Solved Example

Ex.1 Which of the following is not correctly matched :

[1] Hydrolysis of phenyl magnesium iodide – benzene

[2] γ–Isomer of BHC – lindane

[3] $(2n + 4)\pi$ Rule – aromaticity

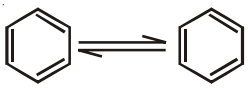
[4] Trimerisation of propyne – mesitylene **Ans. [3]**

Sol. The Huckel rule to account for aromaticity is closed ring of $(4n + 2)\pi$ electrons.

Ex.2 The resonance of the π–electron cloud in the benzene ring was confirmed after ozonolysis of :

[1] Benzene [2] Toluene [3] o–Xylene [4] None of these **Ans. [3]**

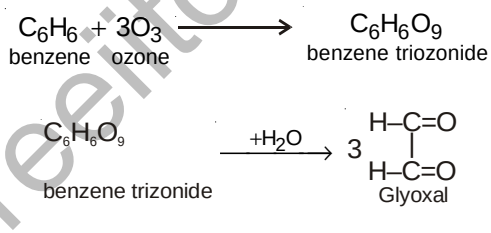
Sol. Benzene is an aromatic hydrocarbon having carbon atom in sp^2 hybridized and, one p-orbital of carbon remains unhybridized, which overlaps colaterally to form a continous π–electron cloud both above and below the plane of the benzene ring. There are two resonating structure of benzene.



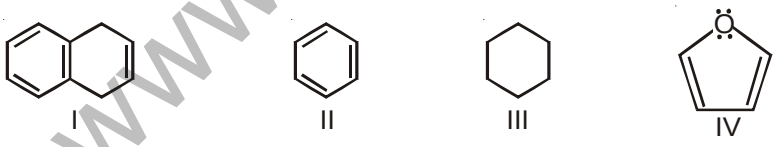
Ex.3 Ozonolysis of benzene yields :

[1] Glyoxal [2] Glycerine [3] Glycol [4] Glycerol **Ans. [1]**

Sol. Ozonolysis of benzene yields glyoxal. Benzene adds three molecules of ozone and forms benzene triozonide which on decomposition with water gives three molecules of glyoxal.



Ex.4 Which of the following will show aromatic character :



[1] I, II and III [2] II and III [3] II and IV [4] All the four **Ans. [3]**

Sol. Benzene has 6π electrons (2 from each double bond) present in cyclic continous form.

Furan also has 6π electrons present in continous cyclic cloud, note that the unused pair of electrons present in p–orbitals is involved in overlapping forming sextet.

Ex.5 Benzene undergoes subsitution reaction more easily than addition because :

[1] It has cyclic structure [2] It has three double bonds

[3] It has six hydrogen atoms [4] Of resonance **Ans. [4]**

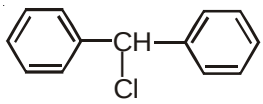
Sol. If there were no resonance in benzne, π electrons would have not been delocalised and hence easily available to undergo addition reactions as in ethylene. Further the subtituted benzene is stable due to resonance.

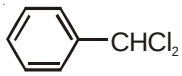
Ex.6 Which of the following reagents and conditions convert benzene to chloro–benzene :

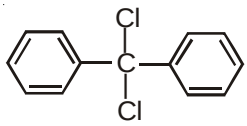
[1] Cl_2, sunlight, heat [2] HCl, heat [3] HCl, sunlight, heat [4] Cl_2, $AlCl_3$, cold **Ans. [4]**

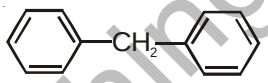
Sol. Chlorination of benzene is carried out by chlorine in presence of halogen carrier like $AlCl_3$.

Ex.7 Which of the following structures correspond to the product expected, when excess of C_6H_6 reacts with CH_2Cl_2 in presence of anhydrous $AlCl_3$:

[1] 

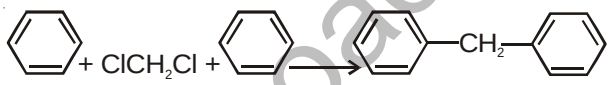
[2] 

[3] 

[4] 

Ans. [4]

Sol. The reaction takes place as follows :

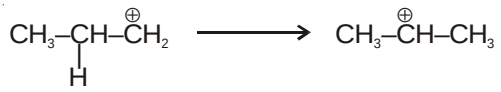


Ex.8 Benzene reacts with n-propyl chloride in the presence of anhydrous $AlCl_3$ to give predominantly :

[1] n–Propylbenzene [2] Isopropylbenzene

[3] 3–Propyl–1–chlorobenzene [4] No reaction **Ans. [2]**

Sol. Propyl carbonium ion, $CH_3CH_2\overset{+}{C}H_2$ is primary carbonium ion, it rearranges to the more stable secondary carbonium ion $CH_3\overset{+}{C}HCH_3$, which then reacts to form isopropylbenzene.



propyl carbonium ion (1º) isopropyl carbonium ion (2º)

Ex.9 Which of the following reactions of benzene does not account for the three 'C = C' bonds in the molecule–

[a] Benzene + $Br_2 \xrightarrow[\text{conc. } H_2SO_4]{FeBr_3}$ bromobenzene + HBr

[b] Benzene + $HNO_3 \rightarrow$ nitrobenzene + H_2O

[c] Benzene + $3O_3 \rightarrow$ Triozonide

[d] Benzne + $3H_2 \xrightarrow{Ni}$ cyclohexane

[1] a, c [2] b, d [3] b, c, d [4] a, b **Ans. [4]**

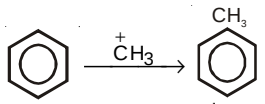
Sol. a and b are the electrophilic subsitution reactions and do not account for the C = C bond reaction.

Ex.10 The function of anhydrous aluminium chloride in the Friedel–Craft's reaction is :

[1] Absorb water [2] To absorb hydrochloric acid

[3] To produce an electrophile [4] To produce nucleophile **Ans. [3]**

Sol. $AlCl_3 + CH_3Cl \rightarrow AlCl_4^- + \overset{+}{C}H_3$ (electrophile)



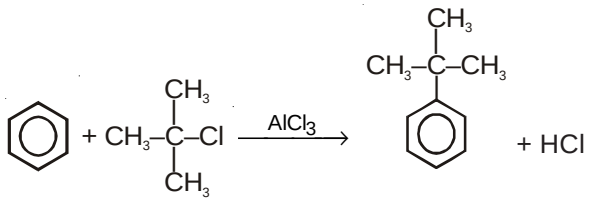
toluene

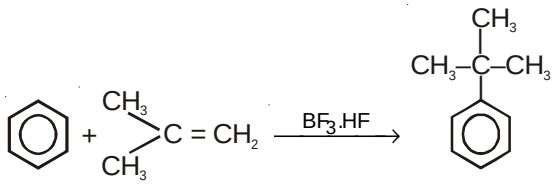
Q.11 In which of the following reaction t–butylbenzene is formed :

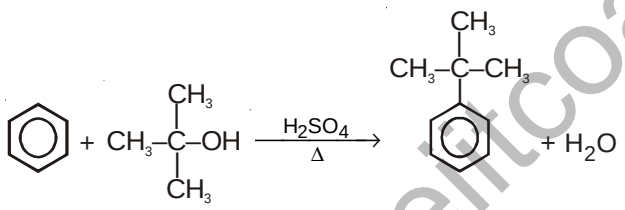
[1] Benzene + t–butyl chloride, $AlCl_3$ [2] Benzene + $(CH_3)_2C = CH_2 \xrightarrow{BF_3.HF}$

[2] Benzene + t–butyl alcohol $\xrightarrow{H_2SO_4}$ [4] All of these **Ans. [4]**

Sol.







Ex.12 The order of reactivity of :

ϕ–CH_3 (I), ϕ–CH_2–CH_3 (II), ϕ–$CH(CH_3)_2$ (III) and ϕ–$C(CH_3)_3$ (IV)

Where $\phi = C_6H_5$

[1] I > II > III > IV [2] IV > III > II > I [3] II > I > III > IV [4] III > II > I > IV **Ans. [1]**

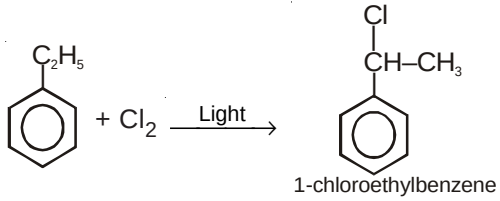
Sol. More are the number of α–hydrogen present in the alkyl group attached to the benzene ring more pronounced will be the hyperconjugation and the benzene ring will be more electron rich and easily be attacked by an electrophile. α–hydrogen in $–CH_3$, $–CH_2–CH_3$, $–CH(CH_3)_2$ and $–C(CH_3)_3$ respectively are three, two one and zero.

Ex.13 Ethylbenzene + $Cl_2 \xrightarrow{Light}$ (main) compound is :

[1] o– & p– Chloroethylbenzene [2] 1–Chloroethylbenzene

[3] 2–Chloroethylbenzene [4] m–Chloroethylbenzene **Ans. [2]**

Sol.



1-chloroethylbenzene

Ex.14 Which of the following triad of group activates the benzene ring and directs the electrophille to o– and p– position for substitution :

[1] $-NO_2$, –CHO, –COOH [2] –OH, $-O^-$, $-CH_3$

[3] –OH, $-SO_2OH$, $-NO_2$ [4] $-NH_2$, –CHO, $-SO_2OH$ **Ans. [2]**

Sol. Groups given in [2] activate the benzene ring and directs the electrophile towards o– and p– positions for substitutuion.

Ex.15 $\phi-CH_3 \xrightarrow{CrO_2Cl_2} A \xrightarrow{H_2O} B$

The functional group present in B and name of the reaction would be :

[1] –CHO, Gattermann aldehyde synthesis [2] –CHO, Etard reaction

[3] $-COCH_3$, Friedel Crafts reaction [4] –CHO, Oxo reaction **Ans. [2]**

Sol. The compound 'B' is benzaldehyde and the reaction is called Etard reaction.

Ex.16 Formation of which of the following compound confirms the unsaturation character of benzene :

[1] Cyclohexane [2] Gammexane [3] Triozonide [4] All the above **Ans. [4]**

Sol. Formation of all the three compounds are the result of addition reaction. Hence confirm the unsaturation nature of benzene.

Ex.17 The possible isomers of C_7H_7Cl will be :

[1] 5 [2] 4 [3] 3 [4] 2 **Ans. [2]**

Sol. There are four isomers o,m & p–chlorotoluenes and benzyl chloride.

Ex.18 Toluene may be prepared by :

[1] Toluic acid [2] Cresol

[3] Toluene sulphonic acid [4] All the above **Ans. [4]**

Sol. Toluene may be prepared by all the above compounds descrbied earlier.

Ex.19 Chlorination of toluene in the presence of light and heat followed by treatment with aqueous NaOH gives :

[1] o–Cresol [2] p–Cresol

[3] 2,4–Dihydroxy toluene [4] Benzoic acid **Ans. [4]**

Sol. $C_6H_5CH_3 \xrightarrow[h\nu]{Cl_2} C_6H_5CH_2Cl \xrightarrow{Cl_2} C_6H_5CHCl_2 \xrightarrow{Cl_2} C_6H_5CCl_3$

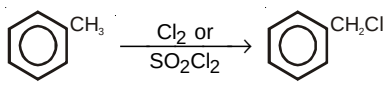
$C_6H_5CH_2Cl \xrightarrow{NaOH} C_6H_5CH_2OH$

$C_6H_5CHCl_2 \xrightarrow{NaOH} C_6H_5CHO$

$C_6H_5CCl_3 \xrightarrow{NaOH} C_6H_5COOH$

Ex.20 Benzyl chloride ($C_6H_5CH_2Cl$) can be prepared from toluene by chlorination with :

[1] SO_2Cl_2 [2] $SOCl_2$ [3] S_2Cl_2 [4] NaOCl **Ans. [1]**

Sol. 

Exercise # 1

Q.1 Which one of the following halide is most unlikely to yield product when react with benzene in presence of anhydrous aluminium chloride :

[1] CCl_4 [2] CH_3CH_2Cl [3] C_6H_5Cl [4] $CH_3CHClCH_3$

Q.2 Which one of the folloiwng is benzo radical :

[1] C_6H_5- [2] $C_6H_4 <$ [3] $C_6H_5CH_2-$ [4] $C_6H_5-C\overleftarrow{}$

Q.3 Benzene + anhydrous $AlCl_3$ + Carbonyl chloride $\longrightarrow$ A.

Benzene + anhydrous $AlCl_3$ + Chloroformamide $\longrightarrow$ B.

Product A and B are :

[1] Benzoyl chloride, benzamide [2] Benzylchloride, Benzylaminoformate

[3] Benzylchloride, Benzamide [4] Benzoyl chloride, Benzylaminoformate

Q.4 Benzene + Conc. $H_2SO_4 \xrightarrow[I]{} ArSO_3H \xrightarrow[II]{H_3O^+} ArH + H_2SO_4$. In the above sequence, the II reaction is known as :

[1] Sulphonation [2] Elimination [3] Protonolysis [4] Dehydrosulphonation

Q.5 Dibenzene chromium is a :

[1] Sandwich compound [2] Complex

[3] Both the above [4] None of the above

Q.6 Reaction of benzene with n–propyl bromide in presence of $FeBr_3$, the chief product is :

[1] n–propyl benzene [2] Isopropyl benzene [3] Both the above [4] None of the above

Q.7 Ethyl benzene is obtained from benzene and ethyl bromide in presence of :

[1] Vacant orbital acid [2] Lewis base [3] Selenium dioxide [4] Bromine water

Q.8 The ultimate product in the reaction :

Benzene + $CCl_4 \xrightarrow{AlCl_3}$? is :

[1] Benzal trichloride [2] Tetraphenyl methane

[3] Triphenyl chloromethane [4] Benzyl chloride

Q.9 When acetyl chloride and anhydrous aluminium chloride are used in Friedel Crafts reaction, the electrophile is :

[1] Cl^+ [2] CH_3CO^+ [3] CH_3^+ [4] $AlCl_3^+$

Q.10 $C_6H_6 \xrightarrow[AlCl_3]{CH_3COCl} A \xrightarrow[HCl]{Zn-Hg} B$:

The end product in the above sequence is :

[1] Toluene [2] Ethyl benzene [3] Both the above [4] None

Q.11 Benzene diazonium chloride does not give benzene when treated with the following reagent :

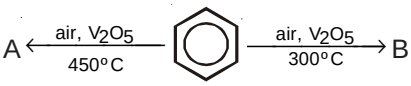
[1] H_3PO_2 [2] C_2H_5OH [3] $SnCl_2$ + NaOH [4] H_2O

Q.12 For the centric formula of benzene credit goes to :

[1] Dewar [2] Kekule [3] Ladenburg [4] Armstrong and Baeyer's

Q.13 Which of the following compound is called cumene :

[1] Vinyl benzene [2] Ethyl benzene [3] Isopropyl benzene [4] t–Butyl benzene

Q.14 

The compounds A and B are respectively :

[1] Maleic anhydride and phenol [2] Maleic acid and p–benzoquinone

[3] Carbon dioxide and carbon monoxide [4] Benzoic acid and perbenzoic acid

Q.15 $C_6H_6 + A \xrightarrow{AlCl_3} C_6H_5CONH_2$

A in the above reaction is :

[1] NH_2CONH_2 [2] $ClCONH_2$ [3] CH_3CONH_2 [4] $CH_2(Cl)CONH_2$

Q.16 Aromatic hydrocarbons can be obtained from naptha by :

[1] Catalytic cracking [2] Catalytic reforming [3] Refining [4] Destructive distillation

Q.17 The true statement for benzene is :

[1] It is heavier than water [2] It is lighter than water

[3] It is soluble in water [4] It's structure is non–planar

Q.18 [a] C_6H_6 + reagent – I $\rightarrow C_6H_5CHO$; [b] C_6H_6 + reagent – II $\rightarrow C_6H_5CHO$

Reaction [a] is Gattermann synthesis while reaction [b] is Gattermann Koch synthesis. The reagents related to [a] and [b] are respectively :

[1] [a] CO + HCl + $AlCl_3$ [b] CO + HCN + $AlCl_3$

[2] [a] HCN + HCl + $AlCl_3$ [b] CO + HCl + $AlCl_3$

[3] [a] CO_2 + $AlCl_3$ [b] $ClCONH_2$ + $AlCl_3$

[4] [a] HCHO + HCl + $ZnCl_2$ [b] CO + HCl + $AlCl_3$

Q.19 Which statement is wrong :

[1] In the chlorination of benzene by [$FeCl_3$ + Cl_2] chloronium ion is formed

[2] Solution of bromine in CCl_4 is not decolourised by benzene

[3] Chiefly phenol and napthalene are the constituents of light oil

[4] In sulphonation benzene reacts with hot and conc. H_2SO_4

Q.20 Direct iodination of benzene is not possible because :

[1] Iodine is an oxidising agent [2] The product C_6H_5I is reduced to C_6H_6 by HI

[3] HI is an unstable compound [4] Ring is deactivated

Q.21 Benzene + propene $\xrightarrow{HF}$ Cumene.

Here the function of HF is :

[1] Proton donor [2] Solvent [3] Both the above [4] None

Q.22 It has been imagined that :

[I] A 22–membered, ring (12–double bond) and (II) A 30–membered ring (15–double bond) can be easily prepared. Point which system is aromatic and which one is non–aromatic :

[1] (I) Aromatic (II) non–aromatic [2] (I) Non–aromatic (II) aromatic

[3] (I) and (II) aromatic [4] (I) and (II) non–aromatic

Q.23 Presence of unstauration in benzene is confirmed by the formation of this compound :

[a] Toluene [b] Cyclohexene [c] Tri–ozonide [d] Dibenzene chromium

[e] Gammexane

Correct answer is :

[1] a, c, b [2] b, c, e [3] c, d, e [4] a, c, d

Q.24 Compounds with aromatic characteristics are :

[a] Gammexane [b] Hexachlorobenzene

[c] Benzene triozonide [d] Cyclohexylamine

[e] N–Phenylacetamide

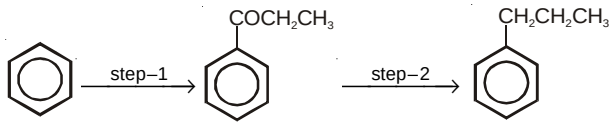
The correct code is :

[1] b, e [2] a, c, d [3] c, d [4] a, d

Q.25 Benzene was discovered by :

[1] Ramsay [2] Dalton [3] Faraday [4] Priestley

Q.26



The correct set of reagents used in step–1 and step–2 are :

	Step–1	**Step–2**
[1]	$AlCl_3$ and CH_3COCl	$Pd/BaSO_4$
[2]	$AlCl_3$ and $(CH_3CO)_2O$	$Zn–Cu/H_2O$
[3]	$ZnCl_2$ and CH_3COCl	Zn–Hg/HCl
[4]	$AlCl_3$ and CH_3CH_2COCl	Zn–Hg/HCl

Q.27 Benzene in presence of u.v. light reacts with chlorine to form :

[1] Benzenehexachloride [2] Benzyl chloride

[3] 1,3,5–Trichlorobenzene [4] Chlrobenzene

Q.28 Aromatic compounds undergo most readily :

[1] Nucleophilic substitution [2] Electrophilic substitution

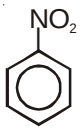
[3] Nucleophilic addition [4] Electrophilic addition

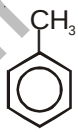
Q.29 Which of the following is formed on reacting benzene with fuming sulphuric acid at 80ºC ?

[1] Phenolsulphonic acid [2] Benzenesulphonic acid

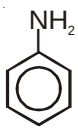
[3] m–Disulphonic acid [4] Benzenedisulphonic acid

Q.30 Which of the following compounds would have slower rate of electrophilic bromination than benzene :

[1] 

[2] 

[3] 

[4] 

Q.31 Catalytic hydrogenation of benzene gives :

[1] Toluene [2] Xylene [3] Cyclohexane [4] Benzoic acid

Q.32 Among the following statement on the nitration of aromatic compounds, the false one is :

[1] The rate of nitration of benzene is almost the same as that of hexadeutero benzene

[2] The rate of nitration of toluene is greater than that of hexadeuterobenzene

[3] The rate of nitration of benzene is greater than that of hexadeutrero benzene

[4] Nitration is an electrophilic substitution reaction

Q.33 Sulphonation of benzene differs from most of the other electrophilic substitution reactions in that the reaction

[1] Is reversible [2] Requires the presence of a Lewis acid catalyst

[3] Takes place with expolsive violence [4] Requires elevated temperature

Q.34 Benzene reacts with a mixture of HNO_3 and H_2SO_4 followed by addition of $Cl_2/FeCl_3$ to form :

[1] 3–Chloro–1–nitrobenzene [2] 2–Chloro–1–nitrobenzne

[3] 4–Chloro–1–nitrobenzene [4] 2–and 4–chloro–1–nitrobenzene

Q.35 The reason for the equal C–C bond lengths in benzene is :

[1] sp^2 hybridisation state of C–atoms and delocalisation of π–electrons

[2] sp^2 hybridisation state of C–atom and localisation of π–electrons

[3] sp^3 hybridisation sate of C–atoms and resonance

[4] None of these

Q.36 Which of the following is a correct statement about benzene ?

[1] All the C–C bond lengths are not equal

[2] All the bond angles are not equal

[3] All the C–atoms are not in sp^2 hybridisation state

[4] Three C–C bond lengths are not different than other three C–C bond lengths

Q.37 C–C bond length in benzene is :

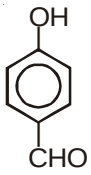
[1] 1.54 Å [2] 1.40 Å [3] 1.36 Å [4] 1.20 Å

Q.38 Which of the following reactions is not an example of electrophilic substitution ?

[1] $C_6H_6 + {}^+NO_2 \rightarrow C_6H_5NO_2 + H^+$

[2] $C_6H_6 + CH_3Cl \xrightarrow{AlCl_3} C_6H_5{-}CH_3 + HCl$

[3] $C_6H_6 + Cl_2 \xrightarrow{\text{UV light}} C_6H_6Cl_6$

[4] $C_6H_5OH + CO + HCl \xrightarrow[AlCl_3]{\text{Anhy.}}$ 

Q.39 Which of the following does not react with benzene in the presence of anhy. $AlCl_3$?

[1] C_6H_5Cl [2] CH_3CH_2Cl [3] $CH_3{-}CH(Cl){-}CH_3$ [4] CCl_4

Q.40 The product of the reaction of benzene with ozone on hydrolysis gives :

[1] Ethane dial [2] Methanoic acid [3] Methyl glyoxal [4] None of these

Q.41 The intermediate formed in the reaction of benzene with an electrophile is :

[1] Whiland intermediate [2] σ–complex

[3] Cyclic secondary cation [4] All of the above

Q.42 The compounds obtained by the reduction of benzene with Na/C_2H_5OH and liquid ammonia is :

[1] Cyclohexane [2] Cyclohexa–1, 4–diene

[3] Cyclohexane + methyl cyclopentane [4] All of the above

Q.43 $X \xrightarrow{Cl_2}$ Benzotrichloride $\xrightarrow{\text{Hydrolysis}}$ Y. X and Y respectively are :

[1] Benzene, Benzaldehyde [2] toluene, Benzaldehyde

[3] Toluene, Benzoic acid [4] Benzene, Benzoic acid

Q.44 $C_6H_6 \xrightarrow{\text{Fuming sulphuric acid}}$ (A) $\xrightarrow{NaOH}$ (B) $\xrightarrow{\text{Zn dust}}$ (C)

In the above reaction compound (C) is :

[1] Phenol [2] Benzene

[3] Benzene sulphonic acid [4] None of these

Q.45 Benzene is reduced with HI at 250°C to from :

[1] Methyl cyclopentane [2] Cyclohexane

[3] A mixture of both of the above [4] None of the above

Q.46 Benzene reacts with chlorine in the presence of iron. The product is :

[1] Benzene hexachloride [2] Chlorobenzene

[3] Benzyl chloride [4] Benzoyl chloride

Q.47 Which of the following groups deactivates benzene nucleus ?

[1] $-CH_3$ [2] $-CCl_3$ [3] $-OH$ [4] $-NH_2$

Q.48 When benzene is heated with mercuric acetate at 110ºC, the product obtained is :

[1] Phenyl mercuric acetate [2] Phenyl mercury

[3] Phenyl acetate [4] A mixture of all of the above

Q.49 Benzene can not be prepared by the following reaction :

[1] Benzenediazonium chloride + Phosphrous acid

[2] Phenyl magnesium bromide + water

[3] Benzene sulphonic acid + dil. H_2SO_4

[4] Benzendiazonium chloride + water

Q.50 $C_6H_6 \xrightarrow[\text{Anhy. } AlCl_3]{HCl + HCN} (A) \xrightarrow[\text{Base}]{CH_3CHO} (B)$ Compound (B) in above reaction sequence is :

[1] Cinnamaldehyde [2] Salicylaldehyde [3] Phenylacetaldehyde [4] Phenyl acetic acid

Answer Key

Qus.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Ans.	3	4	1	3	3	2	1	3	2	2	4	4	3	1	2	2	2	2	3	2
Qus.	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
Ans.	3	2	2	1	3	4	1	2	2	1	3	3	1	1	1	4	2	3	1	1
Qus.	41	42	43	44	45	46	47	48	49	50										
Ans.	4	2	3	2	3	2	2	1	4	1										

Exercise # 2

Q.1 The correct structure of benzene was suggested by :

[1] Faraday [2] Devy [3] Kekule [4] Wohler

Q.2 A mixture of benzene and benzoic acid is separated by the following reagent :

[1] Toluene [2] $NaHCO_3$ [3] HCl [4] Diethyl ether

Q.3 Which of the following is not a correct statement ?

[1] SO_3 is the active electrophile in the sulphonation of benzene

[2] Nitronium ion is the active electrophile in the nitration of benzene

[3] Bromide ion is the active electrophile in the bromination of benzene

[4] Alkyl carbocation is the active electrophile in the alkylation of benzene

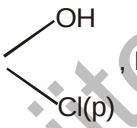
Q.4 $\text{Benzene} \xrightarrow[100^\circ]{?} \text{1,3,5–Trinitrobenzene}$

The reagent in this case is :

[1] Conc. HNO_3 [2] dil HNO_3

[3] Nitrogen dioxide dissolved in conc. HNO_3 [4] Acetyl nitrate

Q.5 The product of the reaction : $\text{Benzene} \xrightarrow{H^+, Ag^+, HOCl} ?$ is :

[1] C_6H_5Cl, H_2O [2]  [3] $C_6H_5OH, AgCl$ [4] None of the above

Q.6 Identify the correct products A and B in the sequence :

$$C_6H_6 \xrightarrow{\overset{\oplus}{N}O_2} A \xrightarrow{SnCl_2/HCl} B \xrightarrow[0^oC]{NaNO_2/HCl}$$

[1] Nitrobenzene, Nitrosobenzene [2] Nitrobenzene, phenylhydroxylamine

[3] Nitrobenzene, benzene diazonium chloride [4] Nitrobenzene, phenol

Q.7 Benzene vapour mixed with air passed over vanadium pentaoxide, the product is :

[1] Dicarboxylic acid [2] Anhydride of monocarboxylic acid

[3] Anhydride of unsaturated dicarboxylic acid [4] Anhydride of unsaturated monocarboxylic acid

Q.8 Ozonolysis, of benzene and subsequent hydrolysis gives :

[1] Glycol [2] Glycolic acid [3] Glycine [4] Glyoxal

Q.9 Wrong statement for benzene is :

[1] Stable to permanganate [2] Gives substitution reaction

[3] Does not form sandwich compound [4] Unreactive to H_2SO_4 at 0^oC

Q.10 Choose the pair, where members differ in molecular formula :

[1] Lindane and triple six [2] Glycine and aminoacetic acid

[3] Aniline and oil of mirbane [4] Urotropine and aminoform

Q.11 Benzene and cyclohexene can be distinguished by :

[1] Br_2 water solution [2] H_2 gas + Ni

[3] Cl_2 in dark , cold, Fe [4] None of these

Q.12 Which of the following reactions is not shown by benzene :

[1] Addition [2] Oxidation

[3] Side chain substitution [4] Complex formation

Q.13 Choose the wrong statement

[1] The dipole moment of benzene is zero .

[2] The properties of benzene resembles with alkene.

[3] C–C(six) bonds in benzene are of equal length

[4] Benzene is a planar molecule with bond angle of 120º

Q.14 The source of benzene is :

[1] Coaltar [2] Gasoline [3] Raschig process [4] None

Q.15 Which of the following saturated group deactivate the benzene ring :

[1] $-CH=CH_2$ [2] $-NO_2$ [3] $-CCl_3$ [4] –OH

Q.16 Reduction of benzene in alcohol by [Sodium + liquid ammonia] is called

[1] Clemeon reduction [2] Wolf-Kishner reduction

[3] Birch reduction [4] Mendius reaction

Q.17 Cumene or isopropyl benzene is formed in the reaction :

[1] $C_6H_6 + CH_2 = CH-CH_3 \xrightarrow{AlCl_3}$ [2] $C_6H_6+CH_3-CH_2-CH_2Cl \xrightarrow{AlCl_3}$

[3] Both the above [4] None of the above

Q.18 Acetylene $\rightarrow$ benzene $\rightarrow$ cyclohexane. In the above sequence the hybridised carbon changes as :

$sp \rightarrow sp^2 \rightarrow sp^3$

In this change, the angle of hybridised orbitals :

[1] Remains unaltered [2] Increases continuously

[3] Decreases continuously [4] First increases then decreases

Q.19 BHC contains predominantly its following isomer :

[1] β [2] α [3] γ [4] δ

Q.20 Which of the following group is divalent :

[1] Benzoyl [2] Benzyl [3] Benzal [4] p-Tolyl

Q.21 C–C Bond length in benzene is ..... then [C≡C] and [C=C] bond length but ..... than [C–C] bond length in alkane.

[1] Greater, smaller [2] Smaller, smaller [3] Smaller, greater [4] Greater, greater

Q.22 Benzene with ethanol

[1] Is insoluble [2] Forms azeortropic mixture

[3] Forms ternary mixture [4] None of the above

Q.23 Toluene reacts with chlorine in presence of ferric chloride to give :

[1] Benzyl chloride [2] Benzal chloride [3] Benzotrichloride [4] o and p chlorotoluene

Q.24 A hydrocarbon contains 10.5 gm carbon per gm of hydrogen. Its empirical formula would be :

[1] C_6H_6 [2] C_7H_8 [4] C_6H_7 [[4] C_6H_8

Q.25 Chlorination of toluene would lead to the formation of :

[1] o–Chlorotoluene [2] p–Chlorotoluene

[3] o– and p– Chlorotoluene [4] m–Chlorotoluene

Q.26 The main product formed by the reaction of toluene with chlorine in the presence of ferric chloride is :

[1] Benzoyl chloride [2] Benzyl chloride [3] Benzotrichloride [4] o– and p–chlorotoluene

Q.27 Toluene is used in the preparation of :

[1] Saccharin [2] T.N.T [3] Chloramine–T [4] All of the above

Q.28 The product obtained by the chlorination of toluene in the presence of light and heat is hydrolysed with aqu. NaOH to form :

[1] o–Cresol [2] p–Cresol

[3] 2,4–Dihydroxy toluene [4] Benzoic acid

Answer Key

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

Exercise # 3

Q.1 Aromactic compounds burn with sooty flame because : **[BIT 1991]**

[1] They have a ring structure of carbon atoms

[2] They have a relatively hight percentage of hydrogen

[3] They have a relatively high percentage of carbon

[4] They resist reaction with oxygen of air

Q.2 Select the true statment about bezene from amongst the following : **[CBSE 1992]**

[1] Because of unsaturation benzene easily undergoes addition reactions

[2] There are two types of C–C bonds in bezene molecule

[3] There is a cyclic delocalisation of π electrons in benzene

[4] Monosubstitution of benzene group gives three isomeric substances

Q.3 The function of anhydrous $AlCl_3$ in the Friedel–Craft's reaction is to : **[MLNR 1986]**

[1] Absorb water [2] Absorb HCl

[3] To produce electrophile [4] To produce nucleophile

Q.4 Benzene reacts with CH_3COCl in the presence of $AlCl_3$ to give : **[CBSE 1991]**

[1] C_6H_5Cl [2] C_6H_5COCl [3] $C_6H_5CH_3$ [4] $C_6H_5COCH_3$

Q.5 Which of the following catalysts is used for preparing toluene by reacting benzene with methyl chloride : **[CPMT 1985]**

[1] Ni [2] Anhydrous $AlCl_3$ [3] Pd [4] Pt

Q.6 The attacking (electrophilic) species in sulphonation of benzene is : **[RPMT 1997 ; CPMT 1999, 2002]**

[1] SO_2 [2] SO_3 [3] SO_4^{2-} [4] HSO_3^-

Q.7 Benzene vapour mixed with air when passed over V_2O_5 catalyst at 775K gives : **[AFMC 1991; CPMT 2001; MP PMT 2003]**

[1]Glyoxal [2] Oxalic acid [3] Maleic anhydride [4] Fumaric acid

Q.8 Attacking or reactive or electrophilic species in nitration of benzene is **or** In the nitration of benzene with concentrated H_2SO_4 + HNO_3, the attack on ring is made by : [**CBSE 1994; MP PET 1996; PMT 1998; BHU 2001]**

[1] NO_2^- [2] NO_2^+ [3] NO_3^- [4] NO_2

Q.9 Which of the following reactions takes place when a mixture of concentrated HNO_3 and H_2SO_4 reacts on benzene at 350 K : **[CPMT 1985]**

[1] Sulphonation [2] Nitration [3] Hydrogenation [4] Dehydration

Q.10 Chemical name of the inseciticide **gammexene** is : **[CPMT 1981; MP PET 1995; MP PMT 1996; CBSE 1999; MP PET 1999]**

[1] DDT [2] Benzene hexachloride

[2] Chloral [4] Hexachloroethane

Q.11 The number of σ and π bonds in a molecule of benzene is : **[MP PMT/PET 1988; BHU 1995; CPMT 1997]**

[1] 6σ and 3π [2] 9σ and 3π [3] 12σ and 3π [4] 6σ and 6π

Q.12 The bond order of individual carbon–carbon bonds in benzene is : **[IIT 1981; MP PET 2000]**

[1] One [2] Two [3] Between one and two [4] One and two, alternately

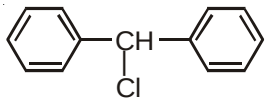
Q.13 The centric structure of benzene was proposed by : **[CPMT 1982, 83, 89]**

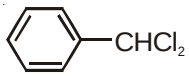
[1] Dewar [2] Ladenberg [3] Kekule [4] Armstrong and Baeyer

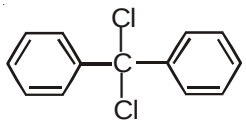
Q.14 The product formed when acetylene is passed through red hot tube is : **[BHU 1989; Rajasthan PMT 2003]**

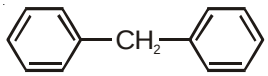
[1] Benzene [2] Cyclohexane [3] Neoprene [4] Ethane

Q.15 Which of the following structures correspond to the product expected, when excess of C_6H_6 reacts with CH_2Cl_2 in presence of anhydrous $AlCl_3$: **[CBSE 1989]**

[1] 

[2] 

[3] 

[4] 

Q.16 Methyl group attached to benzene can be oxidised to carboxyl group by reacting with : **[Karnataka CET 1993]**

[1] Fe_2O_3 [2] $AgNO_3$ [3] $KMnO_4$ [4] Cr_2O_3

Q.17 Benzene is prepared in laboratory from which one of the following compounds **[CPMT 1996]**

[1] $C_6H_5N_2Cl$ [2] C_6H_5OH [3] C_6H_5COONa [4] $C_6H_5SO_3H$

Q.18 Catalytic hydrogenation of benzene gives : **[AIIMS 1996]**

[1] Xylene [2] Cyclohexane [3] Benzoic acid [4] Toluene

Q.19 Benzene is obtained from : **[CPMT 1996]**

[1] Coaltar [2] Plant [3] Animal [4] Charcoal

Q.20 Nitrobenzene can be prepared from benzene by using a mixture of conc. HNO_3 and conc. H_2SO_4. In the nitrating mixture, HNO_3 acts as a : **[IIT 1997]**

[1] Base [2] Acid [3] Reducing agent [4] Catalyst

Q.21 Among the following statements on the nitration of aromatic compounds, the false one is : **[IIT 1997]**

[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 nitration of benzene is greater than that of hexadeuterobenzene

[4] Nitration is an electrophilic substitution reaction

Q.22 After ozonolysis of benzene (not hydrolysis), the product is : **[Rajasthan PMT 1997; CPMT 1997]**

[1] Benzene triozonide [2] Glyoxal [3] Ethanediol [4] All of these

Q.23 Which one of these is not compatible with arenes : **[CBSE 1998]**

[1] Greater stability [2] Delocalisation of π–electrons

[3] Electrophilic additions [4] Resonance

Q.24 Benzene is the polymer of : **[RPET 1999; Bihar MEE 1999]**

[1] Methane [2] Ethane [3] Ethylene [4] Ethyne

Q.25 $C_6H_6 \xrightarrow[H_2SO_4]{HNO_3} X \xrightarrow[FeCl_3]{Cl_2} Y$ In the above sequence Y is : **[AIIMS 1999]**

[1] 1–nitrochloro benzene [2] 3–nitrochlorobenzene

[3] 4–nitrochlorobenzene [4] 1,2–nitrochlorobenzene

Q.26 If benzene reacts with Cl_2 in presence of ultra violet light then which of the following is formed : **[AIIMS 1999]**

[1] C_6Cl_6 [2] CCl_4 [3] C_6H_5Cl [4] $C_6H_6Cl_6$

Q.27 Nitration of benzene is a : **[RPMT 1999]**

[1] Electrophilic displacement [2] Electrophilic addition

[3] Nucleophilic addition [4] Nucleophilic displacement

Q.28 Benzene can be obtained in the reaction : **[RPET 2000]**

[1] Ethene + 1, 3–butadiene [2] Trimerisation of ethyne

[3] Reduction of PhCHO [4] All of these

Q.29 Thiophene and benzene are separated by : **[RPET 2000]**

[1] Sulphonation of thiophene [2] Sulphonation of benzene

[3] Nitration of thiophene [4] Nitration of benzene

Q.30 In chlorination of benzene, the reactive species is : **[MP PET 2000]**
[1] Cl^+ [2] Cl^- [3] Cl_2 [4] Cl_2^-

Q.31 $C_6H_6 + 3Cl_2 \rightarrow C_6H_6Cl_6$. This reaction takes place when : **[MP PET 2002]**
[1] Chlorine is bubbled through benzene [2] When the mixture is kept in dark
[3] Chlorine (aq.) is shaken with benzene [4] When the mixture is exposed to sunlight

Q.32 The compound 'A' when treated with HNO_3 (in presence of H_2SO_4) gives compound 'B' which is then reduced with Sn and HCl to aniline. The compound 'A' is : **[MP PET 2002]**
[1] Toluene [2] Benzene [3] Ethane [4] Acetamide

Q.33 Three fused benzene rings are found in : **[Kerala (Engg.) 2002]**
[1] Naphthalene [2] Anthracene [3] Phenanthroline [4] Triphenyl methane

Q.34 Benzene is obtained by : **[Delhi PMT 2002]**
[1] Substitution of three acetylene molecules [2] Addition of three C_2H_2 molecules
[3] Polymensation three C_2H_5 molecules [4] Condensation of three C_2H_5 molecules

Q.35 Benzene can react with : **[UPSEAT 2003]**
[1] Br_2 water [2] HNO_3 [3] H_2O [4] CH_3OH

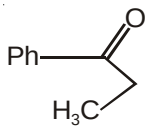
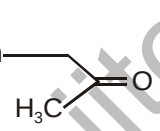
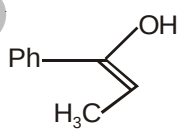
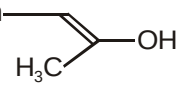
Q.36 Benzene hexachloride is used as : **[MP PMT 1994; Karnataka CET 1999]**
[1] Dye [2] Antimalerial drug [3] Antibiotic [4] Insecticide

Q.37 Benzene reacts with Cl_2 to form Benzene hexachloride in presence of : **[MP PET 1999]**
[1] Nickel [2] $AlCl_3$ [3] Bright sunlight [4] Zn

Q.38 $C_6H_6Cl_6$, on treatement with alcoholic KOH, yields : **[AFMC 2000]**
[1] C_6H_6 [2] $C_6H_3Cl_3$ [3] $(C_6H_6)OH$ [4] $C_6H_6Cl_4$

Q.39 When chlorine is passed through warm benzene in presence of the sunlight the product obtained is : **[Karnataka CET 2003]**
[1] Benzotrichloride [2] Chlorobenzene [3] Gammexane [4] DDT

Q.40 $Ph–C\equiv C–CH_3 \xrightarrow{Hg^{+2}/H^+}$ [A]. [A] is : **[IIT– 2002]**

[1] 
[2] 
[3] 
[4] 

Q.41 What is the end product which is obtained on the nitration of toluene : **[MP PMT/PET 1988]**
[1] o–nitrotoluene [2] p–nitrotoluene [3] 2,4–dinitrotoluene [4] 2,4,6–trinitrotoluene

Q.42 The reaction of toluene with chlorine in presence of ferric chloride gives predominantly **[IIT1986; DCE 2000]**
[1] Benzoyl chloride [2] m–chlorotoluene [3] Benzyl chloride [4] o– and p–chlorotoluenes

Q.43 Nitration of toluene takes place at : **[NCERT 1990]**
[1] o–position [2] m–position [3] p–position [4] Both o– and p–positions

Q.44 The compound formed as a result of potassium permanganate oxidation of ethylbenzene is : **[MP PMT/PMT 1998]**
[1] Benzoic acid [2] Benzyl alcohol [3] Benzophenone [4] Acetophenone

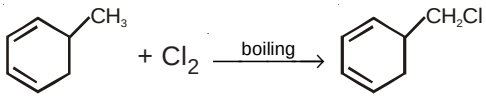
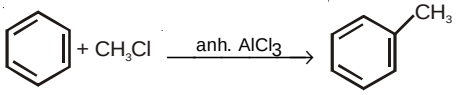
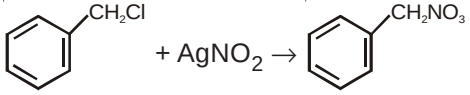
Q.45 Toluene can be oxidised to benzoic acid by : **[AIIMS 1999]**
[1] $KMnO_4$ [2] $K_2Cr_2O_7$ [3] H_2SO_4 [4] Both [1] and [2]

Q.46 In presence of light toluene on reaction with chlorine gives : **[RPET 1999]**
[1] Benzoyl chloride [2] Ortho Chlorotoluene [3] Para chloro toluene [4] Benzyl chloride

Q.47 Xylenes on oxidation with acidic $KMnO_4$ gives : **[JIPMER 2000]**
[1] Terphthalic acid [2] Phthalic acid [3] Isophthalic acid [4] All of these

Q.48 The compound 'A' having formulae C_8H_{10} (aromatic) which gives 1 mononitro substitute and 3 nitrosubstitute compound is : **[Delhi PMT 2002]**
[1] m–Xylene [2] p–Xylene [3] o–Xylene [4] Ethyl benzene

Q.49 Which one of the following is a free-radical substitution reaction : **[CBSE 2003]**

[1] $CH_3CHO + HCN \rightarrow CH_3CH(OH)CN$
[2] 
[3] 
[4] 

Q.50 Chlorination of toluene in the presence of light and heat followed by treatement with aqueous NaOH gives **[IIT 1990]**

[1] o–cresol [2] p–cresol [3] 2,4–dihydroxy toluene [4] Benzyl alcohol

Q.51 Toluene reacts with chlorine in the presence of light to give : **[MH CET 1999; 2002]**

[1] Benzyl chloride [2] Benzoyl chloride [3] p–chloro toluene [4] o–chloro toluene

Q.52 Oxidation of toluene by a strong oxidizing agent gives **[VITEEE-2005]**

[1] Phenol [2] Benzaldehyde [3] Benzoic acid [4] Benzophenone

Q.53 Which of following having delocalised electron **[BCECE 2005]**

[1] Benzene [2] Cyclohexane [3] CH_4 [4] C_2H_6

Q.54 Pyridine is less basic than triethylamine because - **[AIIMS 2005]**

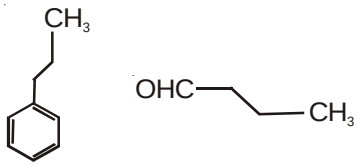
[1] Pyridine has aromatic character [2] Nitrogen in pyridine is sp^2 hybridized

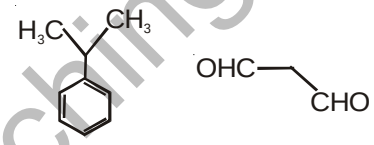
[3] Pyridine is a cyclic system [4] In pyridine,lone pair of nitrogen is delocalized

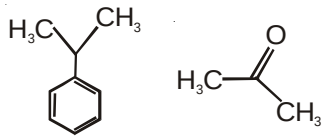
Q.55 When toluene is treated with $KMnO_4$, what is produced **[AFMC 2005]**

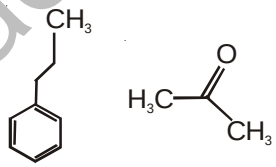
[1] Benzene [2] Chlorobenzene [3] Benzaldehyde [4] Benzoic acid

Q.56  **[IIT 2006]**

[1] 

[2] 

[3] 

[4] 

Q.57 The reaction of toluene with Cl_2 in presence of $FeCl_3$ gives predominantly : **[AIEEE 2007]**

[1] bonzoyl chloride [2] benzyl chloride [3] o-and p-chlorotoluene [4] m-chlorotoluene

Q.58 The compound formed as a result of oxidation of ethyl benzene by $KMnO_4$ is - **[AIEEE 2007]**

[1] benzophenone [2] acetophenone [3] benzoic acid [4] benzyl alcohol

Answer Key

Qus.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Ans.	3	3	3	4	2	2	2	2	2	2	3	3	4	1	4	3	3	2	1	1
Qus.	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
Ans.	3	1	3	4	2	4	1	2	2	1	4	2	2	2	2	4	3	2	3	2
Qus.	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58		
Ans.	2	4	4	1	4	4	4	2	2	4	1	2	1	4	4	3	3	3		