REV-01
MSC/01/05

2023/01

SET A

M.Sc. CHEMISTRY
FIRST SEMESTER
ORGANIC CHEMISTRY-I
MSC – 102 [REPEAT]

[USE OMR SHEET FOR OBJECTIVE PART]

Duration : 3 hrs. **Full Marks : 70**

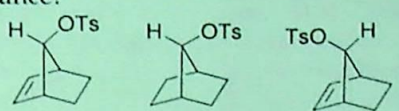
(Objective)

Time: 30 min. **Marks: 20**

Choose the correct answer from the following: ***1X20=20***

1. Protic polar solvent in the list of solvents (1) Et-OH,(2) CH_2Cl_2, (3) CH_3-COOH and (4) CH_3CN, is
   a. 3 only
   b. 1 and 3
   c. 2 and 3
   d. 2, 3 and 4

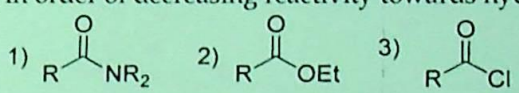
2. In which of the following substrates substitution of -OTs by -OAc will take place through anchimeric assistance?



1 2 3

   a. 1 and 3
   b. 1 only
   c. 3 only
   d. 2 and 3

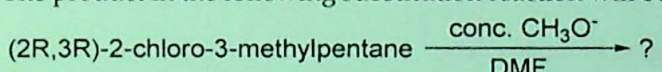
3. List the following in order of decreasing reactivity towards hydrolysis:



   a. 1 > 2 > 3
   b. 2 > 3 > 1
   c. 3 > 2 >1
   d. 1 > 3 > 2

4. Which of the following will act as best leaving group in a nucleophilic substitution reaction
   a. -OTs
   b. -OBs
   c. -OTf
   d. -I

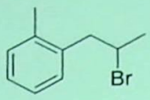
5. The product in the following substitution reaction will be

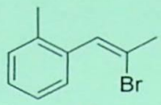


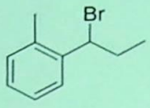
, will produce

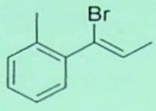
   a. (2S,3S)-2-methoxy-3-methylpentane
   b. (2R,3S)-2-methoxy-3-methylpentane
   c. (2R,3R)-2-methoxy-3-methylpentane
   d. (2S,3R)-2-methoxy-3-methylpentane

6. Which of the following compound undergoes hydrolysis by SN^1 mechanism at the fastest rate?

a. 

b. 

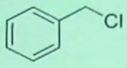
c. 

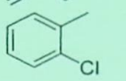
d. 

7. In which of the following substrates nucleophilic substitution is most difficult?

a. 

b. 

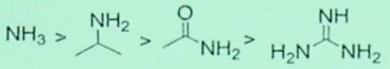
c. 

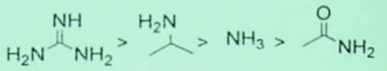
d. 

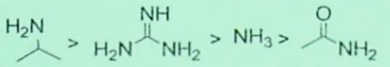
8. Strongest acid among the following is

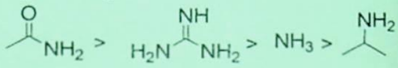
a. CH_3CH_2COOH
b. CH_3CF_2COOH
c. CF_3CH_2COOH
d. CH_3COOH

9. Which is the correct order of basicity?

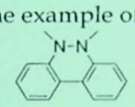
a. 

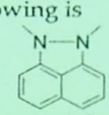
b. 

c. 

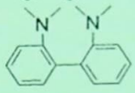
d. 

10. The example of proton sponge among the following is

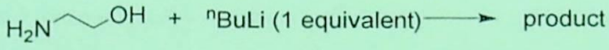
a. 

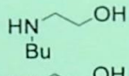
b. 

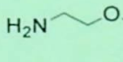
c. 

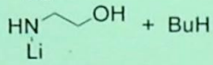
d. 

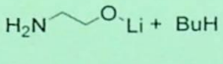
11. What is the major product obtained from the following reaction?



a. 

b. 

c. 

d. 

12. Which one of the followings is homoaromatic

a. 

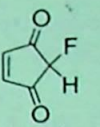
b. 

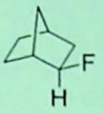
c. 

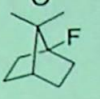
d. 

13. The compound that reacts rapidly with SbF_5 is

a. 

b. 

c. 

d. 

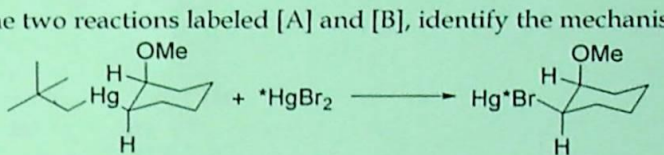
14. Wittig rearrangement involves a reactive intermediate species which is
    a. cation
    b. anion
    c. radial
    d. carbene

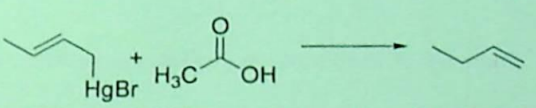
15. Oxime to amide formation occurs *via* a rearrangement reaction, namely
    a. Curtius rearrangement
    b. Beckmann rearrangement
    c. Lossen rearrangement
    d. Wolff rearrangement

16. Baeyer-Villiger rearrangement involves the transformation of
    a. ketone to ester
    b. amide to amine
    c. acyl azide to amine
    d. oxime to amide

17. Benzamide to aniline formation occurs *via* a rearrangement reaction, namely
    a. Curtius rearrangement
    b. Beckmann rearrangement
    c. Hofmann rearrangement
    d. Wolff rearrangement

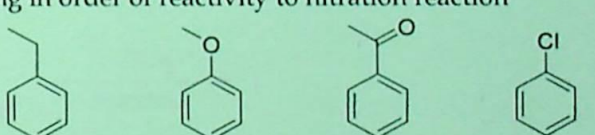
18. In the two reactions labeled [A] and [B], identify the mechanisms involved

[A] 

[B] 

    a. **[A]** is S_E2' and **[B]** is S_E2 (front)
    b. **[A]** is S_E2' and **[B]** is S_E2 (back)
    c. **[A]** is S_E2 (back) and **[B]** is S_E2'
    d. **[A]** is S_E2 (front) and **[B]** is S_E2'

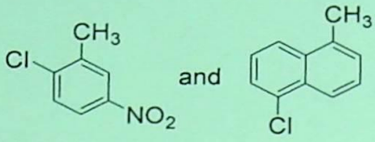
19. Arrange the following in order of reactivity to nitration reaction

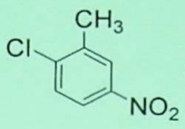
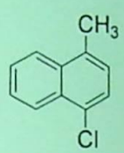


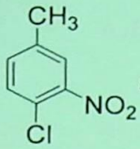
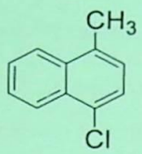
[A] [B] [C] [D]

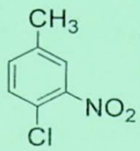
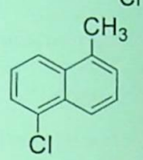
    a. **B > A > D > C**
    b. **A > B > D > C**
    c. **B > A > C > D**
    d. **B > C > A > C**

20. Which will be the main product upon chlorination of *m*-nitrotoluene and 1-methylnaphthalene with $Cl_2/AlCl_3$?

a.  and

b.  and 

c.  and 

d.  and 

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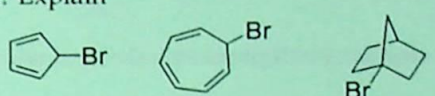
Descriptive

Time : 2 hrs. 30 mins. **Marks : 50**

[Answer question no.1 & any four (4) from the rest]

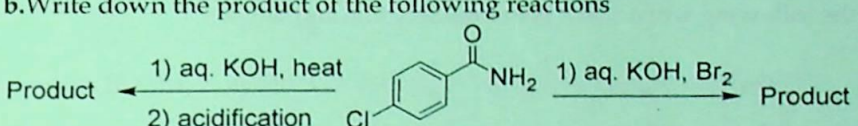
1. Answer the following

a. Which one of the followings will give rapid precipitation of AgBr in the presence of $AgNO_3$? Explain **2**

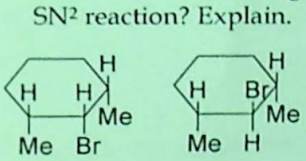


I II III

b. Write down the product of the following reactions **3**

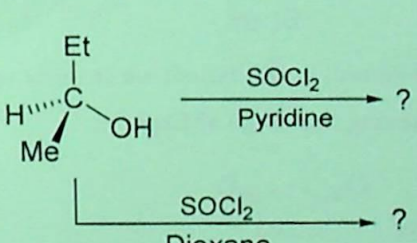


c. Which of the following compound would expect to be more reactive in an SN^2 reaction? Explain. **2**



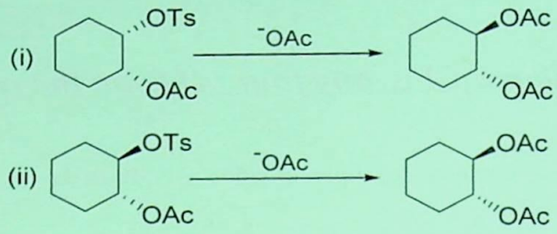
d. Discuss ortho-para ratio for electrophilic aromatic substitution reaction of toluene. **3**

2. a. Write down the product of the reaction with stereo chemistry **3**



b. What do you mean by neighbouring group participation in a SN^2 reaction? **2**

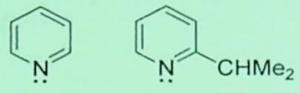
c. Explain the following observations 5



Predict which of the above reactions will proceed faster and why?

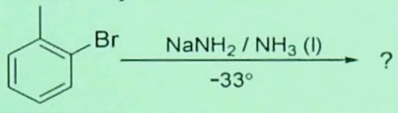
3. a. Explain how does the rate of a SN^2 reaction is influenced by polar hydroxylic and polar non- hydroxylic solvents. 2

b. Which of the following will act as a better nucleophile and why? 2



2

c. Write down the product with mechanism.

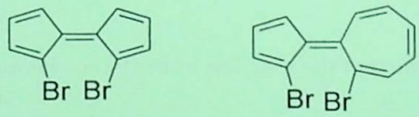


4

d. Discuss in details how the following factors affect an SN^2 reaction?

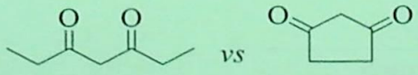
(i) Structure of the substrate (ii) Nature of nucleophile

4. a. Which of the following compound undergoes E-Z isomerization? Explain 2

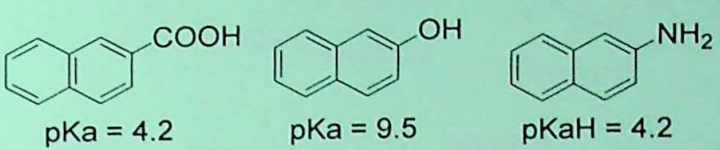


I II

b. Which of the following compound is having lowest pKa? Explain. 2

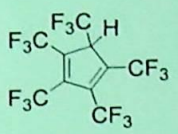


c. How do you separate each compound from a given mixture containing the following compounds? 3



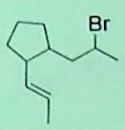
pKa = 4.2 pKa = 9.5 pKaH = 4.2

d. Which one of the following behaves as stronger acid, and why? 3

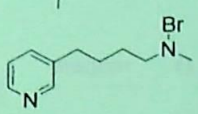


(pKa = -2) *vs* HNO_3 (pKa = -1.3)

5. a. Write the major product of the following reactions with mechanism. 3+2=5

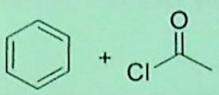
i) 

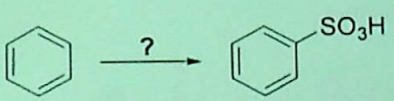
AIBN, Bu_3SnH, heat → major product

ii) 

1) H_2SO_4, hv; 2) aq. NaOH → major product

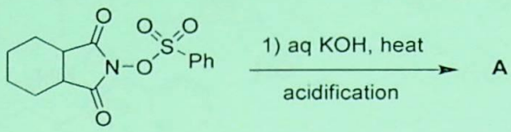
b. Identify the product or reagents for the following reactions. 2

(a) 

(b) 

c. Discuss some of the limitations of Friedel-Craft alkylation reaction. 3

6. Write the major product and the mechanismof the following reactions. 4

(i) 

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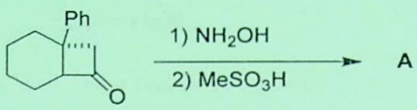
(ii) 

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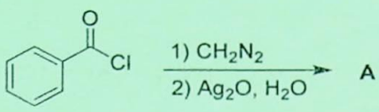
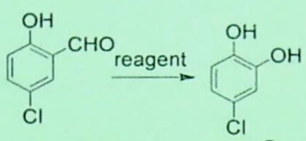
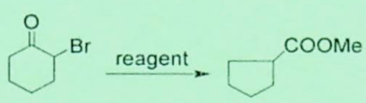
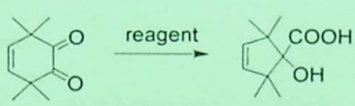
(iii) 

7. Suggest suitable reagents and the mechanism of the following transformations 4×2.5 = 10

(i) 

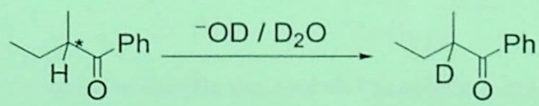
(iii) 

(ii) 

(iv) 

8. a. Isoinversion is observed in 3-carboxamido-9-methylfluorene but not in 2-carboxamido-9-methylfluorene. Explain. 3

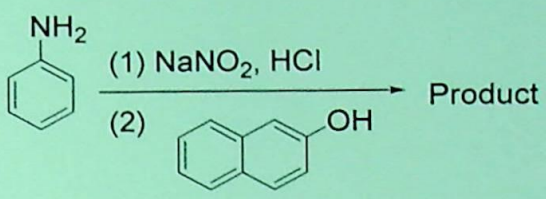
b. Explain why optically active phenyl *sec*-butylketone undergoes deuterium exchange to give optically inactive product. 2



Optically active Optically inactive

c. Discuss in brief the effect of solvent polarity on S_E2 reaction. 2

d.Identify the product giving plausible mechanism of the reaction 3



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