

CHEMISTRY



Swotters

Important Questions

Multiple Choice questions-

Question 1. Which of the following cannot reduce Fehling's solution?

- (a) Formic acid
- (b) Acetic acid
- (c) Formaldehyde
- (d) Acetaldehyde

Question 2. Which of the following acids does not form anhydride?

- (a) Formic acid
- (b) Acetic acid
- (c) Propionic acid
- (d) n-butyric acid

Question 3. The acid which does not contain-COOH group is

- (a) Ethanoic acid
- (b) Lactic acid
- (c) Picric acid
- (d) Palmitic acid

Question 4. Trans-esterification is a reaction between

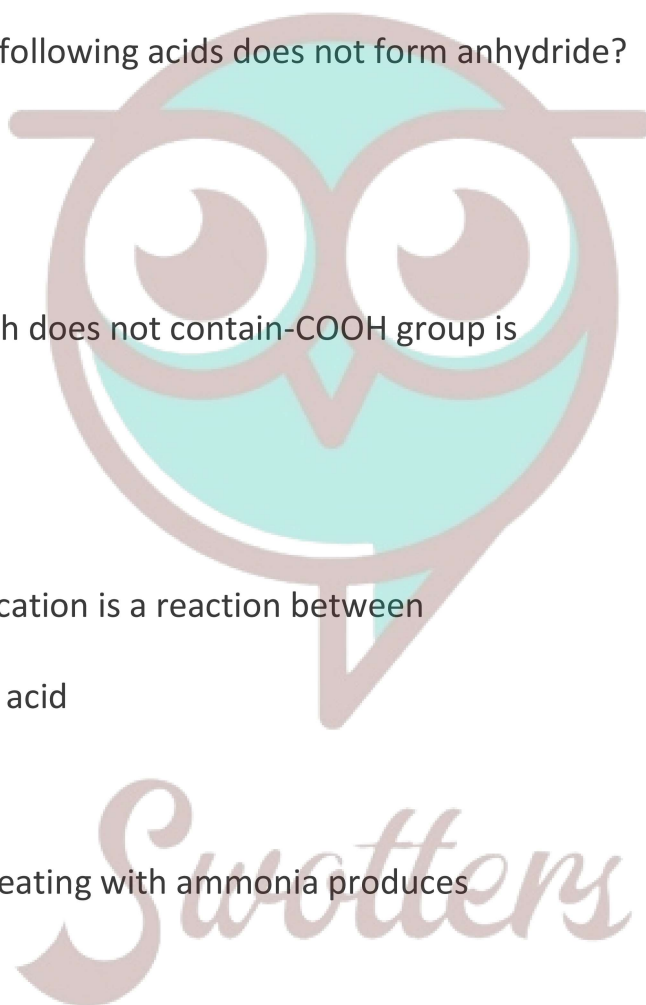
- (a) two ester molecules
- (b) alcohol and carboxylic acid
- (c) alcohol and ether
- (d) alcohol and ester.

Question 5. Acetone on heating with ammonia produces

- (a) Acetaldehyde
- (b) Diacetone alcohol
- (c) Diacetoneamine
- (d) Hydrobenzamide

Question 6. Methyl ketones are usually characterised through

- (a) Tollen's reagent
- (b) Iodoform test
- (c) Schiff's test
- (d) Benedict solution test.



Question 7. Which of the following reagents can be used to prepare ketone from acid chloride?

- (a) Grignard's reagent
- (b) LiAlH_4
- (c) Dimethyl cadmium
- (d) Cadmium chloride

Question 8. HVZ reaction is used to prepare

- (a) β -haloacid
- (b) α -haloacid
- (c) α, β -unsaturated add
- (d) None of these

Question 9. An alkene C_7H_{14} on reductive ozonolysis gives an aldehyde with formula $\text{C}_3\text{H}_6\text{O}$ and a ketone. The ketone is

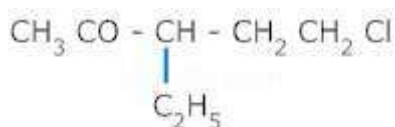
- (a) 2-butanone
- (b) 2-pentanone
- (c) 3-pentanone
- (d) propanone

Question 10. Acetaldo is a condensation product of

- (a) two molecules of ethanal
- (b) two molecules of propanone
- (c) ethanal and methanal
- (d) ethanal and propanone.

Very Short Questions-

1. Give one use of Formalin.
2. What is the chemical name of Tollen's reagent and Fehling's solution.
3. Write the structure of alkenes that on ozonolysis will give ketone only.
4. What is the function of BaSO_4 in Rosenmund reaction?
5. Name the isomers with molecular formula $\text{C}_3\text{H}_6\text{O}$. Which one will have high boiling point?
6. Write a chemical test to distinguish between aldehyde and ketone.
7. What happens when acetaldehyde is kept with a trace of sulphuric acid? Write the structure of product.
8. What is the Hofmann bromamide reaction? Illustrate with one example.
9. Give IUPAC name of following



10. Give IUPAC name of following

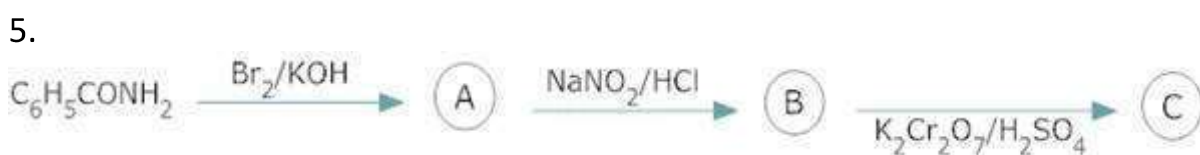
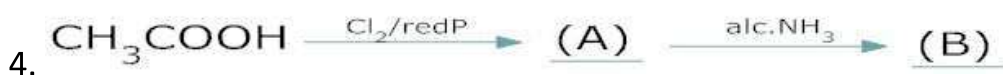


Short Questions-

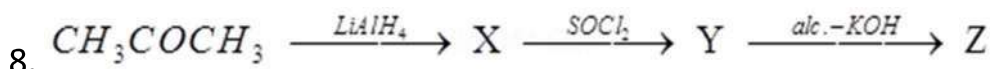
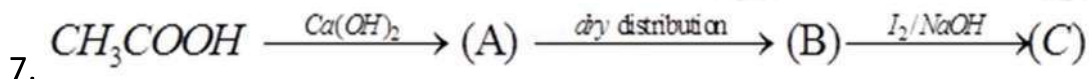
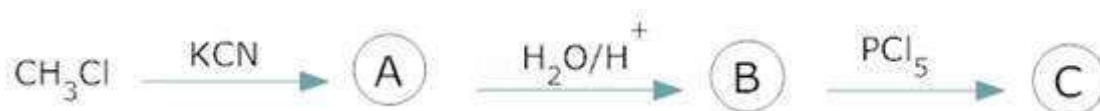
- Ethanoic acid has molar mass of 120 in vapour state.
- Carboxylic acids do not give characteristic reactions of Carboxylic acid is stronger acid than phenol.
- Ethanol is more soluble in water than ethyl chloride
- Aldehydes are more reactive than Ketones towards nucleophilic additions.
- Carboxylic acids has higher boiling points than alcohols of same no. of carbon atoms.
- carbonyl group.
- Formaldehyde does not undergo aldol condensation.
- Floro acetic acid is a stronger acid than acetic acid.
- Toluene to benzaldehyde
- Acetaldehyde to Acetamide

Long Questions-

- A compound 'A' with formula $C_5H_{10}O$ gives a positive 2, 4 -DNP test but a negative Tollen's test It can be oxidizing to carboxylic acid 'B' of molecular formula $C_5H_8O_2$, when treated with alk. $KMnO_4$ under vigorous conditions. The salt of 'B' gives a hydrocarbon 'C' on Kolbes' electrolytic decarboxylation. Identify A, B.C & write chemical equations.
- A compound A with molecular formula $C_5H_{12}O$ on oxidation forms compound B with molecular formula $C_5H_{10}O$. The compound B gives iodoform test but does not reduce ammoniacal silver nitrate. The compound B on reduction with Zn - Hg/ HCl gives compound C with molecular formula C_5H_{12} . Identify A,B.C & give the chemical reactions involved.
- An organic compound A, which has a characteristic odour, on treatment with NaOH forms two compound B and C. Compound B has molecular formula C_7H_8O which on oxidation gives back A. Compound C is the sodium salt of an acid. C, when heated with soda lime yields an aromatic hydrocarbon D. deduce the structures of A to D.



6.



Assertion and Reason Questions-

1. In these questions, a statement of assertion followed by a statement of reason is given. Choose the correct answer out of the following choices.

- Assertion and reason both are correct statements and reason is correct explanation for assertion.
- Assertion and reason both are correct statements but reason is not correct explanation for assertion.
- Assertion is correct statement but reason is wrong statement.
- Assertion is wrong statement but reason is correct statement.

Assertion: Aromatic aldehydes and formaldehyde undergo Cannizzaro reaction.

Reason: Aromatic aldehydes are almost as reactive as formaldehyde.

2. In these questions, a statement of assertion followed by a statement of reason is given. Choose the correct answer out of the following choices.

- Assertion and reason both are correct statements and reason is correct explanation for assertion.
- Assertion and reason both are correct statements but reason is not correct explanation for assertion.
- Assertion is correct statement but reason is wrong statement.
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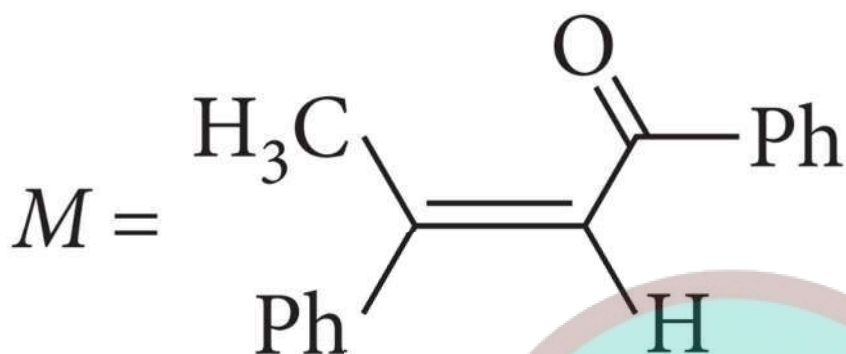
Assertion: O-Substituted benzoic acids are generally stronger acids than benzoic acids.

Reason: Increased strength is due to ortho-effect.

Case Study Questions-

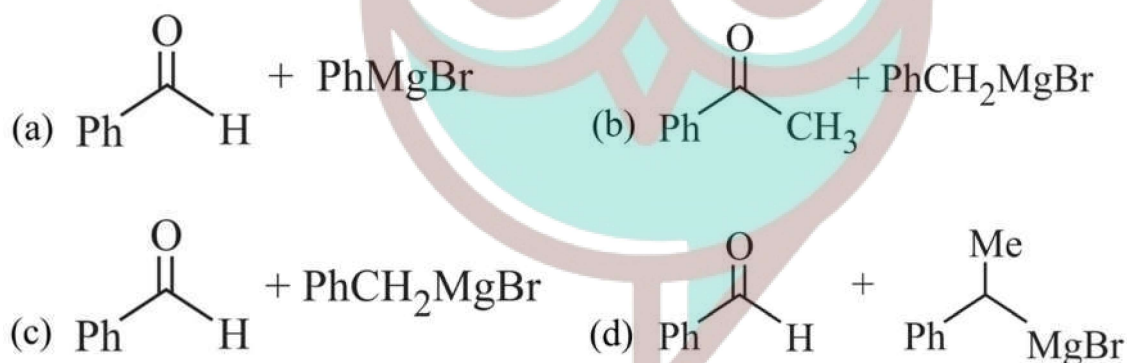
1. Read the passage given below and answer the following questions:

A tertiary alcohol H upon acid catalysed dehydration gives a product I. Ozonolysis of I leads to compounds J and K. Compound J upon reaction with KOH gives benzyl alcohol and a compound I, whereas K on reaction with KOH gives only M.

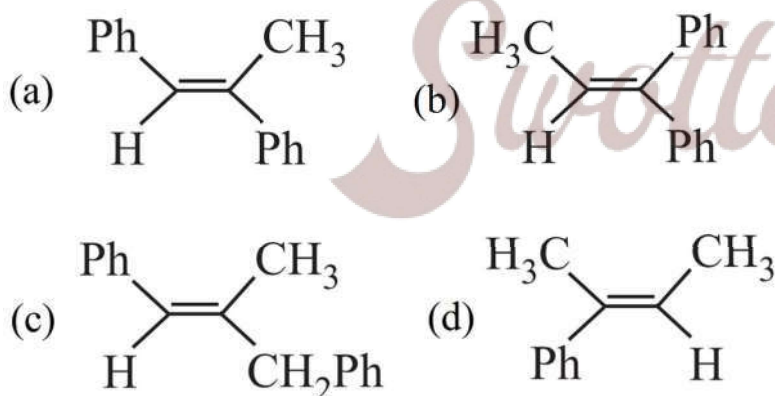


The following questions are multiple choice questions. Choose the most appropriate answer:

(i) Compound H is formed by the reaction of:



(ii) The structure of compound I is:



(iii) The structures of compound J, K and I, respectively, are:

- a) PhCOCH_3 , $\text{PhCH}_2\text{COCH}_3$ and $\text{PhCH}_2\text{COO}^-\text{K}^+$
 b) PhCHO , PhCH_2CHO and PhCOO^-K^+
 c) PhCOCH_3 , PhCH_2CHO and $\text{CH}_3\text{COO}^-\text{K}^+$

d) PhCHO, PhCOCH₃ and PhCOO⁻K⁺

(iv) When (J) is treated with acetic anhydride, in the presence of corresponding salt of an acid, the product obtained is:

- a) Cinnamic acid.
- b) Crotonic acid.
- c) Maleic acid.
- d) Benzylic acid.

(v) Which of the following statements is correct for compound (K)?

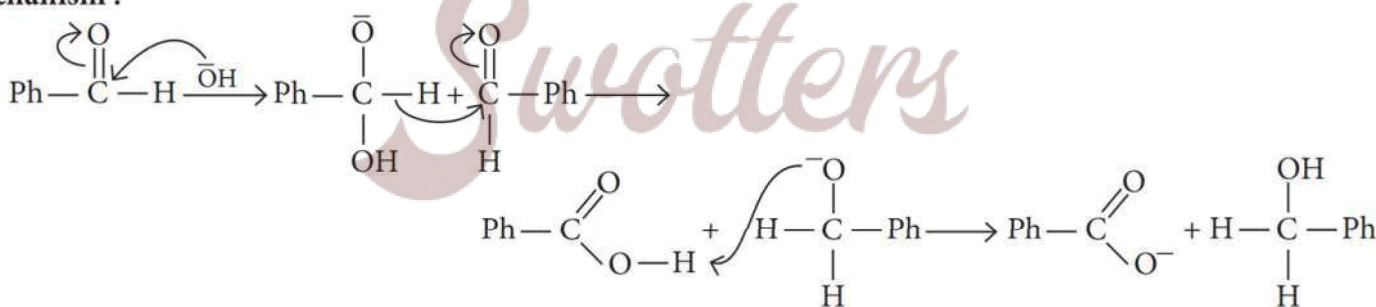
- a) It reacts with alkaline KMnO₄ followed by acidic hydrolysis and forms benzoic acid.
- b) It reacts with iodine and NaOH to form triiodomethane.
- c) It is prepared by the reaction of benzene with benzoyl chloride in presence of anhydrous aluminium chloride.
- d) It reacts with freshly prepared ammoniacal silver nitrate solution.

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

When an aldehyde with no α-hydrogen reacts with concentrated aqueous NaOH, half the aldehyde is converted to carboxylic acid salt and other half is converted to an alcohol. In other words, half of the reactant is oxidized and other half is reduced. This reaction is known as Cannizzaro reaction.



Mechanism :



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

- (i) A mixture of benzaldehyde and formaldehyde on heating with aqueous NaOH solution gives:
- a) Benzyl alcohol and sodium formate.
 - b) Sodium benzoate and methyl alcohol.

- c) Sodium benzoate and sodium formate.
- d) Benzyl alcohol and methyl alcohol.

(ii) Which of the following compounds will undergo Cannizzaro reaction?

- a) CH_3CHO
- b) CH_3COCH_3
- c) $\text{C}_6\text{H}_5\text{CHO}$
- d) $\text{C}_6\text{H}_5\text{CH}_2\text{CHO}$

(iii) Trichloroacetaldehyde is subjected to Cannizzaro's reaction by using NaOH. The mixture of the products contains sodium trichloroacetate ion and another compound. The other compound is:

- a) 2, 2, 2-trichloroethanol.
- b) Trichloromethanol.
- c) 2, 2, 2-trichloropropanol.
- d) Chloroform.

(iv) In Cannizzaro reaction given below:



the slowest step is:

- a) The attack OH^- at the carbonyl group.
- b) The transfer of hydride to the carbonyl group.
- c) The abstraction of proton from the carboxylic group.
- d) The deprotonation of PhCH_2OH .

(v) Which of the following reaction will not result in the formation of carbon-carbon bonds?

- a) Cannizzaro reaction.
- b) Wurtz reaction.
- c) Reimer-Tiemann reaction.
- d) Friedel-Crafts' acylation.

MCQ Answers-

1. Answer: (b) Acetic acid
2. Answer: (a) Formic acid

3. Answer: (c) Picric acid
4. Answer: (d) alcohol and ester.
5. Answer: (c) Diacetoneamine
6. Answer: (b) Iodoform test
7. Answer: (c) Dimethyl cadmium
8. Answer: (b) α -haloacid
9. Answer: (a) 2-butanone
10. Answer: (a) two molecules of ethanal

Very Short Answers-

Ans 1. Formalin is used as a disinfectant, preservative for biological specimens and in leather industry.

Ans 2. Tollen's reagent = Ammoniacal Silver Nitrate
Fehlings solution = Sodium Potassium Tartarate.

Ans 3.

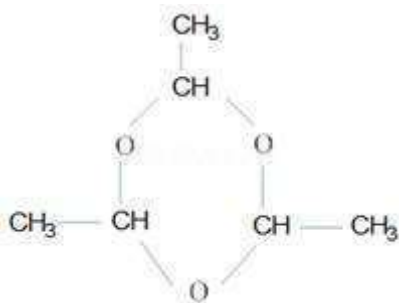


Ans 4. BaSO_4 acts as a catalytic poison which prevents further reduction of aldehyde to alcohol.

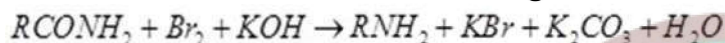
Ans 5. The two isomers are CH_3COCH_3 and $\text{CH}_3\text{CH}_2\text{CHO}$. Acetone boils at higher temperature due to presence of two electron donating alkyl groups.

Ans 6. Aldehydes and ketones can be distinguished by Tollen's test. Aldehydes give a silver mirror on reacting with Tollen's reagent whereas ketones will not react.

Ans 7. A trimer of acetaldehyde, called paraldehyde is formed.



Ans 8. Hoffman bromamide reaction is a reaction in which amides are converted to amines of one carbon less than the starting amide. It is a very important step – down reaction.



Ans 9. 5-Chloro -3- ethylpentan -2-one.

Ans 10. 2 -(2-bromophenyl) ethanal

Short Answers-

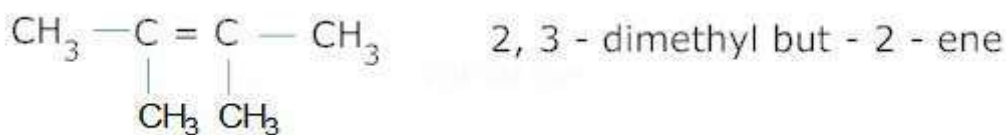
Ans 1. Carboxylic acid on dissociation form carboxylate ion which is stabilized by two equivalent resonance structure in which negative charge is at the more electronegative oxygen atom, whereas the conjugate base of phenol, phenoxide ion, has non – equivalent resonance structures in which negative charge is at the less electronegative carbon atom. Therefore resonance is not as important as it is in carboxylate ion. Moreover the negative charge is delocalized over two more electronegative oxygen atoms in carboxylate ion whereas it is less effectively delocalized over one oxygen atom and one carbon atom in phenoxide ion. Therefore the carboxylate ion is more stabilized than phenoxide ion and carboxylic acids are stronger acids than phenol.

Ans 2. Ethanol can form intermolecular Hydrogen bonding with water molecules, ethyl chloride cannot. Therefore ethanol is soluble in water and ethyl chloride is not.

Ans 3. Aldehydes are more reactive than Ketones due to steric and electronic reasons. In Ketones due to presence of two relatively large alkyl groups, the approach of nucleophile is more hindered than in aldehydes having only one such substitute. More over the +I effect of alkyl groups reduces the electrophilicity of carbonyl group more in Ketone than in aldehydes.

Ans 4. Carboxylic acids have more extensive association of molecules through intermolecular hydrogen bonding than alcohols. Moreover their boiling points are higher than alcohols of same carbon atoms.

Ans 5. Ethanoic acid exists as dimer in vapour state in which two molecules remain together by hydrogen bonding. This increases the effective molecular mass to 120.



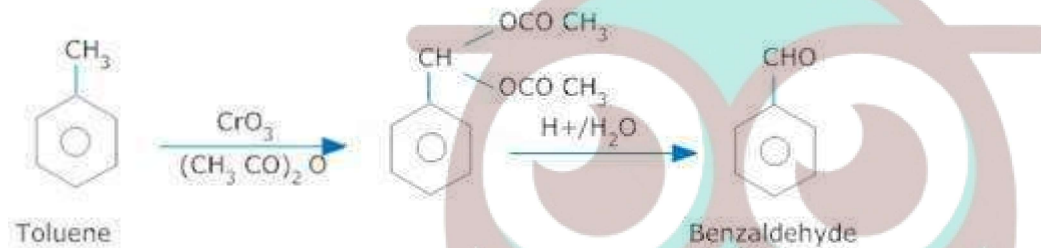
Ans 6. In carboxylic acids due to presence of resonance, the C=O group is not a pure carbonyl group & therefore they do not show characteristic reactions of carbonyl group.

Ans 7. Formaldehyde does not have any $BaSO_4$ -hydrogen and therefore it can not show aldol condensation.

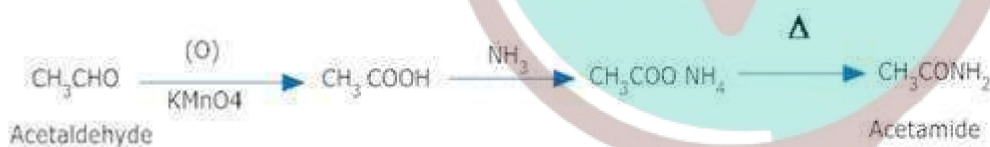
Ans 8. In fluoroacetic acid, Fluorine being electron withdrawing group stabilizes the conjugate base through delocalization of the negative charge
 C_3H_5O

Therefore fluoroacetic acid is a stronger acid than acetic acid.

Ans 9.

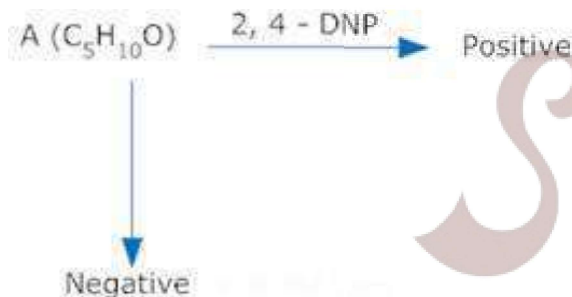


Ans 10.



Long Answers-

Ans 1.



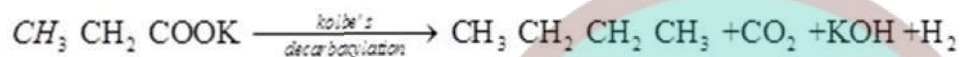
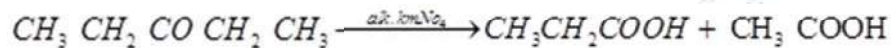
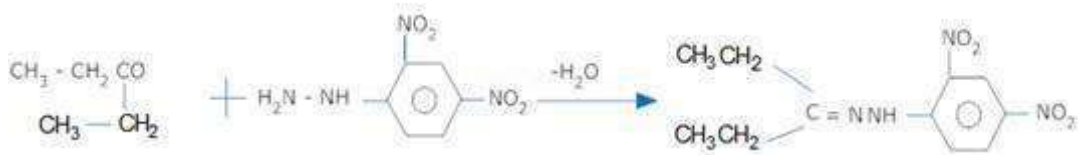
As the compound A gives a positive 2, 4-DNP test but negative Tollen's test, it is a ketone. Since on oxidation, it gives an acid B, of molecular formula $C_3H_6O_2$, it is $CH_3CH_2COCH_2CH_3$ and B is CH_3CH_2COOH . As C is obtained by Kolbe's decarboxylation of B, C is $CH_3CH_2CH_2CH_3$.

Therefore A = Pentan -3 one, $\text{CH}_3\text{CH}_2\text{COCH}_2\text{CH}_3$

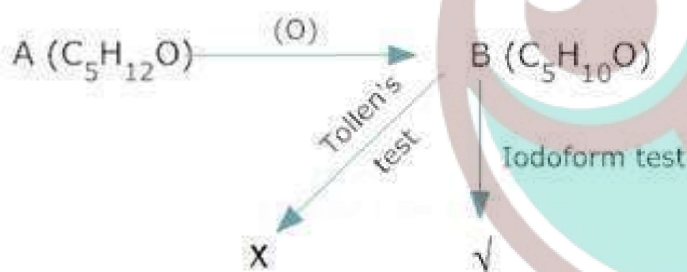
B = Propanoic acid $\text{CH}_3\text{CH}_2\text{COOH}$

And C = Butane $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_3$

The sequence of reactions is



Ans 2.

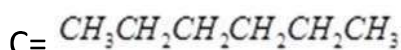
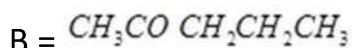
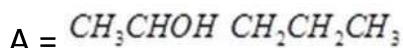


Since B gives a negative Tollen's test but positive Iodoform test, it is methyl ketone, i.e., $\text{CH}_3\text{COCH}_2\text{CH}_2\text{CH}_3$. Also it is formed by oxidation of A.

Therefore A is secondary alcohol i.e., $\text{CH}_3\text{CH(OH)CH}_2\text{CH}_2\text{CH}_3$ on reduction B gives pentane with Zn - HCl.

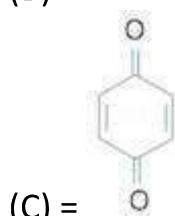
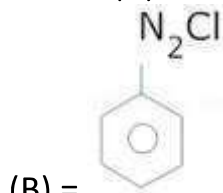
Therefore C is $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_3$

Therefore



Reactions:-

Ans 5. (A) = $C_6H_5CH_2NH_2$



Ans 6. (A) = CH_3CN

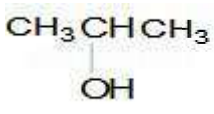
(B) = CH_3COOH

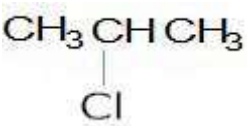
(C) = CH_3COCl

Ans 7. (A) = $(CH_3COO)_2Ca$

(B) = CH_3COCH_3

(C) = CHI_3

Ans 8. X = 

Y = 

Z = $CH_3 - CH = CH_2$



Swotters

Assertion and Reason Answers-

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

Explanation:

Aromatic aldehydes and formaldehyde do not contain α -hydrogen and thus undergo Cannizzaro reaction. Formaldehyde is more reactive than aromatic aldehydes.

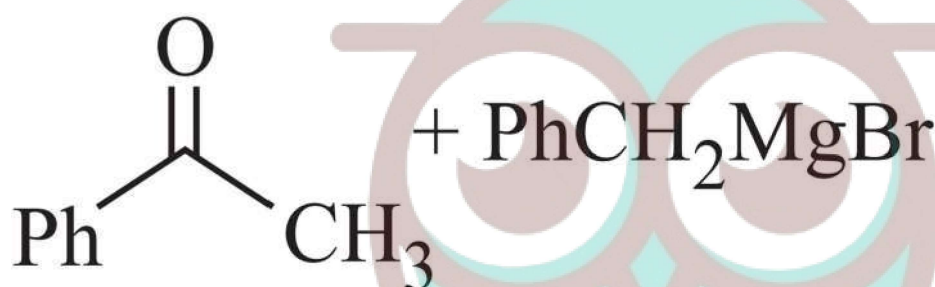
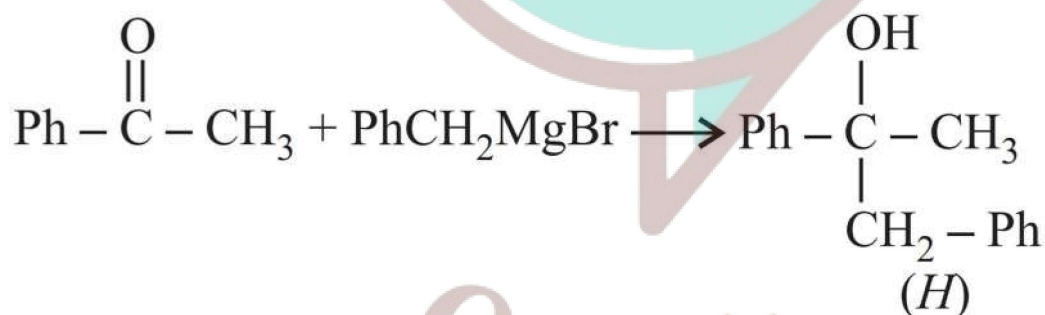
2. (a) Assertion and reason both are correct statements and reason is correct explanation for assertion.

Explanation:

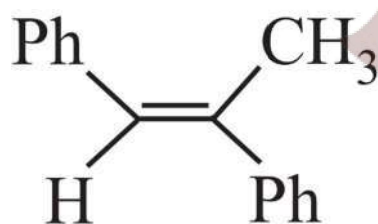
O-Substituted benzoic acids are generally stronger acids than benzoic acid. This is regardless of the nature(+I or -I) of the substituent. This is called ortho-effect and is probably due to a combination of steric and electronic factors.

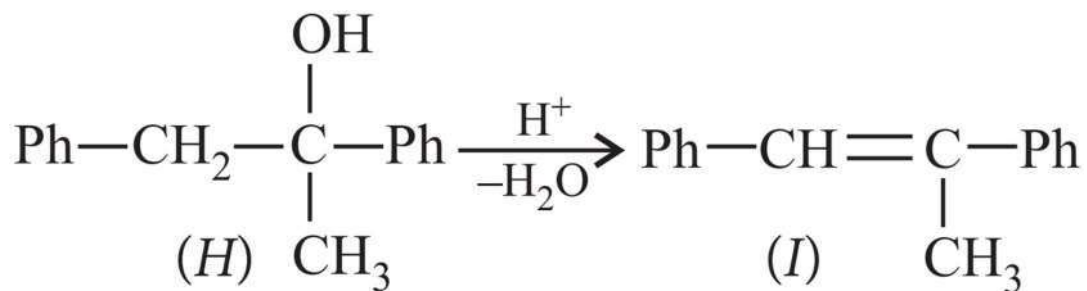
Case Study Answers-**1. Answer :**

(i) (b)

**Explanation:**

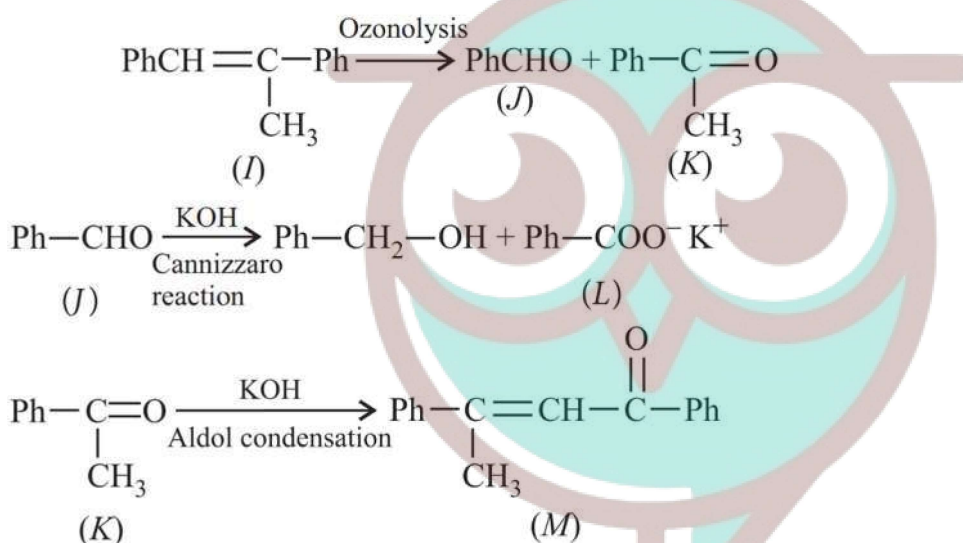
(ii) (a)

**Explanation:**



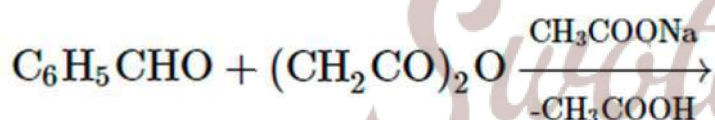
(iii)(d) PhCHO, PhCOCH₃ and PhCOO⁻K⁺

Explanation:

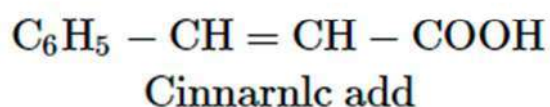


(iv)(a) Cinnamic acid.

Explanation:



Benzaldehyde Acetic anhydride



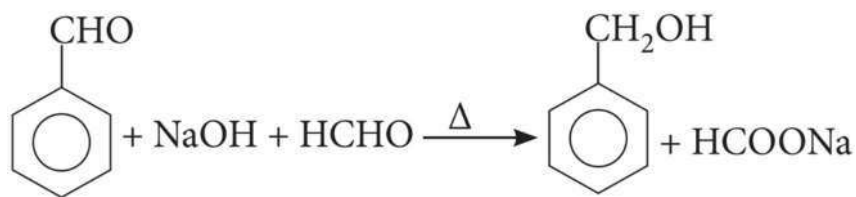
(v) (b) It reacts with iodine and NaOH to form triiodomethane.

2. Answer :

(i) (a) Benzyl alcohol and sodium formate.

Explanation:

It is an example of cross Cannizzaro reaction where aromatic aldehyde gets reduced to alcohol and aliphatic aldehyde gets oxidised to its sodium salt (both aldehydes must not contain any α - α -hydrogen).

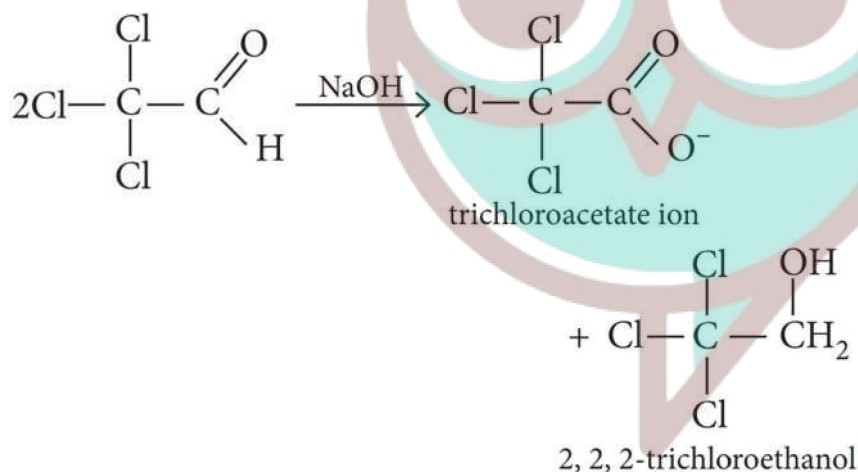


(ii) (c) $\text{C}_6\text{H}_5\text{CHO}$

(iii) (a) 2, 2, 2-trichloroethanol.

Explanation:

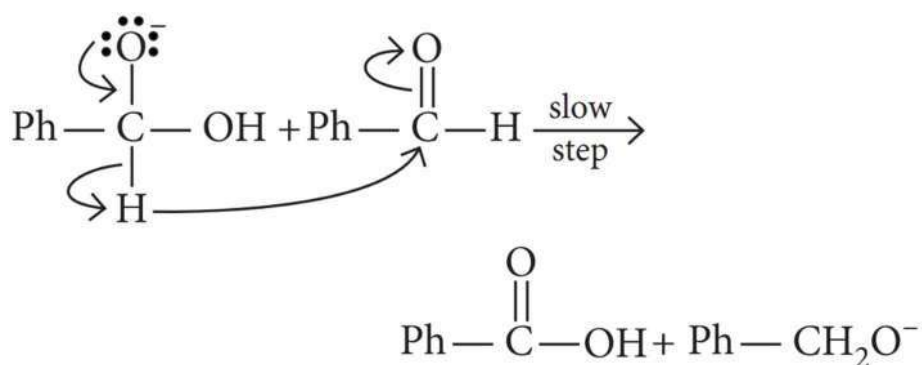
The Cannizzaro product of given reaction yields 2, 2, 2-trichloroethanol.



(iv) (b) The transfer of hydride to the carbonyl group.

Explanation:

Hydride transfer is the slowest step.



(v) (a) Cannizzaro reaction.

Explanation:

C-C bond is not formed in Cannizzaro reaction while other reactions result in the formation of C-C bond.



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