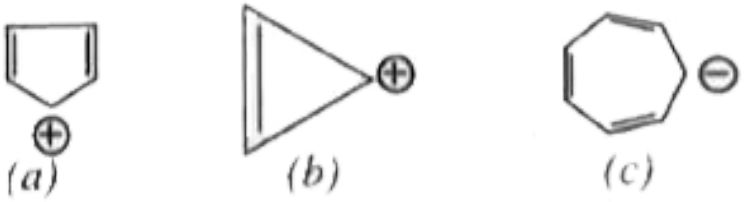
CHEMISTRY

JEE (MAIN AND ADVANCED) CHEMISTRY

AROMATIC HYDROCARBONS

Problem

1. Which of the following are aromatic ?



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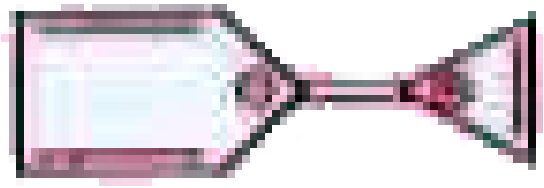
2. Explain whether the compound shown below is aromatic or not?



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3. Which of the following compound is more acidic?

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4. How would you convert the following compounds into benzene ?

(i) Ethyne

(ii) Benzoic acid

(iii) Hexane and

(iv) Ethene

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5. How would you convert chlorobenzne and toulene into benzene ?

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6. How p-niro toluene can be converted to benzene?

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7. Show that the role of conc. Sulphuric acid is not a dehydrating agent, but used for production of nitronium cation.

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8. Write the structures and names of all plossible isomers of trimethyl benzenes.

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9. Compare acetylene and benzene with respect to the following:

(a) hybridisation of carbon atoms,

(b) percentage compositions of C and H,

(c) product of ozonolysis and

(d) reaction with Baeyer's reagent.

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10. What happens when benzene reacts with n-propylchloride in presence of anhydrous aluminium chloride?

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11. What is the electrophile in chlorination of benzene with chlorine in presence ferric chloride?

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12. What are the ozonolysis products of ortho xylene?

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13. How will you convert benzene into

1) p-Nitrobromobenzene

2) m-Nitrochlorobenzene and

3) benzophenone

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14. Which is more acidic, acetylene or benzene?

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15. Arrange the following set of compounds in order of their decreasing relative reactivity with an electrophile, E^+

(a) Chlorobenzene, 2,4-dinitrochlorobenzene, p-nitrochlorobenzene

(b) Toluene, $p-H_3C-C_6H_4-NO_2, p-O_2N-C_6H_4-NO_2$.

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16. Why does benzene undergo electrophilic substitution reactions easily?

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17. Out of benzene, nitrobenzene and toluene which will undergo nitration most easily and why?

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18. Write the sequence of reactions to convert phenol into acetophenone.

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19. Suggest name of another Lewis acid instead of anhydrous aluminium chloride which can be used during ethylation of benzene.

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20. Which is more reactive, C_6H_6 or C_6D_6 towards electrophilic substitution?

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21. What product is obtained when isobutyl chloride reacts with benzene in presence in presence of $AlCl_3$?

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22. What is the major product obtained by nitration of m-xylene?

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23. Predict the major product of chlorination of m-dinitrobenzene.

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24. Write the major product of the following reaction.

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25. How acetic acid can be converted to benzene?

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26. Why polynuclear aromatic compounds are toxic ?

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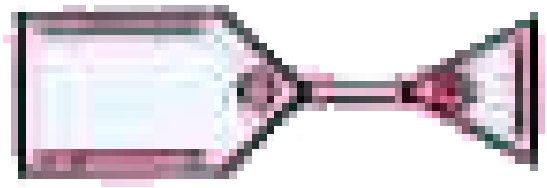
27. Explain whether the compound shown below is aromatic or not?



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28. Which of the following are aromatic?

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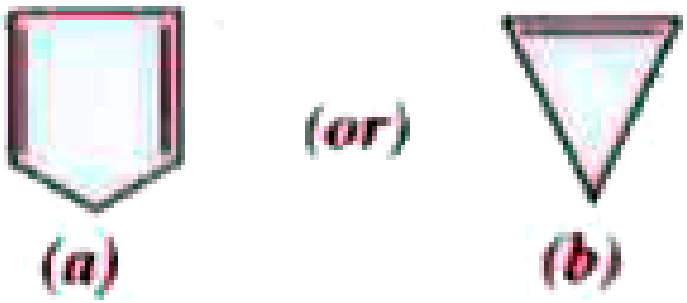
29. Which of the following compounds is more acidic?



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45. What product is obtained when isobutyl chloride reacts with benzene in presence of $AICI_3$?

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46. What is the correct reactivity order of the following electrophites?

Toluene,

$p - H_3C - C_6H_4 - CH_3, p - CH_3 - C_6H_4 - NO - 2, p - O_2N - C_6H_4$

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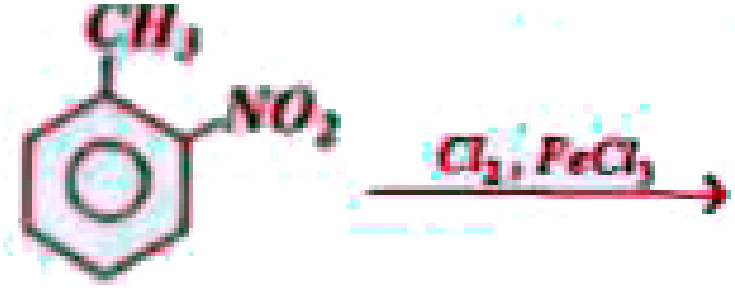

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Subjective Exercise Long Answer Questions

1. Describe any two methods of preparation of benzene. Why benzene does not behave like unsaturated compound? How does benzene react with

i) Methyl chloride presence of anhydrous $AlCl_3$

ii) A mixture of conc. HNO_3 and conc. H_2SO_4 below $60^\circ C$.

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2. Discuss the mechanism of electrophilic substitution reactions in benzene with halogenation and nitration as examples.

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3. Give all the electrophilic substitution reactions of benzene.

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4. How do we get benzene from acetylene? Give the equation. How benzene undergoes ozonolysis?

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5. How would you convert the following compounds into benzene?

Chlorobenzene, Toluene and p-Nitrotoluene

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6. Explain halogenation, alkylation, acylation, nitration and sulphonation of benzene.

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Subjective Exercise Short Answer Questions

1. Complete the following reactions and name the products A,B and C.

$$CaC_2 \xrightarrow{H_2O} A \xrightarrow{\text{hot metal tube}} B \xrightarrow{AlCl_3 + CH_3Cl} C$$

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2. For disubstitution in benzene, what are ring activating and deactivating groups in monosubstituted benzene?

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3. Explain the addition reactions of benzene under drastic conditions.

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4. Discuss orbital model of benzene.

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5. Write the resonance structures of aniline.

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6. Write the resonance forms of nitrobenzene.

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7. Write a note on deactivating groups towards electrophilic substitution in benzene.

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8. Explain the action of ortho of para directing groups and meta directing groups while monosubstituted benzene gets convered to disubstituted benzene.

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9. Discuss carcinogenicity and toxicity in atomatic hydrocarbons. Give two examples.

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10. What is substitution reaction? Explain any two substitution reactions of benzene.

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Subjective Exercise Very Short Answer Questions

1. How benzene is obtained from sodium benzoate ?

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2. How benzene is obtained from phenol?

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3. What product is formed when benzene is treated with chlorine in presence of U.V. light at 500 K ?

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4. Write three important uses of benzene.

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5. How is nitrobenzene prepared?

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6. Write the regents required for conversion of benzene to methyl benzene.

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7. Benzene prefers substitution reactions than addition reactions. Why?

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8. Polynuclear aromatic compounds are carcinogenic. Why?

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Objective Exercise 1

1. Structure of benzene was proposed by

A. Mitcharlich

B. Faraday

C. Kekule

D. Berzelius

Answer: C

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2. Compared with aliphatic hydrocarbons, the number of hydrogens in aromatic hydrocarbons is

A. Less

B. More

C. Equal

D. note predictable

Answer: A

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3. Formation of benzene from acetylene is

A. Trimerisation

B. Tetramerisation

C. Dimerisation

D. Condensation

Answer: A

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4. (A) : Benzene molecule is aromatic.

(R) : Benzene molecule obeys Huckel's rule.

A. A and R are true, R explains A

B. A and R are true, R does not explain A

C. A is true, but R is false

D. A is false, but R is true

Answer: A

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5. The boiling point of benzene is

A. $170^\circ C$

B. $80^\circ C$

C. $250^\circ C$

D. $270^\circ C$

Answer: B

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6. Benzene sulphonic acid is hydrolysed with ..... to get benzene

A. Acid

B. Base

C. Superheated steam

D. Any of the above three

Answer: C

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7. The hybridisation of carbons in benzene is

A. sp & sp^2

B. sp^2 & sp^3

C. sp & sp^3

D. sp^2 only

Answer: D

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8. The carbon-hydrogen bonds in benzene are

A. $\sigma sp^2 - s$

B. $\sigma sp^3 - s$

C. Both $\sigma sp^2 - s \& \sigma sp^3 - s$

D. $\sigma sp - s$

Answer: A

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9. The carbon-carbon bonds in benzene are

A. $\sigma sp^3 - sp$

B. $\sigma sp^2 - sp^2$

C. $\sigma sp^3 - sp^2$

D. $\sigma sp^2 - sp$

Answer: B

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10. The structure of benzene can also be explained by

A. Valence bond theory

B. Crystal field theory

C. Molecular orbital theory

D. VSEPR theory

Answer: C

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11. Huckel's rule of aromaticity is

A. Having 6 pi electrons

B. Having 3 double bonds

C. Having $(4n+2)$pi electrons

D. Having alternate double bonds

Answer: C

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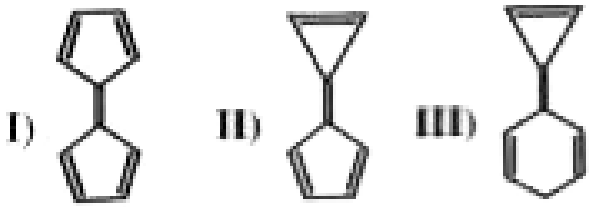
12. Consider the following structures.



Choose the correct statement regarding the above structures.,

A. Dipole moment varies as II gt III gt I

B. II is more stable than I

C. I is the most reactive among III

D. All of the above

Answer: D

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13. Nitration mixture is

A. 1:1 of conc. HNO_3 and conc. HCl

B. 1:1 of conc. HNO_3 and conc. H_2SO_4

C. 1:1 of conc. HNO_2 and conc. H_2SO_4

D. 1:10 of conc. H_2SO_4 and conc. HNO_3

Answer: B

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14. In Friedal-Craft's alkylation, catalyst is

A. Anhydrous $ZnCl_2$

B. Anhydrous $AlCl_3$

C. Trialkyl carbonium ion

D. Alkyl halide

Answer: B

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15. Benzene reacts with -------- to yield acetophenone

A. $CH_3COCl + AlCl_3$

B. $C_6H_5COCl + AlCl_3$

C. $RCOCl + AlCl_3$

D. $C_2H_5COCl + AlCl_3$

Answer: A

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16. The dipolemoment of benzene is

A. Zero

B. Less than p-dichloro benzene

C. Greater than p-dichloro benzene

D. Equal to that of chloro benzene

Answer: A

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17. Which of the following statement is not true for benzene?

A. It is planar molecule

B. All C-C bond lengths are equal

C. The resonance energy is 36 kcal/mole

D. It contains three localised pi bonds

Answer: D

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18. Which of the following reaction is useful to convert benzene into toluene ?

A. Wurtz reaction

B. Kolbe's reaction

C. Friedel-Crafts reaction

D. Grignard reation

Answer: C

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19. In benzene molecule there are three π bonds and

A. 10 sigma bonds

B. 12 sigma bonds

C. 6 sigma bonds

D. 3 sigma bonds

Answer: B

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20. (A) : Benzene is almost non-reactive and it can not be oxidised easily

(R) : Benzene is aromatic and obeys Hinckel rule.

A. A and R are true, R explains A

B. A and R are true, R does not explain A

C. A is true, but R is false

D. A is false, but R is true

Answer: B

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21. Which is false statement with respect to benzene ?

A. It has two types of C - C bond lengths

B. It has only one type of C - C bond length

C. All six carbons are sp^2 carbons

D. It does not decolourise alkaline $KMnO_4$

Answer: A

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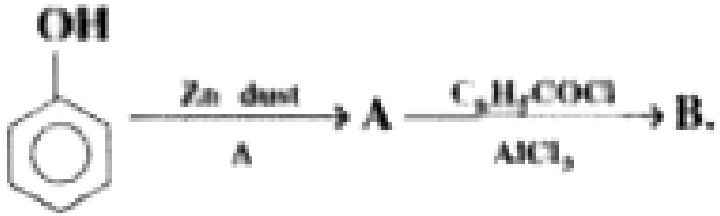

22.

In the above sequence B is

A. a. Acetanilide

B. b. Acetophenone

C. c. EthoxyBenzene

D. d. N-Phenylacetamide

Answer: C

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23. Which of the following behaves as a saturated compound?

A. C_2H_4

B. C_2H_2

C. C_3H_6

D. C_6H_6

Answer: D

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24. $C_2H_2 \xrightarrow[\text{metal tube}]{\text{Red hot}} A \xrightarrow{\text{Fuming } H_2SO_4} B$. B is

A. Benzene

B. Toluene

C. Benzene sulphonic acid

D. Chlorobenzene

Answer: C

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25. What is the molecular formula of the product formed when benzene is reacted with ethyl chloride in presence of anhydrous aluminium chloride?

A. C_8H_{10}

B. C_6H_6

C. C_8H_8

D. C_6H_5Cl

Answer: A

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26. The compound prepared by a substitution reaction of benzene is

A. Acetophenone

B. Glyoxal

C. Cyclohexane

D. Hexabromo cyclohexane

Answer: A

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27. To get benzene, coal tar is subjected to

A. Fractional distillation

B. Destructive distillation

C. Vacuum distillation

D. Steam distillation

Answer: A

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28. The two structures of benzene proposed by Kekule differ in

A. The position of carbon nuclei

B. The position of hydrogen nuclei

C. The position of the single bonds

D. The position of the double bonds

Answer: D

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29. Resonance energy of benzene is

A. $150 \text{Kcals Mol}^{-1}$

B. 36Kcals Mol^{-1}

C. $36 \quad \text{KJ Mol}^{-1}$

D. $200 \quad \text{Kcals Mol}^{-1}$

Answer: B

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30. In benzene there is

A. Delocalization of pi electrons

B. Delocalization of s electrons

C. Delocalization of both s and pi electrons

D. No delocalization of electrons

Answer: A

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31. The C-C bond lengths in benzene are

A. $1.54A^\circ \& 1.34A^\circ$

B. $1.34A^\circ \& 1.20A^\circ$

C. $1.39A^\circ$ only

D. $1.20A^\circ$ only

Answer: C

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32. The number of π electrons in benzene is

A. 3

B. 6

C. 9

D. 12

Answer: B

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33. (A) : Both benzene and ethyne give same product on ozonolysis.

(R) : Ethyne and benzene possess same empirical formula.

A. A and R are true, R Explains A

B. A and R are true, R does not explain A

C. A is true, but R is false

D. A is false, but R is true

Answer: B

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34.

List-I	LIST-2
A) Methane	1) Hawker's lamp
B) Ethylene	2) Paraldehyde
C) Acetyolene	3) Printer's ink
D) Benzene	4) Mustard gas
	5) Motor fuel

The correct match is

A.

A	B	C	D
1	2	3	4

B.

A	B	C	D
3	5	1	4

C.

A	B	C	D
3	4	1	5

D.

A	B	C	D
4	2	3	1

Answer: C

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35. According to the molecular formula, benzene appears to be highly unsaturated. But bezene mainly participates in substitution reactions. It is because benzene is

A. unsaturated

B. saturated

C. aromatic

D. cyclic compound

Answer: C

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36. Which of the following statements is wrong

A. Benznee does not decolourise alkaline potassium permanganate solution

B. Benzene is aromatic hydrocarbon

C. Benzene has delocalised π - electron cloud

D. Benzene does not unndergo substitution reactions

Answer: D

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37. A group which deactivates the benzene ring towards electrophilic substitution but directs the incoming group towards o - and p- positions is

A. $-NH_2$

B. $-Cl$

C. $-NO_2$

D. $-C_2H_5$

Answer: B

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38.

Set-I	Set-II
A) Sodium benzoate	1) Red hot iron tube
B) Phenol	2) dil. HCl
C) Acetylene	3) anhydrous $AlCl_3$
D) Benzene sulphonic acid	4) Zinc dust, Δ
	5) Soda lime, Δ

Correct matching to get benzene is

A. A-3, B-4, C-1, D-5

B. A-2, B-5, C-1, D-3

C. A-5, B-4, C-1 D-2

D. A-2, B-4, C-1, D-3

Answer: C

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39.

The compound "X" is used as

A. Insecticide

B. Solvent

C. Refrigerant

D. Motor fuel

Answer: A

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40.

In 'X', aromatic carbon in attached to

A. Carbonyl carbon

B. Alkyl carbon

C. Halogen

D. Oxygen

Answer: A

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41. (A) : Benzene reacts with n-propyl chloride in presence of $AlCl_3$ to give isopropyl benzene.

(R) : Benzene undergoes electrophilic substitution readily.

A. A and R are true, R explains A

B. A and R are true, R does not explain A

C. A is true, but R is false

D. A is false, but R is true

Answer: B

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42. Maximum number of atoms present in same plane of benzene molecule

A. 6

B. 10

C. 12

D. 4

Answer: C

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43. Number of double bonds in gammaxene (BHC) is

A. 3

B. 2

C. 1

D. 0

Answer: D

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44. (A) : Nitration of toluene is easier than benzene

(R) : The methyl group in toluene is electron releasing

A. A and R are true, R explains A

B. A and R are true, R does not explain A

C. A is true, but R is false

D. A is false, but R is true

Answer: A

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45. In halogenation of aromatic compounds, catalyst is

A. Lewis base

B. $FeCl_3$

C. $AlCl_3$

D. $FeCl_3$ or $AlCl_3$

Answer: D

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46. Hormone that maintain the blood glucose level within the limit is

A. Thyroxine

B. Insulin

C. Textosterone

D. Epinephrine

Answer: B

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47. Electrophile that participates in nitration of benzene is

A. NO^+

B. NO_2^+

C. NO

D. NO_3^-

Answer: B

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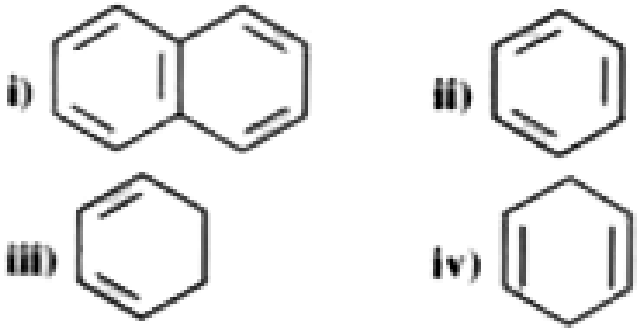
48. Which of the following are aromatic compound?



A. (ii) and (iv)

B. (i), (ii) and (iii)

C. (i) and (ii)

D. (iii) and (iv)

Answer: C

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49. Carcinogenic pollutants are formed on incomplete combustion of

A. tabaco

B. coal

C. petroleum

D. all the above

Answer: D

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50. Benzene and polynuclear hydrocarbons containing more than two benzene rings fused together are

A. toxic

B. possess carcinogenic property

C. Causes cancer

D. All the above

Answer: D

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51. Among the following, which acts ascarcinogenic pollutant?

A) 1, 2-benzpyrene

B) 1,2,5,6-Dibenzanthracene

C) 3-methyl chlolanthrene

A. A only

B. B only

C. C only

D. all

Answer: D

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52. Which one of the following causes cancer?

A. 1, 2-Benzpyrene

B. n-Hexane

C. 2-Butene

D. Cyclohexane

Answer: A

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Objective Exercise 2

1. During ozonolysis of 1mole of benzene, number of moles of ozone consumed is

A. 1

B. 2

C. 3

D. 4

Answer: C

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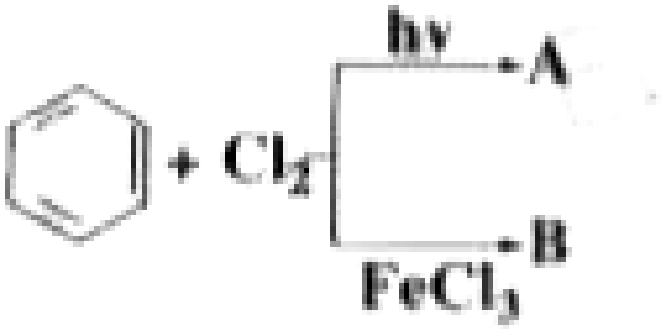

2.

A & B respectively are

A. Hexachlorocyclohexane & C_6H_5Cl

B. Chlorobenzene & Hexachlorocyclohexane

C. o-and p-Dichlorobenzene & chlorobenzene

D. Chlorobenzene & $C_6H_6Cl_6$

Answer: A

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3. $C_2H_4Br_2 \xrightarrow{alc.KOH} A \xrightarrow[\text{metal tube}]{\text{Red hot}} B.$

The characteristic reactions of B are

A. Nucleophilic addition

B. Electrophilic addition

C. Radical addition

D. Electrophilic substitution

Answer: D

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4. Which of the following is not aromatic?

A. Cyclooctatertraene

B. Benzene

C. Naphthalene

D. Anthracene

Answer: A

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5. Benzene does not undergo addition reaction easily because

A. It has six hydrogen atoms

B. It has a cyclic structure

C. Double bonds present in benzene are strong

D. Resonance stabilised system is to be preserved.

Answer: A

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6. The reagent used for converting benzene to ethyl benzene is

A. C_2H_5Cl, anhydrous $AlCl_3$

B. C_2H_5Cl, anhydrous $AlCl_3$

C. C_2H_5OH, anhydrous $AlCl_3$

D. C_2H_5Cl, $SOCl_2$

Answer: D

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7. Benzene on treating with a mixture of conc. HNO_3 and H_2SO_4 at $100^\circ C$ gives

A. Nitrobenzene

B. m-dinitrobenzene

C. o-dinitrobenzene

D. p-dinitrobenzene

Answer: B

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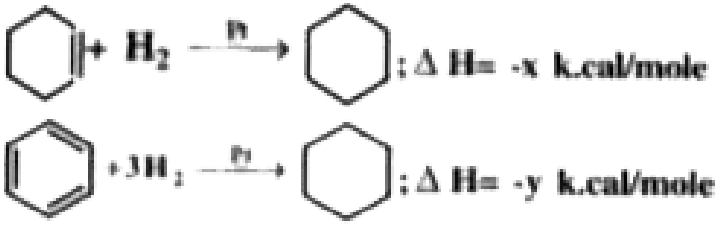
8.



The correct relation among the following is

A. $x = y$

B. $y = 3x$

C. $3x - y = 36$k.cal

D. $x - 3y = 36$k.cal

Answer: C

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9. Arrange the following compound in the descending order of their reactivity towards electrophilic substitution.

a) Chlorobenzene

b) Nitrobenzene

c) Benzene

d) Phenol

e) Toluene

A. d gt e gt c gt a gt b

B. b gt a gt c gt e gt d

C. d gt e gt c gt b gt a

D. e gt d gt c gt a gt b

Answer: A

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10. Which of the following group is meta directing and ring deactivating

A. $-Cl$

B. $-OH$

C. $-NO_2$

D. $-Br$

Answer: B

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11. The decreasing order of reactivity of C_2H_6, C_2H_4, C_2H_2 and C_6H_6 is

A. $C_2H_4 > C_2H_2 > C_6H_6 > C_2H_6$

B. $C_2H_2 > C_2H_4 > C_6H_6 > C_2H_6$

C. $C_6H_6 > C_2H_6 > C_2H_4 > C_2H_2$

D. $C_2H_6 > C_2H_4 > C_2H_2 > C_6H_6$

Answer: A

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12. The ratio of the number of hybrid and pure orbitals in C_6H_6 used for bonding is

A. $3:2$

B. $2:3$

C. $1:1$

D. $4:3$

Answer: A

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13. In the electrophilic substitution of benzene, to restore aromatic character sigma comlex releases proton from

A. sp^3- hybridised carbon

B. sp^2- hybridised carbon

C. sp - hybridised carbon

D. Any one of the carbons

Answer: A

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14. According to Huckel's ruel to explain aromaticity the compound has to posess

A. $(4n+2)$ lone pair electrons $(n=0,1,2,3\ldots)$

B. $(4n+2)\pi$ delocalised electrons (n = any integer including zero)

C. $(4n+2)$ total electrons $(n=0,1,2,3\ldots)$

D. $(4n+2)\pi$ electrons (n = any non zero integer)

Answer: B

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15. When acetylene is passed through red hot iron tube, compound 'X' is formed. Which one of the following reactions will yeild 'X' as major product ?

A. $C_6H_5SO_3H + NaHCO_3 \rightarrow$

B. $C_6H_5Cl + H_2O \xrightarrow{\Delta}$

C. $C_6H_{12} + 3H_2 \xrightarrow{Ni}$

D. $C_6H_5COONa + NaOH \xrightarrow[\Delta]{+CaO}$

Answer: D

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16. A mixture of benzene and aniline can be separated by

A. Alcohol

B. Sodium hydroxide

C. HCl

D. Hot water

Answer: C

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17. $C_6H_6 + CH_3Cl \rightarrow C_6H_5CH_3 + HCl$

The above reaction is an example of

A. Grignard reaction

B. Kolbe's electrolysis

C. Wurtz reaction

D. Friedel Craft reaction

Answer: D

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18. When phenol is distilled with Zn dust then it gives

A. Benzene

B. Toluene

C. Benzaldehyde

D. Benzoic acid

Answer: A

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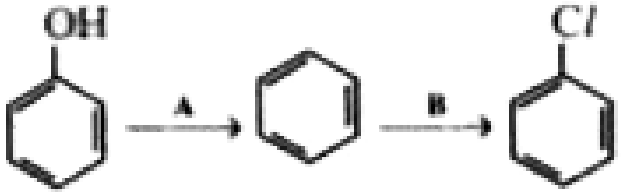
19. Identify the reagents A and B used in the following reactions



A. a. $Zn, Cl_2 / FeCl_3$

B. b. $Sn / HCl, Cl_2 / hv$

C. c. $Cl_2 / Fe, FeCl_3$

D. d. $Cl_2 / hv, Zn$

Answer: B

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20. Which one of the following causes cancer?

A. 1, 2-Benzpyrene

B. n-Hexane

C. 2-Butene

D. Cyclohexane

Answer: A

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21. Benzene on ozonolysis followed by reaction with $Zn + H_2O$ gives

A. 3 moles of glycerol

B. 3 moles of glyoxal

C. 3 moles of glyoxalic acid

D. 3 moles of acetylene

Answer: B

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22. Which one of the following statements is correct?

A. Cyclohexadiene is an aromatic compound

B. Deactivating groups are ortho and para directing groups

C. Reaction of benzene with 1-chloropropane and anhydrous $AlCl_3$ gives n-propylbenzene

D. Electrophilic substitution of benzene takes place via σ- bomplex

Answer: D

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23. Consider the nitration of benzene using mixed conc. H_2SO_4 and HNO_3 If a large amount of $KHSO_4$ is added to the mixture, the rate of nitration will be

A. faster

B. slower

C. unchanged

D. double

Answer: B

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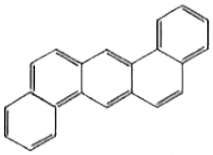
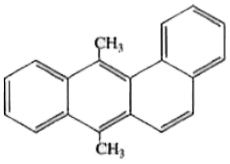
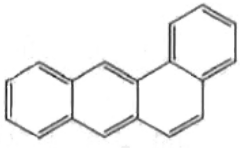
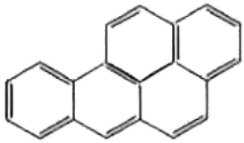
24. 1,2,5, 6- Dibenzation of the following

A. 

B. 

C. 

D. 

Answer: A

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25. Which of the following enter into human body and undergos various biochemical reactions and finally demage DNA and cause cancer ?

A. Ethyl alcohol

B. 3- Methyl cholanthrene

C. 1-D- Glucopyranose

D. 2-D- Fructofuranose

Answer: B

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Practice Exercise

1. Maximum number of aromatic compounds are obtained from

A. Coal tar

B. Natural gas

C. Petroleum

D. Animals

Answer: A

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2. The number of isomers formed when two hadrons of benzene ring are substituted

A. Two

B. Three

C. Four

D. One

Answer: B

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3. Benzene is formed by polymerisation of

A. Ethene

B. Ethyne

C. Ethane

D. Methane

Answer: B

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4. The C-C bond lengths in benzene is

A. $< C - C$ is ethane

B. $> C = C$ in ethane

C. $> C \equiv C$ in ethyne

D. All the above

Answer: D

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5. The increase in stability and decrease in energy of aromatic compounds is due to

A. Localization of pi electrons

B. Delocalization of s electrons

C. Localization of s electrons

D. Delocalization of pi electrons

Answer: D

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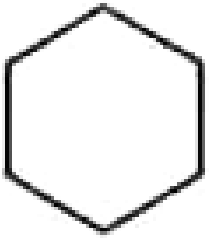
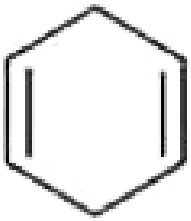
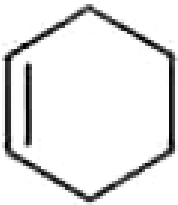
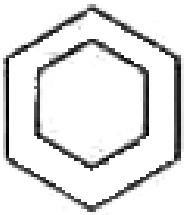
6. Under pressure, (with hydrogen) in presence of nickel catalyst, benzene forms

A. 

B. 

C. 

D. 

Answer: A

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7. The function of anhydrous $AlCl_3$ in the Friedel-Crafts reaction is to

A. absorb water

B. absorb HCl

C. Produce electrophile

D. Produce nucleophile

Answer: C

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8. In Huckel's $(4n + 2)$ rule of for aromaticity, 'n' represents

A. Number of carbon atoms

B. Number of rings

C. Whole number

D. Fraction (or) integer (or) zero

Answer: C

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9. Ratio of π to σ bonds in benzene is

A. $1:4$

B. $1:2$

C. $3:1$

D. $1:6$

Answer: A

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10. Aromatic compounds undergo

A. Electrophilic substitution

B. Electrophilic addition

C. Nucleophilic addition

D. Nucleophilic substitution

Answer: A

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11. In which of the following the bond length between carbon and carbon atom of equal ?

A. 2-butene

B. Benzene

C. 1-butene

D. 1-propyene

Answer: B

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12. Benzene reacts with H_2SO_4 only when the acid is

A. Hot and conc.

B. Cold and dilute

C. Hot and dilute

D. Mixed with HNO_3

Answer: A

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13. Which one of the following is benzene ring activating group towards electrophilic substitution?

A. $-CN$

B. $-CHO$

C. $-SO_3H$

D. $-OCH_3$

Answer: D

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14. Nitrobenzene can be preapred from Benzene by using a mixture of HNO_3 and conc. H_2SO_4. In the nitrating mixture HNO_3 acts as a

A. Base

B. Acid

C. Reducing agent

D. Catalyst

Answer: A

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15. Presence of nitro group in benzene makes further substitution

A. Difficult

B. Easy

C. Remains uneffected

D. Sometimes easy sometimes difficult

Answer: A

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16. $CaC_2 \xrightarrow{H_2O} A \xrightarrow{\text{Red hot tube}} B \xrightarrow[CH_3Cl]{AlCl_3} C,$

In this sequence B and C are

A. Benzene and acetylene

B. Toluene and Benzene

C. Benzene and Toluene

D. Toluene and acetylene

Answer: C

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17. The following group causes high -I effect

A. $-SO_3H$

B. $-CHO$

C. $-CONH_2$

D. $-COOH$

Answer: A

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18. Aromatic compounds undergo most easily

A. Nucleophilic substitution

B. Electrophilic substitution

C. Nucleophilic addition

D. Electrophilic addition

Answer: B

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19. The ozonolysis product of benzene and compound 'A' are same. Empirical formula of compound 'A' is

A. CH

B. CH_2

C. CH_3

D. CH_4

Answer: A

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20. Carbon - carbon bond length of 139 pm is observed in the molecule

A. cyclohexane

B. ethylene

C. benzene

D. acetylene

Answer: C

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21. Which of the following statements is NOT correct?

A. The six carbons in benzene are sp^2 hybridised

B. benzene has $(4\pi + 2)\pi$ electrons

C. Benzene undergoes substitution reactions

D. Benzene has two carbon-carbon bond lengths, $1.54A^0$ and $1.34A^0$

Answer: D

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22. (A) : $-NH_2$ group of aniline is ortho, para directing in electrophilic substitutions

(R) : $-NH_2$ group stabilises the arenium ion formed by the ortho, para attack of the electrophile

A. Both (A) and (R) are correct, (R) is the correct explanation of (A)

B. Both (A) and (R) are correct, (R) is not the correct explanation of (A)

C. (A) is correct, but (R) is not correct

D. (A) is not correct but (R) is correct

Answer: A

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23. Which one of the following gives sooty flame on combution?

A. C_2H_4

B. CH_4

C. C_2H_6

D. C_6H_6

Answer: D

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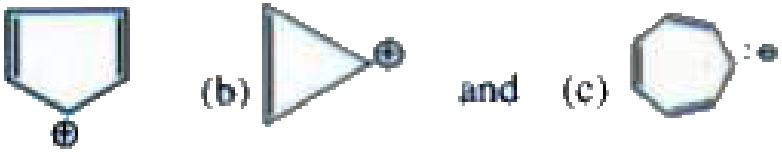
Problems

1. Which of the following are aromatic?



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2. Explain whether the compound  is aromatic or not?

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3. Compare the number of hydrogen atoms per carbon atom of an arene with that of an alkane, having same number of carbon atoms.

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4. Why compounds like 1,3-cyclobutadiene, 1,3,5,7- cycloctatetrane and ions like cyclopropenyl anion, cyclopentadienyl cation are not aromatic?

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5. Which of the following compounds is more acidic?

(or)

(b)

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6. Write the sturcture and names of all possible isomers of trimethyl benzens.

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7. What is the electrophile in chlorination of benzene with chlorine in presence ferrle chloride ?

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8. Which is more acidic, acetylene or benzene?

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9. What are the ozonolysis products of ortho xylene?

Watch Video Solution

10. Show that the role of cone, sulphuric acid is not a dehydrating agent, but used for production of nitronium cation.

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11. What happens when benzene reacts with n-propylchloride in presence of anhydrous aluminium chloride?

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12. Compure acetylene and benzene with respect to the following:

(a) hybridisation of carbon atoms and

(b) reaction with Bueyer's reagent.

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13. What product is obtained when isobutyl chloride reacts with benzene in presence of $AlCl_3$?

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14. Write the sequence of reactions to convert phenol into acetophenone.

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15. Which is more reactive, C_6H_6 or C_6D_6 towards electrophilic substitution?

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16. What is the major product obtained by nitration of m-xylene?

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17. Predict the major product of chlorination of m-dinitrobenzene.

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18. Write the major product of the chlorination reaction of o-nitotoulene.

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19. 

. Where are X and Y?

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20. Is azulene polar and aromatic ?

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21. Why polynuclear aromatic compounds are toxic ?

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Exercise 5 1 1

1. Write the characteristics of aromatic compounds.

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2. State Hucel's rule and explain.

Watch Video Solution

3. Resonance energy of benzene is

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4. Explain the orbital model structure of benzene.

Watch Video Solution

5. Explain the aromatic character of naphthalene and anthracene.

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6. Why the bond distance in benzene is inter-mediate between  ?

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Exercise 5 1 2

1. Explain why benzene mainly undergoes electrophilic substitution reaction ?

Watch Video Solution

2. What are benzonoid compounds ? Give examples.

Watch Video Solution

3. State and explain Huckel's rule.

Watch Video Solution

4. Write any two methods for preparation of benzene.

Watch Video Solution

5. Discuss the general mechanism of electrophilic substitution in benzene.

Watch Video Solution

6. Give the major products obtained in the following reactions :

(a) Nitration of chlorobenzene and (b) Chlorination of nitrobenzene.

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7. How is ozonolysis of benzene is pared that of acatylene ?

Watch Video Solution

Exercise 5 1 3

1. Write examples for electron releasing and electron withdrawing groups.

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2. Write on the theory of orientation.

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3. Draw resonance structures of phenol, Chlorobenzene and benzaldehyde.

Watch Video Solution

4. What are pollynuclear compounds? Give examples.

Watch Video Solution

5. Comment on the toxicity and carcinogenicity of aromatic hydrocarbons.

Watch Video Solution

Exercise 5 2

1. What do you mean by the term arene?

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2. Huckel's rule is used to detect aromaticity. Substantiate.

Watch Video Solution

3. Some experiments lead to the structure of benzene. How?

Watch Video Solution

4. Discuss the mechanism of electrophilic substitution reactions in benzene with halogenation and nitration as examples.

Watch Video Solution

5. How is bengene prepared from coke and lime ?

Watch Video Solution

6. Benzene has three pi bonds bút gives ozonide. Support.

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7. How is diphenyl ketone prepared starting from acetylene?

Watch Video Solution

8. Stability of benzene as compared to cyclohexatriene is more. Substantiate,

Watch Video Solution

9. Benzene prefers substitution reactions than addition reactions. Why?

Watch Video Solution

10. Why the following systems are not aromatic?

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11. 1,3-Dimethylbenzene on bromination gives 1-bromo-2,4-dimethylbenzene as major product. Substantiate.

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12. Arrange the following set of compounds in order of their decreasing relative reactivity with an electrophile, E^+ .

Chlorobenzene, 2, 4-dinitrochlorobenzene and p-nitrochlorobenzene.

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13. Toluene : $p-H_3C-C_6H_4-NO_2$ and $p-O_2N-C_6H_4-NO_2$. Arrange these compounds in their increasing order of reactivity with an electrofile.

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Subjective Exercise 1 Long Answer Questions

1. Describe any two methods of preparation of benzene. Why benzene does not behave like unsaturated compound ?

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2. Describe any two methods of preparation of benzene. Why benzene does not behave like unsaturated compound? How does benzene react with

i) Methyl chloride presence of anhydrous $AlCl_3$

ii) A mixture of conc. HNO_3 and conc. H_2SO_4 below $60^\circ C$.

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3. Discuss the mechanism of electrophilic substitution reactions in benzene with halogenation and nitration as examples.

Watch Video Solution

4. Explain aromatic electroplhilic substitution reactions of benzene.

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5. How do we get benzene from acetylene? Give the equation. How benzene undergoes ozonolysis?

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6. Explain halogenation, alkylation, acylation, nitration and sulphonation of benzene.

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7. How would you convert the following compounds into benzene?

Chlorobenzene, Toluene and p-Nitrotoluene

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Subjective Exercise 1 Short Answer Questions

1. Complete the following reactions and name the products A,B and C.

$$CaC_2 \xrightarrow{H_2O} A \xrightarrow{\text{hot metal tube}} B \xrightarrow{AlCl_3 + CH_3Cl} C$$

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2. For disubstitution in benzene, what are ring activating and deactivating groups in monosubstituted benzene?

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3. Explain the addition reactions of benzene under drastic conditions.

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4. Discuss orbital model of benzene.

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5. Write the resonance structures of aniline.

Watch Video Solution

6. Write the resonance forms of nitrobenzene.

Watch Video Solution

7. Write a note on deactivating groups towards electrophilic substitution in benzene.

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8. Explain the action of ortho of para directing groups and meta directing groups while monosubstituted benzene gets convered to disubstituted benzene.

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9. Discuss carcinogenicity and toxicity in atomatic hydrocarbons. Give two examples.

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10. What is substitution reaction? Explain any two substitution reaction of benzene.

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Subjective Exercise 1 Very Short Answer Questions

1. How benzene is obtained from sodium benzoate ?

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2. How benzene is obtained from phenol?

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3. What product is formed when benzene is treated with chlorine in presence of U.V. light at 500 K ?

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4. Write three important uses of benzene.

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5. How is nitrobenzene prepared?

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6. Write the regents required for conversion of benzene to methyl benzene.

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Objective Exercies 1 Benzene

1. Structure of benzene was proposed by

A. Mitcharlich

B. Faraday

C. Kekule

D. Berzelius

Answer: C

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2. Which of the following is a false statement ?

A. The name benzene was given to it by Mitcherlich

B. The correct structure for benzene was first proposed by Kekule

C. The orbital overlap between carbon atoms in benzene is sp-sp.

D. Benzene molecule is plane hexagonal

Answer: C

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3. Compared with aliphatic hydrocarbons, the number of hydrogens in aromatic hydrocarbons is

A. Less

B. More

C. Equal

D. not predictable

Answer: A

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4. Formation of benzene from acetylene is

A. Trimerisation

B. Tetramerisation

C. Dimerisation

D. Condensation

Answer: A

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5. (A): The carbon -carbon bond lengths in benzene molecule are $1.54A^{\circ}$ and $1.34A^{\circ}$

(R): Benzene has delocalised p - bonds

A. Both A and R are true and R is correct explanation of A

B. Both A and R are true. R is not the correct explanation of A

C. A is true but R is false

D. A is false but R is true

Answer: D

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6. The boiling point of benzene is

A. $170^{\circ}C$

B. $80^{\circ}C$

C. $250^{\circ} C$

D. $270^{\circ} C$

Answer: B

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7. Polynuclear aromatic compound of the following is

A. Benzene

B. Cyclopentadienyl anion

C. Phenanthrene

D. Cyclooctatetraene

Answer: C

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8. The hybridisation of carbons in benzene is

A. $sp \& sp^2$

B. $sp^2 \& sp^3$

C. $sp \& sp^3$

D. sp^2 only

Answer: D

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9. The carbon-hydrogen bonds in benzene are

A. $\sigma sp^2 - s$

B. $\sigma sp^3 - s$

C. $Both \sigma sp^2 - s \& \sigma sp^3 - s$

D. $\sigma sp - s$

Answer: A

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10. The carbon-carbon bonds in benzene are

A. $\sigma sp^3 - sp$

B. $\sigma sp^2 - sp^2$

C. $\sigma sp^3 - sp^2$

D. $\sigma sp^2 - sp$

Answer: B

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11. The structure of benzene can also be explained by

A. Valence bond theory

B. Crystal field theory

C. Molecular orbital theory

D. VSEPR theory

Answer: C

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12. Huckel's rule of aromaticity is

A. Having 6 pi electrons

B. Having 3 double bonds

C. Having (4n+2)pi electrons

D. Having alternate double bonds

Answer: C

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13. In halogenation of aromatic compounds, catalyst is

A. Lewis base

B. $FeCl_3$

C. $AICI_3$

D. $FeCl_3$ or $AICI_3$

Answer: D

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14. Which one of the following is not present in the nitration mixture ?

A. $1:1$ of conc.$HNO_3$and conc.HCI

B. $1:1$ of conc. HNO_3 and conc.H_2SO_4

C. $1:1$ of conc. $HNO_3$and conc. H_2SO_4

D. $1:10$ of conc. H_2SO_4 and conc.HNO_3

Answer: B

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15. In Friedal-Craft's alkylation, catalyst is

A. Anhydrous $ZnCl_2$

B. Anhydrous $AICI_3$

C. Trialkyl carbonium ion

D. Alkyl halide

Answer: B

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16. Benzene reacts with -------- to yield acetophenone

A. $CH3COCI + AICI_3$

B. $C_6H_5COCI + AICI_3$

C. $RCOCI + AICI_3$

D. $C_2H_5COCl + AICI_3$

Answer: A

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17. The dipolemoment of benzene is

A. Zero

B. Less than p-dichloro benzene

C. Greater than p-dichloro benzene

D. Equal to that of chloro benzene

Answer: A

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18. Which of the following statement is not true for benzene?

A. It is planar molecule

B. All C-C bond lengths are equal

C. The resonance energy is 36 kcal/mole

D. It contains three localised pi bonds

Answer: D

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19. Which of the following reaction is useful to convert benzene into toluene ?

A. Wurtz reaction

B. Kolbe's reaction

C. Friedel-Crafts reaction

D. Grignard reation

Answer: C

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20. In benzene molecule there are three π bonds and

A. 10 sigma bonds

B. 12 sigma bonds

C. 6 sigma bonds

D. 3 sigma bonds

Answer: B

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21. (A) : Benzene decolourises cold alkaline potassium permanganate solution

(R) : Benzene is aromatic hydrocarbon

A. Both A and R are true, and R is correct explanation of A

B. Both A and R are true, and R is not the correct explanation of A

C. A is true but R is false

D. A is false but R is true

Answer: D

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22. Which is false statement with respect to benzene ?

A. It has two types of C-C bond lengths

B. It has only one type of C-C bond length

C. All six carbons are sp^2 carbons

D. It does not decolourise alkaline $KMnO_4$

Answer: A

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23. 

In the above sequence B is

A. Acetanilide

B. Acetophenone

C. Benzophenone

D. N-Phenylacetamide

Answer: C

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24. Which of the following behaves as a saturated compound?

A. C_2H_4

B. C_2H_2

C. C_3H_6

D. C_6H_6

Answer: D

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25. $C_2H_2 \xrightarrow{\text{Hot metal tube}} > A \xrightarrow{\text{Fuming } H_2SO_4} B$.Here the product B is

A. Benzene

B. Toluene

C. Benzene sulphonic acid

D. Chlorobenzene

Answer: C

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26. What is the molecular formula of the product formed when benzene is reacted with ethyl chloride in presence of anhydrous aluminium chloride?

A. C_8H_{10}

B. C_6H_6

C. C_8H_8

D. C_6H_5Cl

Answer: A

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27. The compound prepared by substitution reaction of benzene is

A. Acetophenone

B. Glyoxal

C. Cyclohexane

D. Hexabromo cyclohexane

Answer: A

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28. Sodium salt of benzoic acid when heated with which of the following gives benzene

A. Sodamide

B. Sodalime

C. Sodium chloride

D. Soda ash

Answer: B

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29. The two structures of benzene proposed by Kekule differ in

A. The position of carbon nuclei

B. The position of hydrogen nuclei

C. The position of the single bonds

D. The position of the double bonds

Answer: D

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30. Resonance energy of benzene is

A. $150 Kcals Mol^{-1}$

B. $36 Kcals Mol^{-1}$

C. $36 KJ Mol^{-1}$

D. $200 Kcals Mol^{-1}$

Answer: B

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31. In benzene there is

A. Delocalization of pi electrons

B. Delocalization of sigma electrons

C. Delocalization of both sigma and pi electrons

D. No delocalization of electrons

Answer: A

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32. The C-C bond lengths in benzene are

A. $1.54A^{\circ}\&1.34A^{\circ}$

B. $1.34A^{\circ}\&1.20A^{\circ}$

C. $1.39A^{\circ}$ only

D. $1.20A^{\circ}$ only

Answer: C

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33. The number of π electrons in benzene is

A. 3

B. 6

C. 9

D. 12

Answer: B

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34. (A) : Benzene prefers to participate in substitution reactions than addition reactions

(R) : Addition products of benzene do not retain resonance stability

A. Both A and R are true, and R is correct explanation of A

B. Both A and R are true, and R is not the correct explanation of A

C. A is true but R is false

D. A is false but R is true

Answer: A

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35.

The organic compound 'X' is

A. Chlorobenzene

B. Benzene hexachloride

C. Hexachlorobenzene

D. o-dichloro benzene

Answer: C

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36. According to the molecular formula, benzene appears to be highly unsaturated. But bezene mainly participates in substitution reactions. It is because benzene is

A. unsaturated

B. saturated

C. aromatic

D. cyclic compound

Answer: C

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37. Which of the following statements is wrong

A. Benzene does not decolourise alkalin potassium permanganate solution

B. Benzene is aromatic hydrocarbon

C. Benzene has delocalised π - electro cloud

D. Benzene does not undergo substitution reactions

Answer: D

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38. A group which deactivates the benzene ring towards electrophilic substitution but directs the incoming group towards o - and p- positions is

A. $-NH_2$

B. $-Cl$

C. $-NO_2$

D. $-C_2H_5$

Answer: B

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39.

Set-I	Set-II
A) Sodium benzoate	1) Red hot iron tube
B) Phenol	2) dil. HCI
C) Acetylene	3) anhydrous $AICI_3$
D) Benzene sulphonic Acid	4) Zinc dust, $Detla$
	5) Soda lime, Δ

Correct matching to get benzene is

A. A-3, B-4, C-1, D-5

B. A-2, B-5, C-1, D-2

C. A-5, B-4, C-1, D-2

D. A-2, B-4, C-1, D

Answer: C

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40.

The compound "X" is used as

A. Insecticide

B. Solvent

C. Refrigerant

D. Motor fuel

Answer: A

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41. Maximum number of atoms present in same plane of benzene molecule

A. 6

B. 10

C. 12

D. 4

Answer: C

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42. Number of double bonds in gammaxene (BHC) is

A. 3

B. 2

C. 1

D. 0

Answer: D

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43. Why does 1,3-cyclohexadiene undergo dehydrogenation readily ?

A. It can be easily reduced

B. It has no resonance energy

C. It gains considerable stability by becoming benzene

D. It cannot undergo dehydrogenation.

Answer: C

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44. Which of the following is represented incorrectly ?

A. $C_6H_6 + Cl_2 \xrightarrow[\text{anhydrous}AlCl_3]{\text{Sunlight}} C_6H_6Cl_6$

B. $C_6H_6 + CH_3Cl \rightarrow C_6H_5CH_3 + HCl$ is an example of Friedel-Crafts reaction

C. Distillation of phenol with zinc dust gives benzene

D. Benzene reacts with CH_3COCl in the presence of $AICI_3$ to give C_6H_5COCI

Answer: D

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45. The wrong statement in the following is

A. Sulphonation of benzene takes place only with hot concentrated sulphuric acid

B. In the nitration mixture concentrated sulphuric acid is used for the formation of nitronium ion.

C. Because of unsaturation benzene easily undergoes addition reactions

D. Benzene burns with a sooty flame.

Answer: C

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46. Which of the following is a wrong statement ?

A. The reacting species in sulphonation is H_2SO_4

B. In Friedel-Crafts reaction of benzene with an acid chloride the electrophilic reagent is RCO^+

C. In the nitration of toluene by electrophilic substitution the electrophile is nitronium ion

D. Reaction of benzene with chlorine in the presence of sunlight is an addition reaction

Answer: A

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47. Which of the following is not correct ?

A. Benzene can be obtained by the cyclisation of ethene

B. Benzene reacts with H_2 in the presence of Ni at $200^\circ C$ to give cyclohexane

C. $C_6H_6Cl_6$ can be obtained from $C_6H_6 + Cl_2 +$ light

D. Benzene reacts with ozone to form benzene triozonide

Answer: A

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48. The function of anhydrous aluminium chloride in the Friedel-Craft's reaction is

A. to absorb water

B. to absorb hydrochloric acid

C. to produce an electrophile

D. to produce nucleophile

Answer: C

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49. Benzene does not undergo addition reaction easily because

A. It has six hydrogen atoms

B. It has a cyclic structure

C. Double bonds present in benzene are strong

D. Resonance stabilised system is to be preserved.

Answer: D

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50. Under pressure, (with hydrogen) in presence of nickel catalyst, benzene forms

A. 

B. 

C. 

D. C_6H_{14}

Answer: A

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51. $C_6H_6 \xrightarrow[H_2SO_4]{HNO_3} X \xrightarrow[FeBr_3]{Br_2} Y$.The compound Y is

A. o-Bromonitrobenzene

B. m-Bromonitrobenzene

C. o-Bromobenzenesulphonic acid

D. m-Bromobenzenesulphonic acid

Answer: B

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52. In which of the following reactions, aromatic character is observed in the product formed ?

A. $C_6H_6 \xrightarrow{H_2/Ni} X$

B. $C_6H_6 \xrightarrow[hv]{Cl_2} Y$

C. $C_6H_6 \xrightarrow[FeCl_3]{Cl_2} Q$

D. $C_6H_6 \xrightarrow[Zn, H_2O]{O_3} Z$

Answer: C

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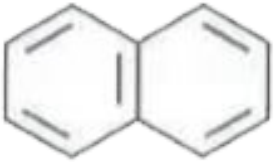
53. Which of the following are aromatic compounds ?

i) 

ii) 

iii) 

iv) 

A. (ii) and (iv)

B. (i), (ii) and (iii)

C. (i) and (ii)

D. (iii) and (iv)

Answer: C

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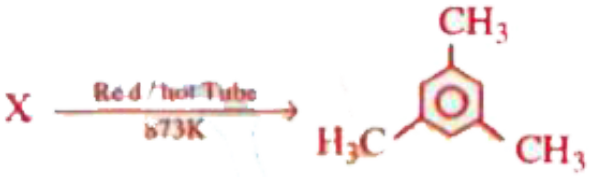
54. Identify the starting material 'X'



A. 3H - H

B. $2H_3C - H$

C. $3H_3C - H$

D. $2H_3C \equiv CH_3$

Answer: C

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Objective Exercies 1 Carcinogenicity

1. Carcinogenic pollutants are formed on incomplete combustion of

A. tobaco

B. coal

C. petroleum

D. all the above

Answer: D

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2. Benzene and polynuclear hydrocarbons containing more than two benzene rings fused together are

A. Toxic

B. Causes cancer

C. Possess carcinogenic property

D. All the above

Answer: D

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3. Among the following which is carcinogenic pollutant ?

A) 1,2-benzpyrene

B) 1,2,5,6-Dibenzanthracene

C) 3-methyl cholanthrene

A. Only A

B. Only B

C. Only C

D. All

Answer: D

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Objective Exercies 2 Benzene

1. In the electrophilic substitution of benzene, to restore aromatic character sigma complex releases proton from

A. sp^3 hybridised carbon

B. sp^2 hybridised carbon

C. sp hybridised carbon

D. Any one of the carbons

Answer: A

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2. According to Huckel's rule to explain aromaticity the compound has to posess

A. (4n+2) lone pair electrons (n = 0, 1, 2,3....)

B. (4n+2) delocalised electrons (n = any integer including zero)

C. (4n+2) total electrons (n = 0, 1, 2, 3....)

D. (4n+2)n electrons (n = any non zero integer)

Answer: B

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3. During ozonolysis of Imole of benzene, number of moles of ozone consumed is

A. 1

B. 2

C. 3

D. 4

Answer: C

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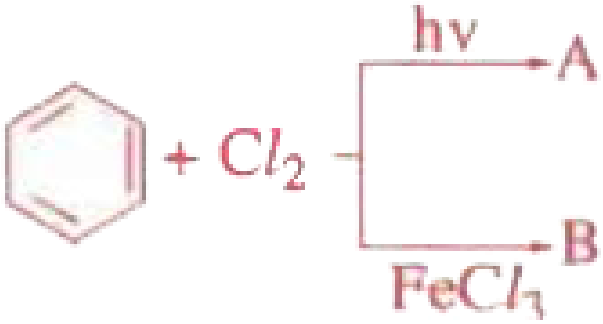
4.



Compounds A and B respectively are

A. Hexachlorocyclohexane, C_6H_5CI

B. Chlorobenzene, Hexa chlorocyclohexane

C. o-and p-Dichlorobenzene, chlorobenzene

D. Chlorobenzene, $C_6H_6Cl_6$

Answer: A

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5. $C_2H_4Br_2 \xrightarrow{alcKOH} A \xrightarrow[\text{Metal tube}]{\text{Red hot}} B.$

The characterisitc reactions of B are

A. Nucleophilic addition

B. Electrophilic addition

C. Radical addition

D. Electrophilic substitution

Answer: D

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6. Which of the following is not aromatic ?

A. Cyclooctatetraene

B. Benzene

C. Naphthalene

D. Anthracene

Answer: A

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7. Benzene does not undergo addition reaction easily because

A. It has six hydrogen atoms

B. It has a cyclic structure

C. Double bonds present in benzene are strong

D. Resonance stabilised system is to be preserved.

Answer: D

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8. The reagent used for converting benzene to ethyl benzene is

A. C_2H_5CI anhydrous $AlCl_3$

B. C_2H_5Cl, aqueous $AlCl_3$

C. C_2H_5OH, anhydrous $AICI_3$

D. C_2H_5CI, $SOCI_2$

Answer: A

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9. Benzene on treating with a mixture of conc. HNO_3 and H_2SO_4 at $100^\circ C$ gives

A. Nitrobenzene

B. m-Dinitrobenzene

C. o-Dinitrobenzene

D. p-Dinitrobenzene

Answer: B

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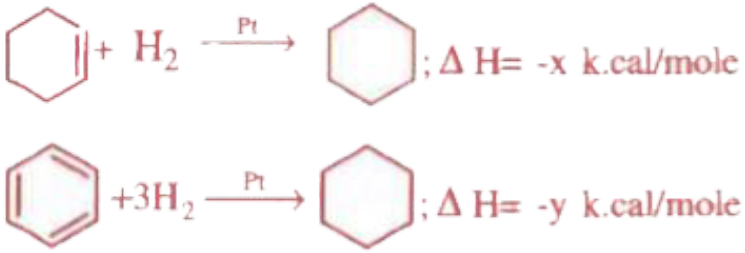

10.

The correct relation among the following is

A. $x = y$

B. $y = 3x$

C. $3x - y = 36k.\ cal$

D. $x - 3y = 36k.\ cal$

Answer: C

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11. Arrange the following compounds in the descending order of their reactivity towards electrophilic substitution.

a) Chlorobenzene

b) Nitrobenzene

c) Benzene

d) Phenol

e) Toluene

A. d gt e gt c gt a gt b

B. b gt a gt c gt e gt d

C. d gt e gt c gt b gt a

D. e gt d gt c gt a gt b

Answer: A

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12. Match the following

List - I	List - II
1) O^-, $p-$ directing and ring activating	a) $-NO_2$
2) O^-, $p-$ directing and ring deactivating	b) $-Cl$
3) m - directing and ring deactivating	c) $-OH$

The correct match among the following is

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13. The ratio of the number of hybrid and pure orbitals in C_6H_6 used for bonding is

A. $3:2$

B. $2:3$

C. $1:1$

D. $4:3$

Answer: A

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14. Number of $\sigma sp^2 - sp^2$ bonds present in a molecule of X in the process

$C_6H_6 \xrightarrow{H_2/Ni}$

A. 5

B. 3

C. 12

D. Zero

Answer: D

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15. In which of the following reactions, aromatic character is retained ?

A. $C_6H_6 \xrightarrow{H_2/Ni} X$

B. $C_6H_6 \xrightarrow[Zn/H_2O]{O_3} Y$

C. $C_6H_6 \xrightarrow[AlCl_3]{CH_3COCl} Q$

D. $C_6H_6 \xrightarrow[\text{light}]{Cl_2} R.$

Answer: C

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16. The correct arrangement for decreasing order of electrophilic subsitution reactions of

I) Toluene II) Benzene

III) Phenol IV) Chlorobenzene

A. I gt II gt III gt IV

B. IV gt I gt II gt III

C. III gt I gt II gt IV

D. II gt IV gt III gt I

Answer: C

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17. Which one of the following is benzene ring deactivating group towards electrophilic substitution ?

A. $-NHCOCH_3$

B. $-N(NH_3)_2$

C. $-OH$

D. $-Br$

Answer: D

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18. When acetylene is passed through red hot iron tube, compound X is formed. Which one of the following reactions will yield X as the major product?

A. $C_6H_5SO_3H + NaHCO_3 \rightarrow$

B. $C_6H_5Cl + H_2O \xrightarrow{\Delta}$

C. $C_6H_{12} + 3H_2 \xrightarrow{Ni}$

D. $C_6H_5COONa + NaOH \xrightarrow[\Delta]{+CaO}$

Answer: D

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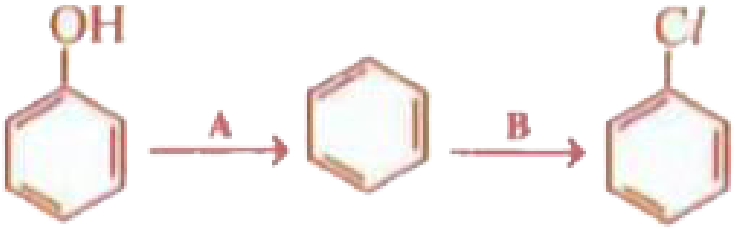
19. Identify the reagents A and B used in the following reactions



A. $Zn, Cl_2 / FeCl_3$

B. $Sn / HCl, Cl_2 / hv$

C. $Cl_2 / Fe, FeCl_3$

D. $Cl_2 / hv, Zn$

Answer: B

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20. Choose the correct reagents used in the conversion,

$$CH_2 = CH_2 \xrightarrow{(p)} \underset{\underset{Br}{|}}{CH_2} - \underset{\underset{Br}{|}}{CH_2} - \xrightarrow{(q)}$$

$$CH_2 = CHBr \xrightarrow{(r)} CH \equiv CH \xrightarrow{(s)} C_6H_6$$

A.

p	q	r	s
Br_2	$alc.\ KOH$	$NaOH$	Al_2O_3

B.

p	q	r	s
HBr	$alc.\ KOH$	CaC_2	$KMnO_4$

C.

p	q	r	s
HBr	$alc.\ KOH$	$NaNH_2$	red hot Fe

D.

p	q	r	s
Br_2	$alc.\ KOH$	$NaNH_2$	red hot Fe

Answer: D

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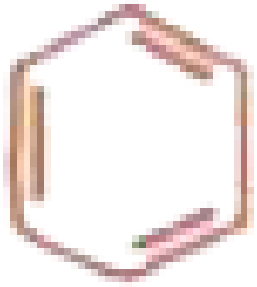
21.  + Excess of chlorine $\xrightarrow[\text{dark,cold}]{\text{anhyd } AlCl_3} X$

The correct statements of the following

I) 'X' is aromatic compound

II) 'X' is benzene hexachloride

III) 'X' is used as insecticide

IV) 'X' is hexachloro benzene

A. I and III

B. II and III

C. III and IV

D. I and IV

Answer: D

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22. What is 'x' in the following reaction ?

$$C_6H_5 - C \equiv C - H \xrightarrow[dil\,, H_2SO_4]{Hg^{+2}} X.$$

A. $C_6H_5 - COCH_3$

B. $C_6H_5 - CH_2CHO$

C. $C_6H_5 - CHO$

D. $C_6H_5 - CH_2OH$

Answer: A

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23. Among the following compounds, which are not aromatic ?

A) 

B) 

C) 

D) 

A. A, B and C

B. A, C and D

C. A, B and D

D. C and D

Answer: B

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24. Deactivating nature and o- ,p- directing nature of halogens can be explained by the effects respectively

A. $-I,\ -M$

B. $-I,\ +M$

C. $+I,\ +M$

D. $+I,\ -M$

Answer: B

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25. $CaC_2 + 2H_2O \rightarrow X$

$CH_3 - CH_2Cl \xrightarrow{\text{alc}KOH} Y, X \xrightarrow{Z} Y$

In this reaction the reagent 'Z' is

A. $Ni\,/\,H_2$

B. $LiAlH_4$

C. $H_2 - Pd + BaSO_4$

D. $(Zn - Hg) + conc.\ HCI$

Answer: C

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26. C_6H_6 easily shown

A. Ring fission reaction since it is unstable

B. Addition reactions since it is saturated

C. Electrophilic substitution reactions due to stable ring

D. Nucleophilic substitution reactions due to stable ring

Answer: C

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27. LIST - 1 (Conversion)

A) Benzene $\rightarrow$ Cyclohexane

B) Ethylene $\rightarrow$ Formaldehyde

C) Acetylene $\rightarrow$ Ethylene

D) Benzene $\rightarrow$ Toluene

LIST - 2 (Process involved)

1) Hydration

2) Controlled hydrogenation

3) Hydrogenation

4) Ozonolysis

5) Alkylation

The correct match is

A. $\begin{matrix} A & B & C & D \\ 5 & 4 & 1 & 2 \end{matrix}$

B. $\begin{matrix} A & B & C & D \\ 1 & 2 & 3 & 4 \end{matrix}$

C. $\begin{matrix} A & B & C & D \\ 3 & 4 & 2 & 5 \end{matrix}$

D. $\begin{matrix} A & B & C & D \\ 4 & 3 & 2 & 1 \end{matrix}$

Answer: C

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28. Ozonolysis of one mole of benzene gives

A. One mole glyoxal and two moles methyl glyoxal

B. three moles of glyoxal

C. one mole methylglyoxal and two moles glyoxal

D. three moles of methyl glyoxal

Answer: B

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29. Ethyl benzene with Br_2 in the presence of $FeBr_3$ gives

A. Phenyl bromoethane

B. o and p-Bromotoluenes

C. o and p-Bromo ethyl benzenes

D. Mixture of all these

Answer: C

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30. Cyclohexene adds one mole of H_2, where the enthalpy of hydrogenation is $-119.6kJmol^{-1}$. The enthalpy of cyclohexatriene is about

A. $-119.6kJmol^{-1}$

B. $-203.3kJmol^{-1}$

C. $-239.2kJmol^{-1}$

D. $-358.8kJmol^{-1}$

Answer: D

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31. Regarding Benzene some statements are given

A) It is aromatic

B) It burns with smoky and sooty flame

C) It can't decolourise Br_2 water

D) It mainly participates in electrophilic substitution reactions

A. Both 'A' and 'B' are correct

B. Both 'B' and 'C' are correct

C. Both 'C' and 'D' are correct

D. All are correct

Answer: D

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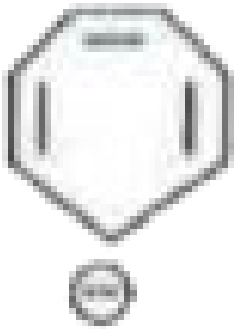
32. Which of the following is not an aromatic compound

A. 

B. 

C. 

D. 

Answer: A

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33. Sodium benzoate gives Benzene on being heated with 'X'. Phenol gives Benzene on being heated wit‘Y'. 'X' and 'Y' are respectively,

A. Sodalime and copper1

B. Zn dust and NaOH

C. Soda lime and Zn dust

D. NaOH and Zn dust

Answer: C

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34. The major product in the reaction of benzene with n-propyl chloride in the presence of anhydrous $AlCl_3$

A. n-propyl benzene

B. Isopropyl benzene

C. Toluene

D. Ter.butyl benzene

Answer: B

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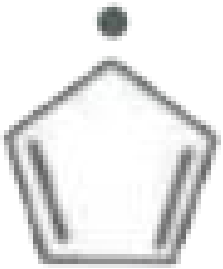
35. Which of the following species is aromatic?



A.

B.

C.

D.

Answer: D

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36. Characterisitc reactions of benzene are

A) addition reactions

B) substitution reactions

A. A but not B

B. B but not A

C. both A and B

D. neither A nor B

Answer: D

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37. Although benzene is highly unsaturated it does not undergo addition reactions. The explanation of this can be suggested as

A. π-electrons of benzene ring are delocalized

B. since -electrons are present inside the ring, addition cannot take place

C. cyclic structures do not show addition reactions

D. benzene is not a reactive compound

Answer: A

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38. Benzene on ozonolysis followed by reaction with Zn and H_2O gives 3 moles of

A. glycerol

B. glyoxal

C. glyoxalic acid

D. acetylene

Answer: B

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39. Which one of the following statements is correct?

A. Cyclohexadiene is an aromatic compound

B. Deactivating groups are ortho and para directing groups

C. Reaction of benzene with 1-chloro propane and anhydrous $AlCl_3$ gives n propylbenzene

D. Electrophilic substitution of benzene takes place via σ-complex

Answer: D

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40. A miscible mixture of $C_6H_6 + CHCl_3$ can be separated by

A. Sublimation

B. Distillation

C. Filtration

D. Crystallisation

Answer: B

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41. Electrophile that participates in nitration of benzene is

A. NO^+

B. NO_2^+

C. NO

D. NO_3^-

Answer: B

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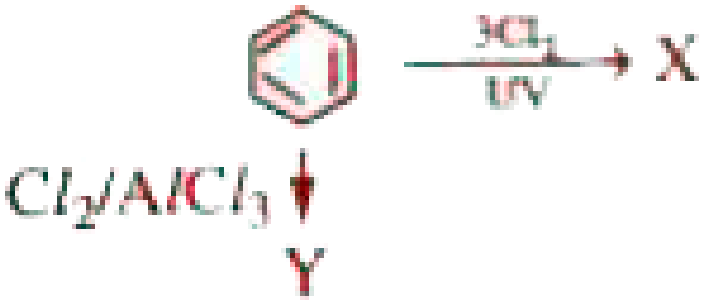
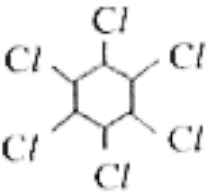
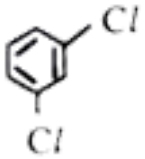
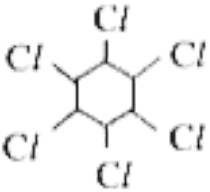
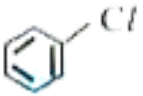
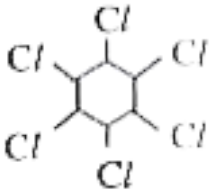
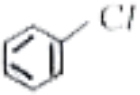
42. Identify X and Y in the following reactions

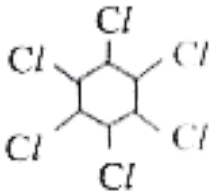
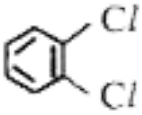


X Y

1)  

2)  

3)  

4)  

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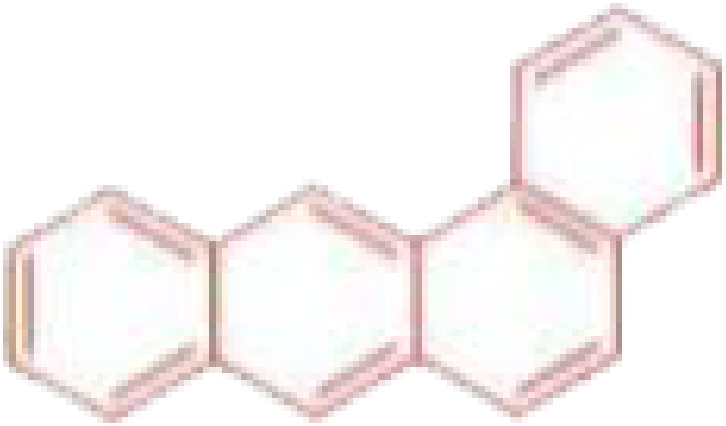
Objective Exercies 2 Carcinogenicity

1. Name of



A. 1, 2 - benzpyrene

B. 1, 2, 5, 6 - Dibenzanthracene

C. 3 - methyl chlolanthrene

D. 1, 2 - benzanthracene

Answer: D

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2. Which of the following enter into human body and undergos various biochemical reactions and finally demage DNA and cause cancer ?

A. Ethyl alcohol

B. 3-Methyl cholanthrene

C. 1-D-Glucopyranose

D. 2-D-Fructofuranose

Answer: B

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3. Which one of the following causes cancer?

A. 1,2-Benzpyrene

B. n-Hexane

C. 2-Butene

D. Cyclohexane

Answer: A

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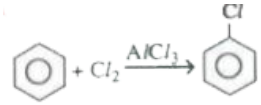
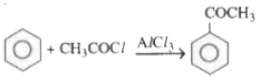
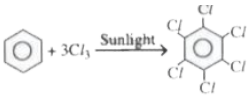
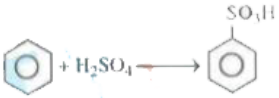
4. Which of the following reactions is not an example of electrophilic substitution in benzene ring?

A. 

B. 

C. 

D. 

Answer: C

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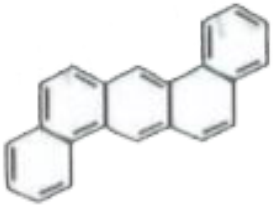
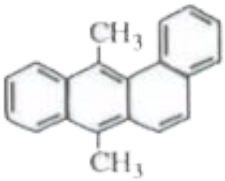
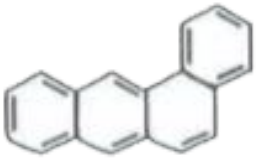
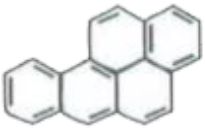
5. 1,2,5,6-Dibenzahthracene of the following

A. 

B. 

C. 

D. 

Answer: A

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Objective Exercies 3 Recent Aipmt Neet Questions

1. Using anhydrous $AICI_3$ as catalyst which one of the following reactions produces ethyl benzene

A. $H_3C - CH_2OH + C_6H_6$

B. $CH_3 - CH = CH_2 + C_6H_6$

C. $H_2C = CH_2 + C_6H_6$

D. $H_3C - CH_3 + C_6H_6$

Answer: C

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2. Benzene reacts with CH_3Cl in the presence of anhydrous $AlCl_3$ to form

A. toluene

B. chlorobenzene

C. benzylchloride

D. xylene

Answer: A

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3. In the following reaction,

$C_6H_5CH_2Br \xrightarrow[2.H_3O^+]{1.\text{Mg .Ehter}} (X)$,X, the product 'X' is

A. $C_6H_5CH_2CH_2C_6H_5$

B. $C_6H_5CH_2OCH_2C_6H_5$

C. $C_6H_5CH_2OH$

D. $C_6H_5CH_3$

Answer: D

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4. Among the following compounds the one that is most reactive towards electrophilic nitration is

A. toluene

B. benzene

C. benzoic acid

D. nitrobenzene

Answer: A

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5. Some meta directing substituents in aromatic substitution are given which one is most deactivating?

A. $-SO_3H$

B. $-COOH$

C. $-NO_2$

D. $-C \equiv N$

Answer: C

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6. Which of the following compounds will not undergo Friedel - Crafts reaction easily ?

A. Xylene

B. Nitrobenzene

C. Toluene

D. Cumene

Answer: B

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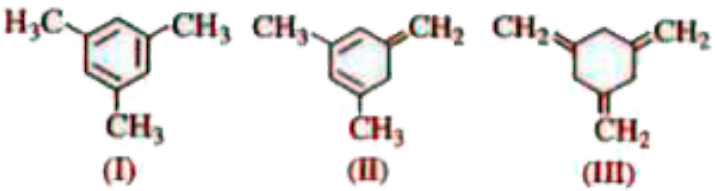
7. Given :



The enthalpy of the hydrogenation of these compounds will be in the order as :

A. II gt II gt I

B. II gt III gt I

C. II gt I gt III

D. I gt II gt III

Answer: A

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8. The oxidation of benzene by V_2O_5 in the presence of air produces

A. benzoic acid

B. benzaldehyde

C. benzoic anhydride

D. maleic anhydride

Answer: D

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9. Consider the nitration of benzene using mixed conc. H_2SO_4 and HNO_3 If a large amount of $KHSO_4$ is added to the mixture, the rate of nitration will be

A. faster

B. slower

C. unchanged

D. doubled

Answer: B

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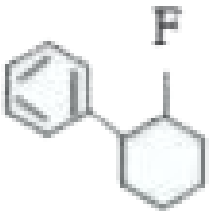
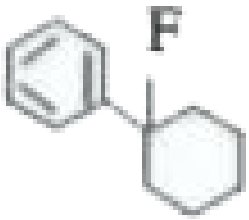
10. In the given reaction the product

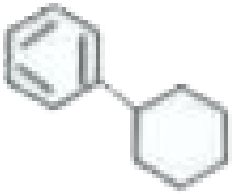
is

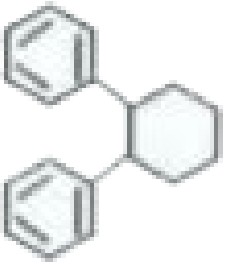


A.



B.

C. 

D. 

Answer: C

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