Reaction Mechanism

1. Introduction to Mechanism & Organic Reaction

Q 1. In the reaction

$$CN^- + CH_3Br \rightarrow CH_3CN + Br^-$$

The nucleophile is

(A) CN^- (B) CH_3^-
(C) Br^- (D) None of these

Q 2. In the reaction

$$H_2C = CH_2 + HBr \rightarrow CH_3 - CH_2Br,$$

the electrophile is

(A) HBr (B) Br^-
(C) H^+ (D) None of these

Q 3. Suggest a suitable mechanism for the reaction

$$2A + 2B \rightarrow C + D \text{ if Rate} = K[A]^2[B]$$

Q 4. For the exothermic reaction happening in 3 steps

1. $A \rightarrow B$ fast
2. $B + C \rightarrow D + E$: slow
3. $A + E \rightarrow 2F$; fast

(A) write complete reaction
(B) Identify the Rds of the reaction
(C) Draw energy diagram for the reaction
(D) Identify the intermediate species formed

Q 5. A and B can react at a certain temperature to give C, the rate controlled product. At a higher temperature they give D, the thermodynamic – controlled product. Draw the reaction diagram for each cases.

Q 6. Kinetically controlled products are formed with path having

(A) Low E_a (B) high E_a
(C) high +ve ΔH (D) high $-ve$ ΔH

Q 7. Thermodynamically controlled products are formed with

((A) Low E_a (B) high E_a
(C) high +ve ΔH (D) high $-ve$ ΔH

Q 8. Rds of a reaction mechanism

(A) is much slower compare to other steps
(B) is slower compare to other steps
(C) have high activation energy compare to that of other steps
(D) have low activation energy compare to that of other steps

Q 9. Which of the following is an example of substitution reaction?

(A) $CH_3-\overset{\overset{O}{\|}}{C}-CH_3 + H^+/CH_3OH \longrightarrow CH_3-\overset{\overset{OH}{|}}{\underset{\underset{OCH_3}{|}}{C}}-CH_3$

(B) $CH_2 = CH_2 + HBr \rightarrow CH_3 - CH_2Br$

(C) $CH_3-\overset{\overset{O}{\|}}{C}-Cl + CH_3OH \longrightarrow CH_3-\overset{\overset{O}{\|}}{C}-OCH_3 + HCl$

(D) None of these

Q 10. Which of the following reaction is an example of addition reaction ?

(A) $CH_3-\overset{\overset{O}{\|}}{C}-Cl + H^+/H_2O \longrightarrow CH_3-\overset{\overset{O}{\|}}{C}-OH + HCl$

(B) $H_2C = CH - CH_3 + Br_2 \rightarrow \underset{\underset{Br}{|}}{CH_2} - \overset{\overset{Br}{|}}{CH} - CH_3$

(C) $CH_3 - CH_2 - OH + H_2SO_4 \xrightarrow{\Delta} CH_2 = CH_2$

(D) None of these

Q 11. Which of the following reaction is an example of elimination reaction?

(A) $CH_3COOCH_3 + H_2O \xrightarrow{H^+} CH_3COOH + CH_3OH$

(B) $CH_3C \equiv H + NaNH_2 \longrightarrow CH_3C \equiv C^-Na^+ + NH_3$

(C) $CH_3CH_2CH_2CHClCH_3 + KOH \xrightarrow{\Delta} CH_3CH_2CH = CHCH_3 + KCl + H_2O$

(D) None of these

Q 12. Which of the following is an example of electrohilic addition reaction ?

(A) $CH_3COOCH_3 + NaOH \longrightarrow CH_3COOH + CH_3ONa$

(B) $CH_3COCl + H_2O \xrightarrow{H^+} CH_3COOH + HCl$

(C) $CH_3CH = CH_2 + BrCl \xrightarrow{\Delta} CH_3CHClCH_2Br$

(D) None of these

Q 13. Which of the statement is wrong?

(A) A more stable product is formed at faster rate
(B) A less stable product is formed at slower rate
(C) A more stable product is formed at slower rate
(D) All of these

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2. Substitution Reaction

Q 1. SN_1 mechanism involves

(A) 1 step (B) 2 steps
(C) 3 steps (D) None of these

Q 2. SN_1 mechanism for the hydrolysis of alkyl halide involves formation of intermediate

(A) free radical (B) carbocation
(C) carbanion (B) None of these

Q 3. Which of the following path is not possible on SP^3 carbon for nucleophilic substitution reaction?

(A) First C-L bond is cleaved & then C-Nu bond is formed
(B) Both C-L bond cleavage & C-Nu bond formation occur simultaneously
(C) First C-Nu bond is formed & then C-L bond is cleaved
(D) All are possible

Q 4. Transition state of SN_2 reaction has

(A) sp^2 carbon (B) sp^3 carbon
(C) Both sp^2 & sp^3 characters
(D) None of these

Q 5. SN_1 Reaction leads to

(A) Reteation of configuration
(B) Inversion of configuration
(C) Recemisation of configuration
(D) None of these

Q 7. SN_2 Reaction is

(A) Endothermic (B) Exothermic
(C) Both endothermic & exothermic
(D) Neither exothermic nor endothermic

Q 8. SN_1 Reaction is

(A) Stereospecific (B) Stereoselective
(C) Regiospecific (D) Regioselective

Q 9. SN_2 Reaction is

(A) Stereospecific (B) Stereoselective
(C) Regiospecific (D) Regioselective

Q 10. SN_2 Reaction on R-configured halide leads to formation

(A) S-configured carbon
(B) R-Configured carbon
(C) May be S or R-configuration
(D) Configuration is lost

Q 11. In SN_1 reaction generally product is greater than retention product Inversion. It occur when

(A) Solvent is polar
(B) Solvent is non – polar
(C) Nucleophile is weaker
(D) Nucleophile is stronger

Q 12. SN_i Reaction

(A) Form retention product
(B) a 2nd order reaction
(C) occur with R–OH with $SoCl_2$
(D) All of the above statements are correct

Q 13. Which of the following reactions is an examples of SN_2 reaction

(A) $(CH_3)_3C-Br+OH^- \rightarrow (CH_3)_3C-OH+Br^-$
(B) $(CH_3)_2CH-Br+OH^- \rightarrow (CH_3)_2CH-OH+Br^-$
(C) $CH_3-Br+OH^- \rightarrow CH_3-OH+Br^-$
(D) $CH_3CH_2OH \xrightarrow[(-H_2O)]{} H_2C=CH_2$

Q 14. Which one of the following statements is wrong about SN_2 reaction?

(A) The rate of reaction is independent of the concentration of nucleophile
(B) Nucleophile attacks the carbon from the side opposite to where the leaving group is attached
(C) Only in one step the bond formation and bond breaking takes place
(D) Rate of reaction $\propto$ [substrate][nucleophile]

Q 15. Arrange the following in order of decreasing tendency towards SN_2 reaction

$\underset{(I)}{CH_3CH_2CH_2CH_2Cl}$, $\underset{(II)}{CH_3CH_2CHClCH_3}$,
$\underset{(III)}{(CH_3)_2CHCH_2Cl}$, $\underset{(IV)}{(CH_3)_3C-Cl}$

Q 16. The compound that does not undergo hydrolysis by SN_1 mechanism is

(A) $H_2C=CHCH_2Cl$ (B) C_6H_5Cl
(C) $C_6H_5CH_2Cl$ (D) $C_6H_5CH(C_6H_5)Cl$

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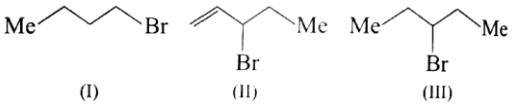
3. SN_1, SN_2 Reaction

Q 1. Consider the following bromides



The correct order of SN_1

(A) $I > II > III$ (B) $II > III > I$
(C) $II > I > III$ (D) $III > II > I$

Q 2. The order of reactivities of the following alkyl halides for a SN_2 reaction is

(A) $RF > RCl > RBr > RI$
(B) $RF > RBr > RCl > RI$
(C) $RCl > RBr > RF > RI$
(D) $RI > RBr > RCl > RF$

Q 3. An SN_2 reaction at an asymmetric carbon of a compound always gives

(A) an enantiomer of the substrate
(B) a product with opposite optical rotation
(C) a mixture of diastereomers
(D) a single stereoisomer

Q 4. Which of the following undergoes nucleophilic substitution exclusively by SN^1 mechanism?

(A) Ethyl chloride (B) Isopropyl chloride
(C) Chlorobenzene (D) Benzyl chloride

Q 5. $CH_3Br + Nu^- \rightarrow CH_3Nu + Br^-$

The decreasing order of the rate of the above reaction with nucleophiles (Nu^-) A to D is

$[Nu^- = (A)PhO^-, (B)AcO^-, (C)HO^-, (D)CH_3O^-]$

(A) $D > C > A > B$ (B) $D > C > B > A$
(C) $A > B > C > D$ (D) $B > D > C > A$

Q 6. Which one is most reactive towards SN_1 reaction?

(A) $C_6H_5CH(C_6H_5)Br$
(B) $C_6H_5C(CH_3)(C_6H_5)Br$
(C) $C_6H_5CH(CH_3)Br$
(D) $C_6H_5CH_2Br$

Q 7. The SN_1 reactivity of the following halides will be in the order

(i) $(CH_3)_3C-Br$ (ii) $(C_6H_5)_2CHBr$
(iii) $(C_6H_5)_2C(CH_3)Br$ (iv) $(CH_3)_2CHBr$

(A) $iv > i > ii > iii$ (B) $ii > i > iii > iv$
(C) $i > iii > ii > iv$ (D) $iii > ii > i > iv$

Q 8. Consider the reactions,

(i) $(CH_3)_2CH-CH_2Br \xrightarrow{C_2H_5OH} (CH_3)_2CH-CH_2OC_2H_5 + HBr$

(ii) $(CH_3)_2CH-CH_2Br \xrightarrow{C_2H_5O^-} (CH_3)_2CH-CH_2OC_2H_5 + Br^-$

The mechanism of reactions (i) and (ii) are respectively

(A) SN_1 and SN_2 (B) SN_1 and SN_1
(C) SN_2 and SN_1 (D) SN_2 and SN_2

Q 9. The hydrolysis of 2-bromo-3-methyl butane by SN_1 mechanism gives mainly

(A) 3-methyl-1-butanol
(B) 2-methyl-2-butanol
(C) 2,2-dimethyl-2-propanol
(D) 2-methyl-1-butanol

Q 10. In a SN_2 substitution reaction of the type

$R-Br + Cl^- \xrightarrow{DMF} R-Cl + Br^-$

Which one of the following has the highest relative rate?

(A) $(CH_3)_3C-CH_2Br$ (B) CH_3CH_2Br
(C) $CH_3CH_2CH_2Br$ (D) $(CH_3)_2CH-CH_2Br$

Q 11. Among the molecules

O_2N-CH_2-Br (I) CH_3-CH_2-Br (II)
CH_3O-CH_2-Br (III)

The order of SN_2 reactivity is

(A) $II > III > I$ (B) $I > III > II$
(C) $I > II > III$ (D) $III > II > I$

Q 12. The correct order of SN_1 reactivity in the molecules

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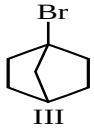
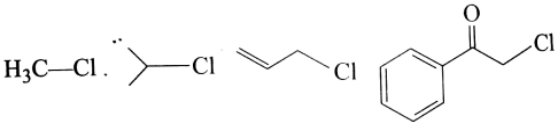
$CH_2=CH-CH_2-Br$ (I), $CH_2=CH-Br$ (II)



III , CH_3-CH_2-Br (IV)

(A) IV > I > II > III (B) I > IV > III > II
(C) I > IV > II > III (D) IV > II > III > I

Q 13. KI in acetone undergoes SN_2 reaction with each of P, Q, R, S. The rates of the reaction vary as



P Q R S

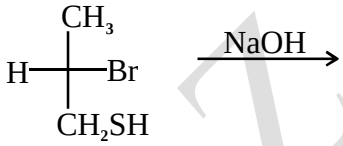
(A) P > Q > R > S (B) S > P > R > Q
(C) P > R > Q > S (D) R > P > S > Q

Q 14. The SN_2 reactivity order for the following leaving group

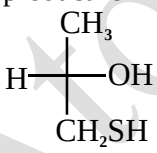
$-OTF$ (I) $-I$ (II)
$-\overset{\oplus}{O}H_2$ (III) $-Cl$ (IV)

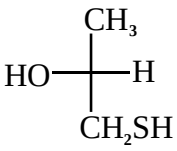
(A) I > III > II > IV (B) I > II > III > IV
(C) I < II < IV < III (D) III < II < IV < I

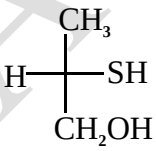
Q 15. In the reaction

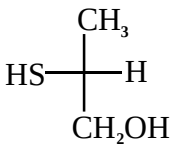


The product formed is

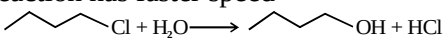
(A) 

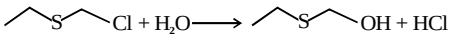
(B) 

(C) 

(D) 

Q 16. Which reaction has faster speed

(1) 

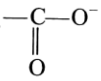
(2) 

(A) 1 (B) 2
(C) Equal rate (D) Can't predict

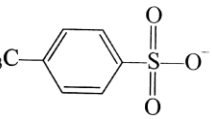
Q 17. In general, Polar solvent favours

(A) SN_1 reaction (B) SN_2 reaction
(C) SN_i reaction (D) Elimination reaction

Q 18. The decreasing order of nucleophilicity among the nucleophiles is

(I) 

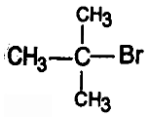
(II) CH_3O^- (III) CN^-

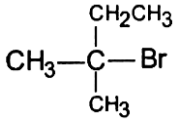
(IV) 

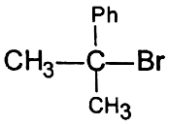
(A) I, II, III, IV (B) IV, III, II, I
(C) II, III, I, IV (D) III, II, I, IV

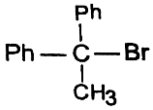
4. SN_1 vs SN_2 Reaction & SN_i Reaction

Q 1. The correct SN_1 Rate of the given compound is

(I) 

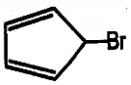
(II) 

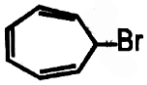
(III) 

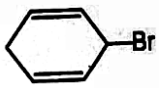
(IV) 

(A) I > II > III > IV (B) IV > III > II > I
(C) IV > III > I > II (D) II > I > III > IV

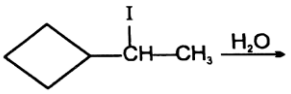
Q 2. SN_1 Rate is maximum in

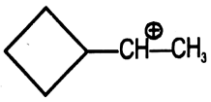
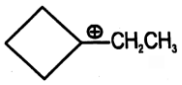
(A) 

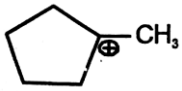
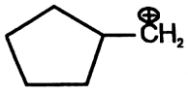
(B) 

(C) Ph_3C-Br (D) 

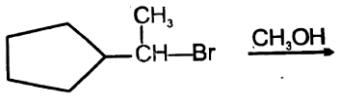
Q 3. The given reaction intermediates are not observed in the given reaction is

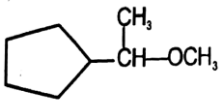
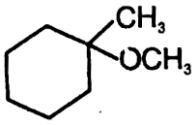


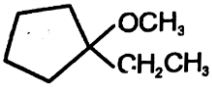
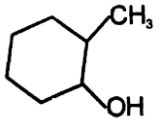
(A)  (B) 

(C)  (D) 

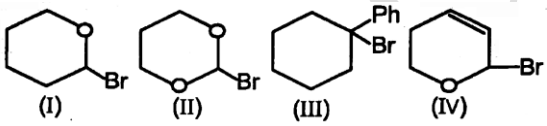
Q 4. The major product in the given reaction would be



(A)  (B) 

(C)  (D) 

Q 5. Correct order of SN_1 Rate of given compound is

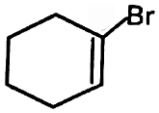
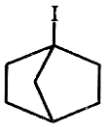


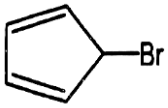
(I) (II) (III) (IV)

(A) I > II > III > IV (B) II > I > IV > III

(C) II > IV > I > III (D) III > IV > I > II

Q 6. In which of the following case, SN_1 rate is almost negligible

(A)  (B) 

(C)  (D) None of these

Q 7. The correct order of Nucleophilicity in polar protic solvent is

$CH_3CH_2CH_2-O^{\ominus}$ I

$CH_3CH_2CH_2-S^{\ominus}$ II

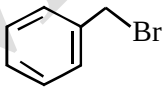
$CH_3CH_2\overset{O}{\overset{\|}{C}}-O^{\ominus}$ III

$CH_3-\overset{CH_3}{\underset{CH_3}{C}}-\overset{O}{\overset{\|}{C}}-O^{\ominus}$ IV

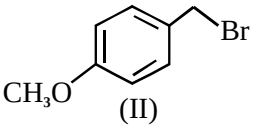
(A) I > II > III > IV (B) II > I > III > IV

(C) IV > III > I > II (D) II > III > I > IV

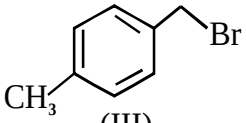
Q 8. The correct order of SN_2 rate of reaction is



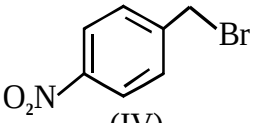
(I)



(II)



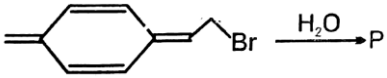
(III)



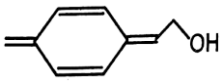
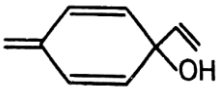
(IV)

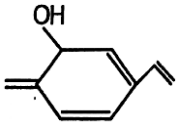
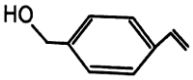
(A) I > II > III > IV (B) III > I > II > IV

(C) IV > I > III > II (D) II > III > I > IV

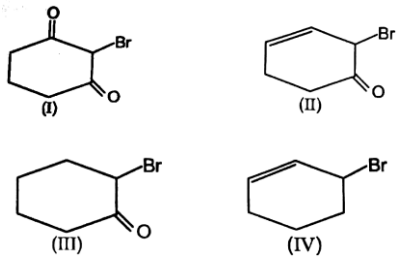
Q 9. 

(Major product), P would be

(A)  (B) 

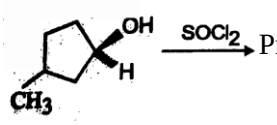
(C)  (D) 

Q 10. Correct order of SN_2 rate is

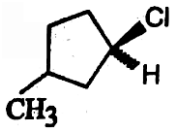


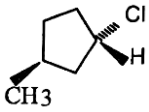
(A) I > II > III > IV (B) III > I > II > IV

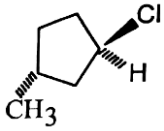
(C) IV > III > I > II (D) II > III > I > IV

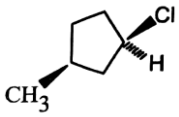
Q 11. 

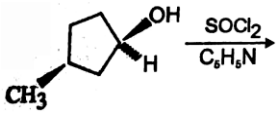
Products would not be

(A) 

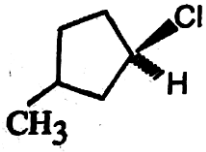
(B) 

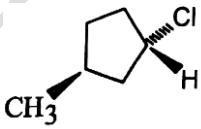
(C) 

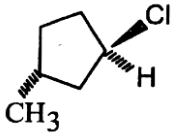
(D) 

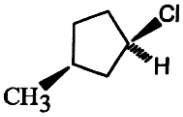
Q 12. 

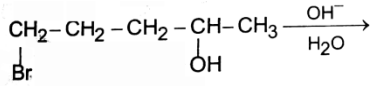
Product (P), P would be

(A) 

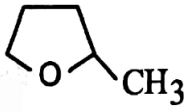
(B) 

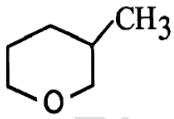
(C) 

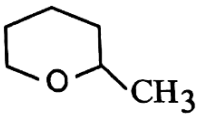
(D) 

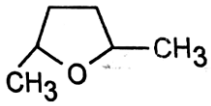
Q 13. 

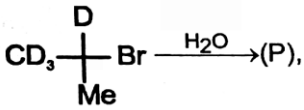
Major product (P), P would be

(A) 

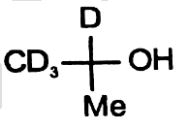
(B) 

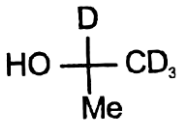
(C) 

(D) 

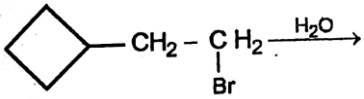
Q 14. 

P would be

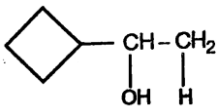
(A) 

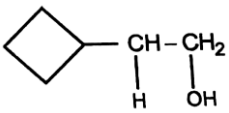
(B) 

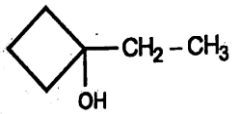
(C) both A and B (D) None of these

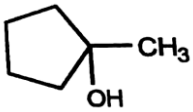
Q 15. 

major product (P), P would be

(A) 

(B) 

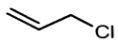
(C) 

(D) 

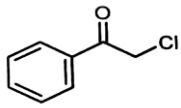
Q 16. Kl in acetone, undergoes SN_2 reaction with each of P,Q,R and S. The rates of the reaction vary as

P

Q



R



S

(A) $P > Q > R > S$ (B) $S > P > R > Q$

(C) $P > R > Q > S$ (D) $R > P > S > Q$

5. Elimination Reaction – E_1 & E_2 Reaction

Q 1. In elimination reaction, if base is strong, if follows

(A) E_1 pathway (B) E_2 pathway

(C) E_{ICB} pathway (D) E_{2CB} pathway

Q 2. E_{1CB} pathway is followed by a substrate molecule is

(A) Carbocation is stable

(B) Carbocation is less stable

(C) Carbanion is stable

(D) Carbanion is less stable

Q 3. In elimination reaction of $CHR_2 - CH_2 - Cl$, Which of the following way(s) are possible ?

(A) Both $C-H$ & $C-Cl$ bonds are cleaved simultaneously

(B) First $C-Cl$ bond is cleaved & there $C-H$ bond is cleaved

(C) First $C-H$ bond is Cleaved & there $C-Cl$ bond is cleaved

(D) All are possible

Q 4. Anti – elimination is preferred because

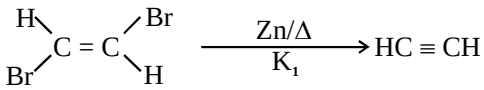
(A) Antiperiplanar transition state is eclipsed form

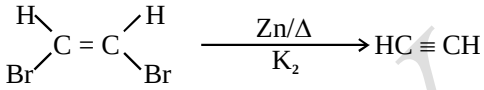
(B) Antiperiplanar transition state is staggered form

(C) Antiperiplanar transition state has double bond character

(D) Antiperiplanar transition state has +M group

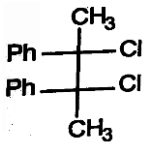
Q 5. In the reaction



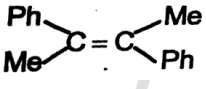


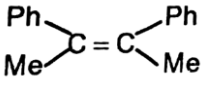
(A) $K_1 < K_2$ (B) $K_1 = K_2$

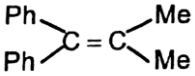
(C) $K_1 > K_2$ (D) can't predict

Q 6. 

Product (P), P would be

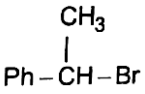
(A) 

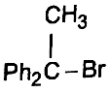
(B) 

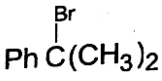
(C) 

(D) None of these

Q 7. E_1 – Elimination rate is maximum in

(A) $(CH_3)_3CBr$ (B) 

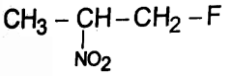
(C) 

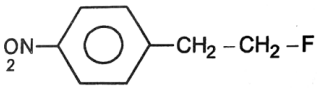
(D) 

Q 8. E_1CB rate is maximum in

(A) $Ph - CH_2 - CH_2 - F$

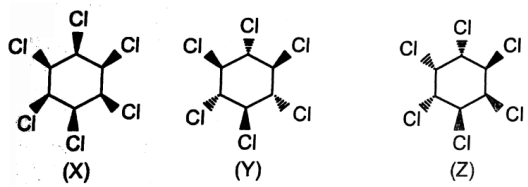
(B) $O_2N - CH_2 - CH_2 - F$

(C) 

(D) 

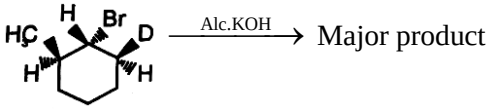
Q 9. Arrange the following in decreasing order of E_2 reaction

AtoZ CHEMISTRY

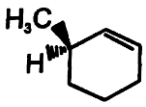


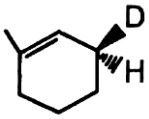
(A) X > Y > Z (B) X > Z > Y

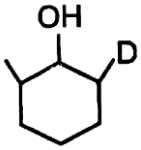
(C) Z > X > Y (D) Y > X > Z

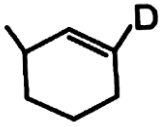
Q 10. 

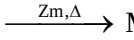
Major product

(A) 

(B) 

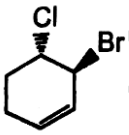
(C) 

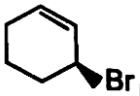
(D) 

Q 11. 

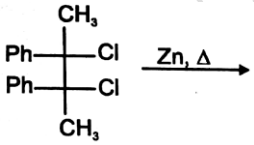
Major product

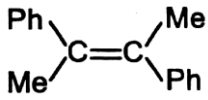
(A)

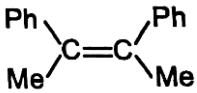
(B) 

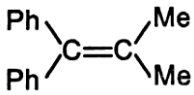
(C) 

(D) None of these

Q 12. 

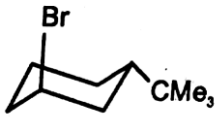
(A) 

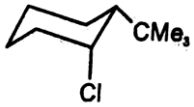
(B) 

(C) 

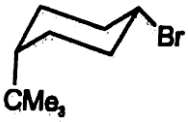
(D) No reaction

Q 13. Which of the following halides undergo E_2 elimination ?

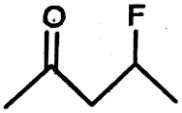
(A) 

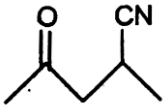
(B) 

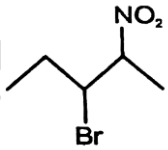
(C)

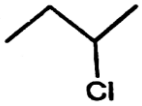
(D) 

Q 14. Which of the following can give E_1 cb reaction ?

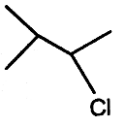
(A) 

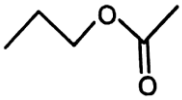
(B) 

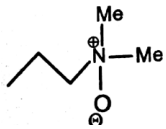
(C) 

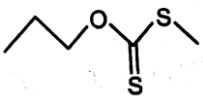
(D) 

Q 15. Which of the following compounds will give syn-elimination reaction?

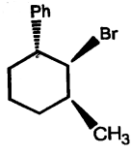
(A) 

(B) 

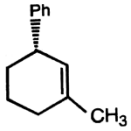
(C) 

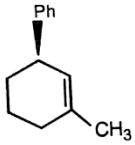
(D) 

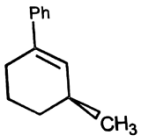
6. E_1 Vs E_2 Reaction, E_{1CB} Reaction

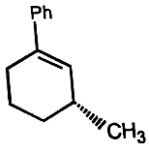
Q 1. 

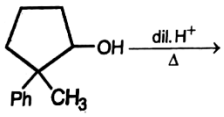
$\xrightarrow[\text{KOH}]{\text{alc.}}$ P (major product), P would be

(A) 

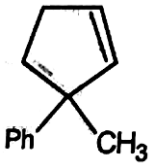
(B) 

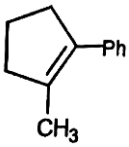
(C) 

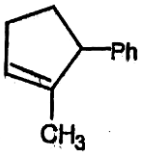
(D) 

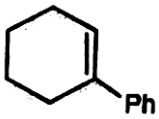
Q 2. 

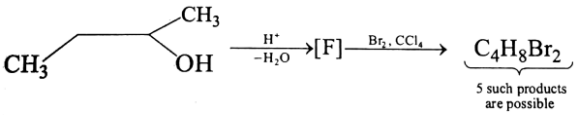
P (major), P would be

(A) 

(B) 

(C) 

(D) 

Q 3. 

How many structures for F are possible?

(A) 2 (B) 5 (C) 6 (D) 3

Q 4. $(CH_3)_2\overset{Br}{C}-CH(CH_3)_2 \xrightarrow[\text{t-but OH}]{\text{t-but } O^{\ominus}K^{\oplus}}$ P (major product), P would be

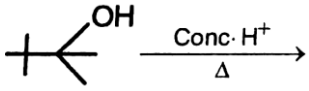
(A) $(CH_3)_2C=C(CH_3)_2$

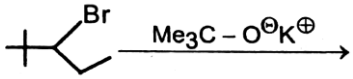
(B) $CH_2=\overset{CH_3}{C}-CH(CH_3)_2$

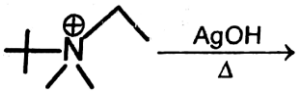
(C) $(CH_3)_3C-CH=CH_2$

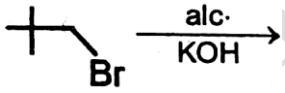
(D) None of these

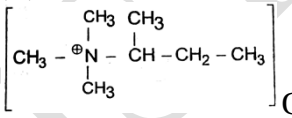
Q 5. Which of the following reactions will give least alkyl substituted alkene?

(A) 

(B) 

(C) 

(D) 

Q 6. 

$OH^- \xrightarrow{\Delta}$ product (P), P would be

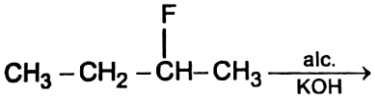
(A) $(CH_3)_3N$

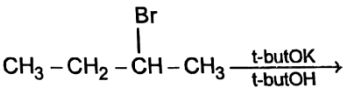
(B) $CH_3-CH=CH-CH_3$

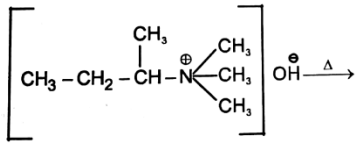
(C) $CH_2=CH-CH_2-CH_3$

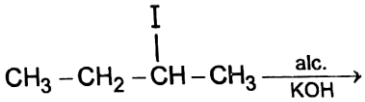
(D) A and C both

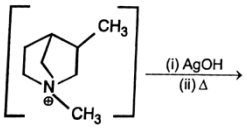
Q 7. The Hoffmann's product is not the major product in the given reaction is

(A) 

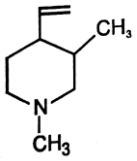
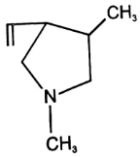
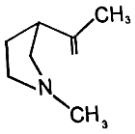
(B) 

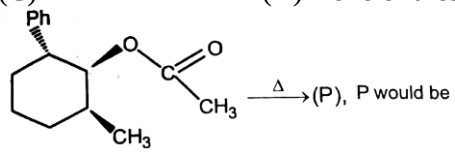
(C) 

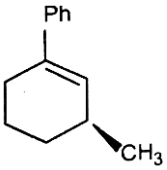
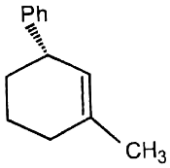
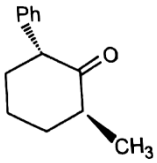
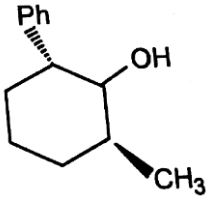
(D) 

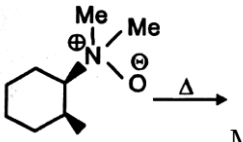
Q 8. 

$\xrightarrow[\text{(ii)}\Delta]{\text{(i) AgOH}}$ P (major), P would be

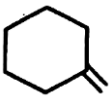
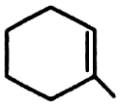
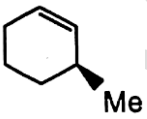
(A) 
(B) 
(C) 
(D) None of these

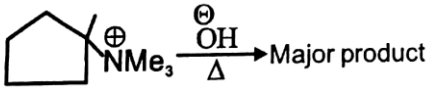
Q 9. 

(A) 
(B) 
(C) 
(D) 

Q 10. 

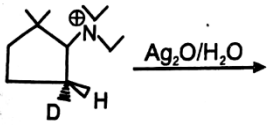
Major product

(A) 
(B) 
(C) 
(D) None of these

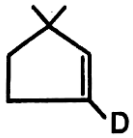
Q 11. 

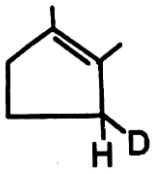
(A)
(B)

(C)
(D)

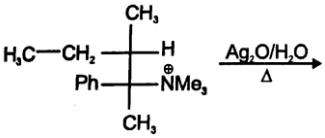
Q 12. 

Major product

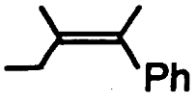
(A)
(B) 

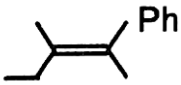
(C) 

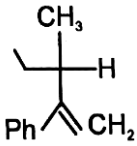
(D) $H_2C = CH_2$

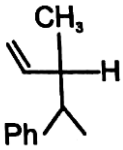
Q 13. 

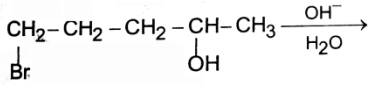
Major Product

(A) 

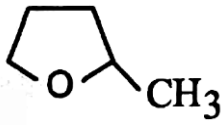
(B) 

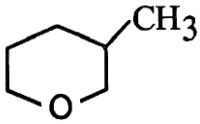
(C) 

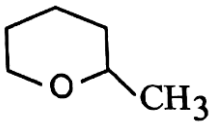
(D) 

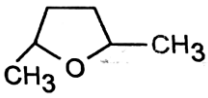
Q 14. 

Major product (P), P would be

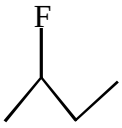
(A) 

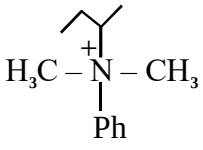
(B) 

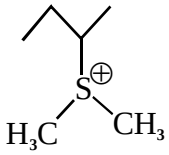
(C) 

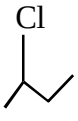
(D) 

Q 15. Which of the following will not product Hofmann's alkene as major product on reaction with

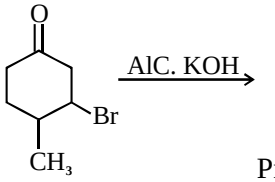
(A) 

(B) 

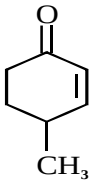
(C) 

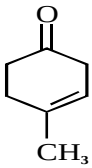
(D) 

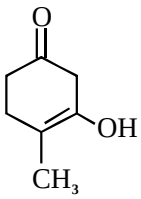
Q 16. In the reaction



Product formed is

(A) 

(B) 

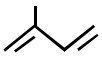
(C) 

(D) None of these

Q 17. In the reaction

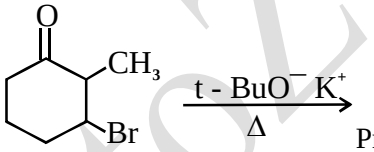
(A)

(B)

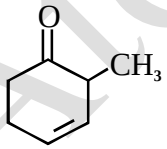
(C) 

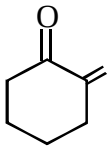
(D)

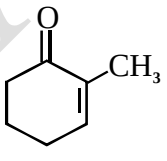
Q 18. In the reaction

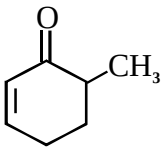


Product is

(A) 

(B) 

(C) 

(D) 

7. Elimination vs Substitution Reaction

Q 1. Match the following

Column I

A. CH_3-CHBr-CD_3 on treatment with alc. KOH gives CH_2=CH-CD_3 as a major product

B. Ph-CHBr-CH_3 reacts faster than Ph-CHBr-CD_3

C. Ph-CH_2-CH_2Br on treatment with $C_2H_5OD/C_2H_5O^-$ gives Ph-CD=CH_2 as the major product

D. $PhCH_2CH_2Br$ and $PhCD_2CH_2Br$ react with same rate .

Column II

P. El reaction

Q. E2 reaction

R. ElcB reaction

S. First order reaction **[IIT JEE 2006]**

Q 2. Which of the following reactions have identical Rds ?

(A) SN_1 & SN_2 (B) SN_1 & E_1

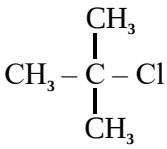
(C) SN_2 & E_2 (D) both B & C

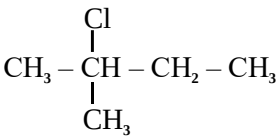
Q 3. Which of the following reaction are parallel reactions?

(A) SN_1 & SN_2 (B) SN_1 & E_1

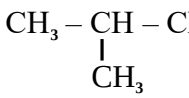
(C) SN_2 & E_2 (D) All of these

Q 4. Which of the following favour elimination reaction?

(A) 

(B) 

(C) $CH_3 – CH_2 – CH_2 – CH_2 – Cl$

(D) 

Q 5. E_2 reaction is favoured in $3°$ R-X because

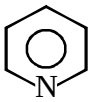
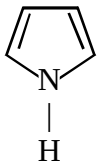
(A) Incipent double bond is more stable

AtoZ CHEMISTRY

(B) Incipent double bond has more B-H-atoms
(C) Activation energy of E_2 pathway is less
(D) All of these

Q 6. Elimination reactions are
(A) Endothermic (B) Exothermic
(C) both A & B (D) none of these

Q 7. Which of the following condition favour substitution reaction?
(A) high temperature (B) low temperature
(C) high pressure (D) low pressure

Q 8. In case of which of the following base, elimination reaction is favoured
(A) KOH (B) $t-BuO^-K^+$
(C)  (D) 

Q 9. Carbocation intermediate is formed in
(A) E_1 pathway (B) SN_1 pathway
(C) both A & B (D) None of these

Q 10. In which of the following case, intermediate resemble to product by larger extent
(A) SN_1 (B) SN_2 (C) E_1 (D) E_2

Q 11. Which of the following has least nucleophilic strength?
(A) CH_3NH_2 (B) $Ph-NH_2$
(C) $(CH_2)NH$ (D) $(CH_3)_3N$

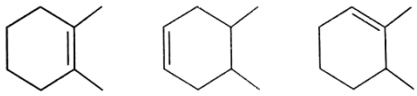
8. Electrophilic Addition Reaction

Q 1. The reaction between ethylene and bromine is an example of
(A) electrophilic addition
(B) electrophilic substitution
(C) nucleophilic addition
(D) nucleophilic substitution

Q 2. In addition reactions of alkenes, the Markownikoff's rule follow
(A) ionic mechanism
(B) radical mechanism
(C) substitution mechanism
(D) rearrangement mechanism

Q 3. The addition of HBr to propylene takes place opposite to Markownikoff's rule in presence of
(A) sunlight (B) hydrogen peroxide
(C) platinum catalyst (D) none of these

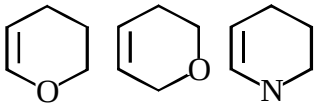
Q 4. Anti-Markownikoff's addition is not observed in
(A) propene (B) 1-butene
(C) 2-pentene (D) 2-butene

Q 5. Which of the following orders is correct for the each of electrophile addition on these alkenes?

I II III
(A) III > II > I (B) I > II > III
(C) I > III > II (D) III > I > II

Q 6. In which of the following molecules, addition of H-Cl form major product according to anti – markownikoff rule
(A) $CH_3-CH=CH_2$ (B) $CH_3O-CH=CH_2$
(C) $O_2N-CH=CH_2$ (D) $CH_2=CH_2$

Q 7. Electrophilic addition reaction on alkene is favoured by
(A) Electron donar group
(B) Electron acceptor group
(C) Electron rich group
(D) Electron deficient group

Q 8. Nucleophilic addition reaction as hemolytic double bond is possible in
(A) $CH_3O-CH=CH-OCH_3$
(B) $F-CH=CH-F$
(C) $CH_3O-CH=CH_2$
(D) $F-CH=CH-NO_2$

Q 9. The reaction order of following alkene towards addition of HCl is

I II III
(A) I > II > III (B) III > I > II
(C) III > II > I (D) II > I > III

AtoZ CHEMISTRY

Q 10. The reactivity order of following alkene towards addition of HCl is

$CH_3-CH=CH_2$ (I) $CH_3O-CH=CH_2$ (II)

$CH_2=CH-Cl$ (III)

(A) $II > III > I$ (B) $III > II > I$
(C) $II > I > II$ (D) $III > I > II$

Q 11. The reactivity order of following alkene towards additional HBr is

$CH_3O-CH=CH_2$ (I) $Cl-CH=CH_2$ (II)

$F-CH=CH_2$ (III) $CH_2=CH_2$ (IV)

(A) $I > II > III > IV$ (B) $I > III > II > IV$
(C) $I > IV > II > III$ (D) $I > IV > III > II$

Q 12. The reactivity order of following alkene towards addition HBr is

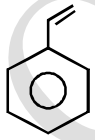
$O_2N-CH=CH_2$ (I) $F-CH=CH_2$ (II)

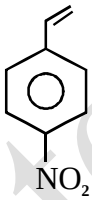
$Cl-CH=CH_2$ (III) $CH_3-CH=CH_2$ (IV)

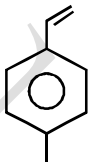
(A) $IV > III > II > I$ (B) $IV > II > III > I$
(C) $I > II > III > IV$ (D) None of these

Q 13. The reactivity order of following alkenes towards addition of HCl is

$CH_2=CH-CH_3$ (I)


(II)


NO_2 (III)

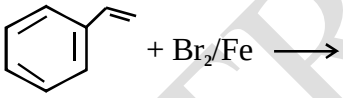

OCH_3 (IV)

(A) $II > IV > III > I$ (B) $II > IV > I > III$
(C) $IV > II > I > III$ (D) $IV > II > III > I$

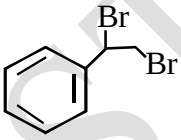
9. Electrophilic Aromatic Substitution

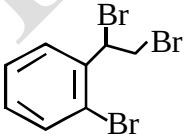
Q 1. Electrophilic addition reaction on benzene ring does not occur because
(A) Cation formed is instable
(B) Anion formed is unstable
(C) Aromaticity is lost on addition reaction
(D) Benzene has no character required to undergo addition

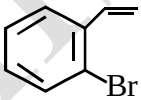
Q 2. In the reaction

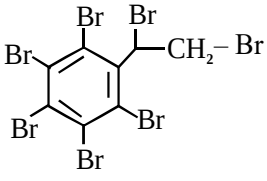


Product, is

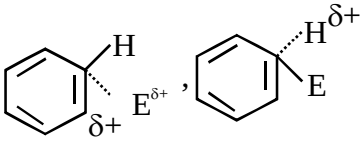
(A) 

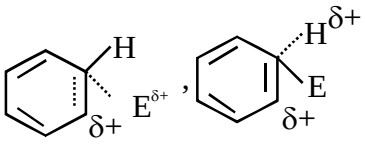
(B) 

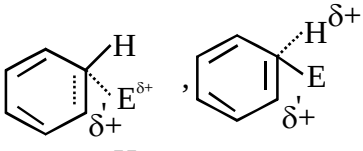
(C) 

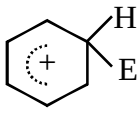
(D) 

Q 3. In electrophilic aromatic substitution, transition states form are

(A) 

(B) 

(C) 

(D) 

Q 4. The electrophile formed in reagent $'Br_2 + Fe'$ is

(A) Br^+ (B) Br^-
(C) Br_2 (D) None of these

Q 5. The electrophile formed in the reagent $'HNO_3 + HSO_4'$ is

AtoZ CHEMISTRY

(A) SO_3 (B) NO_2

(C) $\overset{\oplus}{N}O_2$ (D) $H_2\overset{\oplus}{O}$

Q 6. The electrophile formed in $'R-\overset{O}{\overset{\|}{C}}-Cl+AlCl_3'$ is

(A) $R-\overset{\oplus}{C}=O$ (B) $Cl^{\oplus}$

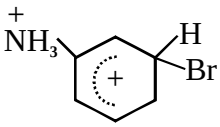
(C) $R^{\oplus}$ (D) $\overset{\oplus}{C}=O$

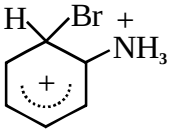
Q 7. The electrophile formed in the reagent $'H_2S_2O_7'$ is

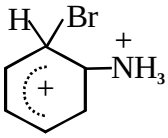
(A) $H_2O^{\oplus}$ (B) $\overset{\oplus}{S}O_3$

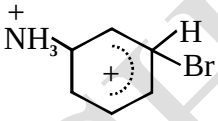
(C) SO_3 (D) $S_2O_7^{2-}$

Q 8. The structure of Wheland intermediate obtained after the attack of Br^+ on anilinium ion is

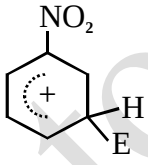
(A) 

(B) 

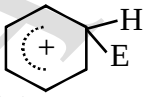
(C) 

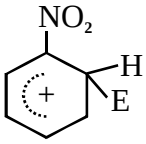
(D) 

Q 9. The electrophile, E^+ attacks benzene ring to generate the intermediate $\sigma-$ complex of the following, which $\sigma-$complex is of lowest energy?

(A) 

(B)

(C) 

(D) 

Q 10. Electrophilic substitution reaction on benzene is a

(A) unimolecular reaction

(B) bimolecular reaction

(C) Trimolecular reaction

(D) None of these

Q 11. In electrophilic aromatic substitution sometimes isotopic effect is found because

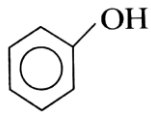
(A) $C-H$ bond is deaved in Rds

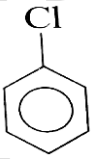
(B) C–H bond is not eleaved in Rds

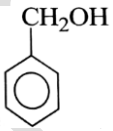
(C) Rds is reversible

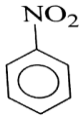
(D) Rds is irreversible

Q 12. Which one of the following is most reactive towards electrophilic attack ?

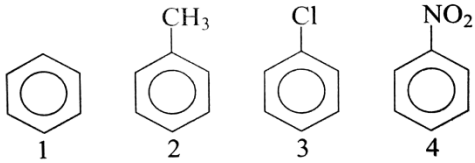
(A) 

(B) 

(C) 

(D) 

Q 13. Identify the correct order of reactivity in electrophilic substitution reactions of the following compounds

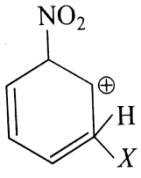


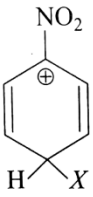
1 2 3 4

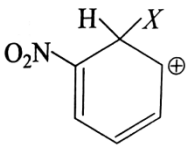
(A) $1>2>3>4$ (B) $4>3>2>1$

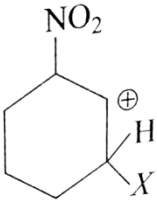
(C) $2>1>3>4$ (D) $2>3>1>4$

Q 14. Which of the following carbocations is most stable?

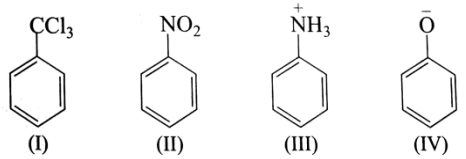
(A) 

(B) 

(C) 

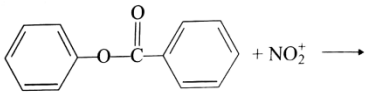
(D) 

Q 15. Electrophile NO_2^+ attacks on the following

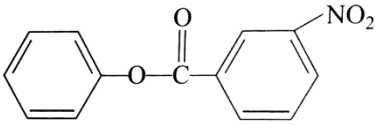


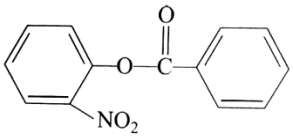
In which cases will NO_2^+ be at meta-position ?

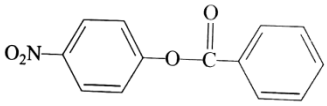
(A) II and IV (B) I, II and III
(C) II and III (D) I only

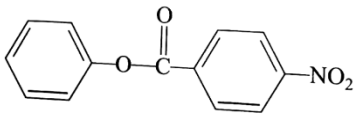
Q 16. 

Product of this reaction by single (S_E) electrophilic substitution is

(A) 

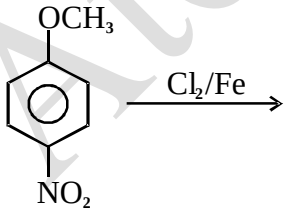
(B) 

(C) 

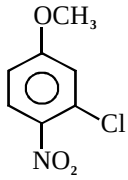
(D) 

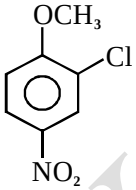
10. Examples of Electrophilic Aromatic substitution

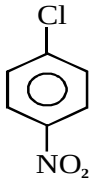
Q 1. In the reaction

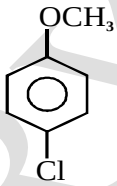


Product, is (Major)

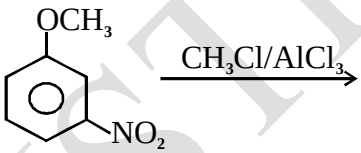
(A) 

(B) 

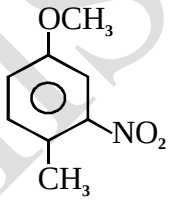
(C) 

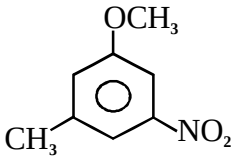
(D) 

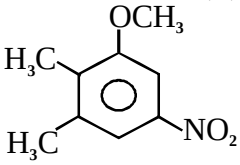
Q 2. In the reaction

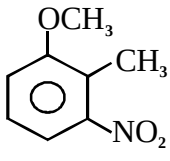


Major product is

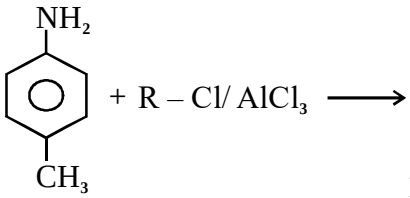
(A) 

(B) 

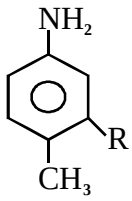
(C) 

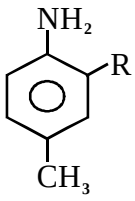
(D) 

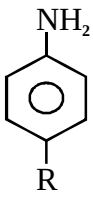
Q 3. In the reaction

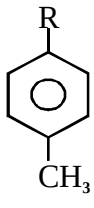


Major product, is

(A) 

(B) 

(C) 

(D) 

Q 4. In the reaction

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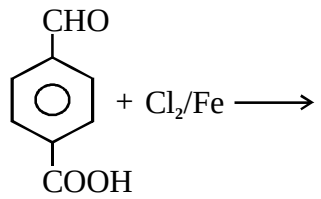
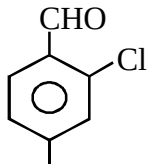
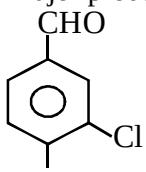
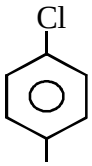
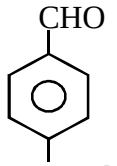


Major product, is

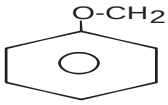
(A) 

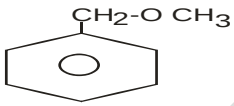
(B) 

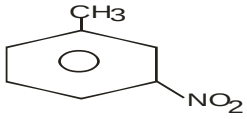
(C) 

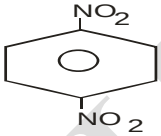
(D) 

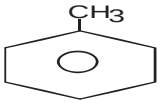
Q 5. Among the following pairs of compounds, which of more reactive in electrophilic aromatic Substitution?

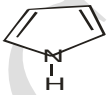
A) 

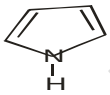
Or 

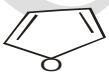
B) 

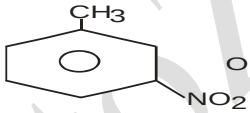


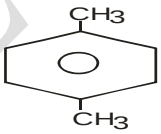
C) 

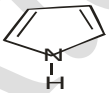
Or 

D) 

Or 

E) 

Or 

F) 

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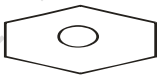
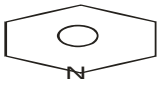
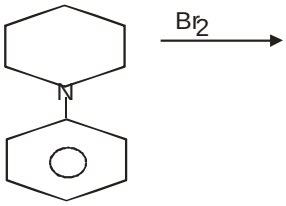
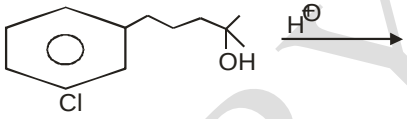
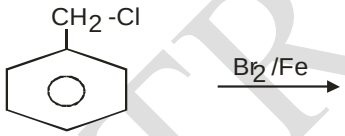
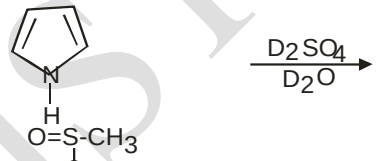
G) 
Or 

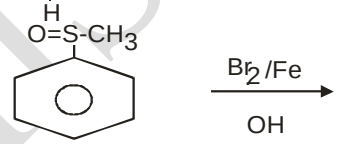
Q 6. Write the major product (s) in each of the following reactions

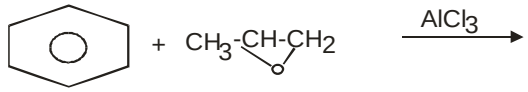
A) 

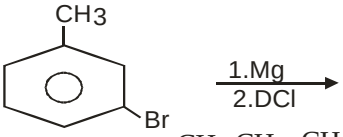
B) 

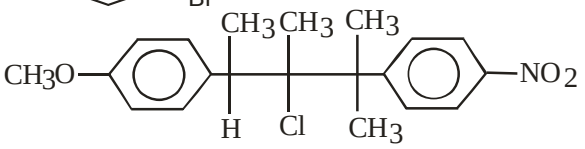
C) 

D) 

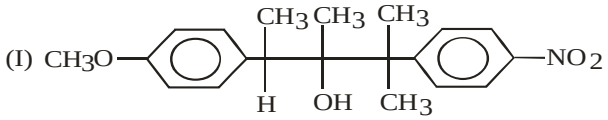
E) 

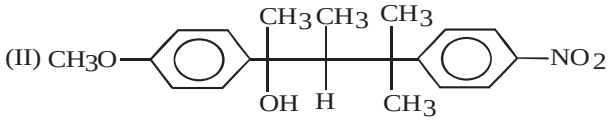
F) 

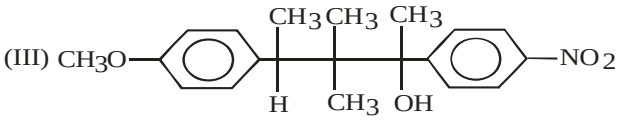
G) 

Q 7. 

Compound on hydrolysis in aqueous acetone will give **[IIT JEE 2005]**

(I) 

(II) 

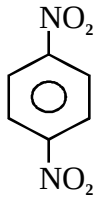
(III) 

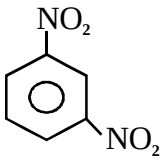
(A) Mixture of (i) & (ii) (B) Mixture of (i) & (iii)

AtoZ CHEMISTRY

(C) Only (iii) (D) Only (i)

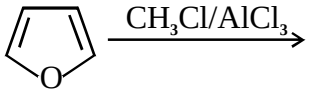
Q 8. Which one is more reactive toward electrophilic aromatic substitution reaction?

I 

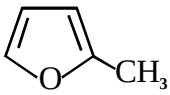
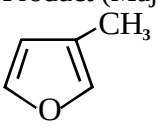
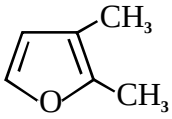
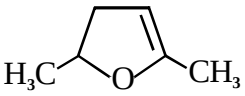
II 

(A) I (B) II
(C) I & II are equally reactive (D) None

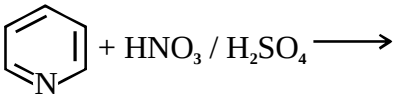
Q 9. In the reaction



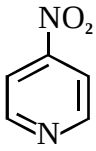
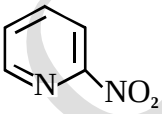
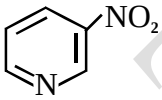
Product (Major), is

(A) 
(B) 
(C) 
(D) 

Q 10. In the reaction

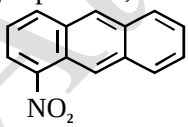
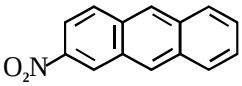
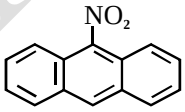
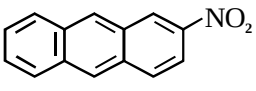


Major product, is

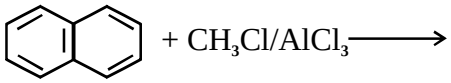
(A) 
(B) 
(C) 
(D) Mixture of A & B

Q 11. In the reaction

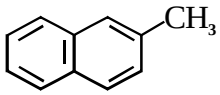
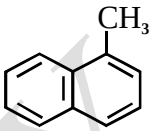
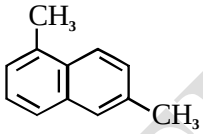
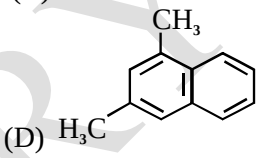
Major product, is

(A) 
(B) 
(C) 
(D) 

Q 12. In the reaction



Major product, is

(A) 
(B) 
(C) 
(D) 

11. Addition Elimination Pathway

Q 1. On Ph-Br, SN_1 reaction is not possible because

(A) $Ph^{\oplus}$ is not stable
(B) Attack of Nucleophile is not possible
(C) Electronic repulsion between e^- pair of Nucleophile & π electro cloud of beuzene ring
(D) It is possible

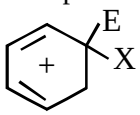
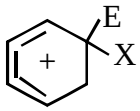
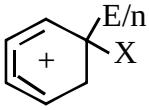
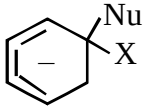
Q 2. On $Ph-Br$, SN_2 reaction is not possible because

(A) $Ph^{\oplus}$ is not stable
(B) Attack of Nucleophile is not possible
(C) Electronic repulsion between e^- pair of Nucleophile & π electro cloud of beuzene ring
(D) It is possible

Q 3. $PhN_2^{\oplus}Cl^{\Theta} + H_2O \rightarrow PhOH$ follows

(A) SN_1 pathway (B) SN_2 pathway
(C) SNAr pathway (D) None of these

Q 4. In SNAr pathway, the intermediate formed is

(A) 
(B) 
(C) 
(D) 

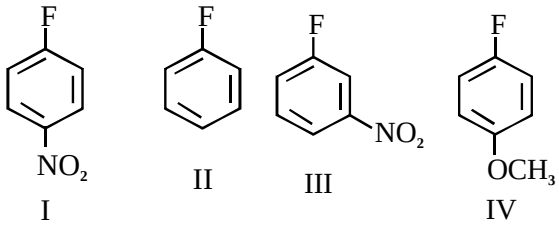
Q 5. The reactivity order of Ph-X is in SNAr reaction

(A) $PhI > PhBr > PhCl > PhF$

AtoZ CHEMISTRY

(B) PhF > PhCl > PhBr > PhI
(C) PhCl > PhBr > PhI > PhF
(D) PhBr > PhI > PhCl > PhF

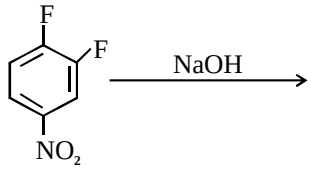
Q 6. The reactivity order of the compound in SNAr reaction



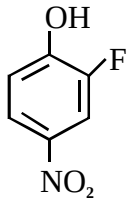
I II III IV

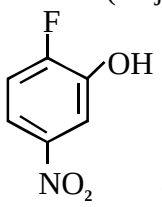
(A) I > III > II > IV (B) I > II > III > IV
(C) I > IV > III > II (D) II > IV > III > I

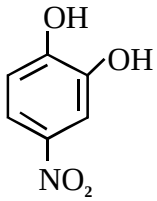
Q 7. In the reaction

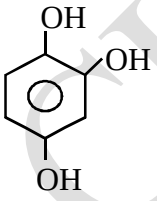


Product (Major) is

(A) 

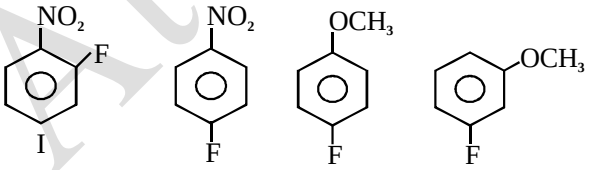
(B) 

(C) 

(D) 

Q 8. SNAr pathway is also called
(A) Addition elimination pathway
(B) Elimination addition pathway
(C) Benzyne pathway
(D) Nucleophilic substitution

Q 9. The oder of SNAr pathway among the given molecules is



I II III IV

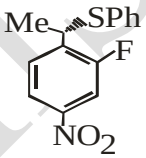
(A) I > II > III > IV (B) II > I > IV > III
(C) II > III > I > IV (D) II > III > IV > I

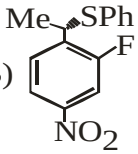
Q 10. In nucleophilic aromatic substitution, the least leaving group tendency is for

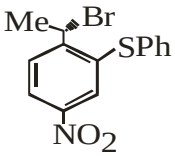
(A) F^- (B) Cl^- (C) H^- (D) OH^-

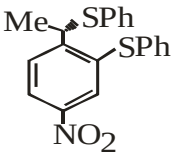
Q 11. The SNAr reaction involves
(A) wheeland in termediate
(B) Areniom ion intermediate
(C) Meisenheimer intermediate
(D) Benzyne intermediate

Q 12. The major product of the following reaction is **[IIT JEE 2008]**

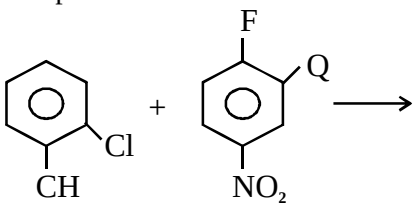
(A) 

(B) 

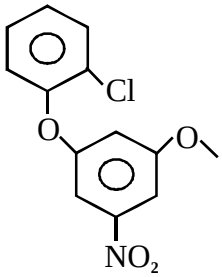
(C) 

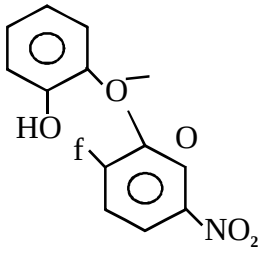
(D) 

Q 13. The product in the reaction

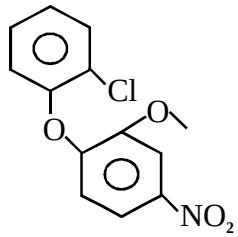


product, is

(A) 

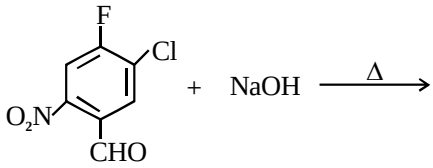
(B) 

AtoZ CHEMISTRY

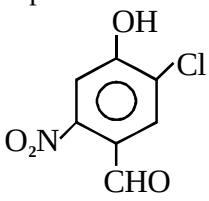


(C) (D) None of these

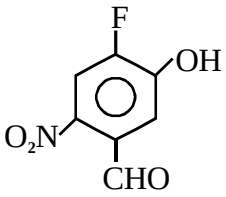
Q 14. In the reaction



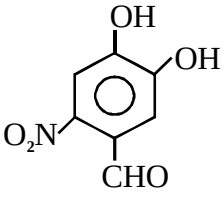
Major product is



(A)



(B)



(C) (D) None of these

12. Benzyne Pathway

Q 1. Benzyne pathway is also called

(A) Addition elimination pathway

(B) Elimination addition pathway

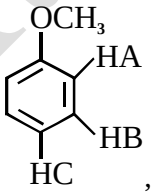
(C) Nucleophilic aromatic substitution

(D) Electrophilic aromatic sbust

Q 2. In benzyne, π bond outside the ring is formed by

(A) P_z - orbitals (B) $P_y -$ orbitals

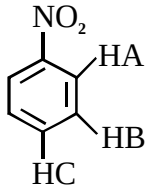
(C) $P_x -$ orbitals (D) $SP^2 -$ orbital



Q 3. In the ring , Relative acidic strength order is

(A) $H_A > H_B > H_C$ (B) $H_C > H_B > H_A$

(C) $H_B > H_A > H_C$ (D) $H_B > H_C > H_A$

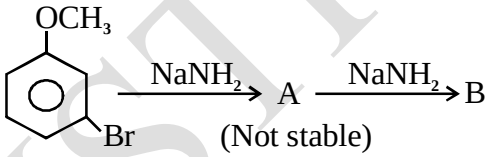


Q 4. In the ring, the relative acidic strength order is

(A) $H_A > H_B > H_C$ (B) $H_A > H_C > H_B$

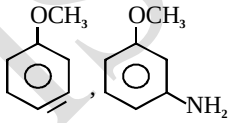
(C) $H_C > H_A > H_B$ (D) $H_B > H_A > H_C$

Q 5. In the reaction

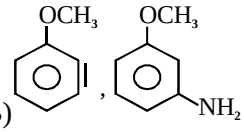


(Not stable)

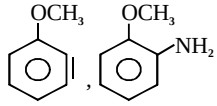
(A)



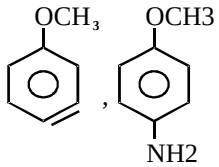
(B)



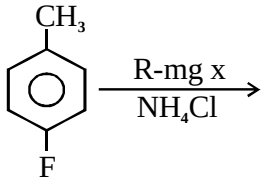
(C)



(D)

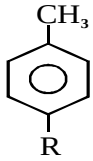


Q 6. In the reaction

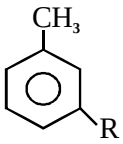


product formed is

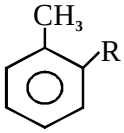
(A)



(B)



(C)



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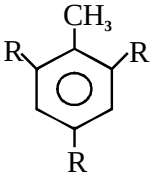
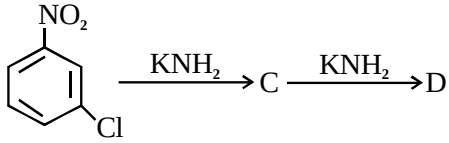


Q 7. In the reaction



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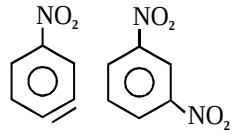
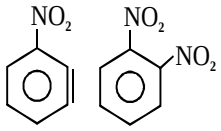
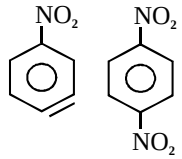
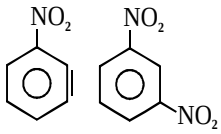
C & D are

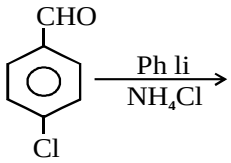
(A) 

(B) 

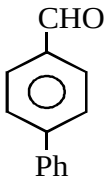
(C) 

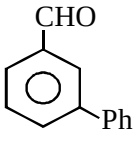
(D) 

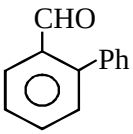
Q 8. In the reaction

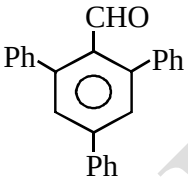


product, is

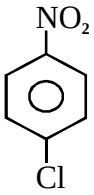
(A) 

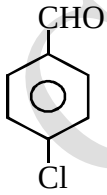
(B) 

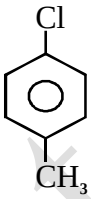
(C) 

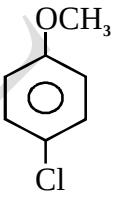
(D) 

Q 9. Which of the following reaction leads to substitution at meta position?

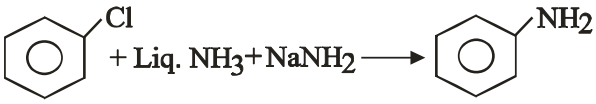
(A) 

(B) 

(C) 

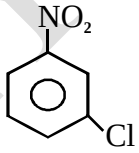
(D) 

Q 10. What is the mechanism of the reaction given below?

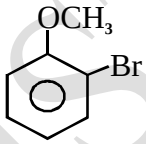


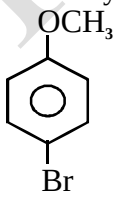
(A) C_N1 (B) S_N2
(C) Addition-elimination
(D) Elimination-addition

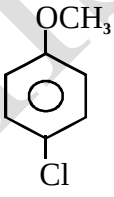
Q 11. Which of the following molecules will form

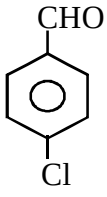


benzyne at same position as done by

(A) 

(B) 

(C) 

(D) 

Q 12. Benzyne is stablised by
(A) electron donar group
(B) electron acceptor group
(C) Not stablised by any group
(D) Not stable at all

Q 13. Benzyne is
(A) Aromatic (B) Non –aromatic
(C) Anti-Aromatic (D) None of these

AtoZ CHEMISTRY

Answer Key

1. Introduction to Mechanism & Organic Reaction

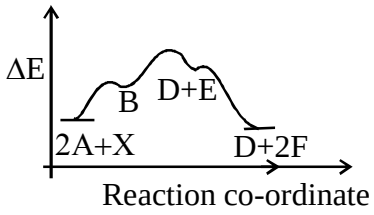
(1). A (2). C

(3). $2A + B \longrightarrow 2C \ (Slow)$
$C + B \longrightarrow D \ (Fast)$

(4).

(A) $2A + C \longrightarrow D + 2F$

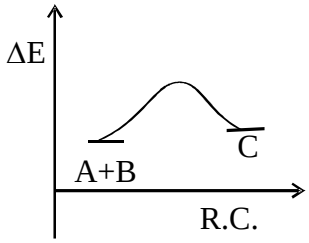
(B) 2nd Step



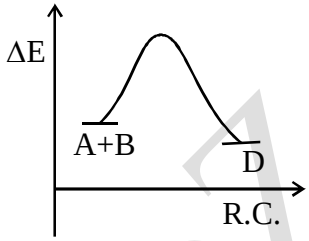
(C)

(D) B, E

(5). Kinetically controlled product



Thermodynamically controlled Product



(6). A

(7). D	(8). A	(9). C
(10). B	(11). C	(12). C
(13). D		

2. Substitution Reaction

(1). B	(2). B	(3). C
(4). A	(5). C	(6). B
(7). B	(8). A	(9). C
(10). B, D	(11). D	(12). C
(13). A	(14). C	

(15). I > III > II > IV

(16). B

3. SN_1, SN_2 Reaction

(1). B	(2). D	(3). D
(4). D	(5). A	(6). B
(7). D	(8). D	(9). B
(10). B	(11). B	(12). C
(13). B	(14). B	(15). C
(16). D	(17). B	(18). A

4. SN_1 vs SN_2 Reaction & SN_i Reaction

(1). C	(2). B	(3). D
(4). B	(5). C	(6). D
(7). D	(8). B	(9). C
(10). A	(11). B	(12). B
(13). A	(14). C	(15). D
(16). B		

5. Elimination Reaction – E_1 & E_2 Reaction

(1). B	(2). C	(3). D
(4). B	(5). C	(6). A
(7). C	(8). D	(9). B
(10). A	(11). C	(12). A
(13). A, B	(14). A, B	(15). B, C, D

6. E_1 Vs E_2 Reaction, E_{1CB} Reaction

(1). A	(2). B	(3). D
(4). B	(5). C	(6). D
(7). D	(8). B	(9). A
(10). C	(11). A	(12). D
(13). C	(14). A	(15). D
(16). A	(17). B	(18). C

7. Elimination vs Substitution Reaction

(1). A – Q ; B – Q, P ; C – R ; D – P, S

(2). B	(3). D	
(4). A	(5). D	(6). A
(7). B	(8). C	(9). C
(10). C	(11). D	

AtoZ CHEMISTRY

8. Electrophilic Addition Reaction

(1). A (2). A (3). B
(4). D (5). C (6). C
(7). A (8). D (9). B
(10). C (11). D (12). B
(13). D

9. Electrophilic Aromatic Substitution

(1). C (2). A (3). C
(4). A (5). C (6). A
(7). C (8). B (9). C
(10). B (11). C (12). A
(13). C (14). A (15). B
(16). C

10. Examples of Electrophilic Aromatic substitution

(1). B (2). A (3). B
(4). B
(5). SUBJ.
(6). SUBJ.
(7). A (8). B (9). A
(10). C (11). C (12). B

11. Addition Elimination Pathway

(1). A (2). C (3). A
(4). D (5). B (6). A
(7). B (8). A (9). B
(10). C (11). C (12). A
(13). C (14). A

12. Benzyne Pathway

(1). B (2). D (3). C
(4). B (5). B (6). B
(7). B (8). A (9). C, D
(10). D (11). B, C, D (12). A
(13). D

AtoZ CHEMISTRY