	Exercise -	1					
		OBJECTIVE	QUESTIONS				
Section A-1.	on (A) : Preparation The characteristic reacti	and chemical prop	perties of benzene				
	(1) Electrophilic addition(3) Electrophilic substitu	tion	(2) Nucleophilic substitution(4) Nucleophilic addition	ution n.			
A-2.	A deactivating group (1) deactivates only o-ar (2) deactivates only m-p (3) deactivates o-and p- (4) deactivates m-more	nd p-positions. position more than m-position than o-and p-positions					
A-3.ங̀	Select the correct staten (I) Ortho-and para-direct (II) Meta-directing group (III) Meta-directing group (IV) Ortho-and para-direction (1) I & II	nent . ting groups increase ele os increase electron den ps decrease electron de ecting groups decrease (2) I & III	ectron density at ortho-ar isity at meta-position ma ensity at ortho pera positi electron density at meta- (3) III & IV	nd para-positions mainly inly ion mainly position (4) II & IV			
A-4.	-NH ₂ group in aniline is : (1) m-directing and dead (3) o, p-directing and ac	ctivating tivating	(2) o, p-directing and deactivating (4) m-directing and activating				
A-5.	Amongst the following, v (1) –NHR	weakest activating group (2) –NHCOCH3	ıp is : (3) –NR ₂ (4) –CH ₃ .				
A-6.	Chlorobenzene is o,p-di by (1) +M of Ph	irecting in electrophilic s	substitution reaction. The	e directing influence is explaned (4) +I of Ph			
A- 7.	Which of the following is $(1) - CF_3$	ortho-para directing gr (2) –CCl ₃	oup ? (3) –CH=CH–COOH	(4) –NO ₂			
A-8.	In a compound electrophilic substitution has occurred. The substituent $-E$ are methy $-CH_2CI$, $-CCI_3$ and $-CHCI_2$. The correct increasing reactivity order towards electrophilic substitution is $(1) -CH_3 < -CH_2CI < -CHCI_2 < -CCI_3$ $(2) -CH_3 < -CHCI_2 < -CCI_3$ $(2) -CH_3 < -CHCI_2 < -CCI_3$ $(3) -CCI_3 < -CH_2CI < -CH_2CI < -CH_3$ $(4) -CCI_3 < -CHCI_2 < -CH_3$						
A-9.ൔ	The fastest ArS _E 2 reaction (1) Phenoxide ion	on is given by ? (2) Phenyl ethanoate	(3) Ethylbenzene	(4) Aniline			
A-10.	The decreasing order of is :	reactivity towards elect	trophilic substitution reac	tion of the following compounds			
	(i) benzene, (1) i > iii > iv > ii	(ii) chlorobenzene, (2) iv > i > iii > ii	(iii) nitrobenzene, (3) iv > i > ii > iii	(iv) toluene (4) iv > ii > i > iii			

(1)

CI

(4)

A-11. Arrange the following compounds in order of decreasing reactivity towards electrophilic substitution reaction.



A-14.The direct iodination of benzene is not possible because :
(1) iodine is an oxidising agent
(3) HI is unstable(2) resulting C_6H_5I is reduced to C_6H_6 by HI
(4) the ring gets deactivated.

A-15. In the nitration of benzene with a mixture of conc. HNO₃ and conc. H₂SO₄, the electrophile involved is : (1) NO₃- (2) NO₂ (3) NO₂- (4) NO₂+

(3)

- A-16. Nitrobenzene can be prepared from benzene by using a mixture of conc. HNO₃ and conc. H₂SO₄. In the nitrating mixture HNO₃ acts as a :
 (1) base
 (2) acid
 (3) reducing agent
 (4) catalyst
- **A-17.** For the electrophilic substitution reaction involving nitration, which of the following sequence regarding the rate of reaction is true?

$$(1) \quad {}^{k_{C_{6}H_{6}}} > {}^{k_{C_{6}D_{6}}} > {}^{k_{C_{6}T_{6}}} \qquad (2) \quad {}^{k_{C_{6}H_{6}}} < {}^{k_{C_{6}D_{6}}} < {}^{k_{C_{6}T_{6}}} \qquad (3) \quad {}^{k_{C_{6}H_{6}}} = {}^{k_{C_{6}D_{6}}} = {}^{k_{C_{6}T_{6}}} \qquad (4) \quad {}^{k_{C_{6}H_{6}}} > {}^{k_{C_{6}D_{6}}} < {}^{k_{C_{6}T_{6}}} = {}^{k_{C_{6}D_{6}}} = {}^{k_{C_{6}}} =$$

A-18. Benzene when heated with conc. H₂SO₄ forms:

(2)

- (1) benzene sulphate (2) benzene sulphite
- (3) benzene hydrogen sulphate (4) benzene sulphonic acid
- A-19. For the electrophilic substitution reaction involving sulphonation, which of the following sequence regarding the rate of reaction is true?

 $(1)^{k_{C_6H_6}} > ^{k_{C_6D_6}} > ^{k_{C_6T_6}} (2)^{k_{C_6H_6}} < ^{k_{C_6D_6}} < ^{k_{C_6T_6}} (3)^{k_{C_6H_6}} = ^{k_{C_6D_6}} = ^{k_{C_6T_6}} (4)^{k_{C_6H_6}} > ^{k_{C_6D_6}} < ^{k_{C_6T_6}} (4)^{k_{C_6H_6}} > ^{k_{C_6D_6}} (4)^{k_{C_6H_6}} (4)^{k_{C_6H_6}}$



A-21.[▲] Benzene reacts with n-propyl chloride in the presence of anhydrous AICI₃ to give predominantly:

- (1) n-propylbenzene
- (3) 3-propyl-1-chlorobenzene
- (2) Cumene
- (4) no reaction
- A-22. For preparing monoalkyl benzene, acylation process is preferred than direct alkylation because
 - (1) In alkylation, a poisonous gas is evolved
 - (2) In alkylation, large amount of heat is evolved
 - (3) In alkylation, polyalkylated product is formed
 - (4) Alkylation is very costly
- A-23. The major product formed in the reaction



- Benzene reacts with acetyl chloride in presence of anhydrous aluminium chloride to form: A-24. (1) acetophenone (2) phenyl acetate (3) chlorobenzene (4) benzoic acid
- A-25. Nitrobenzene does not undergo Friedel-Crafts alkylation and acylation reactions because :
 - (1) it is a highly polar compound
 - (2) it is steam volatile
 - (3) its ring is deactivated by the electron withdrawing effect of the nitro substituent
 - (4) None of these is correct
- A-26. Lindane can be obtained by reaction of benzene with
 - (1) CH₃Cl/anhy AlCl₃ (2) Cl₂/sunlight
- (3) C₂H₅I/anhy. AlCl₃ (4) CH₃COCI/AICI₃
- A-27. Reductive ozonolysis of benzene gives :
 - (1) one mole of glyoxal
 - (3) three moles of glyoxal

- (2) two moles of glyoxal
- (4) three moles of oxalic acid

Secti	on (B) : Alkanes						
B-1.	Ethylbenzene + Cl ₂ — (1) o- & p-Chloroethylb (3) 2-Chloroethylbenze	^{Light} → major product is : enzene ene	is : (2) 1-Chloro-1-phenyl ethane (4) m-Chloroethylbenzene				
B-2.	In which of the followin (1) Isobutane, n-butane (3) Methane, ethane	g pairs, the bromination o	n of first member is easier than the second member ? (2) n-Butane, isobutane (4) None of these				
В-3.	Halogenation of alkane (1) Free radical additio (3) Nucleophilic substit	es is an example of n reaction ution reaction	(2) Free radical substitution reaction(4) Nucleophilic addition reaction.				
B-4.	Which of the following Cl ₂ ?	cannot be considered as	a step of mechanism ir	n chain reaction of methane with			
	(1) $Cl_2 \longrightarrow 2Cl$		(2) CH₄ + CI • ──→ CH	H₃CI + H▪			
	(3) CI + $CH_4 \longrightarrow C$	CH₃▪ + HCI	$(4) \operatorname{CI}^{\bullet} + \operatorname{CH}_{3}^{\bullet} \longrightarrow ($	CH₃CI			
B-5.	During chlorination of r	nethane to methyl chlorid	de, the propagation step	is represented by			
	(1) CI — CI \xrightarrow{hv} CI	+ ĊI	(2) \dot{CH}_3 + \dot{CI}	→CH ₃ CI			
	(3) CH ₄ + $\dot{CI} \longrightarrow CH$	³ + HCl	(4) ^{ĊI} + ^{ĊI} → _{CI}	— CI			
B-6.	Methane reacts with ex (1) Chloroform (3) Methylene chloride	cess of chlorine in diffus	ed sunlight to give the fir (2) Carbon tetrachlorid (4) Methyl chloride.	nal product as e			
B-7.	A gaseous hydrocarbo and HBr. The hydroca	n 'X' on reaction with bro rbon 'X' is :	omine in light forms a mix	ture of two monobromo alkanes			
	(1) CH ₃ –CH ₃	(2)	(3)	(4)			
B-8.	The number of monoch (1) 3	nloro derivatives of isohe (2) 4	xane is (Only structural i (3) 5	somers) (4) 6			
B-9.	The major product obta CH_3 Br_2 hv	ained in the reaction, :					
		(2) CH ₂ Br Br	(3) CH ₃ Br	(4) Br			
B-10.	lodination of an alkane (1) Alcohol	is carried out in presenc (2) P + I ₂	e of (3) HNO₃ or HIO₃	(4) A reducing agent			

B-11. Which of the following statement does not apply to free radical chain reaction ?(1) It may be initiated by ultraviolet rays

- (2) One mole of product is obtained for each mole of free redical produced in the initiation step
- (3) It is not affected by changes in polarity of solvents
- (4) It is inhibited by the presence of certain reagents

Section (C) : Free radical addition and substitution in alkenes/alkynes

C-1. Tert-alkyl halide is obtained as major product in :



D-2. Ethylene readily undergoes:(1) addition reaction (2) substitution reaction (3) elimination reaction (4) rearrangement reaction

D-3. Reaction of ethene with Br₂ in CCl₄ gives:





3. Order of rate of electrophilic substitution reaction is :



- 4. Benzene on reaction with conc. HNO₃ in presence of conc. H₂SO₄ followed by the treatment of Cl₂ in presence of FeCl₃, it gives: (1) 2-Chloro-1-nitrobenzene
 - (3) 4-Chloro-1-nitrobenzene

(2) 1-Chloro-3-nitrobenzene

(4) A mixture of 2-Chloro and 4-Chloro-1-nitrobenzene

- 5. When nitrobenzene is treated with Br₂ in presence of FeBr₃ the major product formed is mbromonitrobenzene. Statement which is related to obtain the m-isomer is :
 - (1) The electron density on meta carbon is more than that on ortho and para positions
 - (2) Loss of aromaticity when Br+ attacks at the ortho and para positions and not at meta position
 - (3) Easier loss of H+ to regain aromaticity from the meta position than from ortho and para positions
 - (4) None of the above

7.

6. Benzene ring can be halogenated by using interhalogens. Identify the product of the following halogenation reaction :



8._🖎 A particular form of tribromobenzene forms three possible mononitrotribromo-benzene. The structure of the compound is :



9. Which of the following will undergo sulphonation at fastest rate ?

Organic Reaction Mechanisms - II



Br₂, hu $CH_3 - CH_2 - CH_2 - CH_3^{-1}$ (1) 1-Bromobutane and 2-Bromobutanes are formed in equal amounts. (2) 2-Bromobutane is formed with faster rate than 2-chlorobutane in the other experiment of chlorination. (3) The major product is an equimolar mixture of two compounds (4) Homolysis of C - H bond has lower activation energy than homolysis of Br - Br bond. 17. The number of possible enantiomer pairs that can be produced during monochlorination of 2-methylbutane is (1) 2(2) 3(3) 4(4) 118. Chlorination of propane is carried out in the presence of sunilght. The % yield of major and minor alkyl halides will be: (1) 55.8%, 44.2% (2) 70%. 30% (3) 80%. 20% (4) 86%, 14% Arrange-the following alkenes in decreasing order of reactivity towards electrophilic addition : 19. (i) H_3C (ii) $CH_3-CH=CH_2$ (iii) $CH_2=CH-CI$ (iv) $CH_2=CH-CH_2-CI$ (1) i > ii > iv > iii (2) i > iv > ii > iii (3) iv > i > ii > iii(4) iii > ii > i > iv $H \xrightarrow{f_3C} C = C \xrightarrow{CH_3} H \xrightarrow{+Br_2} \xrightarrow{CCl_4} ? \text{ Product is :}$ $H \xrightarrow{CH_3} H \xrightarrow{+Br} H \xrightarrow{CH_3} Br \xrightarrow{CH_3} Br \xrightarrow{H} H \xrightarrow{H}$ 20. (1) $CH_3 - C = CH_2$ (4) Both (2) & (3) 21. Which will form 2, 2-Dibromopropane with HBr ? (1) $CH_2 = CH - CH_3$ (2) CH₃ – C ≡ CH (3) $CH_{3}CH_{2}CH_{2}C \equiv CH \xrightarrow{BH_{3}, THF} \xrightarrow{H_{2}O_{2} / OH^{-}} X'$ 22. Identify the product 'X' : CH₃ 23. In the given reaction, Then X will be : OCH₃ $CH_{3} - CH - CH - CH - CH_{3}$ $(2) CH_{3}$ $CH_{3} - CH_{3} - CH_{3} - CH_{3}$ $(4) CH_{3} - CH_{3} - CH_{3}$ $CH_3 - CH_2 - CH_2 - OCH_3$ (1) CH_{3} CI I $CH_{3} - C - CH_{2} - \ddot{C} - CH_{3}$ I $CH_{3} - C - CH_{2} - \ddot{C} - CH_{3}$ (3) (4)



PART - II : MISCELLANEOUS QUESTIONS

Section (A) : ASSERTION/REASONING

DIRECTIONS : Each question has 4 choices (1), (2), (3) and (4) out of which ONLY ONE is correct.

- (1) Assertion is True, Reason is True; Reason is a correct explanation for Assertion.
- (2) Assertion is True, Reason is True; Reason is NOT a correct explanation for Assertion.
- (3) Assertion is True, Reason is False.
- (4) Both Statements are False.
- A-1. Assertion : Neopentane forms one monohalo-substituted compound. Reason : Neopentane is isomer of pentane.
- A-2. Assertion : In the free radical reaction, reactivity slow down for the peroid of time during which inhibitor exists and after which the reaction proceed normally.
 Reason : Oxygen as inhibitor slow down the reactivity.
- **A-3.** Assertion : Trans-2-butene on reaction with Br₂ gives meso-2, 3-dibromobutane. Reason : The reaction involves syn addition of bromine.
- A-4. Assertion : Styrene on reaction with HBr gives 1-bromo-1-phenylethane. Reason : Benzyl radical is more stable than alkyl radical.
- **A-5.** Assertion : n-butane on heating in presence of AlCl₃ gives Isobutane **Reason :** n-butane and isobutane are isomers.
- A-6. Assertion : Addition of HBr on 1-butene in presence of peroxide gives 1-bromobutane as a major product.

Reason : This reaction is proceed via more stable secondary alkyl free radical.

- A-7. Assertion : Propene is more reactive than ethene towards electrophilic addition reactions.
 Reason : Electron density of double bond increases due to hyperconjugation of methyl group.
- A-8. Assertion : $CH_3 C \equiv C CH_3$ is more reactive for electrophilic addition reaction than $CH_3CH = CH CH_3$ Reason : Carbocation intermediate formed in alkene is less stable than the alkyne

Section (B) : MATCH THE COLUMN

B-1. Match the reaction intermediates formed during the reactions given in Column-I with Column-II Column-II

(P) CH₃–C \equiv C–H $\xrightarrow{\text{Na}}$

- (Q) CH₃-CH=CH₂ $\xrightarrow{\text{HBr}}_{\text{HBr}}$
- (R) CH₃-CH=CH₂ Peroxide
- (S) CH₃-CH=CH₂ $\xrightarrow{\text{Br}_2/\text{CCl}_4}$

- (a) Carbocation (Non classical)
- (b) Carbocation (Classical)
- (c) Carbanion
- (d) Alkyl free radical
- B-2. ▲ Match List I (Reaction) with List II (Type of reaction) and select the correct answer using the code given below the lists :

Organic Reaction Mechanisms - II

List I

(P) CH₃-CH₂-CH₂-CH₃ + Br₂ \xrightarrow{hv}

(Q) CH₃–CH=CH–CH₃ + Br₂
$$\xrightarrow{\text{CCl}_4}$$

$$(R) \xrightarrow{Fe} + Br_2 \xrightarrow{Fe}$$

List II

- (a) Electrophilic addition
- (b) Nucleophilic addition

(c) Free radical subsitution

(S) CH₃–CH₂–CH₂–CHO + LiAlH₄ $\xrightarrow{H_2O}$

(d) Electrophilic subsitution

Section (C) : ONE OR MORE THAN ONE OPTIONS CORRECT

C-1. In which of the following reaction reactants and products are correctly matched ?



C-2.

(ii) H₂O₂/oืH True statement about above reaction :

- (1) Reagent involve stereospecific syn addition of H and OH species.
- (2) Product obtained is trans isomer.
- (3) Boron atom acts as electrophile.
- (4) two stereoisomers are obtained as product.
- C-3. Electrophilic aromatic substitution can be seen in which of the following cases ?



C-4. In which of the following reactions correct major product is given ?



					•
	(3) BrCH ₂ –CH ₂ –OCH	3	(4) H ₃ C–CHBr–O	CH ₃	
7.	The reaction of toluer (1) o- and p-chlorotoli (3) benzoylchloride	ne with Cl₂ in presence uene	e of FeCl₃ gives predom (2) m-chlorotolue (4) benzyl chlorid	ne [AIEEE-200] Ne	7, 3/120]
8.	Which of the following	g reactions will yield 2,	2-dibromopropane?	[AIEEE-200	7, 3/120]
	(1) CH ₃ –C≡CH + 2H	$Br \longrightarrow$	(2) CH₃CH=CHB	· + HBr ──→	
	(3) CH≡CH + 2HBr <i>─</i>	>	(4) CH ₃ –CH=CH ₂	+ HBr \longrightarrow	
9.	Presence of a nitro gr (1) activates the ring to (2) renders the ring back (3) deactivates the ring (4) deactivates the ring	roup in a benzene ring towards electrophilic s asic ng towards nucleophilic ng towards electrophilic	ubstitution c substitution. c substitution.	[AIEEE-200 ⁻	7, 3/120]
10.	The electrophile E^{\oplus} , which σ -complex is of	attacks the benzene ri f lowest energy ?	ng to generate the inte	rmediate σ-complex. Of the [AIEEE-200 N 0,	following, B, 3/105]
11.	(1) How many chiral com	(2) H_{E}	(3) NO ₂ + H E	(4) H E 2-methylbutane?	
	(1) 8	(2) 2	(3) 4	[AIEEE-2013 (4) 6	2, 4/120]
12.	Which branched chai mono substituted alky (1) Tertiary butyl chlo (3) Isohexane	in isomer of the hydro /I halide ? ride	(3) Y ocarbon with molecular (2) Neopentane (4) Neohexane	mass 72u gives only one [AIEEE-201	isomer of 2, 4/120]
13.	The reaction of prope	ne with HOCI (Cl ₂ + H	2O) proceeds through t	he intermediate : [JEE-Main 2016, 4/1	20]
	(1) CH ₃ –CH ⁺ –CH ₂ –Cl	l	(2) CH ₃ – CH(OH)-CH ₂ +	-
	$(3) CH_3 - CHCI - CH_2^+$	+ 2	(4) CH₃–CH⁺ – C	H ₂ – OH	
14.	3-Methyl-pent-2-ene of possible stereoisor	on reaction with HBr in ners for the product is	presence of peroxide f	orms an addition product. Th [JEE-Main 2017, 4/120]	ie number
	(1) Zero	(2) Two	(3) Four	(4) Six	

PART - II : JEE (ADVANCED) / IIT-JEE PROBLEMS (PREVIOUS YEARS)

* Marked Questions ma	y have more than	one correct option.
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- In the presence of peroxide, hydrogen chloride and hydrogen iodide do not give anti-Markovnikov addition to alkenes because :
 [IIT-JEE-2001(S), 3/135]
 - (A) both are highly ionic
 - (B) one is oxidising and the other is reducing

- (C) one of the steps is endothermic in both the cases
- (D) all the steps are exothermic in both the cases.
- The reaction of propene with HOCI proceeds via the addition of [IIT-JEE-2001(S), 3/135]
 (A) H⁺ in the first step
 (B) Cl⁺ in the first step
 (C) OH⁻ in the first step
 (D) Cl⁺ and OH⁻ in a single step
- **3.** Identify the correct order of reactivity in electrophilic substitution reactions of the following compounds

4. Consider the following reaction

$$H_3C - CH - CH - CH_3 + \dot{B}r \rightarrow 'X' + HBr$$

| |
D CH₃

Identify the structure of the major product 'X'.

[IIT-JEE-2002(S), 3/150]

[JEE-2004, 3/84]

 $\begin{array}{c} H_{3}C - CH - CH - \dot{C}H_{2} \\ (A) \\ H_{3}C - \dot{C} - CH - CH_{3} \\ H_{3}C - \dot{C} - CH - CH_{3} \\ (C) \\ D \\ CH_{3} \end{array} \qquad \begin{array}{c} H_{3}C - \dot{C}H - \dot{C}H_{3} \\ H_{3}C - \dot{C}H - CH_{3} \\ (D) \\ CH_{3} \end{array} \qquad \begin{array}{c} H_{3}C - \dot{C}H - CH_{3} \\ H_{3}C - \dot{C}H - CH_{3} \\ CH_{3} \end{array} \qquad \begin{array}{c} H_{3}C - \dot{C}H - CH_{3} \\ H_{3}C - \dot{C}H - CH_{3} \\ CH_{3} \end{array} \qquad \begin{array}{c} H_{3}C - \dot{C}H - CH_{3} \\ H_{3}C - \dot{C}H - CH_{3} \\ CH_{3} \end{array} \qquad \begin{array}{c} H_{3}C - \dot{C}H - CH_{3} \\ H_{3}C - \dot{C}H - CH_{3} \\ H_{3}C - \dot{C}H - CH_{3} \end{array} \qquad \begin{array}{c} H_{3}C - \dot{C}H - CH_{3} \\ H_{3}C - \dot{C}H - CH_{3} \\ H_{3}C - \dot{C}H - CH_{3} \end{array} \qquad \begin{array}{c} H_{3}C - \dot{C}H - CH_{3} \\ H_{3}C -$

Assertion : Addition of bromine to trans-2-butene yields meso-2. 3-dibromobutane. [JEE-2001, 1/35]
 Reason : Bromine addition to an alkene is an electrophilic addition

- (A) Assertion is True, Reason is True; Reason is a correct explanation for Assertion.
- (B) Assertion is True, Reason is True; Reason is NOT a correct explanation for Assertion.
- (C) Assertion is True, Reason is False.
- (D) Assertion is False, Reason is True.



7. The number of chiral compounds produced upon monochlorination of 2-methylbutane is :

(A) 2(B) 4(C) 6(D) 88.The major product obtained on acid–catalysed hydration of 2–phenylpropene is[JEE-2004, 3/84](A) 2-Phenylpropan-2-ol(B) 2-Phenylpropan-1-ol(C) 3-Phenylpropan-2-ol(C) 3-Phenylpropan-2-ol(D) 1-Phenylpropan-1-ol

9. $(CH_3)_2CH - CH_2CH_3 \xrightarrow{Cl_2 / h_0} [N] \xrightarrow{Fractional} [P]$ [JEE-2006, 5/184] The number of possible isomers [N] and number of fractions [P] are : (A) (6, 6) (B) (6, 4) (C) (4, 4) (D) (3, 3)

10. The major product of monobromination of the given compound with Br₂ / Fe is - [JEE-2006, 3/184]



- 14.
 Statement-1 : Bromobenzene upon reaction with Br₂/Fe gives 1,4-dibromobenzene as the major product.

 Statement-2 : In bromobenzene, the inductive effect of the bromo group is more dominant than the mesomeric effect in directing the incoming electrophile.
 [IIT-JEE-2008, 3/162]
 - (A) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1.
 - (B) Statement-1 is True, Statement-2 is True; Statement-2 is NOT a correct explanation for Statement-1
 - (C) Statement-1 is True, Statement-2 is False
 - (D) Statement-1 is False, Statement-2 is True
- The compounds P, Q and S were separately subjected to nitration using HNO₃ / H₂SO₄ mixture. The major product formed in each case respectively, is : [IIT-JEE-2010, 5/163]

Organic Reaction Mechanisms - II



18.* Among the following, reaction(s) which gives(give) *tert*-butyl benzene as the major product is(are)[JEE-2016, 3/60]

Organic Reaction Mechanisms - II





	Answ	ers							
-	L)	EXER	CISE - 1				
A-1.	(3)	A-2.	(3)	A-3.	(2)	A-4.	(3)	A-5.	(4)
A-6.	(3)	A- 7.	(3)	A-8.	(4)	A-9.	(1)	A-10.	(3)
A-11.	(1)	A-12.	(2)	A-13.	(2)	A-14.	(2)	A-15.	(4)
A-16.	(1)	A-17.	(3)	A-18.	(4)	A-19.	(1)	A-20.	(3)
A-21.	(2)	A-22.	(3)	A-23.	(4)	A-24.	(1)	A-25.	(3)
A-26.	(2)	A-27.	(3)	B-1.	(2)	B-2.	(1)	B-3.	(2)
B-4.	(2)	B-5.	(3)	B-6.	(2)	B-7.	(3)	B-8.	(3)
B-9.	(3)	B-10.	(3)	B-11.	(2)	C-1.	(4)	C-2.	(3)
C-3.	(1)	C-4.	(1)	C-5.	(3)	C-6.	(3)	C-7.	(2)
C-8.	(2)	D-1.	(1)	D-2.	(1)	D-3.	(2)	D-4.	(2)
D-5.	(2)	D-6.	(1)	D-7.	(2)	D-8.	(1)	D-9.	(3)
D-10.	(3)	E-1.	(3)	E-2.	(1)	E-3.	(1)	E-4.	(3)
E-5.	(4)	E-6.	(2)	E-7.	(2)	E-8.	(1)	E-9.	(4)
E-10.	(2)	F-1.	(1)						
				EXER	CISE - 2				
				PAF	RT - I				
1.	(1)	2.	(3)	3.	(1)	4.	(2)	5.	(1)
6.	(4)	7.	(2)	8.	(2)	9.	(2)	10.	(1)
11.	(2)	12.	(4)	13.	(3)	14.	(3)	15.	(4)
16.	(3)	17.	(1)	18.	(1)	19.	(1)	20.	(2)
21.	(4)	22.	(1)	23.	(2)	24.	(1)		
				PAR	RT - II				
A-1.	(2)	A-2.	(2)	A-3.	(3)	A-4.	(2)	A-5.	(2)
A-6.	(1)	A-7.	(1)	A-8.	(4)				
B-1.	$(P) \rightarrow c, (Q) \rightarrow$	b, (R) →	\rightarrow d, (S) \rightarrow a	B-2.	$(P) \rightarrow c, (C)$	ג) → a, (R) →	d, (S) \rightarrow b		
C-1.	(2, 3, 4)	C-2.	(1,2,3,4)	C-3.	(1,2,3)	C-4.	(1,2,3)	C-5.	(2,4)
				EXER	CISE - 3				
				PAF	RT - I				
1.	(3)	2.	(2)	3.	(3)	4.	(4)	5.	(2)
6. 11	(4)	7. 12	(1)	8. 13	(1)	9. 1 <i>4</i>	(4)	10.	(1)
	(3)	12.	(2)	10.	(')	14.	(0)		
				PAR	RT - II				
1.	(C)	2.	(B)	3.	(C)	4.	(B)	5.	(B)
6.	(A)	7.	(B)	8.	(A)	9.	(B)	10.	(A)
11.	(B)	12.	(A)	13.	(B)	14.	(C)	15.	(C)
16.	(B)	17.	(D)	18.*	(BCD)				

Additional Problems For Self Practice (APSP)

Marked Questions may have for Revision Questions.

PART - I : PRACTICE TEST PAPER

This Section is not meant for classroom discussion. It is being given to promote self-study and self testing amongst the Resonance students.

Max. Marks : 120

Important Instructions

- 1. The test is of 1 hour duration.
- 2. The Test Booklet consists of 30 questions. The maximum marks are 120.
- 3. Each question is allotted 4 (four) marks for correct response.

(2) HBr

Candidates will be awarded marks as stated above in Instructions No. 3 for correct response of each 4. question.

1/4 (one fourth) marks will be deducted for indicating incorrect response of each question. No deduction from the total score will be made if no response is indicated for an item in the answer sheet.

5. There is only one correct response for each question. Filling up more than one response in any question will be treated as wrong response and marks for wrong response will be deducted accordingly as per instructions 4 above.

1.
$$\xrightarrow{x} Br$$

x is

(1)

2.

(1) Br₂ / H₂O

CCL

HBr

R₂O₂



(4) NBS

(3) HBr / Peroxide

- 3.🖎 The chlorination of Toluene in presence of ferric chloride gives predominatly :
 - (1) Benzyl chloride (3) Benzal chloride (2) m-Chlorotoluene (4) o-and p-Chlorotoluene
- The alkene limonene has the following structure, 4.

$$\sim$$

What product results from the reaction of limonene and chlorine water ?



Max. Time : 1 Hr.

5. The reaction of HBr with the following compound would produce :



- 6. Among following statements of aromatic compounds, the false one is
 - (1) The rate of nitration of benzene is almost the same as that of hexadeuterobenzene
 - (2) The rate of nitration of toluene is greater than that of benzene
 - (3) The rate of sulphonation of benzene is greater than that of hexadeuterobenzene
 - (4) Nitration is an electrophilic addition reaction.
- 7. Presence of a cyano group in a benzene ring.
 - (1) Activates the ring towards electrophilic substitution.
 - (2) Renders the ring basic.
 - (3) Deactivates the ring towards nucleophilic substitution.
 - (4) Deactivates the ring towards electrophilic substitution.
- 8. The relative rates of mononitration of $R C_6H_5$, where $R = CH_3$, $-NO_2$, -OH, -CI are : (1) $CH_3 > OH > NO_2 > CI$ (2) $OH > CI > CH_3 > NO_2$ (3) $OH > CH_3 > NO_2 > CI$ (4) $OH > CH_3 > CI > NO_2$
- In the free radical chlorination of Methane, the chain initiating step involves the formation of
 (1) Chlorine radical
 (2) Hydrogen chloride
 (3) Methyl radical
 (4) Chloromethyl radical.
- **10.** Which of the following is the major product for the given reaction ?

 $+ Br_2 \xrightarrow{hv}{333 \text{ K}}$

- (3) 4-Bromo-2-methylpentane
- **11.** Allylic bromination of an olefin is :
 - (1) Nucleophilic substitution
 - (3) Free radical substitution
- (2) Electrophilic substitution

(2) 1-Bromo-2-methylpentane

(4) 3-Bromo-2-methylpentane

- (4) Electrophilic addition.
- **12.** Which of the following is free radical addition reaction ?

$$(1) \bigcirc + N \overset{\oplus}{O}_{2} \longrightarrow \bigcirc \overset{\mathsf{NO}_{2}}{}$$

- (2) $CH_2=CH_2 + HBr \longrightarrow CH_3-CH_2-Br$
- (3) CH₃-CH=CH₂ + HBr $\xrightarrow{R_2O_2}$ CH₃-CH₂-CH₂-Br CH₃-CH-CH₃ (4) CH₂-CH-CH₂ + HCl \longrightarrow Cl
- $(4) CH_3-CH=CH_2 + HCI \longrightarrow$
- **13.** Ph–CH=CH–CH₃ $\xrightarrow{\text{HOCI}}$ X, X is :







- (3) X and Y both are product of radical reaction.
- (4) X is product of radical reaction and Y is product of ionic reaction.
- Which of the following is the best reagent to convert 1-Methylcyclohexene into 2-methylcyclohexanol ?
 (1) Dil H₂SO₄
 (2) Hg(OAc)₂ / NaBH₄, H₂O

(3) B₂H₆/H₂O₂, [⊖]OH

(4) Conc. H₂SO₄

Practice Test-1 (IIT-JEE (Main Pattern))

OBJECTIVE RESPONSE SHEET (ORS)

Que.	1	2	3	4	5	6	7	8	9	10
Ans.										
Que.	11	12	13	14	15	16	17	18	19	20
Ans.										
Que.	21	22	23	24	25	26	27	28	29	30
Ans.										

PART - II : PRACTICE QUESTIONS

1.	$CH_3CH_3 + HNO_3 - 675H$	 			
	(1) CH ₃ CH ₂ NO ₂		(2) CH ₃ CH ₂ N	O2 + CH3NO2	
	(3) 2CH ₃ NO ₂		(4) $H_2C=CH_2$		
2.	Ethylene combines with	h sulphur monochloi	ride to form		
	(1) Phosgene		(2) Mustard g	as	
	(3) Methyl isocyanate (MIC)	(4) Lewisite		
3.	Structural fomula for le	wisite is:			
	CHCI	CHCI	CHCI		
	(1) CHASCI ₃	(2) CHASCI	(3) CHASCI ₂	(4) CHA	501 ₂
4.	Catalyst used in dimeri	sation of acetylene	to prepare chloropre	ne is:	
	(1) HgSO ₄ + H ₂ SO ₄	(2) Cu ₂ Cl ₂	(3) Cu ₂ Cl ₂ + N	NH₄OH (4) Cu₂C	I ₂ + NH ₄ CI
5.	Acetylene is used as a	n anaesthetic under	the name of:		
	(1) narcylene	(2) pyrene	(3) neoprene	(4) pyrol	ine
6.	Chlorination of butane tak	kes place as,			
		CI			
		\xrightarrow{hv} $CH_3 - \dot{C}H - \dot{C}H$	$CH_2 - CH_3 CH_3 - CH_3$	₂ –CH ₂ –CH ₂ –CI	
	$CH_3-CH_2-CH_2-CH_3+CI$ Consider the following rel	ative reactivity of C – 1	H bonds for chlorinatic	inorobutane	
	Degree of C – H	1° C – H	2° C – H	3° C – H	
	Relative reactivity	4	2	Г.	
	for chlorination (RR)	1	3	5	
	Percentage yield of 2-chlo	probutane will be :			
	12	20	6	3	
	(1) 18 × 100	(2) 18 × 100	(3) ¹⁸ × 100	₍₄₎ 18 _×	100
7.					
	Which of the following	compounds reacts s	lower than benzene	in electrophilic bro	mination ?
	Which of the following (1) C ₆ H ₅ CH ₃	compounds reacts s (2) C₀H₅OH	lower than benzene (3) C6H₅NO₂	in electrophilic bro (4) C ₆ H ₅	mination ? NH ₂
8.	Which of the following (1) $C_6H_5CH_3$ The organic products (compounds reacts s (2) C ₆ H₅OH X) formed in the folk	slower than benzene (3) C ₆ H₅NO₂ owing reaction is	in electrophilic bro (4) C ₆ H₅	mination ? NH ₂
8.	Which of the following (1) $C_6H_5CH_3$ The organic products ($C_6H_5CH_2CI + C_6H_6$	compounds reacts s (2) C ₆ H ₅ OH X) formed in the follo	slower than benzene (3) C ₆ H₅NO₂ owing reaction is	in electrophilic bro (4) C ₆ H₅	mination ? NH2
8.	Which of the following (1) $C_6H_5CH_3$ The organic products ($C_6H_5CH_2CI + C_6H_6$	compounds reacts s (2) C ₆ H₅OH X) formed in the follo ^{ଧାଠା} ਤ→X	slower than benzene (3) C ₆ H₅NO₂ owing reaction is CH	in electrophilic bro (4) C ₆ H₅	mination ? NH₂ CH₃
8.	Which of the following (1) $C_6H_5CH_3$ The organic products ($C_6H_5CH_2CI + C_6H_6$	compounds reacts s (2) C ₆ H ₅ OH X) formed in the follo	slower than benzene (3) C ₆ H ₅ NO ₂ owing reaction is	in electrophilic bro (4) C ₆ H₅	CH ₃
8.	Which of the following (1) $C_6H_5CH_3$ The organic products ($C_6H_5CH_2CI + C_6H_6$	compounds reacts s (2) C ₆ H ₅ OH X) formed in the follo $\xrightarrow{NCl_3} X$ (2) $\swarrow -CH_2 - \langle$	slower than benzene (3) $C_6H_5NO_2$ owing reaction is CH_2 (3) CH_2	in electrophilic bro (4) C_6H_5 (4)	mination ? NH₂ CH₃ → → → →

- **9.** In the reaction of hydrogen bromide with an alkene (in the absence of peroxides), the first step of the reaction is the to the alkene.
 - (1) fast addition of an electrophilic
- (2) slow addition of an electrophile
- (3) fast addition of a nucleophilic
- (4) slow addition of a nucleophile



substance (B) with formula C₄H₆Br₄ is formed. (A) forms a white ppt. with ammonical silver nitrate solution.



Organic Reaction Mechanisms - II



	APSF	APSP Answers							
				РА	RT - I				
1.	(4)	2.	(3)	3.	(4)	4.	(4)	5.	(2)
6.	(4)	7.	(4)	8.	(4)	9.	(1)	10.	(1)
11.	(3)	12.	(3)	13.	(2)	14.	(3)	15.	(4)
16.	(2)	17.	(2)	18.	(4)	19.	(2)	20.	(3)
21.	(4)	22.	(2)	23.	(3)	24.	(1)	25.	(4)
26.	(4)	27.	(1)	28.	(3)	29.	(1)	30.	(3)
				PA	RT - II				
1.	(2)	2.	(2)	3.	(3)	4.	(4)	5.	(1)
6.	(1)	7.	(3)	8.	(2)	9.	(2)	10.	(4)
11.	(2)	12.	(4)	13.	(3)	14.	(2)	15.	(1)
16.	(1)	17.	(3)	18.	(1)	19.	(2)	20.	(1)
21.	(2)								