KATHMANDU UNIVERSITY
End Semester Examination
February/March 2018

Marks Scored:

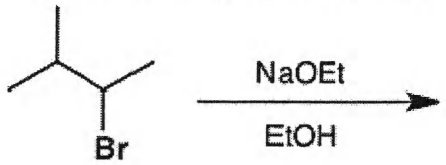
Level : B. E./B. Sc./B. Pharm.
Year : II
Course : CHEM 201
Semester : I
Exam Roll No. :
Time: 30 mins.
F. M. : 20
Registration No.:
Date MAR 1 1 2018

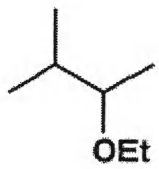
SECTION "A"
[20 Q × 1= 20 marks]

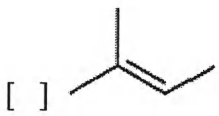
I. Select the most appropriate answer.

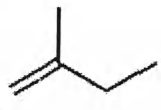
1. Which one of the following statement is wrong to describe E1 mechanism?
[ ] Reactions going via E1 mechanism are unimolecular in rate determining step
[ ] Reactions going via E1 mechanism are generally first order
[ ] Reactions going via E1 mechanism usually occur in one step
[ ] Reactions going via E1 mechanism are multi-step reactions

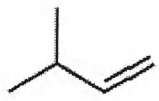
2. What is the main product of the following reaction?



[ ] 

[ ] 

[ ] 

[ ] 

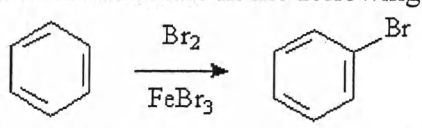
3. Which of the following is a good nucleophile?

[ ] BH_3 [ ] Br_2 [ ] HBr [ ] NH_3

4. A chemical reaction between carbonyl compound and semicarbazide is an example of

[ ] condensation reaction
[ ] addition reaction
[ ] substitution reaction
[ ] elimination reaction

5. The intermediate in the following reaction is



[ ] radical [ ] carbanion [ ] carbocation [ ] transition state

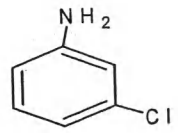
6. What can be said with certainty if a compound has $[\alpha]^{D}_{25} = -10°$?
[ ] The compound has the (S) configuration
[ ] The compound has the (R) configuration
[ ] The compound is not a meso form
[ ] The compound has an optical purity of less than 100%

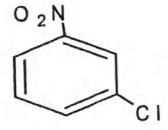
7. What is the likely mechanism for the following reaction?
$CH_3Cl + NaOH = CH_3OH + NaCl$
[ ] S_N1 [ ] S_N2
[ ] Neither S_N1 nor S_N2 [ ] Both S_N1 and S_N2

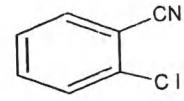
8. Which of the following is NOT true of enantiomers? They have the same:
[ ] boiling point [ ] melting point [ ] specific rotation [ ] density

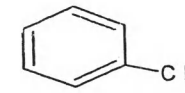
9. Which of the following solvent is highly favorable for the S_N1 reaction?
[ ] Water [ ] Ethanol
[ ] Dimethylsulfoxide [ ] Trifluroacetic acid

10. Which one of the following is the least reactive towards nucleophilic aromatic substitution reaction?

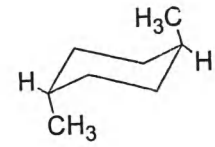
[ ] 

[ ] 

[ ] 

[ ] 

11. The name of the compound is
[ ] cis-1,4-dimethylcyclohexane
[ ] trans-1,4-dimethylcyclohexane
[ ] cis-1,3-dimethylcyclohexane
[ ] trans-2,4-dimethylcyclohexane.



12. A sample of 2-butanol shows a specific rotation $[\alpha]^{D}_{25} = +6.76°$ and the sample is mixture of (S) (+)-2-butanol $[\alpha]^{D}_{25} = +13.52°$, and (R) (-)-2-butanol $[\alpha]^{D}_{25} = -13.52°$. What is the percent composition of the mixture?
[ ] 75%(R) 25%(S) [ ] 67%(R) 33%(S)
[ ] 25%(R) 75%(S) [ ] 50%(R) 50%(S)

13. What is the electrophile in the electrophilic substitution reaction of benzene using HNO_3 and H_2SO_4?
[ ] SO_3 [ ] NO_3 [ ] NO_2^+ [ ] NO^+

14. In a benzene molecule, each carbon atom shares electrons with
[ ] one neighbor [ ] two neighbors [ ] three neighbors [ ] four neighbors

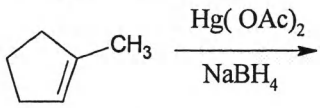
15. In the transition state of nucleophilic aromatic substitution,
[ ] positive charge develops on carbon [ ] negative charge develops on carbon
[ ] little charge develops on carbon [ ] three is no charge on carbon

II. Fill in the blanks with appropriate words/symbols.

16. Anti-conformation of *n*-butane is more stable than the gauche by----------kcal/mol energy.

17. In the chair conformation of cyclohexane, the bulky group has more room in an---------- ----------position.

18. The product of the following reaction is ----------.



19. Reaction of ethene with cold alkaline $KMnO_4$ forms----------.

20. CH_3-CH=CH_2 reacts with HBr in presence of peroxides to give----------.

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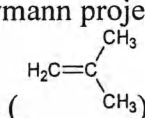
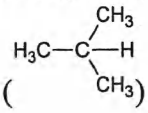
SECTION "B"

Attempt *ALL* the questions.

1. A. Define confirmation and draw confirmations of propane in Newmann projection formula.[2]

B. Show with mechanism the product of the reaction of isobutylene () with isobutane () performed in acidic condition. [2]

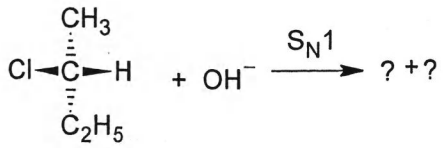
C. Write down the structures of enantiomers formed when *n*-butane reacts with Cl_2 in presence of heat. [2]

2. Give appropriate reasons for the following facts (*ANY FIVE*). [2 × 5 =10]

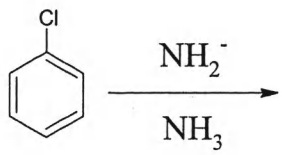
A. Both *m*-bromoanisole and *o*-bromoanisole yield the same product *m*-anisidine when reacted with $NaNH_2/NH_3$.
B. Cyclopropane generally shows reactions leading to ring opening.
C. Presence of chiral centre can sometimes lead to optical inactivity.
D. A strong nucleophile favors the S_N2 reaction and a weak nucleophile favors the S_N1 reaction.
E. In E2 mechanism, the order of reactivity of alkyl halide is 3°>2°>1°.
F. Insertion of nitro group facilitates the conversion of chlorobenzene to phenol in presence of aqueous NaOH.

3. Give mechanisms for the following reactions (ANY *FOUR*). [2.5 × 4 = 10]

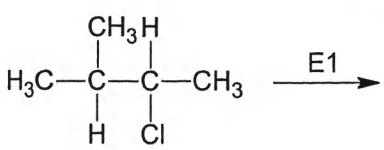
A. Addition of HBr to ethene in the presence of peroxide
B. Sulfonation of benzene
C.



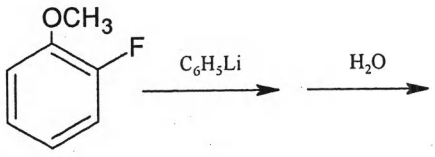
D.

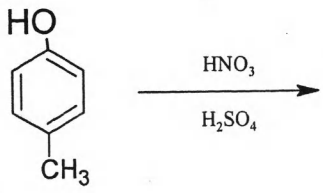


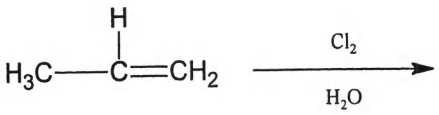
E.

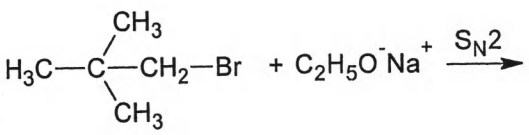


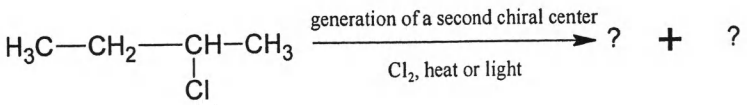
4. Give reactions of the following reactants. [1 × 6 = 6]

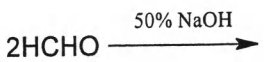
A. 

B. 

C. 

D. 

E. 

F. 

5. How do you convert to respective products (give appropriate reactions) (*ANY THREE*)? [1× 3 = 3]

A. Benzene to bromobenzene
B. Benzene to nitrobenzene
C. $CH_3CH_2CH_2CH_2$-Br to $CH_3CH_2CH{=}CH_2$
D. Methyl bromide to methyl amine

6. A. Reaction of carbonyl compound with ammonia derivatives requires right acidity in the system. Give reason. [2]
B. Write down the reaction of Br_2 with $CH_2{=}CH_2$ showing the intermediate of it. What happens if some salt such as NaI is added and what can be interfered from it? [2]
C. What are the factors that affect the orientation of hydroboration reaction? [2]
D. How can a racemic modification be separated into enantiomers? [2]
E. Write down the reaction of toluene with $KMnO_4$ followed by nitration. What happens if nitration is performed first and then reacts with $KMnO_4$? [2]

7. Write short notes on (*ANY FOUR*) [2.5 × 4 = 10]

A. Phase transfer catalysis
B. Structure of benzene
C. Sequence rules
D. Bayer strain theory
E. Carbocations