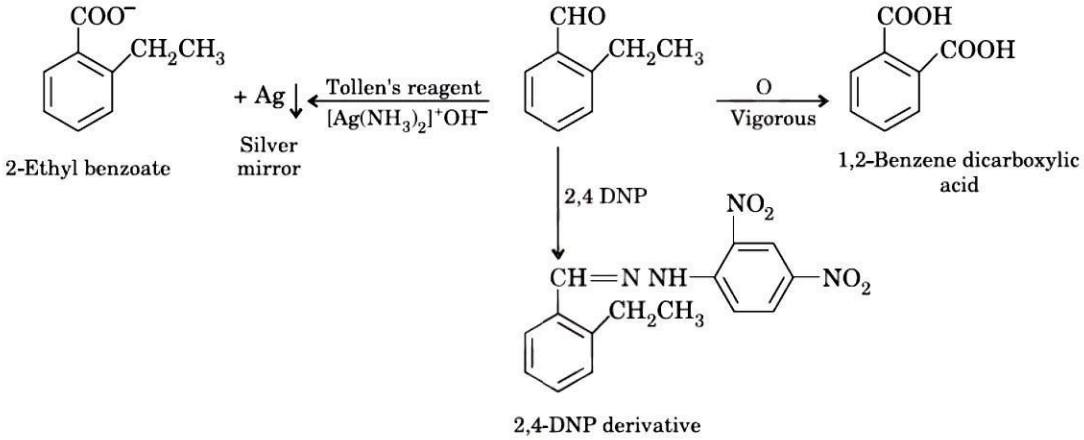
This also suggests that the ester (A) must be butyl butanoate. The relevant reactions are :





16. (*a*) The given compound forms 2,4-DNP derivative. Therefore, it is an aldehyde or ketone. Since it reduces Tollen's reagent, it must be an aldehyde. The compound undergoes Cannizzaro's reaction, so it does not contain a-hydrogen. On vigorous oxidation, it gives 1,2-benzenedicarboxylic acid, it means that it must be containing alkyl group at 2-position with respect to CHO group on the benzene ring.

The molecular formula suggests it should be  2-Ethylbenzaldehyde



(*b*) butanone < Propanone < propanal < ethanal

(*c*) –OH group is electron releasing group and therefore, it increases the negative charge on the anion. As a result, *p*-hydroxy benzoic acid is less acidic than benzoic acid. However, *o*-hydroxy benzoic acid is more acidic than benzoic acid. The enhanced acidity of *o*-isomer is due to very effective intramolecular hydrogen bonding in the carboxylate ion. As a result, *o*-hydroxy benzoate ion is stabilized to a great extent and therefore, it makes *o*-isomer more acidic.