# U.G. 3rd Semester Examination 2021

**CHEMISTRY (Honours)**

**Paper Code : DC-7**

**(Organic Chemistry)**

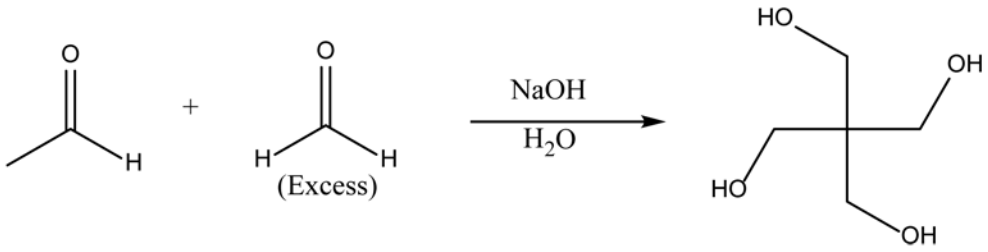
**(CBCS)**

Full Marks: 25 Time: Two Hours

*The figures in the margin indicate full marks.*
*Candidates are required to give their answers in their own words as far as practicable*

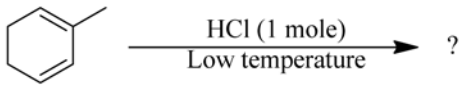
**1. Answer any *five* questions from the following:** (5x1) = **5**

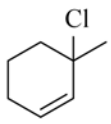
(a) The mechanism of the following transformation involves

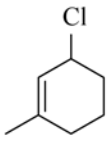


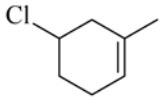

(i) Aldol reaction followed by Cannizzaro reaction
(ii) Perkin reaction followed by Cannizzaro reaction
(iii) Knoevenagel condensation followed by Cannizzaro reaction
(iv) Stobbe condensation and Cannizzaro reaction

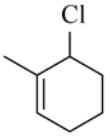
(b) Which of the following is major product –



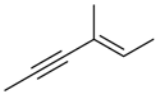

(i) 

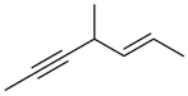

(ii) 

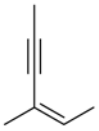

(iii) 

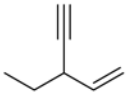

(iv) 


(c) The ene-yne that produces a chiral compound upon treatment with Lindlar's catalyst is:

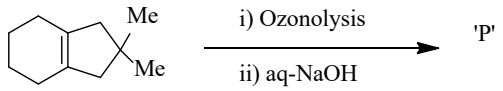
(i) 

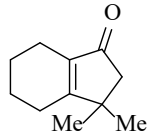
(ii) 

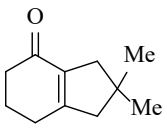
(iii) 

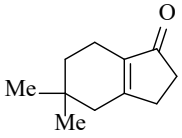
(iv) 

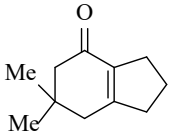
(d) The product '**P**' in the following reaction is -



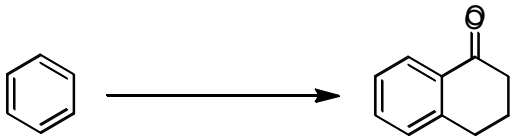

(i) 


(ii) 


(iii) 


(iv) 


(e) The appropriate reagent for carrying out the following transformation are-




(i) a) Succinic anhydride, $AlCl_3$ ; b) Zn/Hg, HCl ; c) Polyphosphoric acid

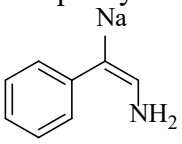
(ii) a) Maleic anhydride , $AlCl_3$ ; b) $NH_2$-$NH_2$, KOH ; c) $H_2SO_4$

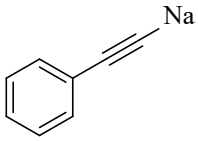
(iii) a) Succinic anhydride, $FeCl_3$ ; b) $LiAlH_4$ ; iii) $H_2SO_4$

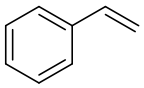
(iv) a) Phthalic anhydride, $F_3B.OEt_2$ ; b) $HSCH_2$-$CH_2SH$, $H^+$ ; c) Raney Ni ;

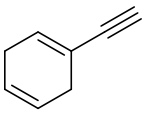
d) Polyphosphoric acid

(f) Reaction of phenylacetylene with sodamide in liquid ammonia generates

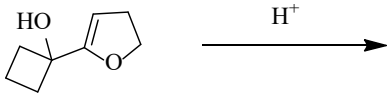
(i) 

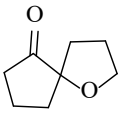

(ii) 

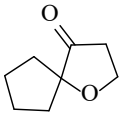

(iii) 

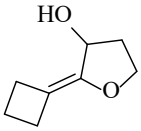
iv) 

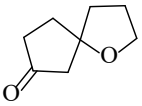
(g) Product of the following reaction is



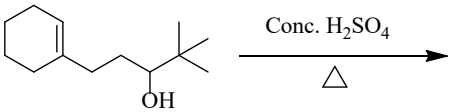

(i) 

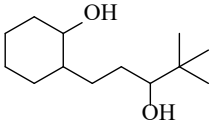

(ii) 

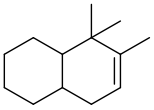

(iii) 

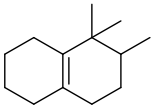

(iv) 

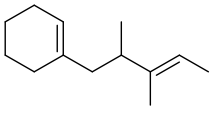

(h) Which of the following will be the correct product of the reaction -




(i) 


(ii) 

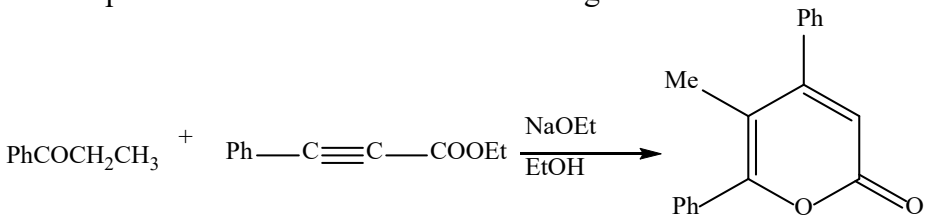
(iii) 

(iv) 

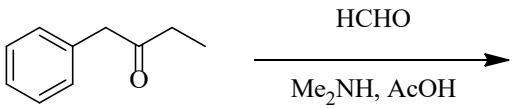
2. **Answer any *four* questions**: (2x4) = **8**

(a) What happens when one equivalent of phenyl magnesium bromide is treated with two equivalents of benzaldehyde?

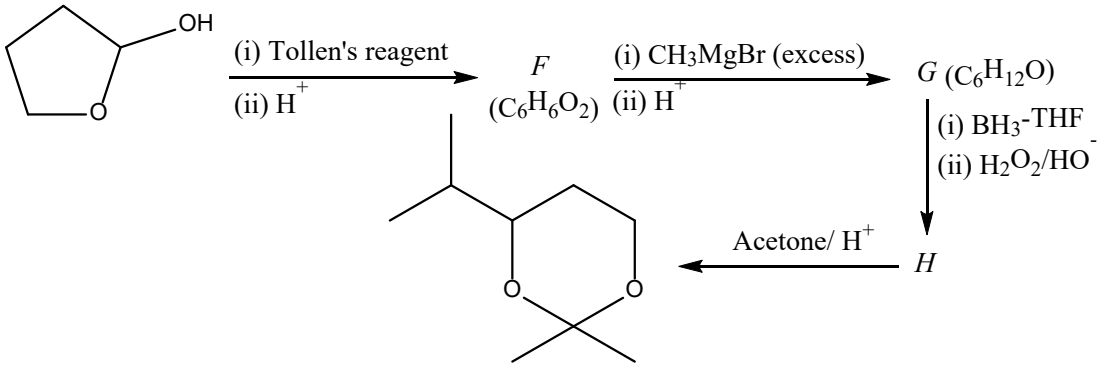
(b) Formulate a plausible mechanism for the following reaction.




(c) Predict the major product of the following reaction with a plausible mechanism.

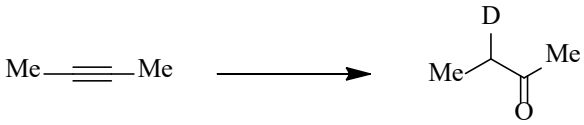



(d) Give the structures of the products (F-H) in the following sequence of reactions.




(e) How can you synthesise 2,2-dimethylbutane using an organocopper reagent?

(f) Carry out the following conversion:




(g) Treatment of 2-butyne with sodium in liquid ammonia gives *E*-2-butene but 1,3-butadiene, under identical conditions, produces mainly *Z*-2-butene. Explain the observation.

(h) A compound *O* having molecular formula $C_6H_{12}$ decolourises both permanganate and bromine water. *O* on ozonolysis followed by reductive work-up ($Zn/H_3O^+$) produces equal amounts of *P* and *Q* with identical molecular formula. Both *P* and *Q* form 2, 4-dinitrophenyl hydrazones, however, only *Q* shows positive test with Tollen's reagent. Identify the compounds *O*, *P* and *Q*.

3. **Answer any *two* questions**: (6x2) = 12

(a) (i) Compound *U* having molecular formula $C_8H_8O$ on treatment with Zn and ethyl bromoacetate gave compound *V* ($C_{12}H_{16}O_3$). Compound *V* on dehydration followed by hydrogenation over $SrCO_3$ gave *W* ($C_{12}H_{16}O_2$). Hydrolysis of *W* produced *X* ($C_{10}H_{12}O_2$) as one of the products. Decarboxylation *X* gave isopropyl benzene. Identify *U*, *V*, *W* and *X*. [3

(ii) Acid catalysed hydration of 3,3-dimethyl-1-butene is not a good method for its conversion into 3,3-dimethyl-2-butanol. Why? How can this transformation be achieved efficiently? [3

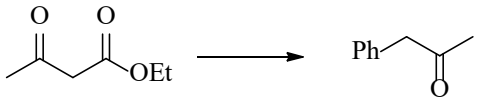
(b) (i) An optically active compound *R* ($C_5H_6O$) on treatment with $H_2$ in presence of Lindlar's catalyst gave a compound *S* ($C_5H_8O$). Upon catalytic hydrogenation compound *R* gave *T* ($C_5H_{12}O$). Both *S* and *T* were found to be optically inactive. Identify *R*, *S* and *T*. [3

(ii) What should be the sign of optical rotation of the product formed by acid hydrolysis of *S*-1-phenylethyl acetate? Explain with mechanism. [2

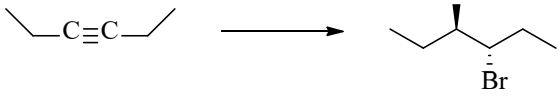
(iii) What is *ipso* substitution? Give an example. [1

(c) (i) Carry out the following conversions. [2+2 = 4

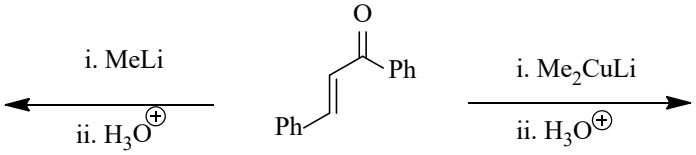
i)



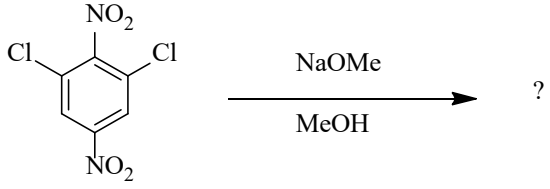

ii)




(ii) Predict the major product of the following reactions and show mechanisms in each case. [2




(d) (i) Predict the product(s) with mechanism. [2




(ii) When aniline is subjected to the Friedel-Crafts alkylation in presence of catalytic amount of $AlCl_3$, alkylation does not occur. In presence of a large excess of $AlCl_3$, a very small amount of *meta*-alkylation is obtained. Explain. [2

(iii) How can you convert acetophenone into PhCH(OH)COOH? [2