Organic Chemistry Some Basic Principles & Techniques

Question1

The set of meta directing functional groups from the following sets is:

[1-Feb-2024 Shift 2]

Options:

A.

^{-}CN, $^{-}NH2$, ^{-}NHR, $^{-}OCH_3$

B.

$^{-}NO2$, $^{-}NH2$, $^{-}COOH$, $^{-}COOR$

C.

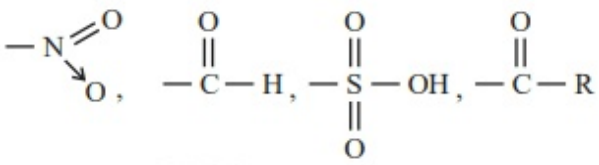
$^{-}NO_2$, ^{-}CHO, $^{-}SO_3H$, ^{-}COR

D.

$-CN$, $-CHO$, $-NHCOCH_3$, $-COOR$

Answer: C

Solution:



All are −M, Hence meta directing groups.

Question2

Following Kjeldahl's method, 1g of organic compound released ammonia, that neutralised 10 mL of $2MH_2SO_4$. The percentage of nitrogen in the compound is_____ %.

[1-Feb-2024 Shift 2]

Answer: 56

Solution:

$H_2SO_4 + 2NH_3 \rightarrow (NH_4)_2SO_4$

Millimole of $H_2SO_4 \rightarrow 10 \times 2$

So Millimole of $NH_3 = 20 \times 2 = 40$

Organic $\rightarrow$ NH_3

Compound 40 Millimole

$\therefore$ Mole of $N = \frac{40}{1000}$

wt. of N = $\frac{40}{1000} \times 14$

% composition of N in organic compound

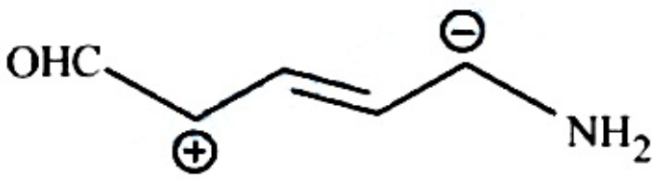
$= \frac{40 \times 14}{1000 \times 1} \times 100$

$= 56\%$

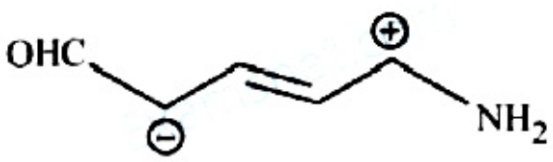
Question3

Increasing order of stability of the resonance structure is :

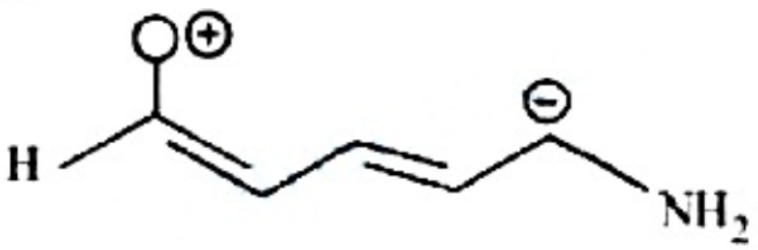
A.



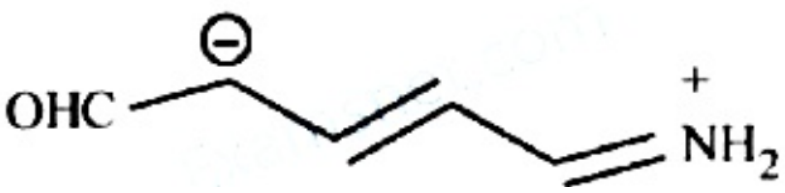
B.



C.



D.



[24-Jan-2023 Shift 1]

Options:

A. C, D, B, A

B. C, D, A, B

C. D, C, A, B

D. D, C, B, A

Answer: B

Solution:

No option is matching the correct answer.
Order should be : C < A < B < D

Question4

Given below are two statements, one is labelled as Assertion A and the other is labelled as Reason R. Assertion A : Benzene is more stable than hypothetical cyclohexatriene.
Reason R : The delocalized π electron cloud is attracted more strongly by nuclei of carbon atoms. In the light of the above statements, choose the correct answer from the options given below:
[24-Jan-2023 Shift 2]

Options:

A. A is true but R is false.

B. A is false but R is true.

C. Both A and R are correct and R is the correct explanation of A.

D. Both A and R are correct but R is NOT the correct explanation of A.

Answer: C

Solution:

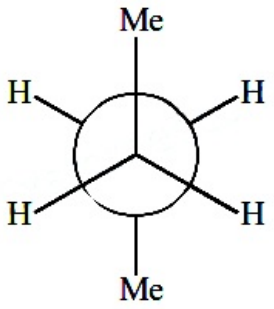
Assertion - A : Benzene is more stable than cyclohexatriene (True)
Reason $-$R : Delocalised $\pi - e$ cloud lies B.M.O so more attracted by nuclei of carbon atom.
(True & Correct Explanation)

Question5

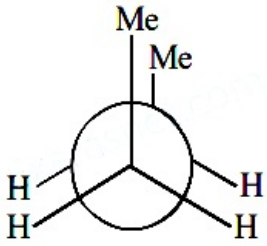
Which of the following conformations will be the most stable?
[25-Jan-2023 Shift 1]

Options:

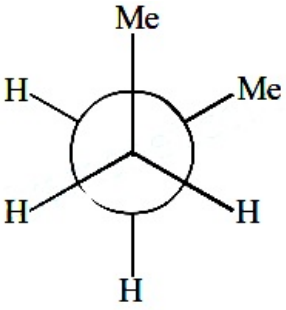
A.



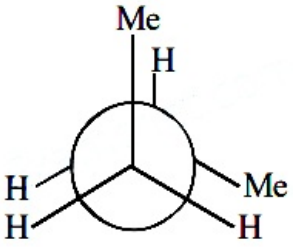
B.



C.



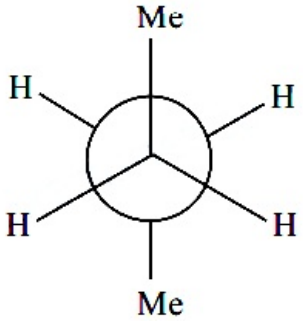
D.



Answer: A

Solution:

Conformation



has lowest vanderwaal and torsional strain. Hence it must be most stable.

Question6

In sulphur estimation. 0.471g of an organic compound gave 1.4439g of barium sulphate.
The percentage of sulphur in the compound is _____ (Nearest Integer)
(Given: Atomic mass Ba: 137u : S : 32u, O : 16u)
[25-Jan-2023 Shift 1]

Answer: 42

Solution:

$$\%\text{sulphur} = \frac{32}{233} \times \frac{\text{weight of } BaSO_4 \text{ formed}}{\text{weight of organic compound}} \times 100$$

$$= \frac{32}{233} \times \frac{1.4439}{0.471} \times 100$$

$$= 42.10$$

Nearest integer 42

Question7

The isomeric deuterated bromide with molecular formula C_4H_8DBr having two chiral carbon atoms is
[25-Jan-2023 Shift 2]

Options:

A. 2-Bromo-1-deuterobutane

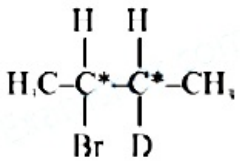
B. 2-Bromo-2-deuterobutane

C. 2-Bromo-3-deuterobutane

D. 2-Bromo-1-deutero-2-methylpropane

Answer: C

Solution:



Question8

Match List I with List II.

List I Isomeric pairs	List II Type of isomers
A. Propanamine and N-Methylethanamine	I. Metamers
B. Hexan-2-one andHexan-3-one	II. Positional isomers
C. Ethanamide andHydroxyethanimine	III. Functional isomers
D. o-nitrophenol and pnitrophenol	IV. Tautomers

Choose the correct answer from the options given below :- [25-Jan-2023 Shift 2]

Options:

A. A-III, B-IV, C-I, D-II

B. A-IV, B-III, C-I, D-II

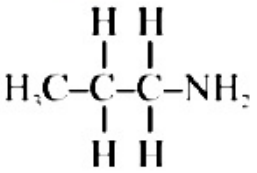
C. A-II, B-III, C-I, D-IV

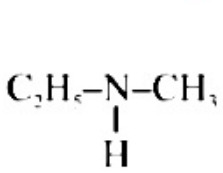
D. A-III, B-I, C-IV, D-II

Answer: D

Solution:

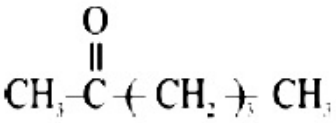
A. Propanamine N–Methylethanamine

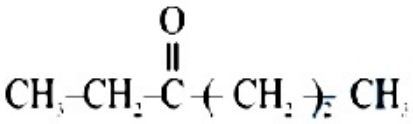




⇒ Functional isomers

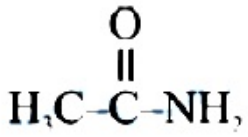
B. Hexan–2–one Hexan–3–one

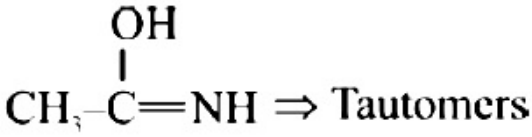




⇒ Metamers

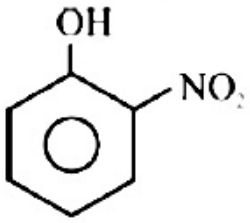
C. Ethanamide Hydroxyethanimine





⇒ Tautomers

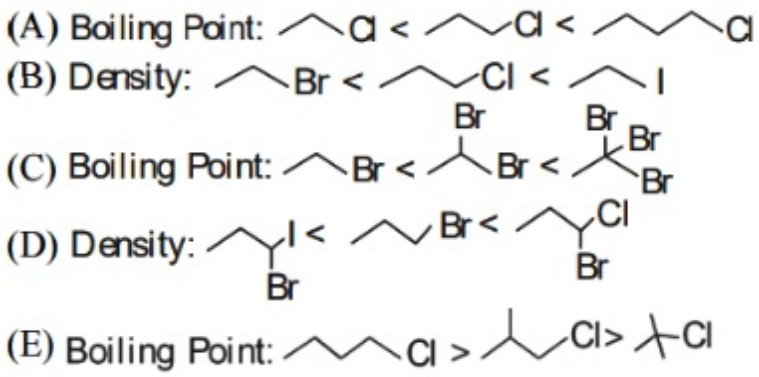
D. o–Nitrophenol p–nitrophenol



⇒ Positional isomers

Question9

Identify the correct order for the given property for following compounds



Choose the correct answer from the option given below :-
[29-Jan-2023 Shift 1]

Options:

A. (B), (C) and (D) only

B. (A), (C) and (E) only

C. (A), (C) and (D) only

D. (A), (B) and (E) only

Answer: B

Solution:

Boiling point of alkyl halide increases with increase in size, mass of halogen atom and size of alkyl group
Boiling point of isomeric alkyl halide decreases with increase in branching
Density increases with increase in atomic mass of halogen atom

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Question10

Compound that will give positive Lassaigne's test for both nitrogen and halogen is
[29-Jan-2023 Shift 1]

Options:

A. $N_2H_4 \cdot HCl$

B. $CH_3NH_2 \cdot HCl$

C. NH_4Cl

D. $NH_2OH \,.\, HCl$

Answer: B

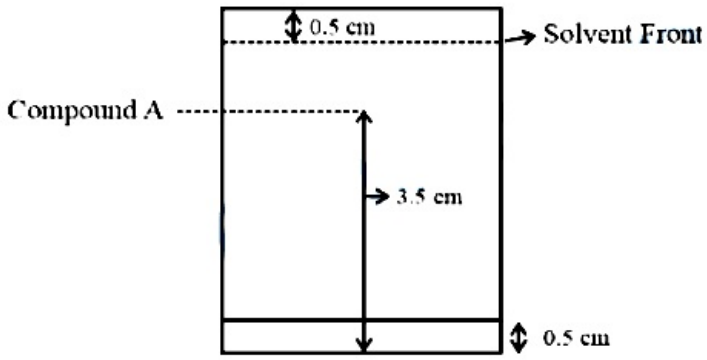
Solution:

$$CH_3NH_2 \cdot HCl \xrightarrow[\text{fusion}]{\text{Na}} \text{NaCN and NaCl}$$

NaCN gives +ve test for nitrogen and
NaCl gives +ve test for halogen

Question11

Following chromatogram was developed by adsorption of compound ' A ' on a 6 cm TLC glass plate. Retardation factor of the compound ' A ' is $\times 10^{-1}$.



[29-Jan-2023 Shift 1]

Answer: 6

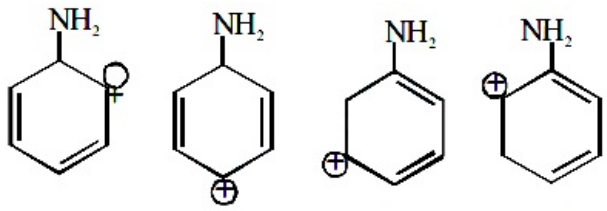
Solution:

$$R_f = \frac{\text{Distance moved by the substance frombase line}}{\text{Distance move dby the solvent frombase line}}$$

$$= \frac{3.0\,\text{cm}}{5.0\,\text{cm}} = 0.6 \text{ or } 6 \times 10^{-1}$$

Question12

The most stable carbocation for the following is:



[30-Jan-2023 Shift 2]

Options:

A. c

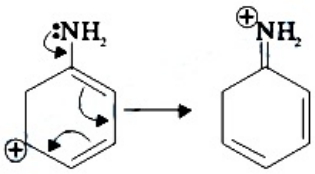
B. d

C. b

D. a

Answer: A

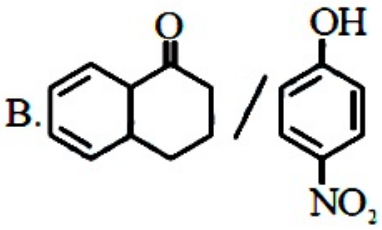
Solution:



The +M effect of NH_2 is stabilizing the carbocation.

Question13

Match items of column I and II

Column I (Mixture of compounds)	Column II (Separation Technique)
A. H_2O/CH_2Cl_2	i. Crystallization
B. 	ii. Differential solvent extraction
C. Kerosene/Naphthalene	iii. Column chromatography
D. $C_6H_{12}O_6/NaCl$	iv. Fractional Distillation

Correct match is:
[31-Jan-2023 Shift 1]

Options:

A. A-(iii), B-(iv), C-(ii), D-(i)

B. A-(i), B-(iii), C-(ii), D-(iv)

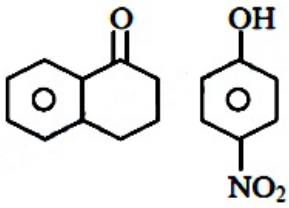
C. A-(ii), B-(iii), C-(iv), D-(i)

D. A-(ii), B-(iv), C-(i), D-(iii)

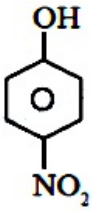
Answer: C

Solution:

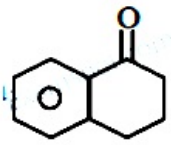
A. H_2O / CH_2Cl_2→ ii, CH_2Cl_2 > H_2O (density) so they can be separated by differential solvent extraction.
B.



iii. column chromatography Due to H-bonding in



it can be separated from



by column chromatography.
C. Kerosene / Naphthalene → iv. Fractional distillation.
Due to different B.P. of kerosene and Naphthalene it can be separated by fractional distillation.
D. $C_6H_{12}O_6$ / NaCl→ i. Crystallization.
NaCl (ionic compound) can be crystallized.

Question14

Consider the following reaction

Propanal + Methanal $\xrightarrow[\substack{(ii)\Delta \\ (iii)\,NaCN \\ (iv)H_3O+}]{(i)dil.\ NaOH}$ Product B $(C_5H_8O_3)$

The correct statement for product B is. It is [31-Jan-2023 Shift 1]

Options:

A. optically active and adds one mole of bromine

B. racemic mixture and is neutral

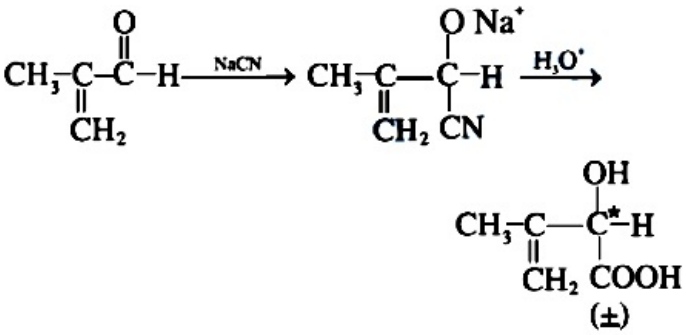
C. racemic mixture and gives a gas with saturated $NaHCO_3$ solution

D. optically active alcohol and is neutrall

Answer: C

Solution:

$$CH_3 - CH_2 - CHO + HCHO \xrightarrow[\Delta]{OH^-}$$



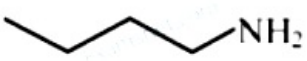
Carboxylic acid will give CO_2 gas, with $NaHCO_3$ solution

Question15

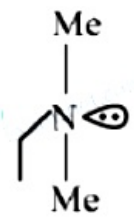
An organic compound [A]($C_4H_{11}N$), shows optical activity and gives N_2 gas on treatment with HNO_2. The compound [A] reacts with $PhSO_2Cl$ producing a compound which is soluble in KOH. The structure of A is: [31-Jan-2023 Shift 2]

Options:

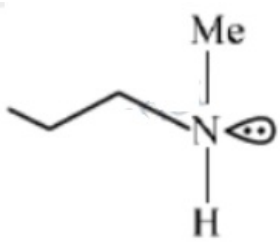
A.



B.



C.



D.

Answer: D

Solution:

$C_4H_{11}N$ releases N_2 with HNO_2 i.e. it is primary amine.
After reacting with Hinsberg reagent it forms a compound which is soluble in KOH,
Hence, the amine is primary.

Question16

In Dumas method for the estimation of N_2, the sample is heated with copper oxide and the gas evolved is passed over:
[31-Jan-2023 Shift 2]

Options:

A. Ni

B. Copper gauze

C. Pd

D. Copper oxide

Answer: B

Solution:

Duma's method.
The nitrogen containing organic compound, when heated with CuO in a atmosphere of CO_2, yields free N_2 in addition to CO_2 and H_2O.

$$C_xH_yN_z + \left(2x + \frac{y}{2}\right) CuO \rightarrow$$

$$xCO_2 + \frac{y}{2}H_2O + \frac{z}{2}N_2 + \left(2x + \frac{y}{2}\right) Cu$$

Traces of nitrogen oxides formed, if any, are reduced to nitrogen by passing the gaseous mixture over heated copper gauze.

Question17

In the following halogenated organic compounds the one with maximum number of chlorine atoms in its structure is :
[31-Jan-2023 Shift 2]

Options:

A. Chloral

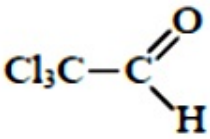
B. Gammaxene

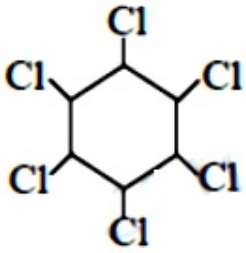
C. Chloropicrin

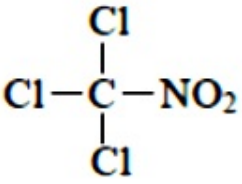
D. Freon -12

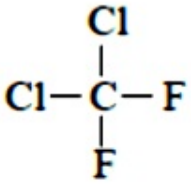
Answer: B

Solution:

(1) Chloral 

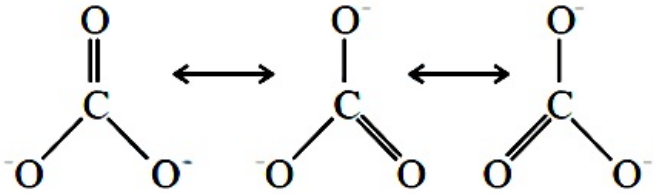
(2) Gammaxene 

(3) Chloropicrin 

(4) Freon - 12 

Question18

Resonance in carbonate ion (CO_3^{2-}) is



Which of the following is true?
[1-Feb-2023 Shift 1]

Options:

A. It is possible to identify each structure individually by some physical or chemical method.

B. All these structures are in dynamic equilibrium with each other.

C. Each structure exists for equal amount of time.

D. CO_3^{2-} has a single structure i.e., resonance hybrid of the above three structures.

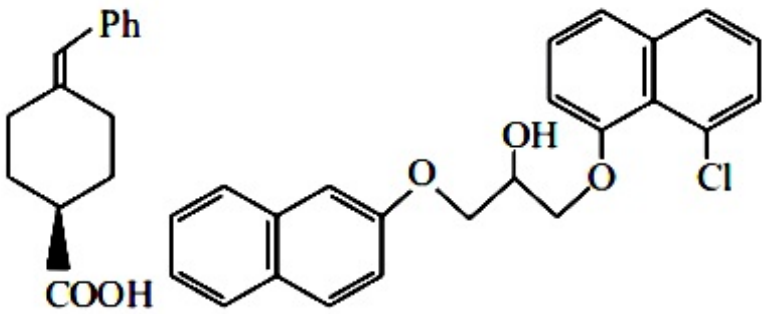
Answer: D

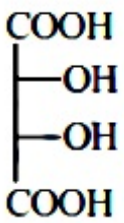
Solution:

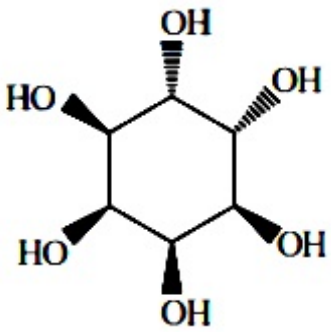
Resonating structure are hypothetical and resonance hybrid is real structure which is weighted average of all the resonating structures.

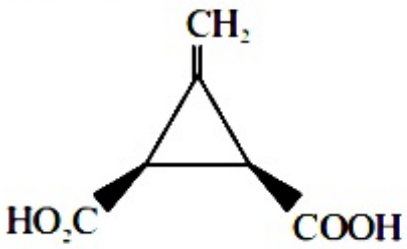
Question19

The total number of chiral compound/s from the following is _____.





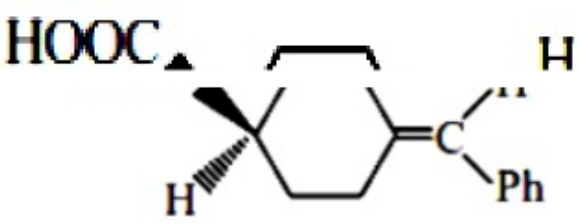




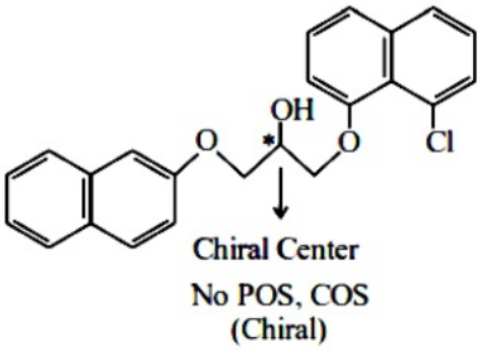
[1-Feb-2023 Shift 1]

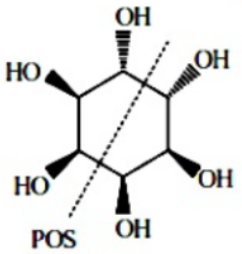
Answer: 2

Solution:

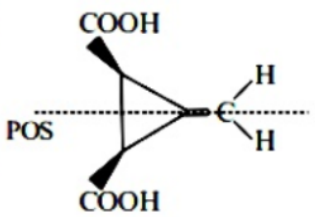


No POS, COS
(Chiral)





(Achiral)



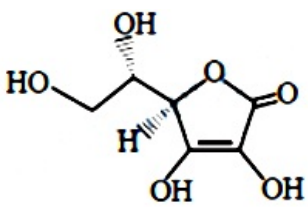
(Achiral)

Question20

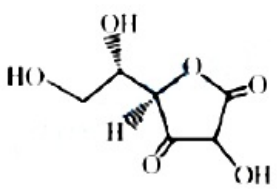
All structures given below are of vitamin C. Most stable of them is : [1-Feb-2023 Shift 2]

Options:

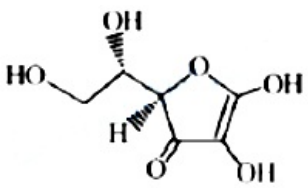
A.



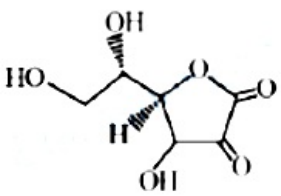
B.



C.



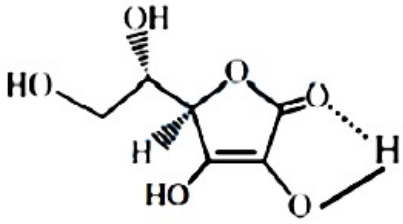
D.



Answer: A

Solution:

H-bonding stabilised vitamin C



Question21

Given below are two statements:
Statement I : Sulphanilic acid gives esterification test for carboxyl group.
Statement II : Sulphanilic acid gives red colour in Lassigne's test for extra element detection.
In the light of the above statements, choose the most appropriate answer from the options given below :
[1-Feb-2023 Shift 2]

Options:

A. Statement I is correct but Statement II is incorrect.

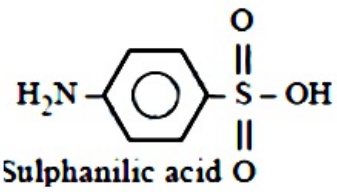
B. Both Statement I and Statement II are incorrect.

C. Both Statement I and Statement II are correct.

D. Statement I is incorrect but Statement II is correct.

Answer: D

Solution:

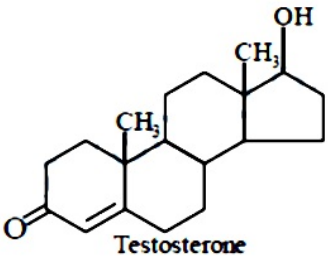


Sulphanilic acid

Does not show esterification test.
Presence of both sulphur and nitrogen give red colour in Lassigne's test.

Question22

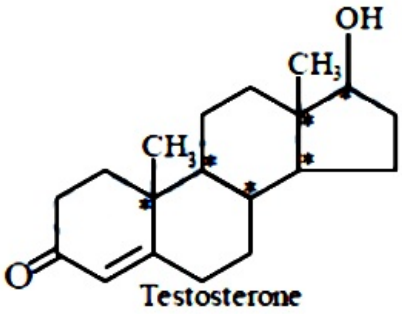
Testosterone, which is a steroidal hormone, has the following structure.



The total number of asymmetric carbon atom / s in testosterone is _____.
[1-Feb-2023 Shift 2]

Answer: None

Solution:



Question23

Match List I with List II

	List I Element detected		List II Reagent used Product formed
A	Nitrogen	I.	$Na_2[Fe(CN)_5NO]$
B	Sulphur	II.	$AgNO_3$
C	Phosphorous	III.	$Fe_4[Fe(CN)_6]_3$
D	Halogen	IV.	$(NH_4)_2MoO_4$

Choose the correct answer from the options given below:
[6-Apr-2023 shift 1]

Options:

A. A-II, B-IV, C-I, D-III

B. A-IV, B-II, C-I, D-III

C. A-II, B-I, C-IV, D-III

D. A-III, B-I, C-IV, D-II

Answer: D

Solution:

Nitrogen detection by lassaigne's method

$Na + C + N \rightarrow NaCN$

$6\,NaCN + FeSO_4 \rightarrow Na_4[Fe(CN)_6] + Na_2SO_4$

$Na_4[Fe(CN)_6] + Fe^{3+} \rightarrow \underset{\text{(Prussian blue)}}{Fe_4[Fe(CN)_6]_3}$

Sulphur detection by Sodium nitroprusside

$Na_2[Fe(CN)_5\,NO] + Na_2S \rightarrow \underset{\text{[Purple]}}{Na_4[Fe(CN)_5\,NOS]}$

Phosphorus detection by ammonium molybdate

$Na_3PO_4 + 3HNO_3 \rightarrow H_3PO_4 + 3NaNO_3$

$H_3PO_4 + 12(NH_4)_2MoO_4 + 21HNO_3 \rightarrow$

$\underset{\text{(canary yellow)}}{(NH_4)_3PO_4 \cdot 12MoO_3} + 21NH_4NO_3 + 12H_2O$

Halogen give specific coloured ppt with $AgNO_3(aq)$

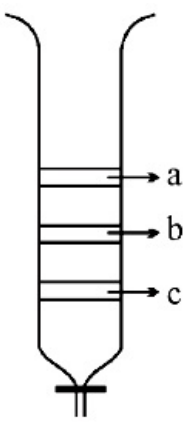
$NaCl + AgNO_3(aq) \rightarrow \underset{\text{(White)}}{AgCl} + NaNO_3$

$NaBr + AgNO_3(aq) \rightarrow \underset{\text{(Pale yellow)}}{AgBr} + NaNO_3$

$NaI + AgNO_3(aq) \rightarrow \underset{\text{(Yellow)}}{AgI} + NaNO_3$

Question24

From the figure of column chromatography given below, identify incorrect statements.
A. Compound 'c' is more polar than ' a ' and ' b '
B. Compound ' a ' is least polar
C. Compound ' b ' comes out of the column before 'c' and after ' a '
D. Compound ' a ' spends more time in the column Choose the correct answer from the options given below :-



[6-Apr-2023 shift 2]

Options:

A. A, B and C only

B. B, C and D only

C. A, B and D only

D. B and D only

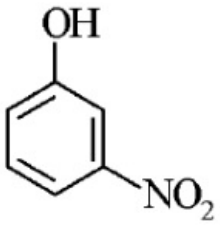
Answer: A

Question25

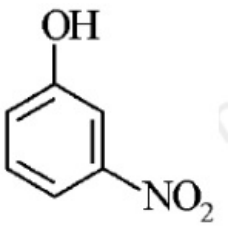
The strongest acid from the following is [6-Apr-2023 shift 2]

Options:

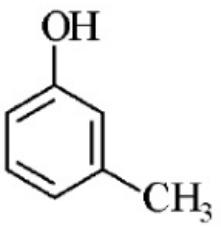
A.



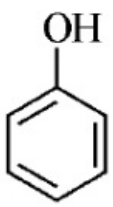
B.



C.



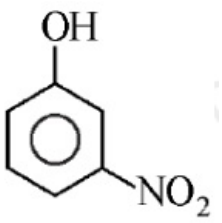
D.



Answer: A

Solution:

Strongest acid from the following is



$-NO_2$ group has more EWG nature so more acidic,

Question26

The descending order of acidity for the following carboxylic acid is -

A. CH_3COOH

B. $F_3C-COOH$

C. $ClCH_2-COOH$

D. $BrCH_2-COOH$

Choose the correct answer from the options given below: [8-Apr-2023 shift 2]

Options:

A. D > B > A > E > C

B. B > D > C > E > A

C. E > D > B > A > C

D. B > C > D < E > A

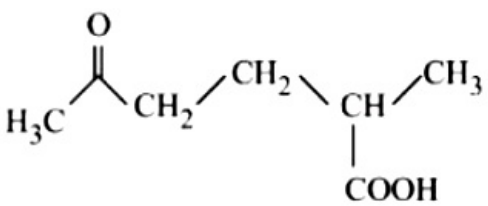
Answer: B

Solution:

Solution:
Acidity α stability of conjugate base
Stability order
$F_3C-COO^- > F-CH_2-COO^- > Cl-CH_2-COO^- > Br-CH_2-COO^- > CH_3COO^-$

Question27

The correct IUPAC nomenclature for the following compound is :



[8-Apr-2023 shift 2]

Options:

A. 2-Methyl-5-oxohexanoic acid

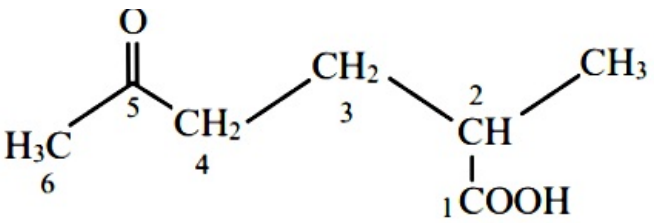
B. 2-Formyl-5-methylhexan-6-oic acid

C. 5-Formyl-2-methylhexanoic acid

D. 5-Methyl-2-oxohexan-6-oic acid

Answer: A

Solution:



2-Methyl-5-oxohexanoic acid

Question28

Using column chromatography mixture of two compounds ' A ' and ' B ' was separated. 'A' eluted first, this indicates ' B ' has [10-Apr-2023 shift 1]

Options:

A. high R_f, weaker adsorption

B. high R_f, stronger adsorption

C. low R_f, stronger adsorption

D. low R_f, weaker adsorption

Answer: C

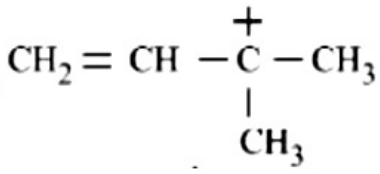
Solution:

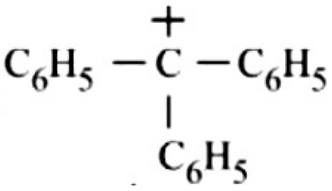
Solution:
More Polar the compound, the more it will adhere to the adsorbent and the smaller the distance it will travel from baseline, and Lower its R_f value.
B has Low R_f value and strong Adsoption

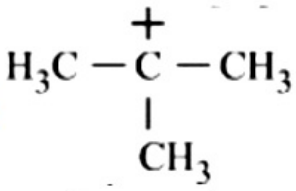
$$R_f = \frac{\text{distance covered by substance from base line}}{\text{total distance covered by solvent form base line}}$$

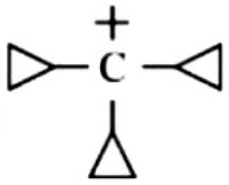
Question29

The decreasing order of hydride affinity for following carbonations is:

A. 

B. 

C. 

D. 

Choose the correct answer from the options given below:
[10-Apr-2023 shift 2]

Options:

A. C, A, D, B

B. A, C, B, D

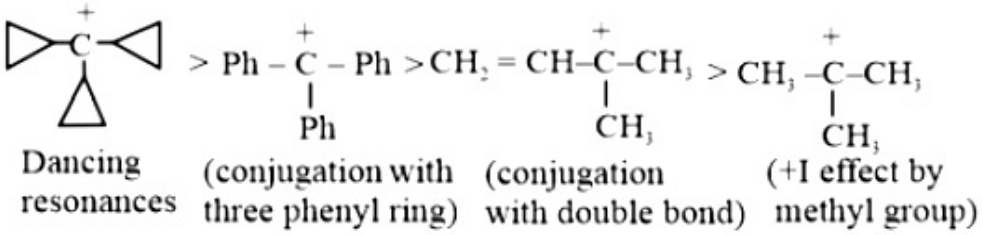
C. A, C, D, B

D. C, A, B, D

Answer: D

Solution:

$$\text{Stability of carbocation} \propto \frac{1}{\text{Hydride affinity}}$$

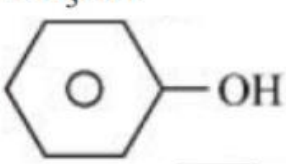


Question30

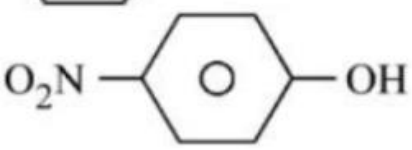
The correct order for acidity of the following hydroxyl compound is :

A. CH_3OH

B. $(CH_3)_3COH$

C. 

D. 

E. 

Choose the correct answer from the options given below:
[10-Apr-2023 shift 2]

Options:

A. E > C > D > A > B

B. D > E > C > A > B

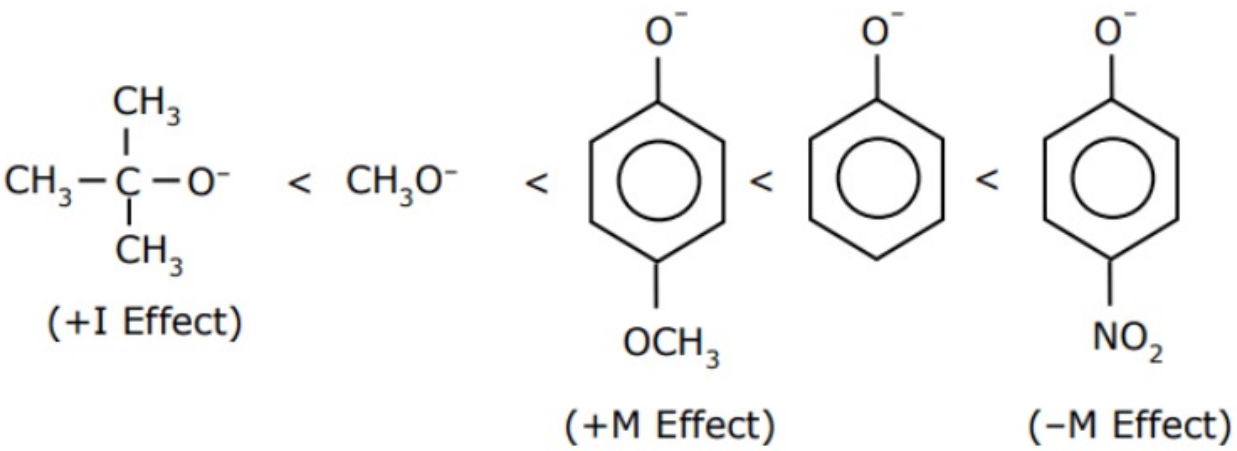
C. E > D > C > B > A

D. C > E > D > B > A

Answer: A

Solution:

Acidity ∝ stability of conjugate base
Stability order



Activity →E > C > D > A > B

Question31

In Carius tube, an organic compound ' X′ is treated with sodium peroxide to form a mineral acid ' Y′.The solution of $BaCl_2$ is added to ' Y′ to form a precipitate ' Z′ '.' Z ' is used for the quantitative estimation of an extra element. ' X ' could be
[10-Apr-2023 shift 2]

Options:

A. Chloroxylenol

B. Methionine

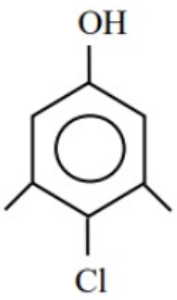
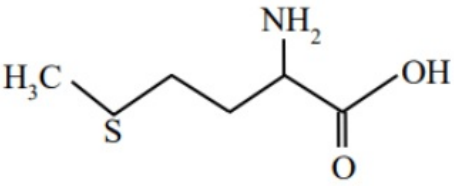
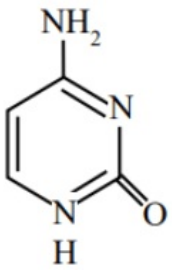
C. A nucleotide

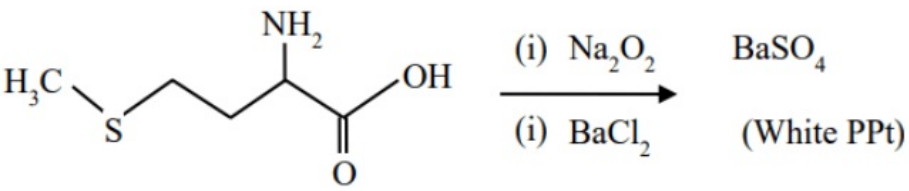
D. Cytosine

Answer: B

Solution:

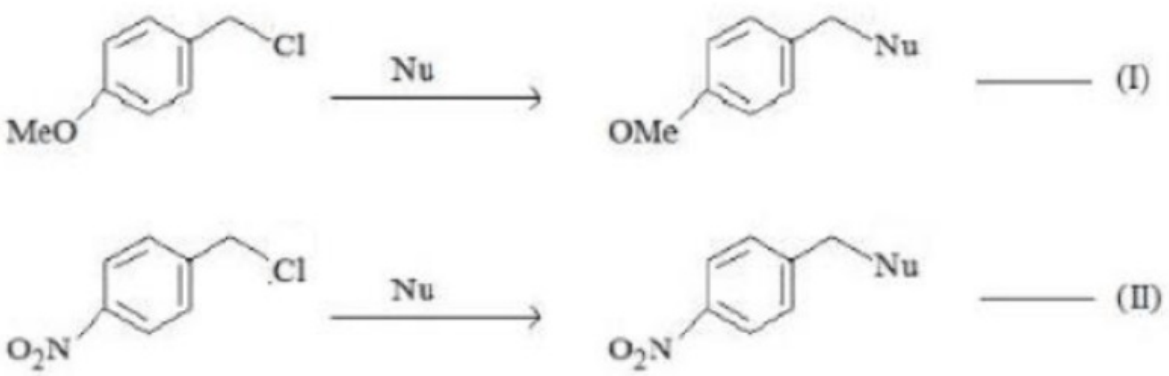
Carious method is used for quantitative analysis of sulfur

Chloroxylenol	Methionine		Cylosine
		Nucleotide Phosphate+ Sugar+ Nitrogeneous base	



So Methionine is correct answer

Question32



Where Nu = Nucleophile
Find out the correct statement from the options given below for the above 2 reactions.
[11-Apr-2023 shift 1]

Options:

A. Reaction (I) is of 1 st order and reaction (II) is of 2 nd order

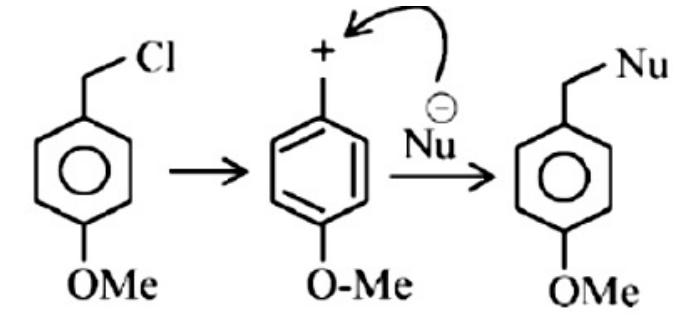
B. Reaction (I) and (II) both are 2 nd order

C. Reaction (I) and (II) both are 1 st order

D. Reaction (I) is of 2 nd order and reaction (II) is of 1 st order

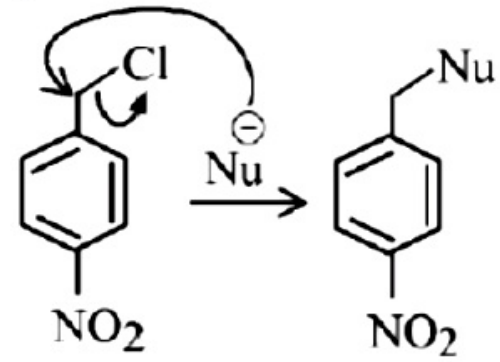
Answer: A

Solution:



Electron Donating group

S_N1 Mech. : I st order

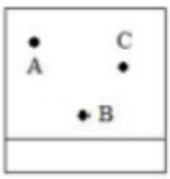


Electron withdrawing group

S_{N^2} Mech: 2 nd order

Question33

Thin layer chromatography of a mixture shows the following observation :



The correct order of elution in the silica gel column chromatography is [11-Apr-2023 shift 1]

Options:

A. B, A, C

B. C, A, B

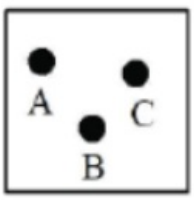
C. A, C, B

D. B, C, A

Answer: C

Solution:

Solution:



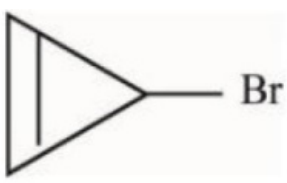
According to the observation, A is more mobile and interacts with the mobile phase more than C, and C is more drawn to the mobile phase than B.
Hence, the correct order of elution in the silica gel column chromatography is - B < C < A

Question34

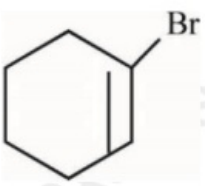
Compound from the following that will not produce precipitate on reaction with $AgNO_3$ is :
[11-Apr-2023 shift 2]

Options:

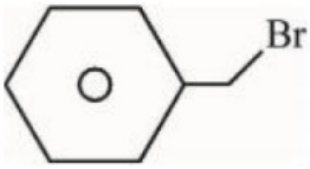
A.



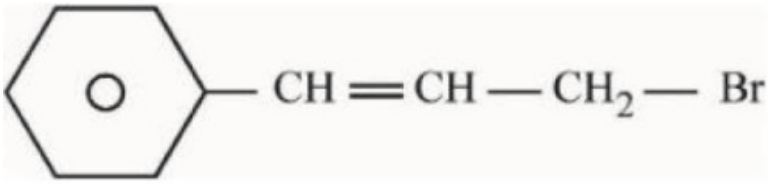
B.



C.

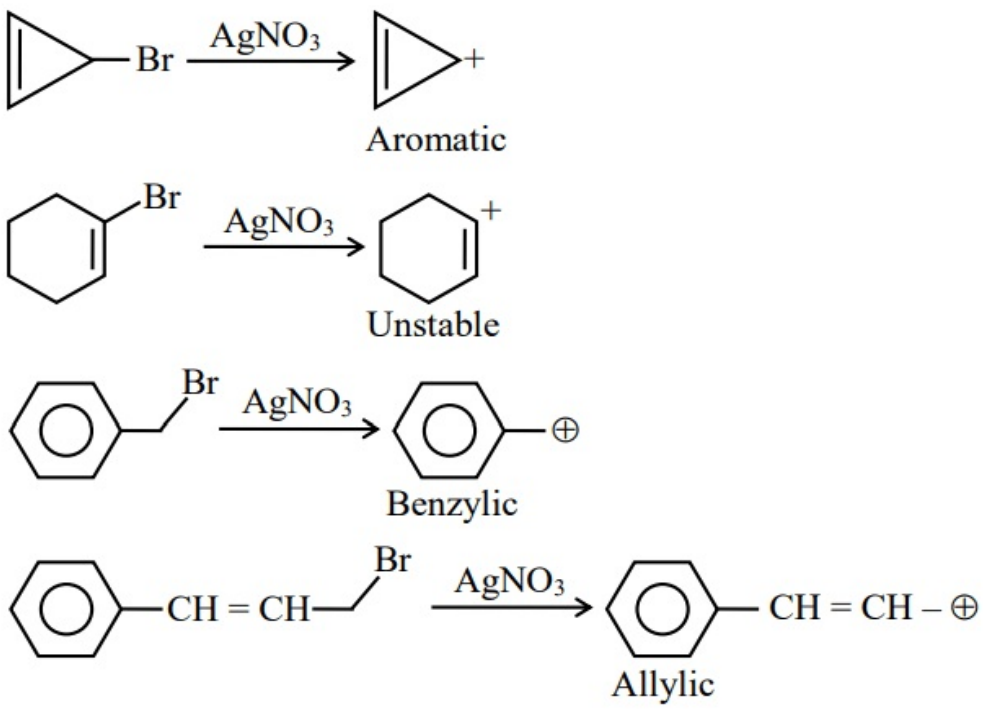


D.



Answer: B

Solution:

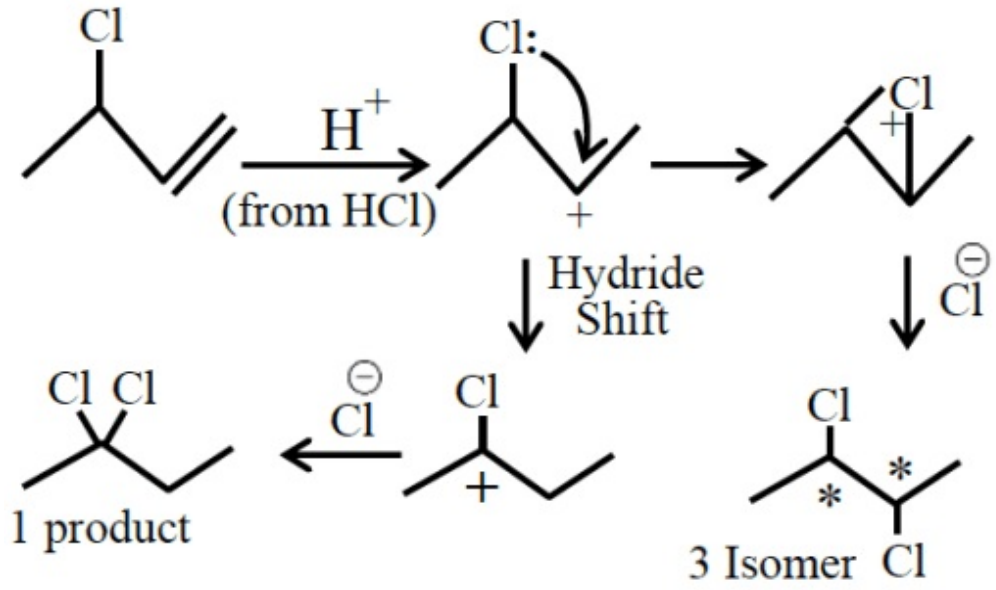


Question35

The number of possible isomeric products formed when 3-chloro-1-butene reacts with HCl through carbocation formation is _____ [11-Apr-2023 shift 2]

Answer: 4

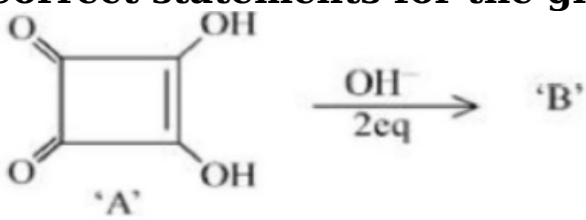
Solution:



Total Possible Isomeric product = 1 + 3 = 4

Question36

Correct statements for the given reaction are :



A. Compound ' B' is aromatic
B. The completion of above reaction is very slow
C. 'A' shows tautomerism
D. The bond lengths of C − C in compound B are found to be same
Choose the correct answer from the options given below:
[12-Apr-2023 shift 1]

Options:

A. A,B and C only

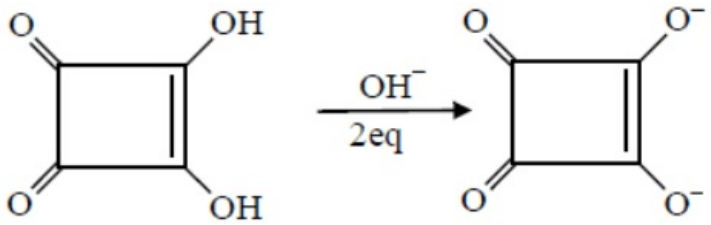
B. A, C and D only

C. B, C and D only

D. A, B and D only

Answer: B

Solution:

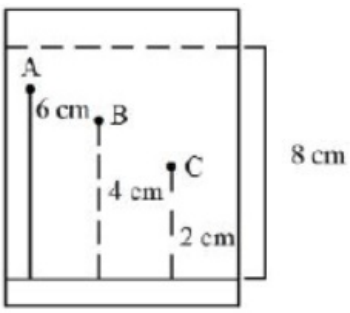


(A) (B)

(i) B is Aromatic
(ii) Completion of reaction is very fast due to formation of aromatic compound
(iii) A show keto-enol tautomerism
(iv) B is aromatic so C − C bond length are same.

Question37

Three organic compounds A, B and C were allowed to run in thin layer chromatography using hexane and gave the following result (see figure). The R_f value of the most polar compound is _____ $\times 10^{-2}$.



[12-Apr-2023 shift 1]

Answer: 25

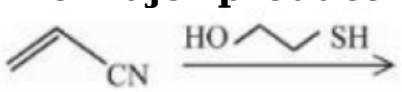
Solution:

Most polar compound - C - because of lowest moulmerls in upper direction

$$R_f = \frac{\text{Dis tan ce covered by compound}}{\text{Dis tance covered by solvent}} = \frac{2}{8} = 0.25 = 25 \times 10^{-2}$$

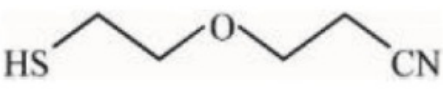
Question38

The major product for the following reaction is :

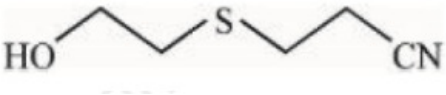


[13-Apr-2023 shift 2]

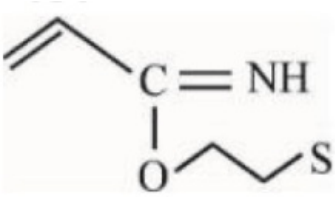
A.



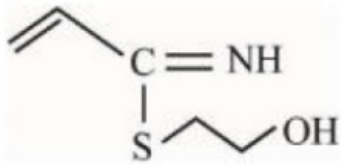
B.



C.

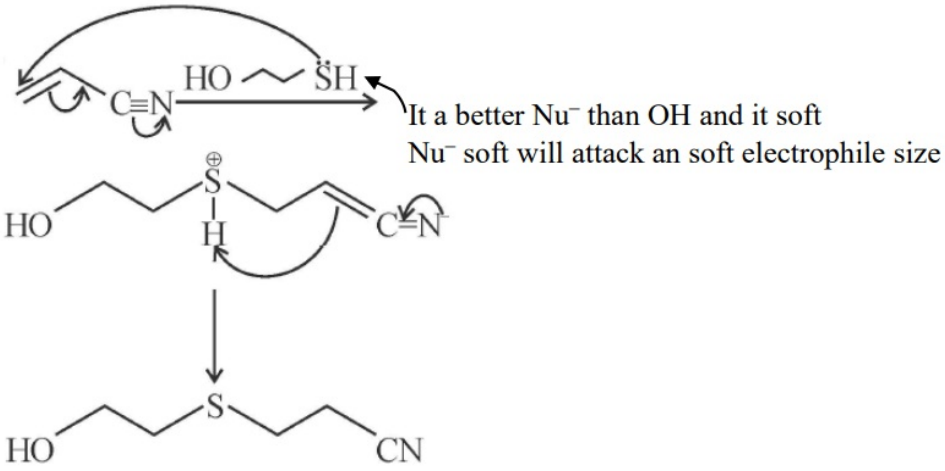


D.



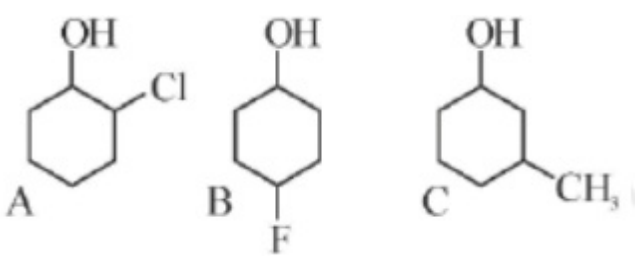
Answer: B

Solution:



Question39

Given below are two statements, one is labelled as Assertion A and the other is labelled as Reason R. Assertion A : Order of acidic nature of the following compounds is A >B > C.



Reason R : Fluoro is a stronger electron withdrawing group than Chloro group.
In the light of the above statements, choose the correct answer from the options given below :
[13-Apr-2023 shift 2]

Options:

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

B. A is false but R is true

C. Both A and R are correct but R is NOT the correct explanation of A

D. A is true but R is false

Answer: C

Solution:

Acidic strength $\alpha -I$ effect
$\alpha \frac{I}{+I}$ effect
F, Cl exerts -1 effect, Methyl exerts +I effect, C is least acidic.
Among A and B; since inductive effect is distance dependent, Extent of $-I$ effect is higher in A followed by B even though F is stronger electron withdrawing group than Cl. Thus, A is more acidic than B.

Question40

Given below are two statements :
Statement I : Tropolone is an aromatic compound and has 8π electrons.
Statement II : π electrons of >C = O group in tropolone is involved in aromaticity
In the light of the above statements, choose the correct answer from the options given below :
[13-Apr-2023 shift 2]

Options:

A. Statement I is false but Statement II is true

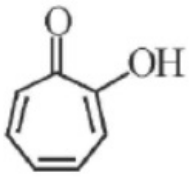
B. Statement I is true but Statement II is false

C. Both Statement I and Statement II are true

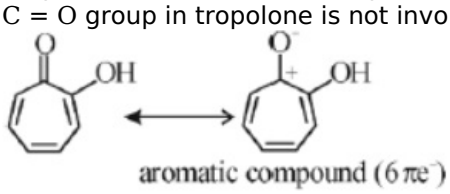
D. Both Statement I and Statement II are false

Answer: B

Solution:



Tropolone is an aromatic compound and has 8π electrons ($6\pi e^-$ are endocyclic and $2\pi e^-$ are exocyclic) and π electrons of C = O group in tropolone is not involved in aromaticity.



Question41

0.400g of an organic compound (X) gave 0.376g of AgBr in Carius method for estimation of bromine. \% of bromine in the compound (X) is _____ . (Given: Molar mass AgBr = 188gmol^{-1}, Br = 80gmol^{-1}) [13-Apr-2023 shift 2]

Answer: 40

Solution:

$$\text{mole of AgBr} = \frac{0.376}{188}$$

$$\text{mole of } Br^- = \text{mole of AgBr} = \frac{0.376}{188}$$

$$\text{mass of } Br^- = \frac{0.376}{188} \times 80$$

$$\%\ \text{of } Br^- = \frac{0.376 \times 80}{188 \times 0.4} \times 100 = 40\%$$

Question42

Which of the following statement is correct for paper chromatography? [15-Apr-2023 shift 1]

Options:

A. Water present in the pores of the paper forms the stationary phase.

B. Water present in the mobile phase gets absorbed by the paper which then forms the stationary phase

C. Paper sheet forms the stationary phase.

D. Paper and water present in its pores together form the stationary phase.

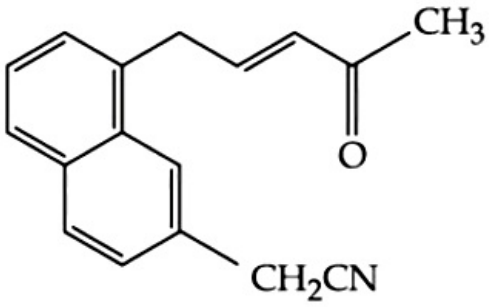
Answer: A

Solution:

Fact

Question43

Number of electrophilic centres in the given compound is

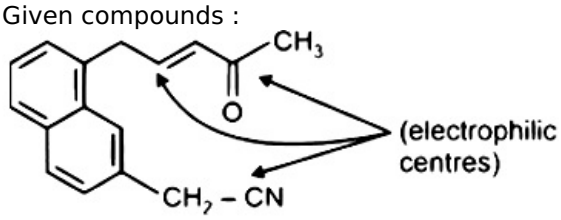


[24-Jun-2022-Shift-1]

Answer: 3

Solution:

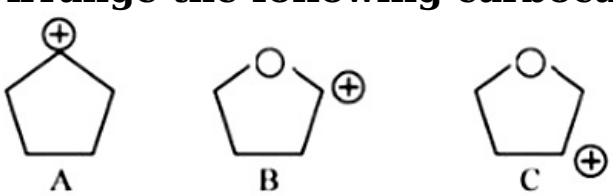
Given compounds :



Number of electrophilic centres = 3

Question44

Arrange the following carbocations in decreasing order of stability. A



[24-Jun-2022-Shift-2]

Options:

A. A > C > B

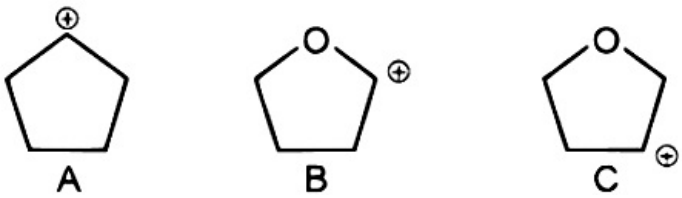
B. A > B > C

C. C > B > A

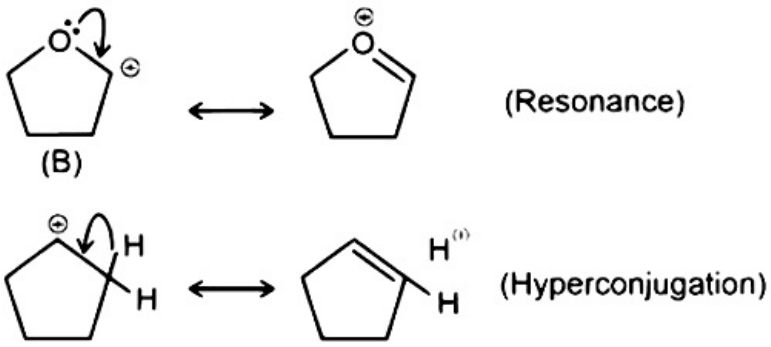
D. C > A > B

Answer: A

Solution:



Carbocation (A) is stabilised by hyperconjugation due to 4α hydrogen atoms. Carbocation (C) is also stabilised by hyperconjugation due to 4 a hydrogen atoms but destabilised by −1 effect of O-atom. Carbocation (B) is most stable as it is stabilised by resonance.
∴ Correct decreasing order of stability is B > A > C



Question45

0.2g of an organic compound was subjected to estimation of nitrogen by Dumas method in which volume of N_2 evolved (at STP) was found to be 22.400 mL. The percentage of nitrogen in the compound is _____[nearest integer]
(Given : Molar mass of N_2 is $28 gmol^{-1}$. Molar volume of N_2 at STP : 22.4L)
[24-Jun-2022-Shift-2]

Answer: 14

Solution:

Given volume of $N_2 = 22.400\,mL$

$\therefore$ Moles of $N_2 = \frac{22.400}{22400} = 10^{-3}$ mole

$\therefore$ Moles of N atoms $= 2 \times 10^{-3}$ mole

$\therefore$ Weigh of N atoms $= 14 \times 2 \times 10^{-3}$ mole

$= 28 \times 10^{-3}$ mole

$\therefore$% of N atom in the compound

$= \frac{28 \times 10^{-3}}{0.2} \times 100$

$= 14$

Question46

Phenol on reaction with dilute nitric acid, gives two products. Which method will be most efficient for large scale separation?
[25-Jun-2022-Shift-1]

Options:

A. Chromatographic separation

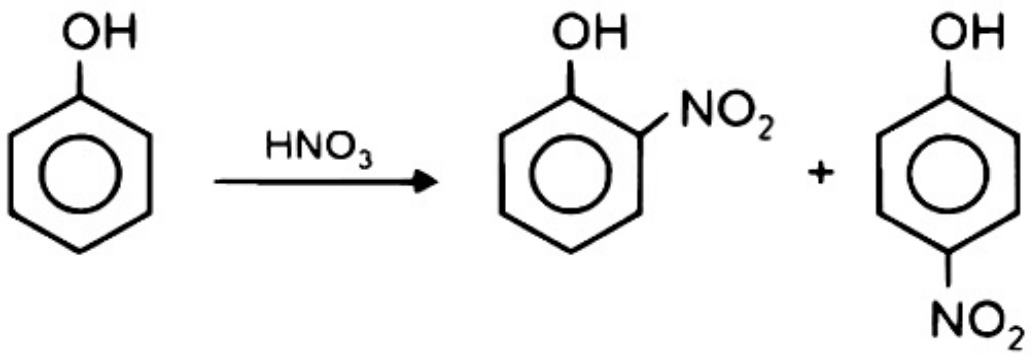
B. Fractional Crystallisation

C. Steam distillation

D. Sublimation

Answer: C

Solution:



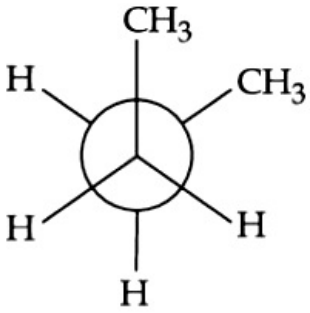
o-Nitrophenol and p-Nitrophenol can be easily separated by steam distillation.

Question47

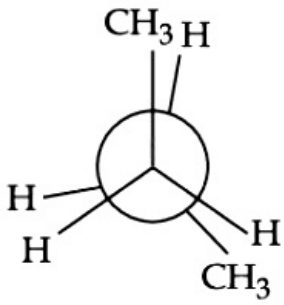
In the following structures, which on is having staggered conformation with maximum dihedral angle?
[25-Jun-2022-Shift-1]

Options:

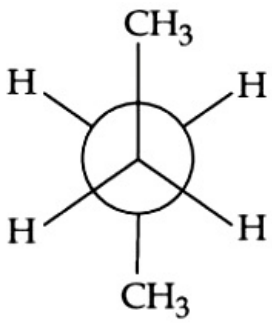
A.



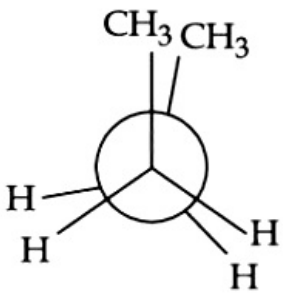
B.



C.

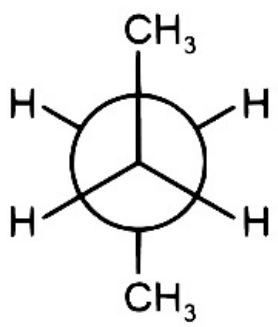


D.



Answer: C

Solution:



It is the staggered conformation with maximum dihedral angle.

Question48

The IUPAC name of ethylidene chloride is : [25-Jun-2022-Shift-1]

Options:

A. 1-Chloroethene

B. 1-Chloroethyne

C. 1,2-Dichloroethane

D. 1,1-Dichloroethane

Answer: D

Solution:

Solution:
Ethylidene chloride is $CH_3 - CHCl_2$, its IUPAC name is 1,1-Dichloromethane.

Question49

Given below are two statements : one is labelled as Assertion A and the other is labelled as Reason R.
Assertion A : A mixture contains benzoic acid and napthalene. The pure benzoic acid can be separated out by the use of benzene.
Reason R : Benzoic acid is soluble in hot water.
In the light of the above statements, choose the most appropriate answer from the options given below.
[25-Jun-2022-Shift-2]

Options:

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

B. Both A and R are true but 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

Solution:

Solution:
Since, both benzoic acid and naphthalene will dissolve in benzene. Hence assertion is wrong.
Benzoic acid is almost insoluble in cold water but soluble in hot water. Hence Reason is true

---

Question50

Given below are two statements :
Statement I : In 'Lassaigne's Test', when both nitrogen and sulphur are present in an organic compound, sodium thiocyanate is formed.
Statement II : If both nitrogen and sulphur are present in an organic compound, then the excess of sodium used in sodium fusion will decompose the sodium thiocyanate formed to give NaCN and Na_2S.
In the light of the above statements, choose the most appropriate answer from the options given below :
[26-Jun-2022-Shift-1]

Options:

A. Both Statement I and Statement II are correct.

B. Both Statement I and Statement II are incorrect.

C. Statement I is correct but Statement II is incorrect.

D. Statement I is incorrect but Statement II is correct.

Answer: A

Solution:

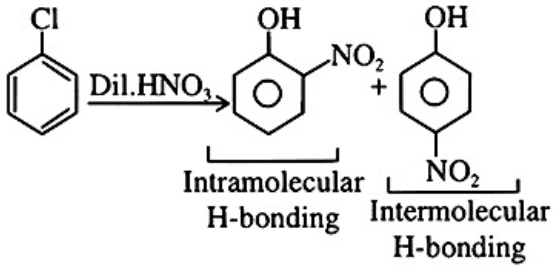
Solution:
Both statement I \& statement II are correct
$NaSCN + 2\,Na \rightarrow NaCN + Na_2S$

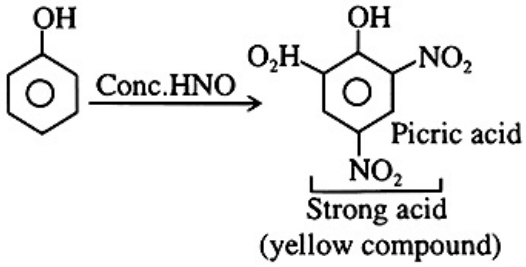
Question51

Compound 'P' on nitration with dil. HNO_3 yields two isomers (A) and (B). These isomers can be separated by steam distillation. Isomers (A) and (B) show the intramolecular and intermolecular hydrogen bonding respectively. Compound (P) on reaction with conc. HNO_3 yields a yellow compound ' C ', a strong acid. The number of oxygen atoms is present in compound ' C '_____
[26-Jun-2022-Shift-1]

Answer: 7

Solution:





Question52

The correct order of nucleophilicity is [26-Jun-2022-Shift-2]

Options:

A. $F^- > OH^-$

B. $H_2\ddot{O} > OH^-$

C. $R\ddot{O}H > RO^-$

D. $NH_2^- > NH_3$

Answer: D

Solution:

Solution:

$\underset{\text{Acid}}{NH_3} \longrightarrow \underset{\text{Conjugate base}}{NH_2^-} + H^+$

Conjugate base of acid is always a stronger nucleophile.

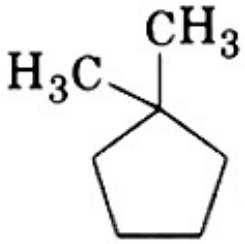
Question53

Total number of possible stereoisomers of dimethyl cyclopentane is___ [27-Jun-2022-Shift-1]

Answer: 6

Solution:

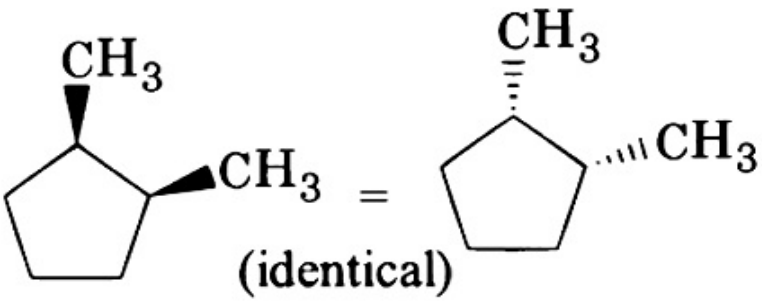
Dimethyl cyclopentane



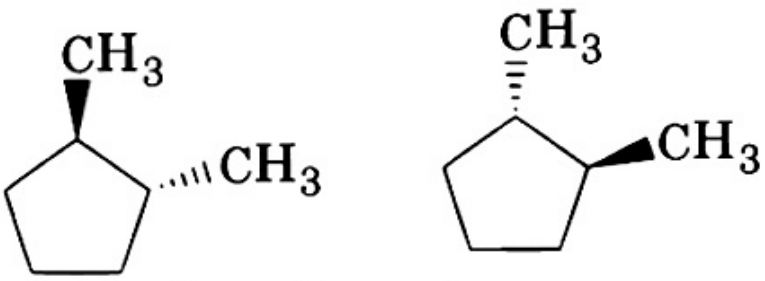
1,1-dimethylcyclopentane

no stereoisomer

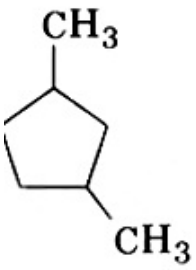
will show stereo isomerism, Its stereo isomers are



(identical)

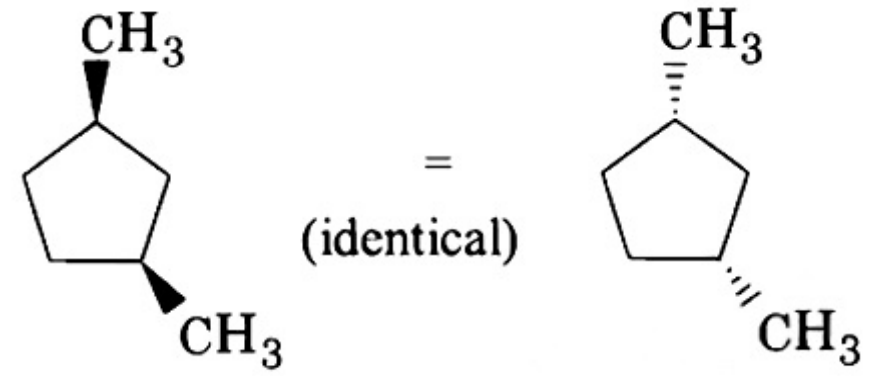


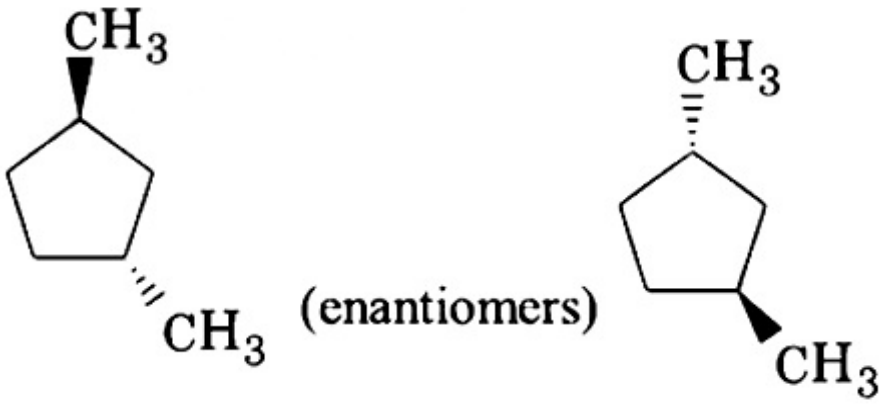
(enantiomers)



1,3-dimethylcyclopentane

will show stereo isomerism, Its stereo isomers are



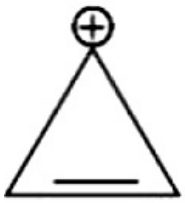


Question54

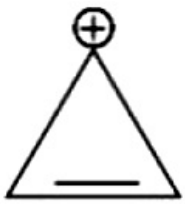
Which of the following is most stable?
[27-Jun-2022-Shift-2]

Options:

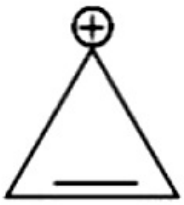
A.



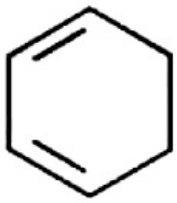
B.



C.



D.



Answer: A

Solution:

Solution:

 — Aromatic compound ($2\pi e^-$)

 — Carbene (electron deficient)

 — Anti Aromatic compound ($4\pi e^-$)

 — Non-aromatic conjugated diene

1,3-cyclohexadiene is most stable because it is a neutral molecule. All others are intermediates and hence less stable.

Question55

0.25g of an organic compound containing chlorine gave 0.40g of silver chloride in Carius estimation. The percentage of chlorine present in the compound is_____ [in nearest integer]
(Given : Molar mass of Ag is $108 g mol^{-1}$ and that of Cl is $35.5 g mol^{-1}$)
[27-Jun-2022-Shift-2]

Answer: 40

Solution:

Given, weight of organic compound $= 0.25\text{g}$

Moles of AgCl $= \frac{0.4}{\text{M}}$

Molecular mass of AgCl(M) $= 143.5\,\text{gm}$

$\therefore$ Moles of AgCl $= \frac{0.4}{143.5}$

$\therefore$ Mass of Cl $= \frac{0.4}{143.5} \times 35.5$

Mass % of Cl in the organic compound

$$= \frac{\frac{35.5 \times 0.4}{143.5}}{0.25} \times 35.5$$

$= 39.58$

$\simeq 40$

Question56

Which one of the following techniques is not used to spot components of a mixture separated on thin layer chromatographic plate? [28-Jun-2022-Shift-1]

Options:

A. I_2 (Solid)

B. U.V. Light

C. Visualisation agent as a component of mobile phase

D. Spraying of an appropriate reagent

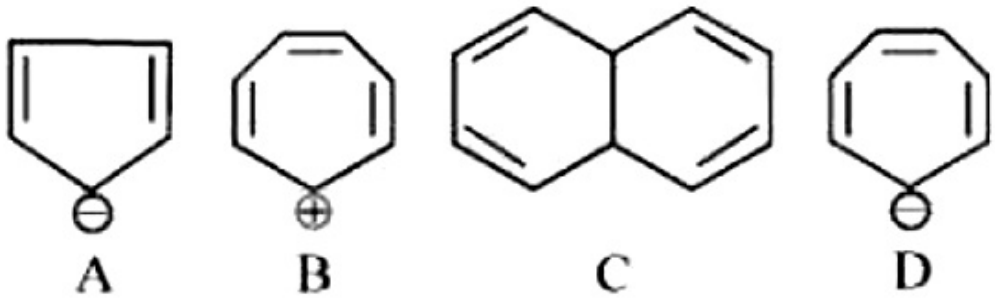
Answer: C

Solution:

Solution:
TLC is a technique used to separate mixture of compounds based on differences in polarity. In TLC a glass plate coated with a stationary phase is spotted with the mixture to be separated.

Question57

Which of the following structure are aromatic in nature?



[28-Jun-2022-Shift-1]

Options:

A. A, B, C, and D

B. Only A and B

C. Only A and C

D. Only B, C and D

Answer: B

Solution:

Solution:
A and B are aromatic as they are cyclic, planar and has $4n + 2\pi e^-(n = 1)$

Question58

The formula of the purple colour formed in Laissaigne's test for sulphur using sodium nitroprusside is
[28-Jun-2022-Shift-1]

Options:

A. $NaFe[Fe(CN)_6]$

B. $Na[Cr(NH_3)_2(NCS)_4]$

C. $Na_2[Fe(CN)_5(NO)]$

D. $Na_4[Fe(CN)_5(NOS)]$

Answer: D

Solution:

$S^{2-} + [Fe(CN)_5 NO)]^{2-} \rightarrow [Fe(CN)_5(NOS)]^{4-}$

Question59

In the estimation of bromine, 0.5g of an organic compound gave 0.40g of silver bromide. The percentage of bromine in the given compound is ____% (nearest integer)
(Relative atomic masses of Ag and Br are 108u and 80u, respectively).
[28-Jun-2022-Shift-1]

Answer: 34

Solution:

Solution:
188g AgBr has 80g of Br

$\therefore 0.4\,\text{g AgBr} = \frac{80}{188} \times 0.4$

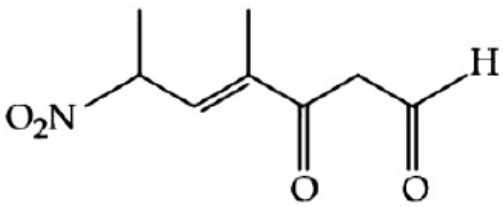
% of Br in given organic compound

$= \frac{80 \times 0.4}{188 \times 0.5} \times 100$

$\approx 34\%$

Question60

The correct IUPAC name of the following compound is :



[28-Jun-2022-Shift-2]

Options:

A. 4-methyl-2-nitro-5-oxohept-3-enal

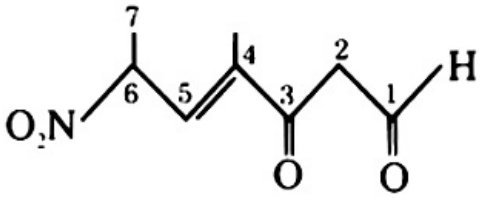
B. 4-methyl-5-oxo-2-nitrohept-3-enal

C. 4-methyl-6-nitro-3-oxohept-4-enal

D. 6-formyl-4-methyl-2-nitrohex-3-enal

Answer: C

Solution:



4-Methyl-6-nitro-3-oxohept-4-enal

Question61

Kjeldahl's method was used for the estimation of nitrogen in an organic compound. The ammonia evolved from 0.55g of the compound neutralised 12.5 mL of 1M H_2SO_4 solution. The percentage of nitrogen in the compound is_____ . (Nearest integer)
[29-Jun-2022-Shift-1]

Answer: 64

Solution:

Meq of H_2SO_4 used by $NH_3 = 12.5 \times 1 \times 2 = 25$

% of N in the compound $= \dfrac{25 \times 10^{-3} \times 14 \times 100}{0.55} = 63.6$

Meq. of H_2SO_4 = Meq. of NH_3

$12.5 \times 1 \times 2 = 25$ meq. of NH_3

$= 25$ millimoles of NH_3

So Millimoles of ' $N^{'}$ $= 25$

Moles of ' $N^{'}$ $= 25 \times 10^{-3}$

wt. of N $= 14 \times 25 \times 10^{-3}$

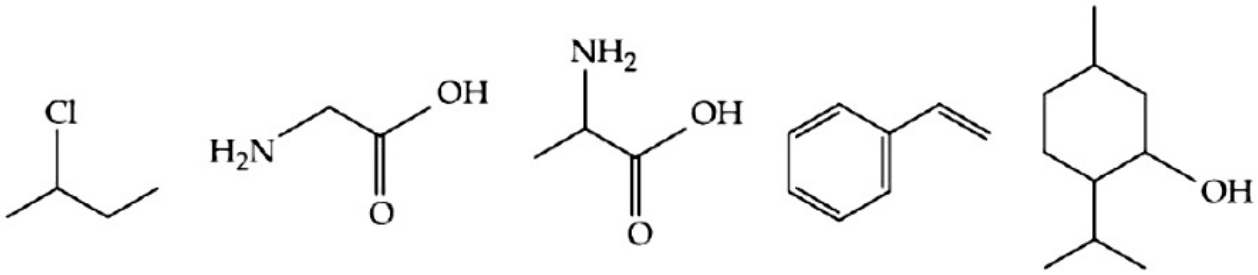
$\%N = \dfrac{14 \times 25 \times 10^{-3}}{0.55} \times 100$

$= 63.66$

$\approx 64\%$

Question62

Observe structures of the following compounds

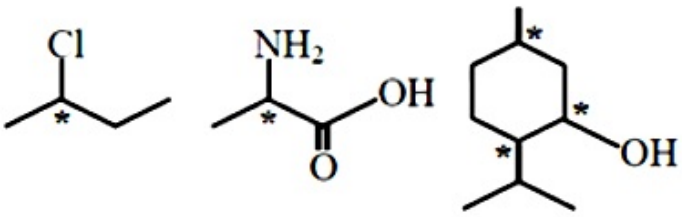


The total number of structures/compounds which possess asymmetric

carbon atoms is _____.
[29-Jun-2022-Shift-1]

Answer: 3

Solution:



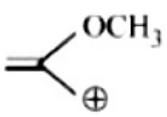
Number of compounds containing asymmetric carbons are three.

Question63

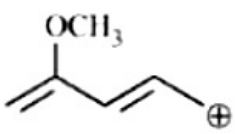
Which of the following carbocations is most stable?
[29-Jun-2022-Shift-2]

Options:

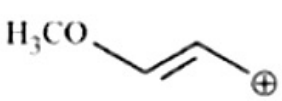
A.



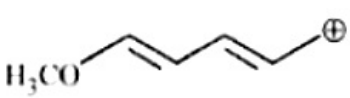
B.



C.

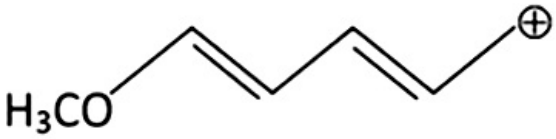


D.



Answer: D

Solution:



Is most stable carbocation

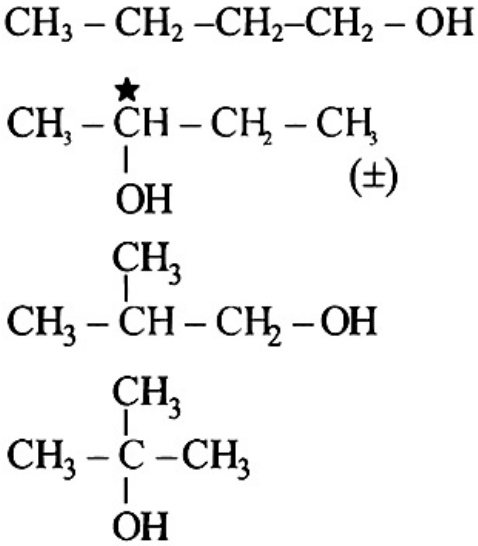
Question64

The number of chiral alcohol(s) with molecular formula $C_4H_{10}O$ is____
[29-Jun-2022-Shift-2]

Answer: 2

Solution:

Solution:



Out of which only two are chiral

Question65

While estimating the nitrogen present in an organic compound by Kjeldahl's method, the ammonia evolved from 0.25g of the compound neutralized 2.5mL of 2M H_2SO_4. The percentage of nitrogen present in organic compound is
[25-Jul-2022-Shift-1]

Answer: 56

Solution:

NH_3 gas is neutralized by $2.5\,mL$ of $2MH_2SO_4$

$\therefore$ Moles of NH_3 neutralized $= 2.5 \times 2 \times 2$ millimole $= 10 \times 10^{-3}$ moles

$\therefore$ Weight of N present in the compound will be

$= 10 \times 10^{-3} \times 14$

$= 0.14g$

$\therefore$% of ' N ' in compound

$= \frac{0.14}{0.25} \times 100$

$= 56\%$

Question66

The number of sp^3 hybridised carbons in an acyclic neutral compound with molecular formula C_4H_5N is

[25-Jul-2022-Shift-1]

Answer: 1

Solution:

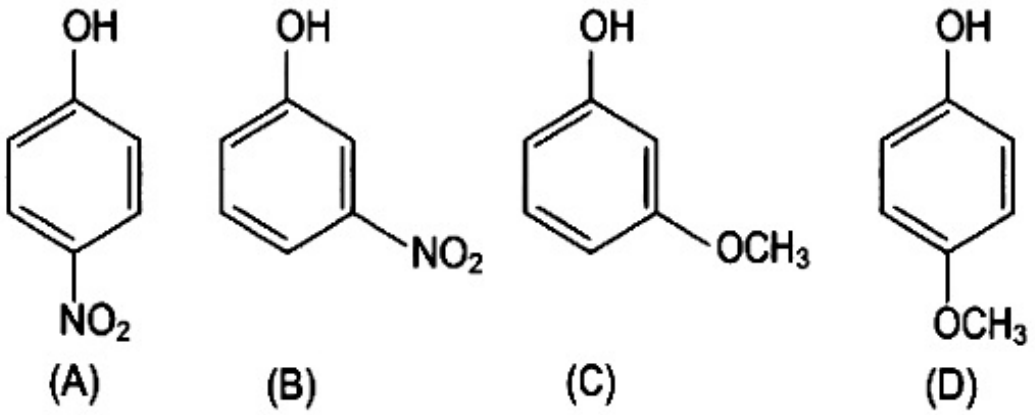
$$DU = 4 + 1 - \left(\frac{5-1}{2}\right) = 3$$

$$H_3\underset{\uparrow}{C}_{sp^3} - CH = CH - C \equiv N$$

$$CH_2 = C = \underset{\text{Zero } sp^3 \text{ carbon}}{CH} = CH = NH$$

Question67

Arrange the following in decreasing acidic strength:



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

[25-Jul-2022-Shift-2]

Options:

A. A > B > C > D

B. B > A > C > D

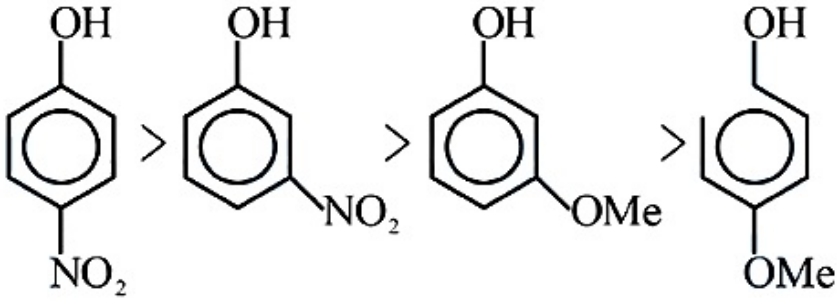
C. D > C > A > B

D. D > C > B > A

Answer: A

Solution:

The correct order of acid strength is



Question68

The separation of two coloured substances was done by paper chromatography. The distances travelled by solvent front, substance A and substance B from the base line are 3.25cm, 2.08cm and 1.05cm, respectively. The ratio of R_f values of A to B is____

[25-Jul-2022-Shift-2]

Answer: 2

Solution:

$$R_f = \frac{\text{Distance travelled by the substance}}{\text{Distance travelled by the solvent front}}$$

$$(R_f)_A = \frac{2.08}{3.25}$$

$$(R_f)_B = \frac{1.05}{3.25}$$

$$\frac{(R_f)_A}{(R_f)_B} \simeq 2$$

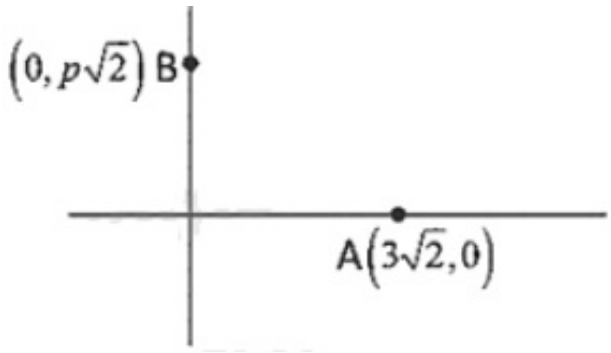
Question69

The total number of monobromo derivatives formed by he alkanes with

molecular formula C_5H_{12} is (excluding stereo isomers)
[25-Jul-2022-Shift-2]

Answer: 8

Solution:



It is sum of distance of z from $(3\sqrt{2}, 0)$ and $(0, p\sqrt{2})$ For minimising, z should lie on AB and AB = $5\sqrt{2}$
$(AB)^2 = 18 + 2p^2$
$p = \pm 4$

Question70

$\dot{C} + CH_4 \rightarrow A + B$
A and B in the above atmospheric reaction step are :
[26-Jul-2022-Shift-1]

Options:

A. C_2H_6 and Cl_2

B. $\dot{C}HCl_2$ and H_2

C. $\dot{C}H_3$ and HCl

D. C_2H_6 and HCl

Answer: C

Solution:

$\dot{Cl} + CH_4 \longrightarrow \dot{C}H_3 + HCl$

Question71

Which technique among the following, is most appropriate in separation

of a mixture of 100 mg of p nitrophenol and picric acid? [26-Jul-2022-Shift-1]

Options:

A. Steam distillation

B. $2-5$ ft long column of silica gel

C. Sublimation

D. Preparative TLC (Thin Layer Chromatography)

Answer: D

Solution:

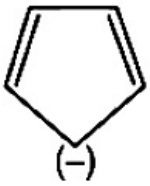
Solution:
Thin layer chromatography is a technique used to isolate non-volatile mixtures.
Hence, mixture of p-nitrophenol and Picric acid is separated by TLC.

Question72

Which of the following compounds is not aromatic? [26-Jul-2022-Shift-1]

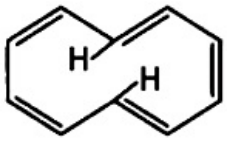
Options:

A.

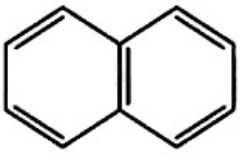


B.

C.



D.



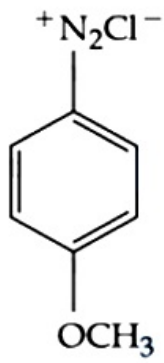
Answer: C

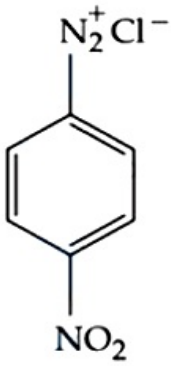
Solution:

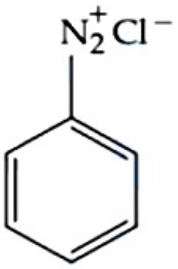
[10] Annulene, although follow $(4n + 2)\pi$ electron rule, but it is non-aromatic due to its non planar nature. It is nonplanar due to repulsion of $C - H$ bonds present inside the ring.

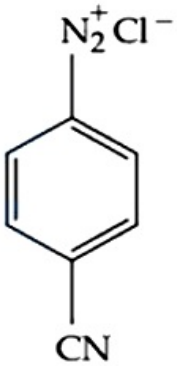
Question73

The correct stability order of the following diazonium salt is

(A) 

(B) 

(C) 

(D) 

[26-Jul-2022-Shift-1]

Options:

A. (A) > (B) > (C) > (D)

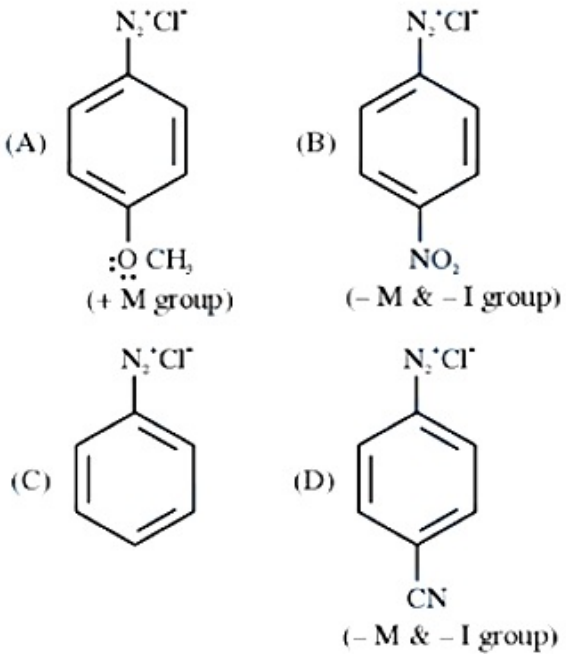
B. (A) > (C) > (D) > (B)

C. (C) > (A) > (D) > (B)

D. (C) > (D) > (B) > (A)

Answer: B

Solution:



Since diazonium ion is a cation hence it is stabilized by electron donating groups and destabilized by electron withdrawing group.
Hence Stability order should be A > C > D > B.

Question74

The correct decreasing order of priority of functional groups in naming an organic Question: compound as per IUFAC system of nomenclature is [26-Jul-2022-Shift-2]

Options:

A. $-COOH > -CONH_2 > -COCl > -CHO$

B. $SO_3H > -COCl > -CONH_2 > -CN$

C. $-COOR > -COCl > -NH_2 > C = 0$

D. $-COOH > -COOR > -CONH_2 > -COCl$

Answer: B

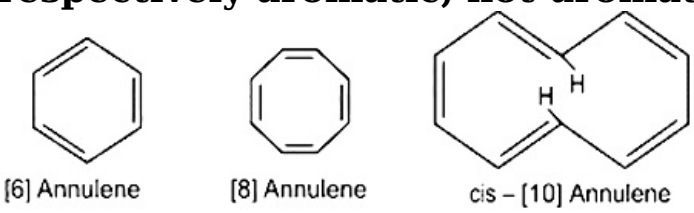
Solution:

Solution:
$-SO_3H > -COCl > -CONH_2 > -CN$

Question75

Given below are two statements: one is labelled as Assertion A and, the

other is labelled as Reason R.
Assertion A: [6] Annulene, [8] Annulene and cis-[10] Annulene, are respectively aromatic, not-aromatic and aromatic.



[6] Annulene [8] Annulene cis – [10] Annulene

Reason R: Planarity is one of the requirements of aromatic systems.
In the light of the above statements, choose the most appropriate answer from the options given below.
[27-Jul-2022-Shift-1]

Options:

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

B. Both A and R are correct but 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

Solution:

Solution:
[6] Annulene is aromatic because it is planar.
[8] Annulene and [10] Annulene are both not aromatic because they are not planar. So, Assertion (A) is not correct.
Reason (R) is correct because planarity is one of the requirements of aromatic system.

Question76

In Carius method of estimation of halogen, 0.45g of an organic compound gave 0.36g of AgBr. Find out the percentage of bromine in the compound.
(Molar masses : AgBr = 188gmol^{-1}; Br = 80gmol^{-1})
[27-Jul-2022-Shift-1]

Options:

A. 34.04%

B. 40.04%

C. 36.03%

D. 38.04%

Answer: A

Solution:

Mass of organic compound $= 0.45\,gm$
Mass of AgBr obtained $= 0.36\,gm$

$\therefore$ Moles of AgBr $= \frac{0.36}{188}$

$\therefore$ Mass of Bromine $= \frac{0.36}{188} \times 80 = 0.1532\,gm$

$\therefore$%Br in compound $= \frac{0.1532}{0.45} \times 100 = 34.04\%$

Question77

Optical activity of an enantiomeric mixture is +12.6° and the specific rotation of (+) isomer is +30° The optical purity is _____ % [27-Jul-2022-Shift-1]

Answer: 42

Solution:

Optical purity $= \frac{\text{Total rotation}}{\text{Specific rotation}} \times 10 = \frac{12 \cdot 6}{30} \times 100$

$= 42\%$

Question78

Match List - I with List - II.

List I (Mixture)	List II (Purification Process)
(A)Chloroform & Aniline	(I)Steam distillation
(B)Benzoic acid & Napthalene	(II)Sublimation
(C)Water & Aniline	(III)Distillation
(D)Napthalene & Sodium chloride	(IV)Crystallisation

Choose the correct answer from the options given below : [27-Jul-2022-Shift-2]

Options:

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

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

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

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

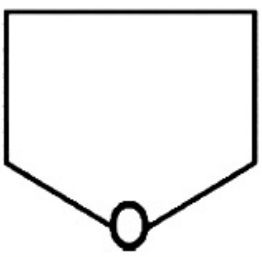
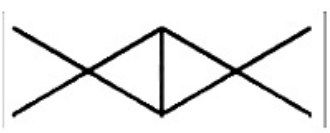
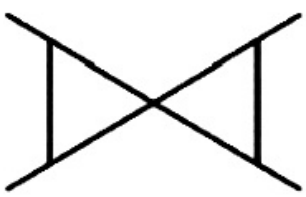
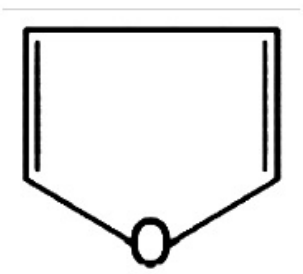
Answer: D

Solution:

(A) Chloroform + Aniline → (III) Distillation
(B) Benzoic acid + Napthalene → (IV) Crystallisation
(C) Water + Aniline → (I) Steam distillation
(D) Napthalene + Sodium chloride → (II) Sublimation

Question79

Match List - I with List - II.

List - I	List - II
	(I)Spiro compound
	(II)Aromatic compound
	(III)Non-planar Heterocyclic compound
	(IV)Bicyclo compound

Choose the correct answer from the options given below:
[28-Jul-2022-Shift-1]

Options:

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

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

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

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

Answer: C

Solution:


: Non-planar heterocyclic Compound


: Bicyclo Compound


: Spiro Compound

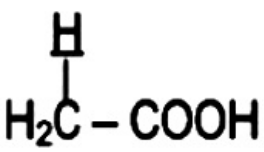

: Aromatic Compound

Question80

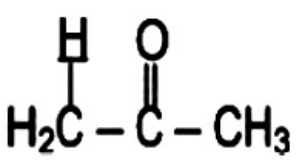
Among the following marked proton of which compound shows lowest pK_a value?
[28-Jul-2022-Shift-1]

Options:

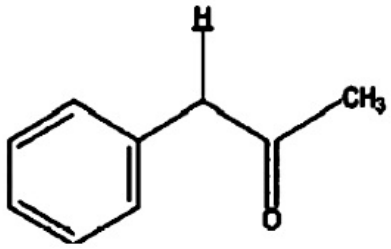
A.



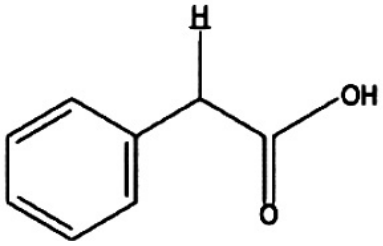
B.



C.

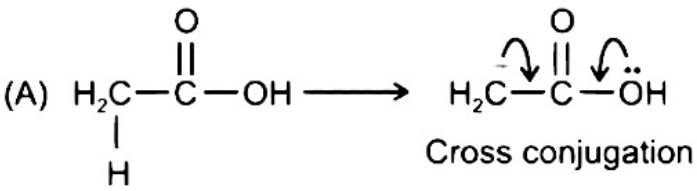


D.



Answer: C

Solution:



The conjugate base of compound (C) is stabilized by extended conjugation. Hence the indicated proton of compound C is most acidic i.e. will have lowest pK_a.

Question81

Given below are two statements: One is labelled as Assertion A and the other is labelled as Reason R
Assertion A : Thin layer chromatography is an adsorption chromatography.
Reason R: A thin layer of silica gel is spread over a glass plate of suitable size in thin layer chromatography which acts as an adsorbent.
In the light of the above statements, choose the correct answer from the options given below
[28-Jul-2022-Shift-2]

Options:

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

B. Both A and R are true but 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

Solution:

Thin layer chromoatography (TLC) is another type of adsorption chromatography, which involve sepration of substance of a mixture ovel a thin layer of an adsorbent coated on glass plate.
A thin layer (about $0.2\,\mathrm{mm}$ thick) of an adsorbent (silica gel) or (Alumina) in spread overa glass plate of suitable size.
Hence Assertion (A) is correct and Reason (R) is correct explanation of (A)

Question82

A sample of 0.125g of an organic compound when analyzed by Duma's method yields 22.78 mL of nitrogen gas collected over KOH solution at 280K and 759 mm Hg. The percentage of nitrogen in the given organic compound is ____(Nearest integer)
Given :

(a) The vapour pressure of water of 280K is 14.2 mm Hg.
(b) R = 0.082L atm $K^{-1}mol^{-1}$
[28-Jul-2022-Shift-2]

Answer: 22

Solution:

$$P_{actual} = 759 - 14.2 = 744.8\,\mathrm{mmHg}$$

$$n_{N_2} = \frac{744.8 \times 22.78}{760 \times 0.0821 \times 280 \times 1000}$$

$$= 0.000971\,\mathrm{mol}$$

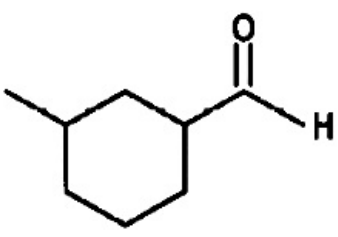
Mass of $N_2 = 0.02719\,\mathrm{gm}$
Percentage of nitrogen

$$= \frac{0.0271}{0.125} \times 100 = 21.75 \simeq 22$$

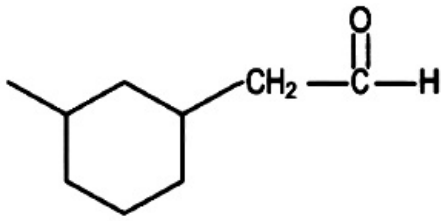
Question83

Correct structure of γ-methylcyclohexane carbaldehyde is
[29-Jul-2022-Shift-2]
Options:

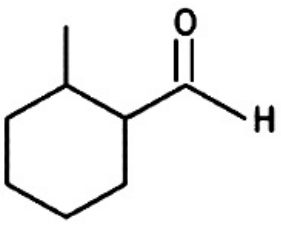
A.



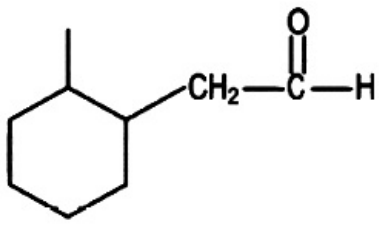
B.



C.

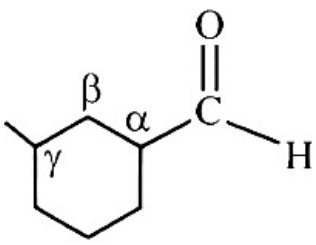


D.



Answer: A

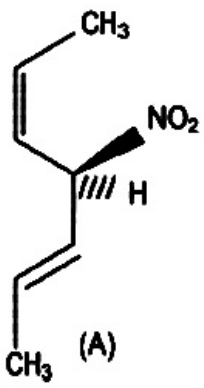
Solution:



γ-Methyl cyclohexane carbaldehyde

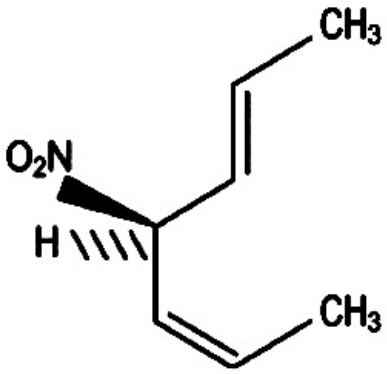
Question84

Given below are two statements.
Statement 1: The compound



is optically active.

Statement II :



is mirror image of above compound A.
In the light of the above statement, choose the most appropriate answer from the options given below.
[29-Jul-2022-Shift-2]

Options:

A. Both Statement I and Statement II are correct.

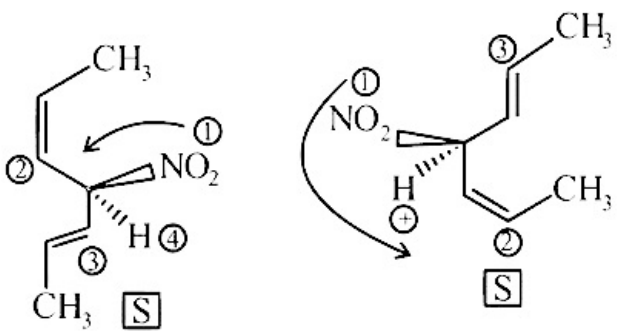
B. Both Statement I and Statement II are incorrect.

C. Statement I is correct but Statement II is incorrect.

D. Statement I is incorrect but Statement II is correct.

Answer: C

Solution:



Compound (A) in Statement-I and compound in Statement-II is not the mirror image of (I).

Question85

Given below are two statements:
Statement I A mixture of chloroform and aniline can be separated by simple distillation.
Statement II When separating aniline from a mixture of aniline and water by steam distillation aniline boils below its boiling point.
In the light of the above statements, choose the most appropriate answer from the options given below.
[26 Feb 2021 Shift 1]

Options:

A. Statement I is false but statement II is true

B. Both statement I and statement II are false

C. Statement I is true but statement II is false

D. Both statement I and statement II are true

Answer: D

Solution:

Solution:
Statement I is true, i.e. a mixture of chloroform and aniline can be separated by simple distillation. Boiling points of chloroform ($334K$) and aniline (457 K) differ largely. So, on boiling the\/mixture, vapours of $CH\,Cl_3$ are formed first which is then condensed to pure liquid $CH\,Cl_3$.
Whereas, the vapours of aniline will form later and liquid aniline can be collected separately.
Statement II is also true, i.e. aniline and water can be separated by steam distillation technique. Aniline is steam volatile but immiscible with water. So, a mixture of aniline and water will boil close to but below $373K$. After distillation, the mixture of aniline (bottom layer) and water (top layer) can be separated by separating funnel.
So, both statements I and II are true (option-d).

Question86

Reagent, 1-naphthylamine and sulphanilic acid in acetic acid is used for the detection of
[18 Mar 2021 Shift 1]

Options:

A. N_2O

B. NO_3^-

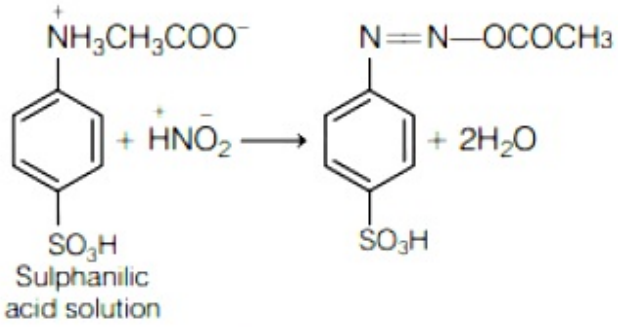
C. NO

D. NO_2^-

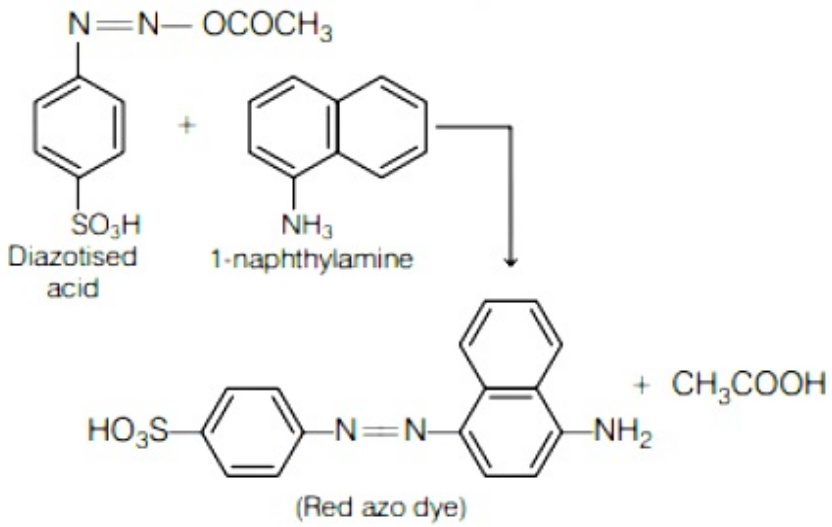
Answer: D

Solution:

When a solution is acidified with acetic acid, sulphanilic acid and then 1-naphthylamine is added, the red coloured precipitate obtain indicates presence of NO_2^-anions. For detection of NO_2^- following test is used.



Above reagent is used to detect NO_2^- ion.

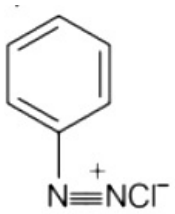


Question87

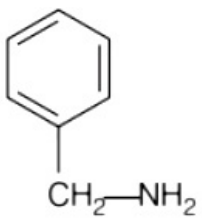
Nitrogen can be estimated by Kjeldahl's method for which of the following compound?
[17 Mar 2021 Shift 2]

Options:

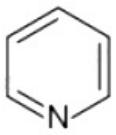
A.



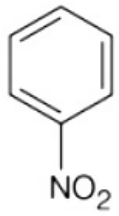
B.



C.



D.



Answer: B

Solution:

Solution:
Nitrogen can be estimated by Kjeldahl's method for the benzyl amine as in this compound nitrogen is not the part of ring and is free to react.
Because this method can be readily applied to the compound in which nitrogen is free to react with the reagent. The compounds which have nitrogen in the ring (like pyridine), an azo compound, or in nitro compounds are not readily converted into the ammonium sulphate by the action of sulphuric acid.

Question88

Given below are two statements.
Statement I Retardation factor (R_f) can be measured in metre\/centimetre.
Statement II R_f value of a compound remains constant in all solvents.
Choose the most appropriate answer from the options given below
[17 Mar 2021 Shift 1]

Options:

A. Statement I is true but statement II is false.

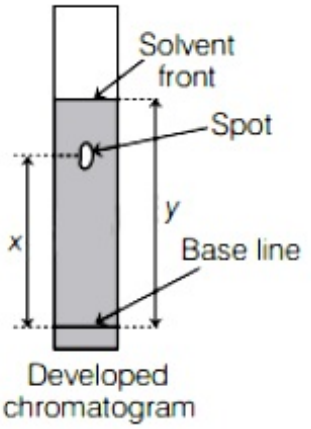
B. Both statement I and statement II are true.

C. Both statement I and statement II are false.

D. Statement I is false but statement II is true.

Answer: C

Solution:



$R_f = \frac{\text{Distance moved by the substance from base line (x)}}{\text{Distance moved by the solvent from base line (y)}}$

R_f (Retardation factor is dimensionless)

Different compounds are differently adsorbed in various.

So, R_f value of a compound varies with solvent and it is not constant. Both statements I and II are false.

Question89

In chromatography technique, the purification of compound is independent of
[16 Mar 2021 Shift 1]

Options:

A. mobility or flow of solvent system

B. solubility of the compound

C. length of the column or TLC plate

D. physical state of the pure compound

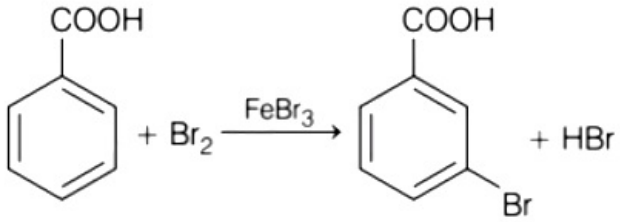
Answer: D

Solution:

In chromatography technique, the purification of compound is independent of physical state of the pure compound (stationary phase). Chromatography is based on the principle of adsorbtion. Different substances are differently adsorbed.

The technique of chromatography uses the difference in the rates at which the components of a mixture move through a porous medium (stationary phase) under the influence of some solvent or gas (moving phase).

Question90



Consider the above reaction where 6.1g of benzoic acid is used to get 7.8g of m-bromo benzoic acid. The percentage yield of the product is ..... . (Round off to the nearest integer). [Given : Atomic masses : C = 12.0u, H = 1.0u, O = 16.0u, Br = 80.0u]
[18 Mar 2021 Shift 2]

Answer: 78

Solution:

Moles of benzoic acid

$$= \frac{6.1}{122} \frac{\text{(weight)}}{\text{(molecular weight)}}$$

= moles of m-bromobenzoic acid

So, weight of m-bromobenzoic acid

$$= \frac{6.1}{122} \times 201\text{g}$$

$$= 10.05\text{g}$$

$$\% \text{ yield} = \frac{\text{Actual weight}}{\text{Theoretical weight}} \times 100$$

$$= \frac{7.8}{10.05} \times 100$$

$$= 77.61\% = 78\%$$

Question91

_____ grams of 3-hydroxy propanal (M W = 74) must be dehydrated to produce 7.8g of acrolein (M W = 56)(C_3H_4O), if the percentage yield is 64 (Round off to the nearest integer). [Given: Atomic masses : C = 12.0u, H = 1.0u, O = 16.0u]
[18 Mar 2021 Shift 1]

Answer: 16

Solution:

On reaction

$$\underset{\substack{\text{3-hydroxy propanal} \\ (\text{mol . wt} = 74)}}{HO - CH_2 - CH_2 - CHO} \xrightarrow[64]{\Delta} \underset{(\text{mol . wt} = 56)}{C_3H_4O} + H_2O$$

Let's assume required man of 3-hydroxypropanal be x to produce 0.64g acrolein.

∴ Number of moles = x/74

Now, 7.8g of acrolein gives, $\frac{x}{74} \times 0.64 = 7.8/56$

$\Rightarrow x = 16.10$

or $x \cong 16.00$

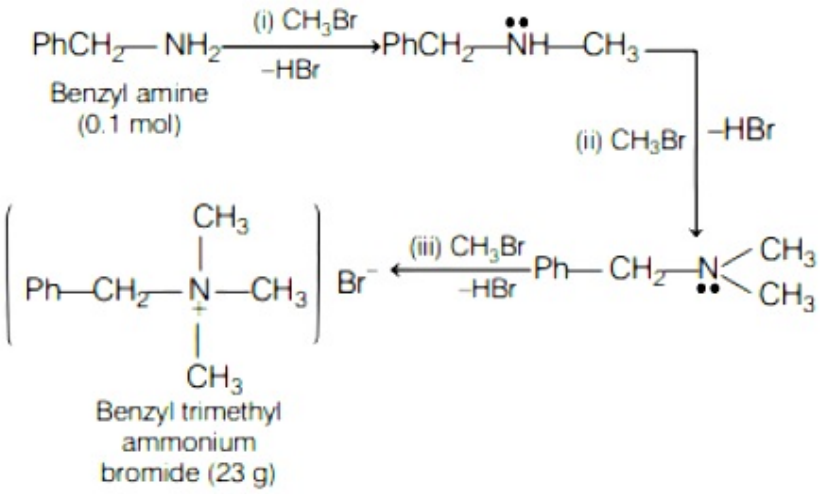
Question92

A reaction of 0.1 mole of benzylamine with bromomethane gave 23g of benzyl trimethyl ammonium bromide. The number of moles of bromomethane consumed in this reaction are n × 10^{-1}, when n = ... (Round off to the nearest integer).
(Given : Atomic masses: C = 12.0u, H = 1.0u, N = 14.0u, Br = 80.0u]
[18 Mar 2021 Shift 1]

Answer: 3

Solution:

Benzylamine reacts with bromoethane to produce benzyl trimethyl ammonium bromide.
The reaction is as follows :



$$Ph - CH_2NH_2 + 3CH_3Br \longrightarrow PhCH_2N\mu^+_3Br^-$$

$$\frac{w}{m} = \frac{23g}{230} = 0.1mol$$

$\Rightarrow 0.1 \times 3 = 03$
Total moles of $CH_3Br = 03 = 3 \times 10^{-1} mol$.

Question93

Which purification technique is used for high boiling organic liquid compound (decomposes near its boiling point)?
[22 Jul 2021 Shift 2]

Options:

A. Simple distillation

B. Steam distillation

C. Fractional distillation

D. Reduced pressure distillation

Answer: D

Solution:

Solution:
Reduced pressure distillation or vacuum distillation is used for the purification of high boiling organic liquids which decomposes at or below their boiling point.

Question94

The metal that can be purified economically by fractional distillation method is:
[20 Jul 2021 Shift 1]

Options:

A. Fe

B. Zn

C. Cu

D. Ni

Answer: B

Solution:

Solution:
Zinc can be purified economically by fractional distillation.

Question95

0.8 g of an organic compound was analysed by Kjeldahl's method for the estimation of nitrogen. If the percentage of nitrogen in the compound was found to be 42%, then _____ mL of 1 M H_2SO_4 would have been neutralized by the ammonia evolved during the analysis.
[25 Jul 2021 Shift 2]

Answer: 12

Solution:

Organic compound : 0.8gm

wt. of N $= \left(\frac{42}{100} \times 0.8\right) \text{gm}$

mole of N $= \frac{42 \times 0.8}{100 \times 14} = \frac{2.4}{100} \text{mol}$

moles of $NH_3 = \frac{2.4}{100}$

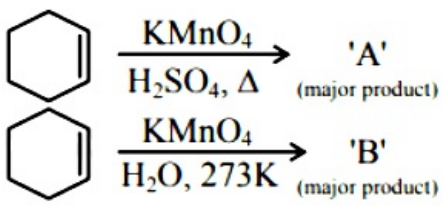
$$2NH_3 + H_2SO_4 \rightarrow (NH_4)_2SO_4$$

$\frac{2.4}{100}$ mole $\frac{1.2}{100}$ mole

$\frac{1.2}{100} = 1 \times V(l)$

$\Rightarrow V_{H_2SO_4} = \frac{1.2}{100} l = 12ml$

Question96



For above chemical reactions, identify the correct statement from the following:
[20 Jul 2021 Shift 1]

Options:

A. Both compound 'A' and compound 'B' are dicarboxylic acids

B. Both compound 'A' and compound 'B' are diols

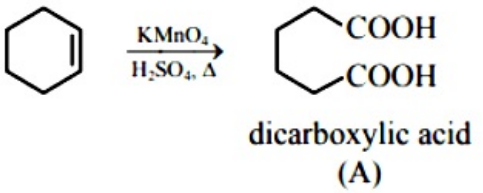
C. Compound 'A' is diol and compound 'B' is dicarboxylic acid

D. Compound 'A' is dicarboxylic acid and compound 'B' is diol

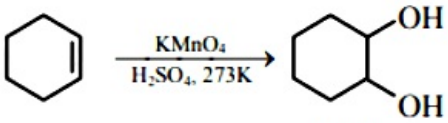
Answer: D

Solution:

Solution:



dicarboxylic acid
(A)



Diol
(B)

Question97

Methylation of 10 g of benzene gave 9.2 g of toluene. Calculate the percentage yield of toluene _____. (Nearest integer)
[22 Jul 2021 Shift 2]

Answer: 78

Solution:

$C_6H_6 + CH_3Cl \rightarrow C_6H_5CH_3 + HCl$

$\frac{10}{78} \qquad \left(\frac{10}{78} \times 92\right) gm \Rightarrow$

$\frac{A_y}{T_y} = \%\ \text{yield} = \frac{9.2}{920} \times 78 \times 100 \Rightarrow 78\%$

Question98

When 0.15g of an organic compound was analyzed using Carius method for estimation of bromine, 0.2397g of AgBr was obtained. The percentage of bromine in the organic compound is _____.(Nearest integer)
[Atomic mass : Silver = 108, Bromine = 80]
[20 Jul 2021 Shift 2]

Answer: 68

Solution:

Moles of Br = Moles of AgBr obtained

$\Rightarrow$ Mass of Br = $\frac{0.2397}{188} \times 80g$

therefore % Br in the organic compound

$= \frac{W_{Br}}{W_T} \times 100$

$= \frac{0.2397 \times 80}{188 \times 0.15} \times 100 = 0.85 \times 80$

$= 68$

$\Rightarrow$ Nearest integer is '68'

Question99

In Carius method, halogen containing organic compound is heated with fuming nitric acid in the presence of : [20 Jul 2021 Shift 2]

Options:

A. HNO_3

B. $AgNO_3$

C. $CuSO_4$

D. $BaSO_4$

Answer: B

Solution:

Solution:

Organic compound is heated with fuming nitric acid in the presence of silver nitrate in carius method.

Lunar caustic ($AgNO_3$) is used as reagent hare to distinguish Cl^-, Br and I^-respectively as follows.

$Cl^-(aq) \xrightarrow{AgNO_3} AgCl \downarrow_{ppt}$ white

$Br^-(aq) \xrightarrow{AgNO_3} AgBr \downarrow$ ppt pale yellow

$I^-(aq) \xrightarrow{AgNO_3} AgI \downarrow$ ppt Dark yellow

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Question100

In the sulphur estimation, 0.471g of an organic compound gave 1.44g of barium sulphate. The percentage of sulphur in the compound is ……..%. (Nearest integer) (Atomic mass of Ba = 137u) [26 Aug 2021 Shift 2]

Answer: 42

Solution:

Atomic mass of sulphur is 32 g.
Molecular weight of $BaSO_4$ is 233g.
So, weight of sulphur in $BaSO_4$

$$= \frac{\text{Atomic mass of sulphur}}{\text{Molecular weight of } BaSO_4} \times \text{Weight of } BaSO_4$$

$$= \frac{32}{233} \times 1.44$$

$$\text{Percentage of sulphur} = \frac{\text{Weight of sulphur}}{\text{Weight of organic compound}} \times 100$$

$$= \frac{32}{233} \times \frac{1.44}{0.471} \times 100 = 41.98 \simeq 42\%$$

Question101

The number of stereoisomers possible for 1, 2 - dimethyl cyclopropane is
[26 Aug 2021 Shift 2]

Options:

A. one

B. four

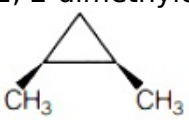
C. two

D. three

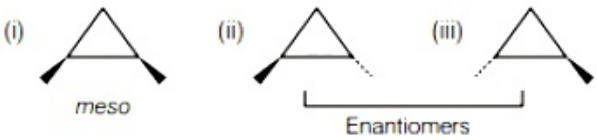
Answer: D

Solution:

1, 2-dimethylcyclopropane is



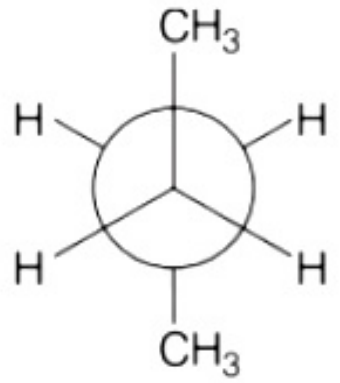
Hence, stereoisomers are as follows

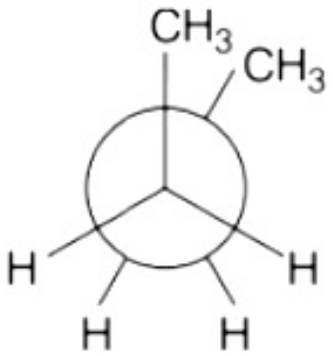


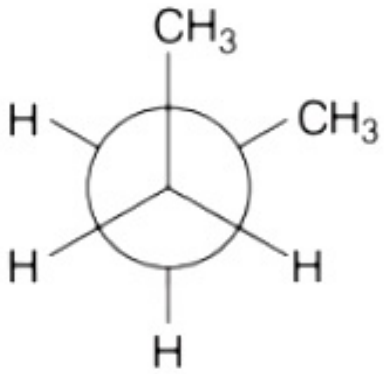
meso form in optically inactive, whereas enantiomeric pairs are optically active. Therefore, total number of stereo isomers are three (3).

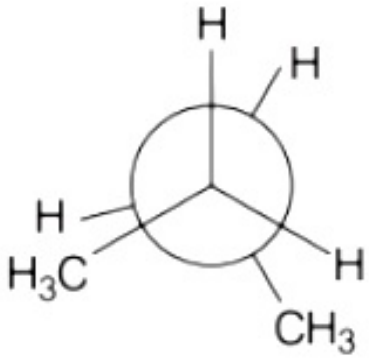
Question102

Arrange the following conformational isomers of n -butane in order of their increasing potential energy

I. 

II. 

III. 

IV. 

[31 Aug 2021 Shift 2]

Options:

A. II < III

B. I < IV < III < II

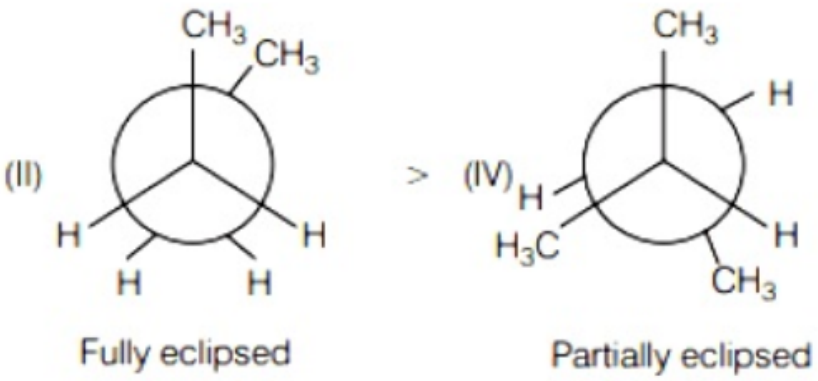
C. II < IV < III < I

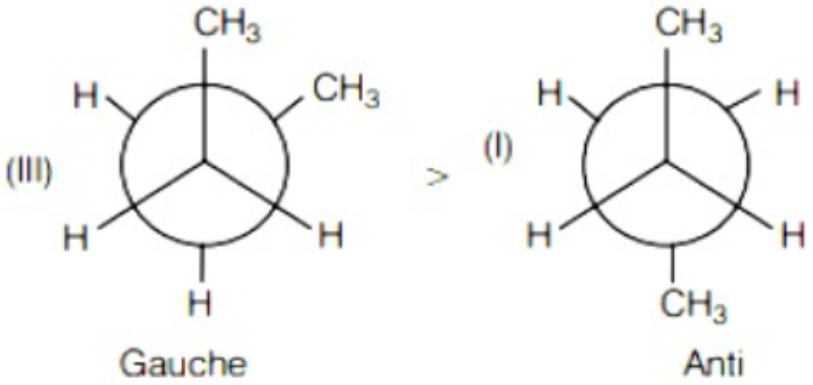
D. I < III < IV < II

Answer: D

Solution:

The order of potential energy of above conformations is





The fully eclipsed form is least stable due to repulsion between bulky ($-CH_3$) methyl group at front and rear carbon atom.
∴ It has maximum potential energy.
While the repulsion in anti form is minimum.
∴ It has minimum potential energy.

Question103

Given below are two statements.
One is labelled as Assertion (A) and the other is labelled as Reason (R).
Assertion (A) A simple distillation can be used to separate a mixture of propanol and propanone.
Reason (R) Two liquids with a difference of more than 20°C in their boiling points can be separated by simple distillations.
In the light of the above statements, choose the most appropriate answer from the
options given below.
[31 Aug 2021 Shift 1]

Options:

A. (A) is false but (R) is true.

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

C. (A) is true but (R) is false

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

Answer: D

Solution:

Propanol and propanone can be separated by simple distillation technique as difference in boiling point of propanol and propanone is more than 20°C.
Boiling point of propanol = 97°C.
Boiling point of propanone = 56°C
Difference in boiling points = 41° C > 20°C
Hence, option (d) is correct.

Question104

The transformation occurring in Duma's method is given below

$$\mathbf{C_2H_7N + \left(2x + \frac{y}{2}\right) CuO \rightarrow xCO_2 + \frac{y}{2}H_2O + \frac{z}{2}N_2 + \left(2x + \frac{y}{2}\right) Cu}$$

The value of y is ..... . (Integer answer)
[31 Aug 2021 Shift 2]

Answer: 7

Solution:

For the reaction

$$C_2H_7N + \left(2x + \frac{y}{2}\right) CuO \rightarrow xCO_2 + \frac{y}{2}H_2O + \frac{z}{2}N_2 + \left(2x + \frac{y}{2}\right) Cu$$

On reactant side number of H-atom = 7

On product side number of H-atom $= \frac{y}{2} \times 2$

$7 = \frac{y}{2} \times 2$

$\therefore y = 7$

Question105

The number of moles of CuO, that will be utilised in Dumas method for estimation nitrogen in a sample of 57.5g ofN, N- dimethylaminopentane is ..... $\times 10^{-2}$.(Nearest integer)

[27 Aug 2021 Shift 1]

Answer: 1125

Solution:

In Dumas method,

$C_xH_yN_z + \left(2x + \frac{y}{2}\right) CuO \rightarrow x\,CO_2 + \frac{y}{2}H_2O + \frac{z}{2} + \left(2x + \frac{y}{2}\right) Cu$

N, N-dimethylaminopentane has formula $C_7H_{17}N$.

So, relating with $C_xH_yN_z$

x = 7

y = 17

z = 1

Molar mass of $C_7H_{17}N$ = 115g

= 22.5 moles of CuO

57.5g i.e. $\left(\frac{57.5}{115}\right) C_7H_{17}N$ will utilise

$= \frac{22.5}{115} \times 57.5$ moles of CuO

$= 11.25\,g\,mol \approx 1125 \times 10^{-2}\,mol$

Question106

In carius method for estimation of halogens, 0.2g of an organic compound gave 0.188g of AgBr. The percentage of bromine in the compound is ..... (Nearest integer)
[Atomic mass; Ag = 108, Br = 80]
[27 Aug 2021 Shift 1]

Answer: 40

Solution:

Mass of bromine = 80 u

Mass of silver = 108 u

Mass of AgBr = 108 + 80 = 188 u

Weight of organic compound = 0.2 g

$$\% \text{ of Br} = \frac{\text{Molar mass of Br}}{\text{Molar mass of AgBr}} \times \frac{\text{Weight of AgBr}}{\text{Weight of organic compound}} \times 100$$

$$= \frac{80}{188} \times \frac{0.188}{0.2} \times 100 = 40\%.$$

Question107

The increasing order of basicity for the following intermediates is (from weak to strong)

(i) $H_3C - \overset{CH_3}{\underset{CH_3}{\overset{|}{\underset{|}{C^{\ominus}}}}}$

(ii) $H_3C = CH - \overset{\ominus}{C}H_2$

(iii) $HC \equiv \overset{\ominus}{C}$

(iv) $\overset{\ominus}{C}H_3$

(v) $\overset{\ominus}{C}N$

[Jan. 09,2020 (I)]

Options:

A. (iii) <(i) < (ii) < (iv) < (v)

B. (v) < (i) < (iv) < (ii) < (iii)

C. (v) < (iii) < (ii) < (iv) < (i)

D. (iii) <(iv) < (ii) < (i) < (v)

Answer: C

Solution:

Solution:
Basicity order can be determined by the cummulative effect of the factors on the electron density of concerned atom.

Question108

A flask contains a mixture of is hexane and 3 methyl pentane. One of the liquids boils at 63˚C while the other boils at 60˚C. What is the best way to separate the two liquids and which one will be distilled out first? [Jan. 08,2020(I)]

Options:

A. fractional distillation, isohexane

B. simple distillation, 3 -methylpentane

C. simple distillation, isohexane

D. fractional distillation, 3 -methylpentane

Answer: A

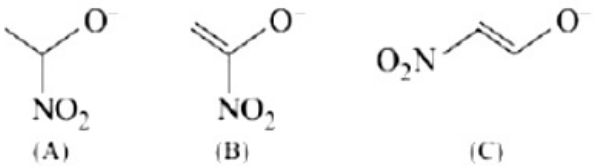
Solution:

Liquid having lower boiling point comes out first in fractional distillation. Simple distillation can't be used as boiling point difference is very small.

3-Methylpantane will show greater boiling point (63°C) comparative to isohexane due to symmetrical structure. Therefore isohexane distilled out first.

Question109

The correct order of stability for the following alkoxides is:



[Jan. 07, 2020 (II)]

Options:

A. (B) > (A) > (C)

B. (C) > (B) > (A)

C. (C) > (A) > (B)

D. (B) > (C) > (A)

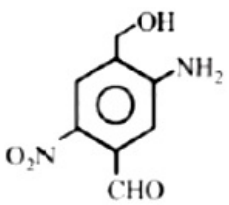
Answer: B

Solution:

Solution:
Electron withdrawing group like (N O_2) increase stability of alkoxide ion by dispersal of negative charge.
In (B) and (C) structures negative charge is in conjugation with double bond and also stabilised by electron withdrawing effect of nitro group.

Question110

The IUPAC name of the following compound is:



[Sep. 06, 2020 (II)]

Options:

A. 2 -nitro-4-hydroxymethyl-5-amino benzaldehyde

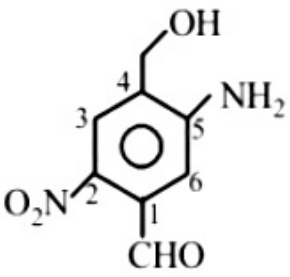
B. 3-amino-4-hydroxymethyl-5-nitrobenzaldehyde

C. 5-amino-4-hydroxymethyl-2-nitrobenzaldehyde

D. 4 -amino-2-formyl- 5 -hydroxymethyl nitrobenzene

Answer: C

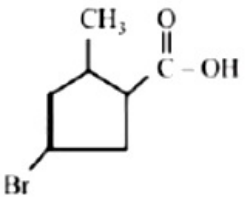
Solution:



5-Amino- 4 -hydroxymethyl-2-nitrobenzaldehyde

Question111

The IUPAC name of the following compound is :



[Sep. 04,2020 (I)]

Options:

A. 5-Bromo-3-methylcyclopentanoic acid

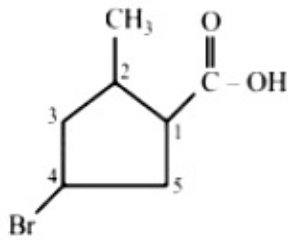
B. 4 -Bromo-2-methylcyclopentane carboxylic acid

C. 3-Bromo-5-methylcyclopentanoic acid

D. 3-Bromo-5-methylcyclopentane carboxylic acid

Answer: B

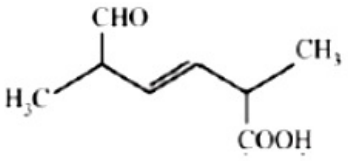
Solution:



4-Bromo-2-methylcyclopentane carboxylic acid

Question112

The IUPAC name for the following compound is :



[Sep. 02, 2020 (I)]

Options:

A. 2,5 -dimethyl-5-carboxy-hex-3-enal

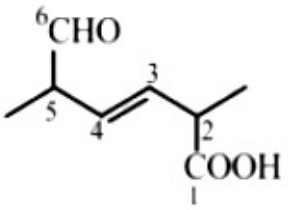
B. 2,5 -dimethyl-6-carboxy-hex-3-enal

C. 2,5 -dimethyl-6-oxo-hex-3-enoic acid

D. 6-formyl-2-methyl-hex-3-enoic acid

Answer: C

Solution:



(2, 5 -dimethyl 1 − 6 -oxo-hex-3-enoic acid)

Question113

In an estimation of bromine by Carius method, 1.6g of an organic compound gave 1.88g of AgBr. The mass percentage of bromine in the compound is
(Atomic mass, Ag = 108, Br = 80gmol $^{-1}$)
[NV, Sep. 06, 2020 (I)]

Answer: 50

Solution:

Mass of organic compound = 1.6g
Mass of AgBr = 1.88g

Moles of Br = Moles of AgBr = $\frac{1.88}{188} = 0.01$

Mass of Br = $0.01 \times 80 = 0.80$g

% of Br = $\frac{0.80 \times 100}{1.60} = 50\%$

Alternate Method: % of Br $= \frac{\text{Wt. of AgBr}}{\text{Wt . of O . C.}} \times \frac{\text{Molar mass of Br}}{\text{AgBr}} \times 100$

$= \frac{1.88}{1.6} \times \frac{80}{188} \times 100 = 50\%$

Question114

Which one of the following compounds possesses the most acidic hydrogen?
[Sep. 03,2020(I)]

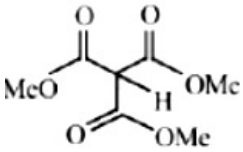
Options:

A.

B. $H_3C - C \equiv C - H$

C.

D.



Answer: D

Solution:

Solution:
Acidic strength $\propto -I$, $-M$ effect. Due to strong $-I$, and $-M$ effect of three $-COOCH_3$ groups, it has most acidic Hydrogen.

Question115

Glycerol is separated in soap industries by:
[Sep. 03,2020(I)]

Options:

A. Fractional distillation

B. Differential extraction

C. Steam distillation

D. Distillation under reduced pressure

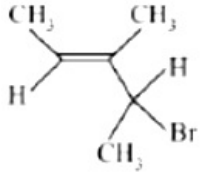
Answer: D

Solution:

Glycerol can be separated from spent-lye in soap industry by using reduce pressure distillation technique.

Question116

What is the IUPAC name of the following compound?



[Jan. 10, 2019 (II)]

Options:

A. 3-Bromo-1, 2-dimethylbut-1-ene

B. 3-Bromo-3-methyl-1,2-dimethylprop-1-ene

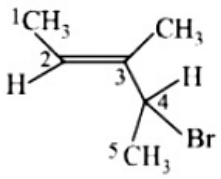
C. 2-Bromo-3-methylpent-3-ene

D. 4-Bromo-3-methylpent-2-ene

Answer: D

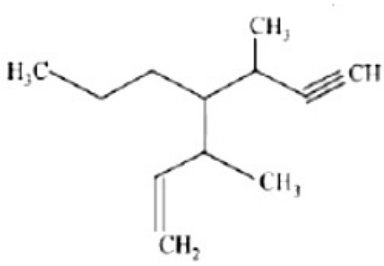
Solution:

Solution:
IUPAC name: 4 -Bromo-3-methylpent- 2 -ene



Question117

The IUPAC name for the following compound is:



[April 12, 2019 (II)]

Options:

A. 3 -methyl-4-(3-methylprop-l-enyl)-l-heptyne

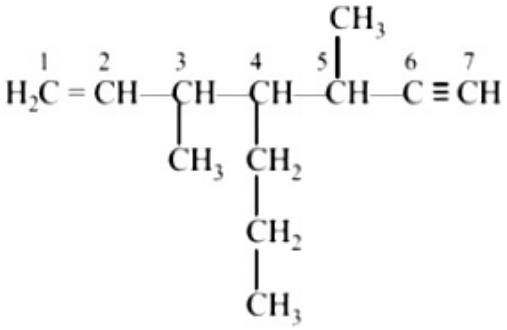
B. 3,5-dimethyl-4-propylhept-6-en-l-yne

C. 3-methyl-4-(1-methylprop-2-ynyl)-l-heptene

D. 3,5-dimethyl-4-propylhept-l-en-6-yne

Answer: D

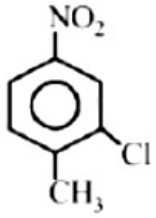
Solution:



3, 5 -dimethyl-4-propylhept- 1 -en-6-yne

Question118

The correct IUPAC name of the following compound is:



[April 9, 2019(I)]

Options:

A. 5-chloro-4-methyl-1-nitrobenzene

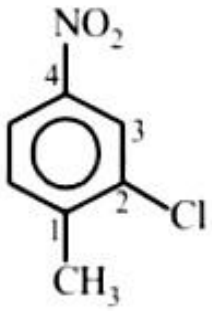
B. 2 -chloro-1-methyl-4-nitrobenzene

C. 3-chloro-4-methyl-1-nitrobenzene

D. 2 -methyl-5-nitro-1-chlorobenzene

Answer: B

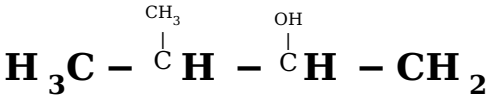
Solution:



2-Chloro-1-methyl-4-nitrobenzene

Question119

The IUPAC name of the following compound is:



[April 8, 2019 (I)]

Options:

A. 4, 4-Dimethyl-3-hydroxybutanoic acid

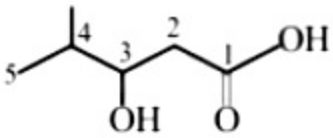
B. 2-Methyl-3-hydroxypentan-5-oic acid

C. 3-Hydroxy-4-methylpentanoic acid

D. 4-Methyl-3-hydroxypentanoic acid

Answer: C

Solution:



3-Hydroxy-4-methyl pentanoic acid

Question120

Which of the following compounds will show the maximum 'enol' content?
[April 8, 2019 (II)]

Options:

A. $CH_3COCH_2COOC_2H_5$

B. $CH_3COCH_2COCH_3$

C. CH_3COCH_3

D. $CH_3COCH_2CONH_2$

Answer: B

Solution:

Solution:
Enolic form of acetylacetone (b) is quite stable due to H-bonding which leads to stable 6 -membered ring.

Question121

The increasing order of nucleophilicity of the following nucleophiles is:

(i) $CH_3CO_2^{\ominus}$
(ii) H_2O
(iii) $CH_3SO_3^{\ominus}$
(iv) $\overset{\ominus}{O}H$
[April 10, 2019 (II)]

Options:

A. (i) <(iv) < (iii) < (ii)

B. (ii) <(iii) < (iv)< (i)

C. (iv) <(i) < (iii) < (ii)

D. (ii) <(iii) < (i) < (iv)

Answer: D

Solution:

Solution:
If the lone pair donating tendency on oxygen is reduced, nucleophilicity reduced. This is because the electron density of larger atoms is more readily distorted since the electrons are further from the nucleus.
H_2O = Neutral molecule

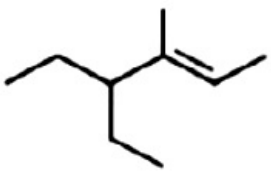
$CH_3SO_3^{\ominus} = CH_3\overset{\overset{O}{\|}}{\underset{\underset{O}{\|}}{S}}-O^- =$ Charged ion

$CH_3COO^{\ominus} = CH_3-\overset{\overset{O}{\|}}{C}-O^- =$ Charged ion

$\overset{\ominus}{O}H$ = Charged ion
Thus, the increasing order of nucleophilicity is:
$H_2O < CH_3SO_3^{\ominus} < CH_3COO^{\ominus} < OH$

Question122

The IUPAC name of the following compound is:



[Online April 15, 2018(I)]

Options:

A. 3 -cthyl-4-methylhex-4-ene

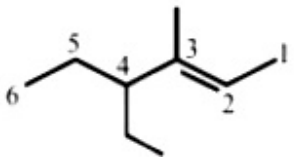
B. 4,4 -diethyl-3-methylbut-2-ene

C. 4 -methyl-3-ethylhex-4-ene

D. 4 -ethyl-3-methylhex-2-ene

Answer: D

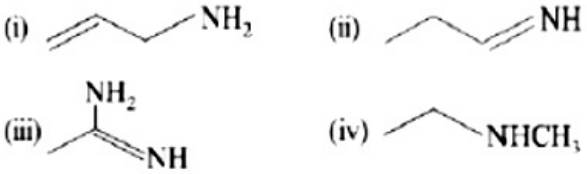
Solution:



4-Ethyl-3-methylhex-2-cne

Question123

The increasing order of basicity of the following compounds is



[2018]

Options:

A. (i) < (ii) < (iii) < (iv)

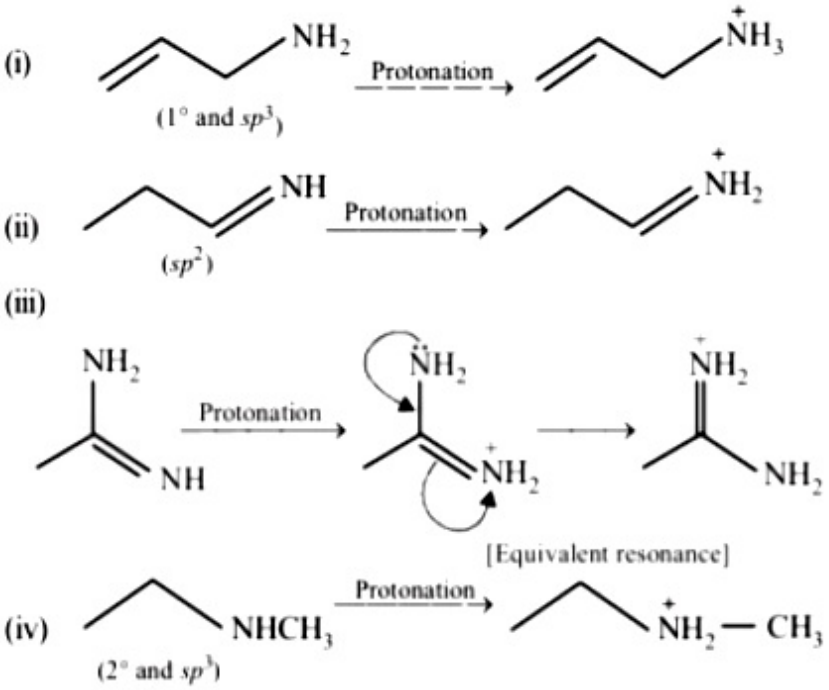
B. (ii) < (i) < (iii) < (iv)

C. (ii) <(i) < (iv) < (iii)

D. (iv) < (ii) < (i) < (iii)

Answer: C

Solution:



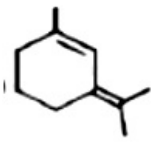
Hence, correct order of basicity will be: (ii) <(*i*) < (*iv*) < (*iii*).

Question124

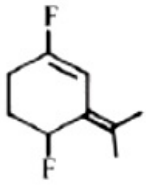
The most polar compound among the following is: [Online April 16, 2018]

Options:

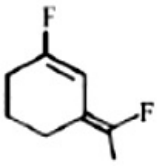
A.



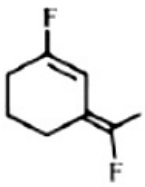
B.



C.



D.



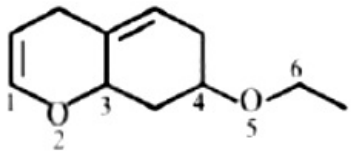
Answer: C

Solution:

Among the substituents attached to the given compounds, fluorine has maximum electronegativity. so it will push electron pair towards itself. In option (b), the two F groups are attached opposite to each other, thus net dipole moment will cancel out and reduce its polarity. In option (d), the F groups are attached in slightly opposite direction, thus this also decreases its polarity. But in option (c), the compound has the two F groups along same direction, thus net dipole moment will increase in this direction and therefore it will exhibit maximum polarity. Hence the compound in option (c) has maximum polarity.

Question125

On the treatment of the following compound with a strong acid, the most susceptible site for bond cleavage is:



[Online April 15, 2018(II)]

Options:

A. O2 − C3

B. O5 − C6

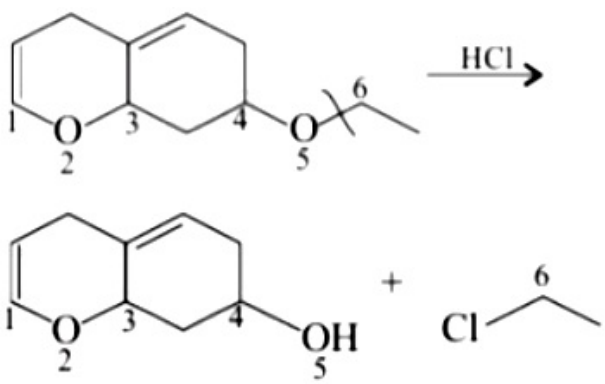
C. C4 − O5

D. C1 − O2

Answer: B

Solution:

Solution:
The lone pair of electrons on O_2 is involved in resonance with C = C. Hence O_2 will not be protonated. The lone pair of electrons on O5 is not involved in resonance with C = C. Hence, O5 will be protonated. Chloride ion will then attack least substituted C atom (C6)



Question126

Two compounds I and II are eluted by column chromatography(adsorption of I > II). Which one of the following is a correct statement?
[Online April 15, 2018 (II)]

Options:

A. II moves slower and has higher R_p value than I

B. II moves faster and has higher R_f value than I

C. I moves faster and has higher R_f value than II

D. I moves slower and has higher R_f value than II

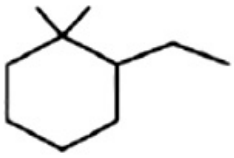
Answer: B

Solution:

Solution:
Since, adsorption of I > II, I is firmly attached to column (stationary phase). Hence, it moves slowly and will cover little distance, while II is loosely attached to column (stationary phase). Hence, it moves faster and will cover large distance.

Question127

The IUPAC name of the following compound is:



[Online April 8, 2017]

Options:

A. 1, 1− dimethyl-2-ethylcyclohexane

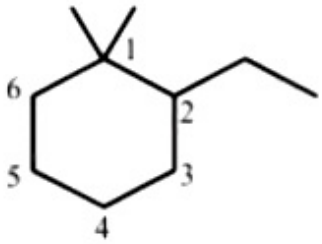
B. 2 - ethyl −1, 1 -dimethylcyclohexane

C. I-cthyl-2,2-dimethylcyclohexane

D. 2, 2-dimethyl-1-ethylcyclohexane

Answer: B

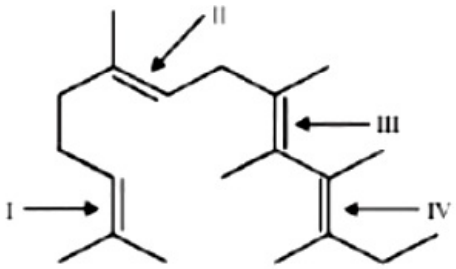
Solution:



2-Ethyl-1,1-dimethylcyclohexane

Question128

In the following structure, the double bonds are marked as I, II, III and IV



Geometrical isomerism is not possible at site(s):
[Online April 9, 2017]

Options:

A. III

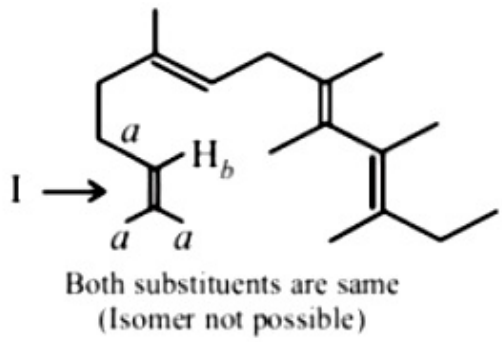
B. I

C. I and III

D. III and IV

Answer: B

Solution:



Both substituents are same
(Isomer not possible)

Question129

Which of the following statements is not true about partition chromatography?
[Online April 8, 2017]

Options:

A. Mobile phase can be a gas

B. Stationary phase is a finely divided solid adsorbent

C. Separation depends upon equilibration of solute between a mobile and a stationary phase

D. Paper chromatography is an example of partition chromatography

Answer: B

Solution:

Solution:
Partition chromatography is the process of separation whereby the component of the mixture get distributed into two phases that may be liquid-liquid, liquid gas but not to solid-gas. Thus, it is not possible that the stationory phase is a finally devided solid adsorbent in partition chromatography.

Question130

The increasing order of the boiling points for the following compounds is :
(I) C_2H_5OH
(II) C_2H_5Cl
(III) $C_2H_5CH_3$
(IV) $C_2H_5OCH_3$
[Online April 9, 2017]

Options:

A. (III) < (IV) < (II) < (I)

B. (IV) < (III) < (I) < (II)

C. (II) < (III) < (IV) < (I)

D. (III) < (II) < (I) < (IV)

Answer: A

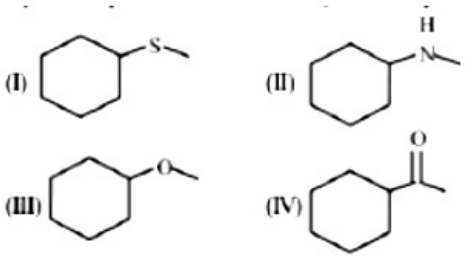
Solution:

(I) C_2H_5OH Hydrogen bonding Hydrogen bonding > dipole-dipole
(II) C_2H_5Cl Dipole-dipole C_2H_5Cl is more polar than $C_2H_5OCH_3$ so, dipole-dipole C_2H_5Cl > dipole-dipole$C_2H_5OCH_3$
(III) $C_2H_5CH_3$ Weak vander Waals yarces

(IV) $C_2H_5OCH_3$ Dipole-dipole
Thus, boiling points order is
$(III) < (IV) < (II) < (I)$.

Question131

A mixture containing the following four compounds is extracted with 1M HCl. The compound that goes to aqueous layer is :



[Online April 8,2017]

Options:

A. (I)

B. (II)

C. (III)

D. (IV)

Answer: B

Solution:

Solution:

When the given mixture is shaken with $1M\ HCl$, amine get protonated and becomes cation $\left(R_2\overset{\oplus}{N}H_2\right)$, which does not dissolve in organic solvent but usually dissolve in H_2O due to its charge. So, shaking with aqueous HCl willpull amines into the aqueous phase and leave all other compounds in organic layer.

Question132

The increasing order of the reactivity of the following halides for the S_N1 reaction is

$$\underset{\underset{(I)}{Cl}}{\overset{|}{CH_3}}CH\,CH_2CH_3CH_3CH_2CH_2Cl$$

$$p-H_3CO-\underset{(III)}{\overset{(II)}{C_6H_4}}-CH_2Cl$$

[2017]

Options:

A. $(III) < (II) < (I)$

B. $(II) < (I) < (III)$

C. (I) < (III) < (II)

D. (II) < (III) < (I)

Answer: B

Solution:

Solution:
Since S_N1 reactions involve the formation of carbocation as intermediate in the rate determining step, more the stability of carbocation higher will be the reactivity of alkyl halides towards S_N1 route. Since stability of carbocationsfollows order.

$$\underset{1^\circ \text{carbocation}}{CH_3 - CH_2 - CH_2} < \underset{2^\circ \text{carbocation}}{CH_3 - CH - CH_2 - CH_3}$$

$$< p - H_3CO - C_6H_4 - CH_2$$

Max. stable due to + M effect of $-OCH_3$ group.

Question133

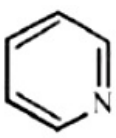
Which of the following molecules is least resonance stabilized? [2017]

Options:

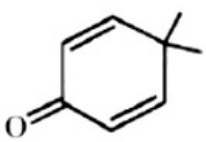
A.

B.

C.

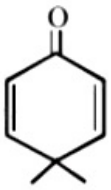


D.



Answer: D

Solution:



is nonaromatic and hence least resonance stabilized, whereas other three are aromatic.

Question134

The hydrocarbon with seven carbon atoms containing a neopentyl and a vinyl group is:
[Online April 9, 2016]

Options:

A. 2,2 - dimethyl −4 - pentene

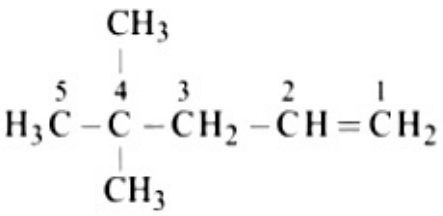
B. 4,4 - dimethyl pentene

C. isopropyl-2-butene

D. 2, 2- -dimethyl-3-pentene

Answer: B

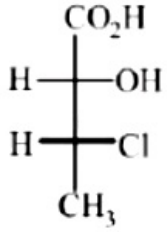
Solution:



4, 4− Dimethyl pentene

Question135

The absolute configuration of is:



[2016]

Options:

A. (2S, 3S)

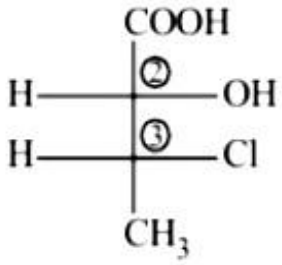
B. (2R, 3R)

C. (2R, 3S)

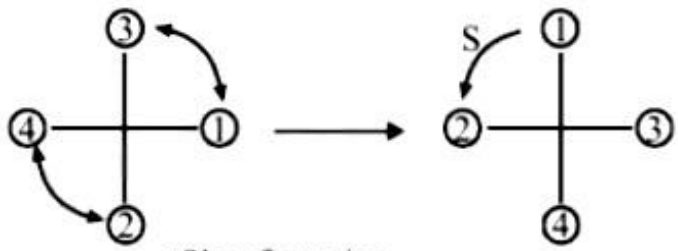
D. (2S, 3R)

Answer: D

Solution:

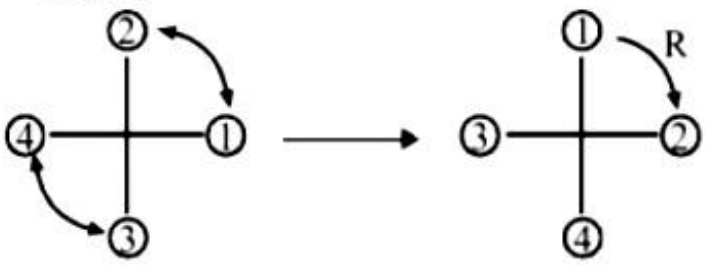


At (2),



'S' configuration

At (3),



'R' configuration

Question136

The distillation technique most suited for separating glycerol from pent-l-ye in the soap industry is:

[2016]

Options:

A. Steam distillation.

B. Distillation under reduced pressure.

C. Simple distillation

D. Fractional distillation

Answer: B

Solution:

Pent-l-ye and glycerol are separated by distillation under reduced pressure. Under the reduced pressure, the liquid boil at low temperature and the temperature of decomposition will not reach. e.g. glycerol boils at $290^{\circ}C$ with decomposition but at reduced pressure it boils at $180^{\circ}C$ without decomposition.

Question137

Which of the following compounds will exhibit geometrical isomerism? [2015]

Options:

A. 2 - Phenyl -1 - butene

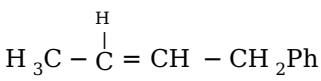
B. 1, $1-$ Diphenyl -1 - propene

C. 1 - Phenyl -2 - butene

D. 3 - Phenyl - 1 - butene

Answer: C

Solution:



In 1 -phenyl-2-butene, the two groups around the doubly bonded carbons are different. This compound can show cis-and trans-isomerism.

Question138

The optically inactive compound from the following is: [Online April 10, 2015]

Options:

A. 2 - chloropropanal

B. 2 - chlorobutane

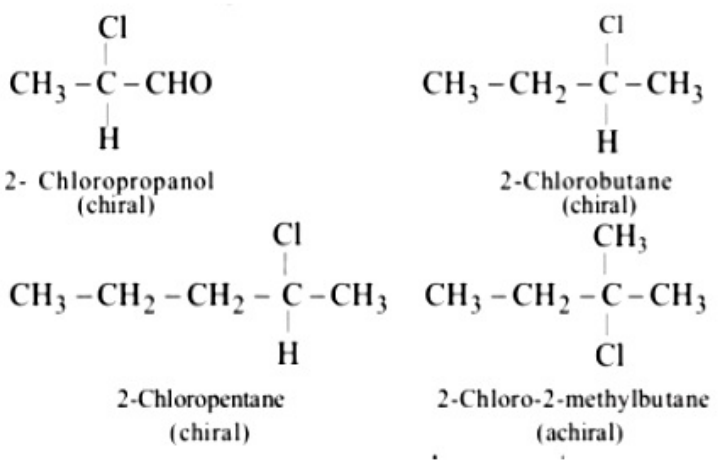
C. 2 - chloropentane

D. 2 - chloro -2 - methylbutane

Answer: D

Solution:

The optically inactive compound must contains achiral carbon atom(s). Option (d) contains achiral carbon atom



Question139

The number of structural isomers for C_6H_{14} is : [Online April 11,2015]

Options:

A. 4

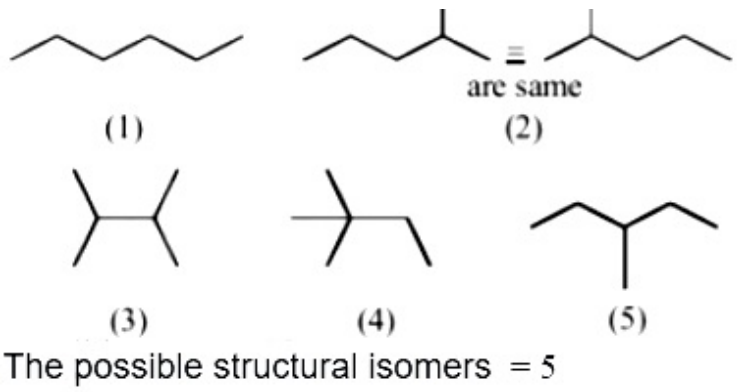
B. 3

C. 6

D. 5

Answer: D

Solution:



Question140

Which of the following pairs of compounds are positional isomers ? [Online April 11,2015]

Options:

A. $CH_3-CH_2-CH_2-\underset{\underset{O}{\|}}{C}-CH_3$ and $CH_3-CH_2-\underset{\underset{O}{\|}}{C}-CH_2-CH_3$

B. $CH_3-CH_2-CH_2-CH_2-CHO$ and $CH_3-CH_2-CH_2-\overset{\overset{O}{\|}}{C}-CH_3$

C. $CH_3-CH_2-CH_2-\underset{\underset{O}{\|}}{C}-CH_3$ and $CH_3-\underset{\underset{CH_3}{|}}{CH}-CH_2-CHO$

D. $CH_3-CH_2-\underset{\underset{O}{\|}}{C}-CH_2-CH_3$and $CH_3\overset{CH_3}{}CH-CH_2-CHO$

Answer: A

Solution:

Solution:
Pentan-2-one and pentan-3-one are position isomers. (b), (c), (d) contain different compounds aldehyde and ketones. These exhibit functional group is omerism.

Question141

In allene (C_3H_4), the type(s) of hybridization of the carbon atoms is (are): [Online April 11, 2014]

Options:

A. sp and sp^3

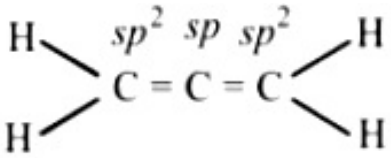
B. sp^2 and sp

C. only sp^2

D. sp^2 and sp^3

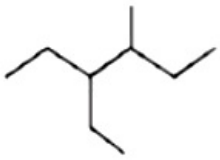
Answer: B

Solution:



Question142

The correct IUPAC name of the following compound is:



[Online April 19, 2014]

Options:

A. 4 - methyl −3 - ethylhexane

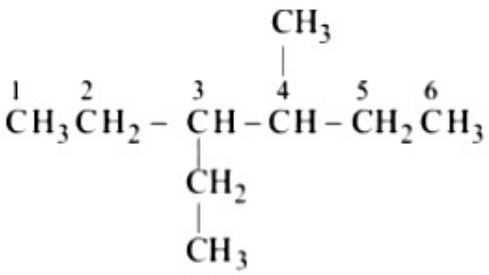
B. 3 - ethyl −4 - methylhexane

C. 3,4 -ethylmethylhexane

D. 4 - ethyl - 3 - methylhexane

Answer: B

Solution:



3-Ethyl-4-methylhexane

Question143

Which one of the following acids does not exhibit optical isomerism? [Online April 12, 2014]

Options:

A. Lactic acid

B. Tartaric acid

C. Maleic acid

D. alpha -amino acids

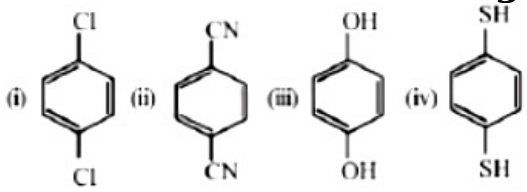
Answer: C

Solution:

Solution:
Optically active compounds contain an asymmetric (chiral) carbon atom (a carbon atom attached to four different atoms or groups). Therefore, all acids except maleic acid exhibit optical isomerism.

Question144

For which of the following molecule significant μ ≠ 0?



[2014]

Options:

A. Only (i)

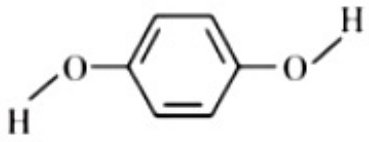
B. (i) and (ii)

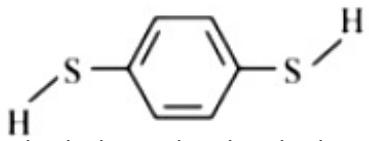
C. Only(iii)

D. (iii) and (iv)

Answer: D

Solution:





In both the molecules the bond moments are not cancelling with each other and hence the molecules has a resultant dipole.

Question145

In which of the following pairs A is more stable than B ? [Online April 9, 2014]

Options:

A.

B.

C.

D. $Ph_3C^{\bullet}$, $(CH_3)_3C^{\bullet}$

Answer: D

Solution:

Solution:
$Ph_3\dot{C}$ is more stable than $(CH_3)_3\dot{C}$ because resonance stabilisation effect in $Ph_3\dot{C}$ is more pronounced as compared to hyperconjugation stabilisation effect in $(CH_3)_3\dot{C}$, overall stability orderamong free radical is:
Triphenylmethyl > benzyl > allyl > tertiary alkyl > secondary > primary > methyl > vinyl

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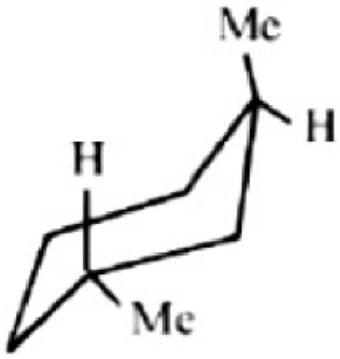
Question146

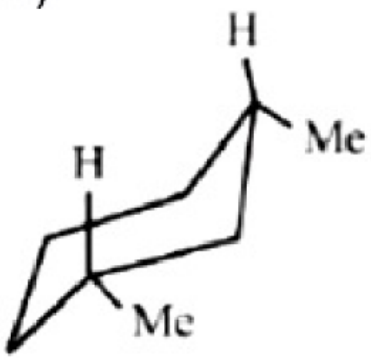
Arrange in the correct order of stability (decreasing order) for the following molecules:

(I)



(II)

(III)



(IV)

[Online April 22, 2013]

Options:

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

B. (IV) > (III) > (II) ≈ (I)

C. (I) > (II) ≈ (III) > (IV)

D. (III) > (I) ≈ (II) > (IV)

Answer: D

Solution:

Question147

A solution of (−) − 1− chloro −1− phenylethane in toluene racemises slowly in the presence of a small amount of $SbCl_5$, due to the formation of:
[2013]

Options:

A. carbanion

B. carbene

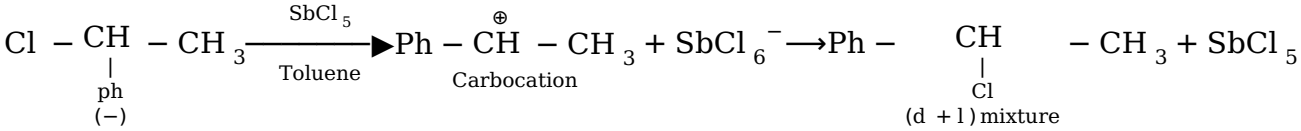
C. carbocation

D. free radical

Answer: C

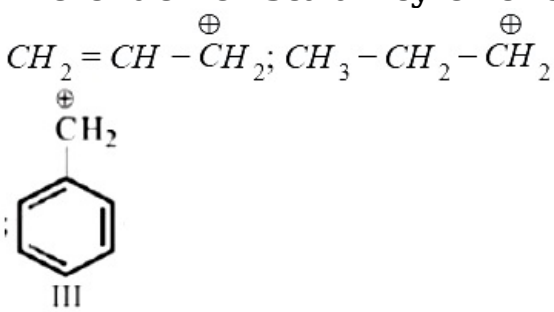
Solution:

Carbocations are planar, hence can beattacked on either sideto form racemic mixture.



Question148

The order of stability of the following carbocations is:



is:

[2013]

Options:

A. I I > I I > I

B. I I > I I I > I

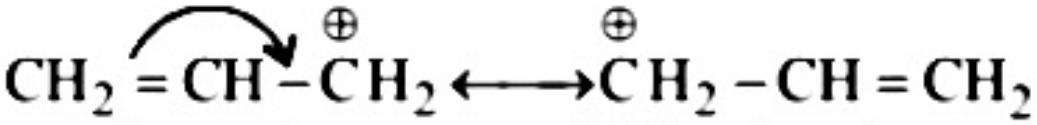
C. I > I I > I I I

D. I I I > I > I I

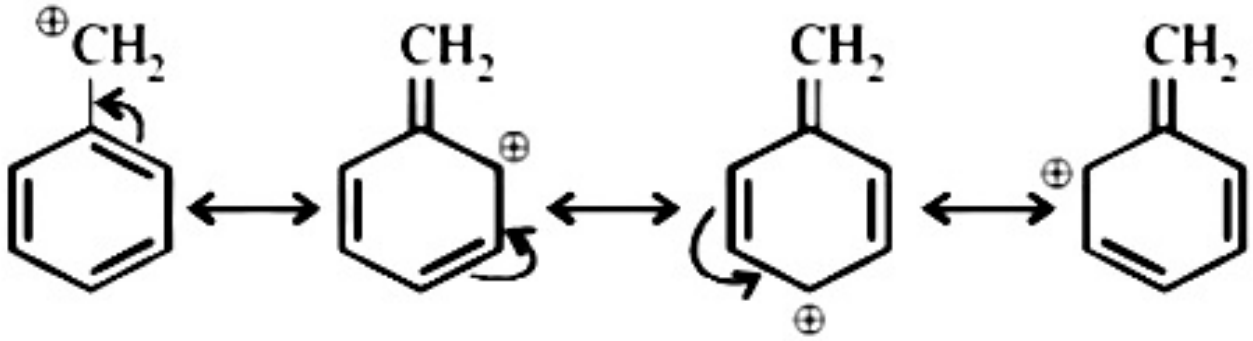
Answer: D

Solution:

Solution:
Higher stability of allyl and benzyl carbocations is due to dispersal of positive charge by resonance

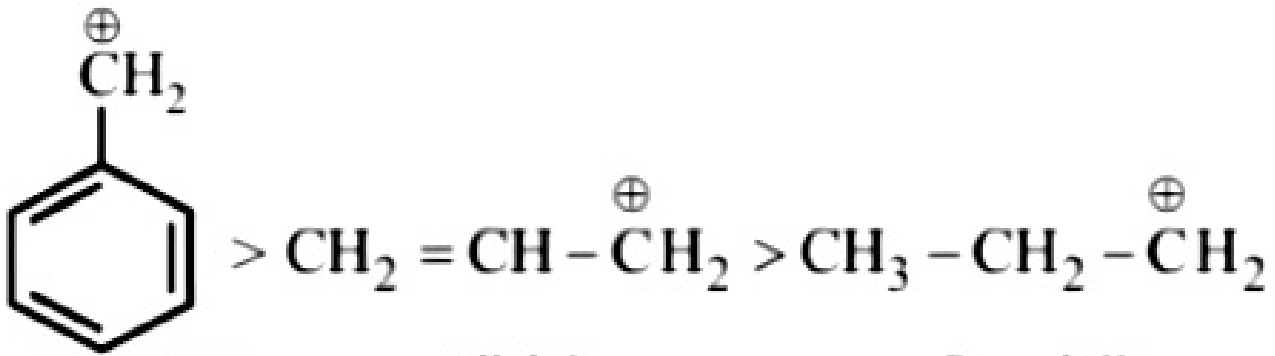


Resonating structures of allyl carbocation



Resonating structures of benzyl carbocation

whereas in alkyl carbocations dispersal of positive charge on different hydrogen atoms is due to inductive effect. Hence the correct order of stability will be



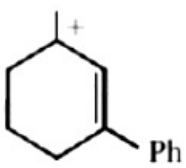
Benzyl, III Allyl, I Propyl, II

Question149

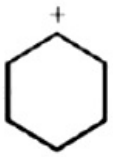
Which one of the following is most stable? [Online April 9, 2013]

Options:

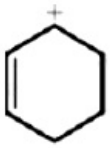
A.



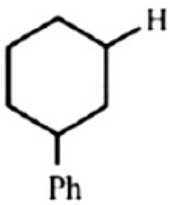
B.



C.



D.



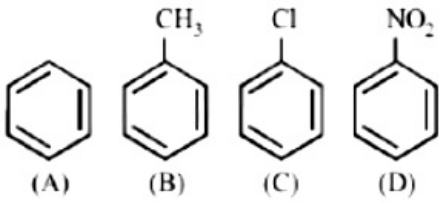
Answer: A

Solution:

Solution:
3˚ carbocations are most stable.

Question150

Given



In the above compounds correct order of reactivity in electrophilic substitution reactions will be:
[Online April 25,2013]

Options:

A. B > A > C > D

B. D > C > B > A

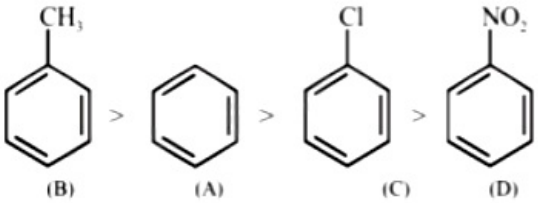
C. A > B > C > D

D. B > C > A > D

Answer: A

Solution:

$-Cl$ and $-CH_3$ groups are o and p directing. They are electron releasing due to $+M$ and hyperconjugation effects. Further since such groups increase electron density in the nucleus, they facilitate further electrophilic substitution and hence known as activating group. The activating effect of these groups is in order of $-CH_3 > -X$ but chlorine exceptionally deactive the ring due to strong $-$ I effect. Hence, it is difficult to carry out substitution in chlorobenzene than in benzene. Further $-NO_2$ is a deactivating group, hence deactivates the benzene nucleus, i.e. hinder the further substitution. Thus nitrobenzene undergo electrophilic substitution with a great difficulty, hence the correct order will be



Question151

In nucleophilic substitution reaction, order of halogens as incoming (attacking) nucleophile is:
$I^- > Br^- > Cl^-$
The order of halogens as departing nucleophile should be:
[Online April 25, 2013]

Options:

A. $Br^- > I^- > Cl^-$

B. $I^- > Br^- > Cl^-$

C. $Cl^- > Br^- > I^-$

D. $Cl^- > I^- > Br^-$

Answer: B

Solution:

Solution:
Since the leaving group breaks away as a base, it is easier to displace weaker bases as compared to stronger bases. Thus less basic the substituent, the more easily it is displaced.
Since the basic strength of the given groups is in order.
$I^- < Br^- < Cl^-$
Thus the order of halogen leaving groups is
$I^- > Br^- > Cl$

Question152

Which of the following cannot be represented by resonance structures?
[Online May 7, 2012]

Options:

A. Dimethyl ether

B. Nitrate anion

C. Carboxylate anion

D. Toluene

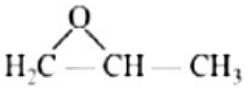
Answer: A

Solution:

Solution:
Ethers, due to absence of delocalized pair of electrons do not show resonance.

Question153

The IUPAC name of the compound is



[Online May 7, 2012]

Options:

A. 1,2 -propoxide

B. propylene oxide

C. 1, 2− oxo propane

D. 1,2 -cpoxy propane

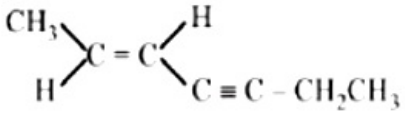
Answer: D

Solution:

Solution:
1,2 -Epoxy propane is the correct IUPAC name of given compound.

Question154

The IUPAC name of the following compound is



[Online May 19,2012]

Options:

A. (E)-2-hepten-4-yne

B. (Z) − 5 -hepten- 3 -yne

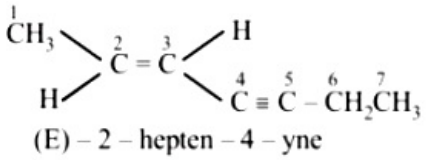
C. (E)-5-hepten-3-yne

D. (Z)-2-hepten-4-yne

Answer: A

Solution:

Solution:



(E) – 2 – hepten – 4 – yne

Question155

Dipole moment is shown by [Online May 26, 2012]

Options:

A. 1,2 -dichlorobenzene

B. trans-2, 3 -dichloro-2-butene

C. 1,4 -chlorobenzene

D. trans-1,2-dinitroethene

Answer: A

Solution:

Solution:
In 1,2 -dichlorobenzene the two dipoles are at 60˚ (i.e. unsymmetric). Thus possesses dipole moment.

Question156

How many cyclic structures are possible for C_4H_6 ? [Online May 7, 2012]

Options:

A. 3

B. 5

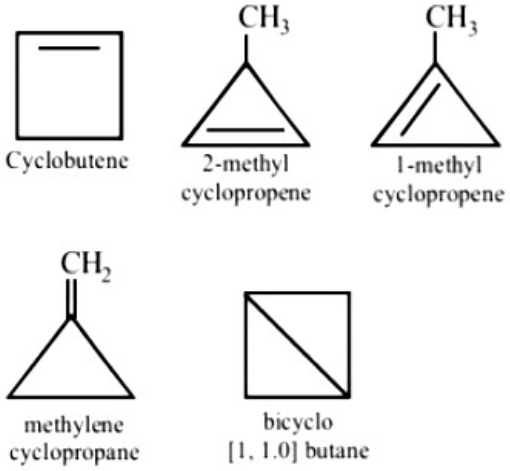
C. 6

D. 4

Answer: B

Solution:

Five cyclic structures are possible for C_4H_6. These are as following:



Question157

Maleic acid and fumaric acids are [Online May 26,2012]

Options:

A. chain isomers

B. functional isomers

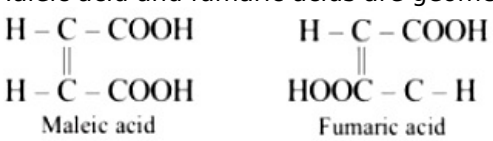
C. tautomers

D. geometrical isomers

Answer: D

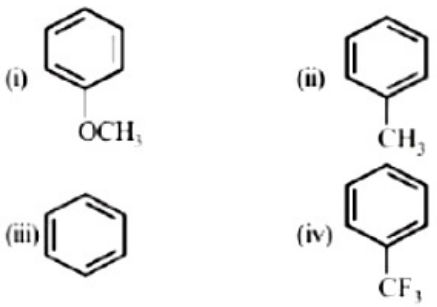
Solution:

Solution:
Maleic acid and fumaric acids are geometrical isomers.



Question158

In the below mentioned compounds the decreasing order of reactivity towards electrophilic substitution is



[Online May 12, 2012]

Options:

A. (iv) > (i) > (ii) > (iii)

B. (ii) >(iii) > (i) > (iv)

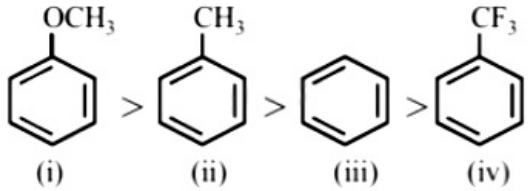
C. (iii) >(i) > (iv)> (ii)

D. (i) > (ii) > (iii) > (iv)

Answer: D

Solution:

Solution:
$-OCH_3$ and $-CH_3$ groups are activating group while $-CF_3$ is a deactivating group. Thus order is



Question159

The change in the optical rotation of freshly prepared solution of glucose is known as:
[2011RS]

Options:

A. racemisation

B. specific rotation

C. mutarotation

D. tautomerism

Answer: C

Solution:

Solution:
When either of the two forms of glucose is dissolved in water, there is change in rotation till the equilibrium value of

$+52.5^{\circ}$. This is known as mutarotation

$$\underset{+111.5^{\circ}}{\alpha - D(+) \text{ Glucose}} \rightleftharpoons \underset{+52.5^{\circ}}{\text{Equilibrium mixture}} \rightleftharpoons \underset{+19.5^{\circ}}{\beta - D - (+) \text{ Glucose}}$$

Question160

Out of the following, the alkene that exhibits optical isomerism is [2010]

Options:

A. 3-methyl-2-pentene

B. 4 -methyl-1-pentene

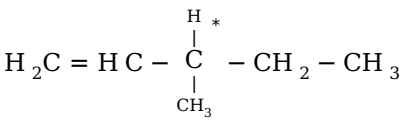
C. 3-methyl-1-pentene

D. 2 -methyl-2-pentene

Answer: C

Solution:

Solution:



3- Methyl-1-pentene

Question161

The correct order of increasing basicity of the given conjugate bases ($R = CH_3$) is [2010]

Options:

A. $RCO\overline{O} < HC \equiv \overline{C} < \overline{R} < \overline{N}H_2$

B. $\overline{R} < HC \equiv \overline{C} < RCO\overline{O} < \overline{N}H_2$

C. $RCO\overline{O} < \overline{N}H_2 < HC \equiv \overline{C} < \overline{R}$

D. $RCO\overline{O} < HC \equiv \overline{C} < \overline{N}H_2 < \overline{R}$

Answer: D

Solution:

Solution:

The corresponding conjugate acid are $\underset{\text{Most acidic}}{CH_3COOH} > CH \equiv CH > NH_3 > \underset{\text{Least acidic}}{RH}$

$\therefore$ the correct order of basicity is $RCOO^- < CH \equiv C^- < NH_2^- < R^-$

Question162

The IUPAC name of neopentane is [2009]

Options:

A. 2, 2-dimethylpropane

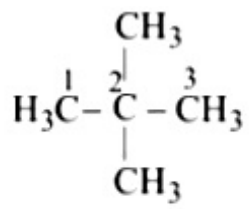
B. 2-methylpropane

C. 2,2 -dimethylbutane

D. 2- methylbutane

Answer: A

Solution:



Neopentane
or 2,2- Dimethylpropane

Question163

The alkene that exhibits geometrical isomerism is: [2009]

Options:

A. 2 - methyl propene

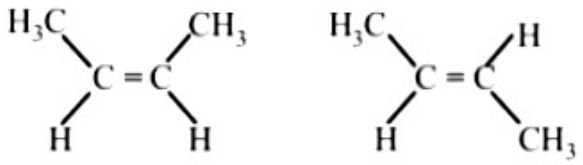
B. 2 -butene

C. 2 - methyl −2 - butene

D. propene

Answer: B

Solution:



cis-2-Butene *trans*-2-Butene

Question164

The number of stereoisomers possible for a compound of the molecular formula $CH_3 - CH = CH - CH(OH) - Me$ is:
[2009]

Options:

A. 2

B. 4

C. 6

D. 3

Answer: B

Solution:

$CH_3 - CH = CH - \underset{\underset{OH}{|}}{C}H\,CH_3$

It exhibits both geometrical as well as optical isomerism.
cis $-$R cis $-$S
trans - R trans - S

Question165

Arrange the carbanions,
$(CH_3)_3\bar{C}$, $\bar{C}Cl_3$, $(CH_3)_2\bar{C}H$, $C_6H_5\bar{C}H_2$
order of their decreasing stability is
[2009]

Options:

A. $(CH_3)_2\bar{C}H > \bar{C}Cl_3 > C_6H_5\bar{C}H_2 > (CH_3)_3\bar{C}$

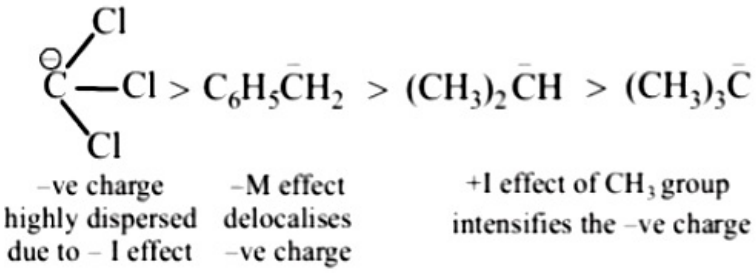
B. $\bar{C}Cl_3 > C_6H_5\overline{CH_2} > (CH_3)_2\overline{CH} > (CH_3)_3\bar{C}$

C. $(CH_3)_3\bar{C} > (CH_3)_2\bar{C}H > C_6H_5\bar{C}H_2 > \bar{C}Cl_3$

D. $C_6H_5\bar{C}H_2 > \bar{C}Cl_3 > (CH_3)_3\bar{C} > (CH_3)_2\overline{CH}$

Answer: B

Solution:



Question166

The correct decreasing order of priority for the functional groups of organic compounds in the IUPAC system of nomenclature is [2008]

Options:

A. $-COOH$, $-SO_3H$, $-CONH_2$, $-CHO$

B. $-SO_3H$, $-COOH$, $-CONH_2$, $-CHO$

C. $-CHO$, $-COOH$, $-SO_3H$, $-CONH_2$

D. $-CONH_2 - CHO$, $-SO_3H$, $-COOH$

Answer: A

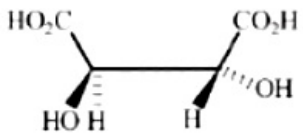
Solution:

The correct order of priority for the given functional group is

$$-COOH > -SO_3H > -\overset{O}{\overset{\|}{C}}-NH_2 > -\overset{O}{\overset{\|}{C}}-H$$

Question167

The absolute configuration of



[2008]

Options:

A. S, S

B. R, R

C. R, S

D. S, R

Answer: B

Solution:

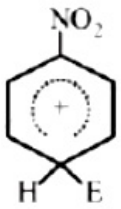
Solution:
The absolute configuration is (R, R)
(use priority rules to get the absolute configuration)

Question168

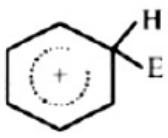
The electrophile, $E^{\oplus}$ attacks the benzene ring to generate the intermediate σ− complex. Of the following, which σ^{-} complex is lowest energy?
[2008]

Options:

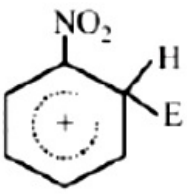
A.



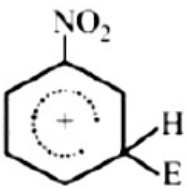
B.



C.



D.



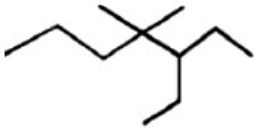
Answer: B

Solution:

In option (b) the complex formed is with benzene whereas in other cases it is formed with nitrobenzene with $-NO_2$ group in different positions ($o-$, $m-$, $p-$). The complex formed with nitrobenzene in any position of $-NO_2$ group is less stablethan the complex formed with benzene, so the most stable complex has lowest energy.

Question169

The IUPAC name of is



[2007]

Options:

A. 3-ethyl-4,4-dimethylheptane

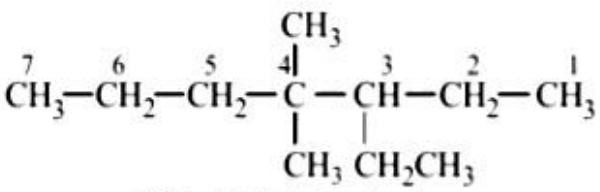
B. 1,1 -diethyl-2,2-dimethylpentane

C. 4,4 -dimethyl -5, 5 -diethylpentane

D. 5,5 -dicthyl -4, 4 -dimethylpentane.

Answer: A

Solution:



3-Ethyl-4,4-dimethylheptane

Question170

Which one of the following conformations of cyclohexane is chiral? [2007]

Options:

A. Boat

B. Twist boat

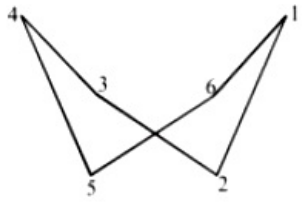
C. Rigid

D. Chair

Answer: B

Solution:

Chiral conformation will not have plane of symmetry. Since twist boat does not have plane of symmetry, it is chiral.

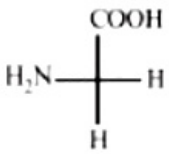


Question171

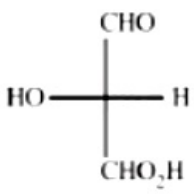
Which of the following molecules is expected to rotate the plane of plane-polarised light?
[2007]

Options:

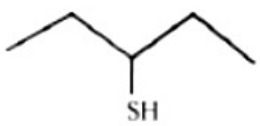
A.



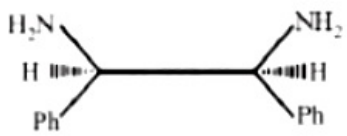
B.



C.



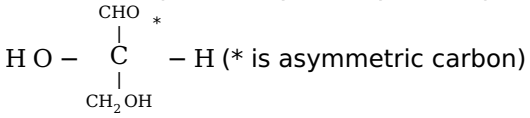
D.



Answer: B

Solution:

Solution:
The organic compounds which have chiral carbon atom (a carbon atom attached to four different groups or atoms) and do not have plane of symmetry rotate plane polarised light.



Question172

Presence of a nitro group in a benzene ring [2007]

Options:

A. deactivates the ring towards electrophilic substitution

B. activates the ring towards electrophilic substitution

C. renders the ring basic

D. deactivates the ring towards nucleophilic substitution.

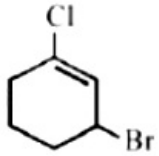
Answer: A

Solution:

Solution:
Nitro group is electron withdrawing group, so it deactivates the ring towards electrophilic substitution.

Question173

The IUPAC name of the compound shown below is :



[2006]

Options:

A. 3 -bromo-1-chlorocyclohexene

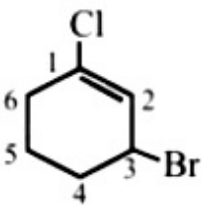
B. 1 -bromo-3-chlorocyclohexene

C. 2 -bromo-6-chlorocyclohex-1-ene

D. 6-bromo-2-chlorocyclohexene

Answer: A

Solution:



3-Bromo-1-chlorocyclohexene

Question174

Increasing order of stability among the three main conformations (i.e. Eclipse, Anti, Gauche) of 2 -fluorocthanol is [2006]

Options:

A. Eclipse, Anti, Gauche

B. Anti, Gauche, Eclipse

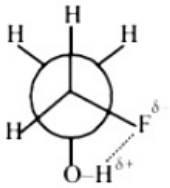
C. Eclipse, Gauche, Anti

D. Gauche, Eclipse, Anti

Answer: A

Solution:

Solution:



Due to hydrogen bonding between H &F gauche conformation is most stable, hence the correct order is Eclipse, Anti, Gauche

---

Question175

The increasing order of stability of the following free radicals is [2006]

Options:

A. $(C_6H_5)_2\dot{C}H < (C_6H_5)_3\dot{C} < (CH_3)_3\dot{C} < (CH_3)_2\dot{C}H$

B. $(CH_3)_2\dot{C}H < (CH_3)_3\dot{C} < (C_6H_5)_2\dot{C}H < (C_6H_5)_3\dot{C}$

C. $(CH_3)_3\dot{C} < (CH_3)_2\dot{C}H < (C_6H_5)_2\dot{C}H < (C_6H_5)_3\dot{C}$

D. $(C_6H_5)_3\dot{C} < (C_6H_5)_2\dot{C}H < (CH_3)_3\dot{C} < (CH_3)_2\dot{C}H$

Answer: B

Solution:

Solution:
The order of stability of free radicals
$(C_6H_5)_3\dot{C} > (C_6H_5)_2\dot{C}H > (CH_3)_3\dot{C} > (CH_3)_2\dot{C}H$
The stabilisation of first two is due to resonance and last two is due to hyper conjugation.

Question176

$CH_3Br + Nu^- \longrightarrow CH_3 - Nu + Br^-$ The decreasing order of the rate of the above reaction with nucleophiles (Nu) A to D is
[Nu^- = (A)PhO, (B)AcO, (C)HO, (D)CH_3O^-]
[2006]

Options:

A. A > B > C > D

B. B > D > C > A

C. D > C > A > B

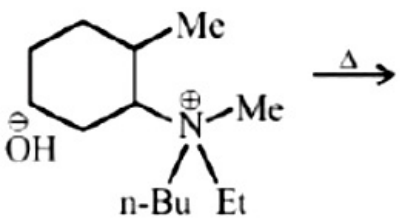
D. D > C > B > A

Answer: C

Solution:

$$\underset{e^- s \text{ are delocalised}}{CH_3COO^-} < C_6H_5O^- < OH^- < \underset{\text{Max . } e^- \text{ density on O}}{OCH_3}$$

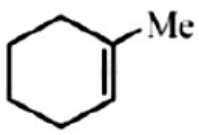
Question177



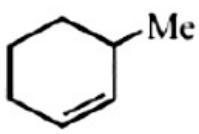
The alkene formed as a major product in the above elimination reaction is
[2006]

Options:

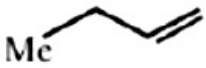
A.



B.



C.

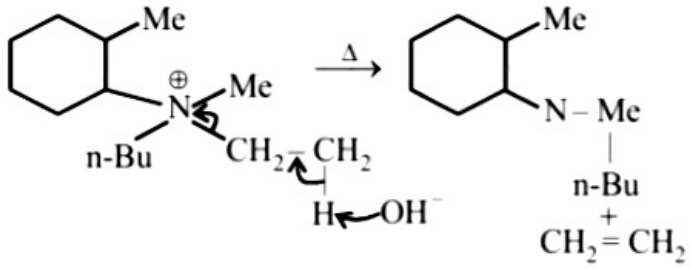


D. $CH_2 = CH_2$

Answer: D

Solution:

Hofmann's rule : When theoretically more than one type of alkenes are possible in eliminations reaction, the alkene containing least alkylated (least substituted) double bond is formed as major product. Hence



Note: Therefore less sterically hundred β -hydrogen is removed.

Question178

Which types of isomerism is shown by 2,3 -dichlorobutane? [2005]

Options:

A. Structural

B. Geometric

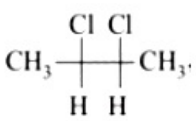
C. Optical

D. Diastereo

Answer: C

Solution:

Solution:



$CH_2 - CH_2$, 2, 3 -Dichlorobutane exhibits optical isomerism due to the presence of two asymmetric carbon atoms.

Question179

Due to the presence of an unpaired electron, free radicals are: [2005]

Options:

A. cations

B. anions

C. chemically inactive

D. chemically reactive

Answer: D

Solution:

Solution:
Free radicals are electrically neutral, unstable and very reactive on account of the presence of odd electrons.

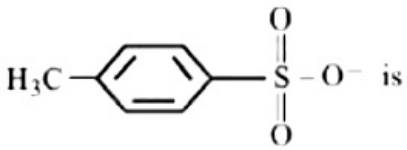
Question180

The decreasing order of nucleophilicity among the nucleophiles is

(A) $CH_2\overset{\overset{O}{\|}}{C} - O^-$

(B) CH_3O^-

(C) CN^-



is

[2005]

Options:

A. (C) > (B) > (A) > (D)

B. (B) > (C) > (A) > (D)

C. (D) > (C) > (B) > (A)

D. (A) > (B) > (C) > (D)

Answer: A

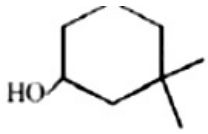
Solution:

Solution:
In moving down a group, the basicity and nucleophilicity are inversely related, i.e. nucleophilicity increases while basicity decreases. In going from left to right across a period, the basicity and nucleophilicity are directly related. Both of the characteristics decrease as the electronegativity of the atom bearing lone pair of electrons increases. If the nucleophilic centre of two or more species is same, nucleophilicity parallels basicity, i.e. more basic the species, stronger is its nucleophilicity.
Hence based on the above facts, the correct order of nucleophilicity will be

$\underset{(C)}{CN^-} > \underset{(B)}{CH_3O^-} > \underset{(A)}{CH_3COO^-} > \underset{(D)}{H_3CC_6H_4SO_3^-}$

Question181

The IUPAC name of the compound is



[2004]

Options:

A. 3,3 -dimethyl −1 - cyclohexanol

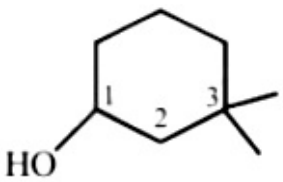
B. 1, 1 -dimethyl-3-hydroxy cyclohexane

C. 3, 3-dimethyl-1-hydroxy cyclohexanc

D. 1, l-dimethyl-3-cyclohexanol

Answer: A

Solution:



3 , 3-Dimethyl - 1 cyclohexanol

Question182

Which one of the following does not have sp^2 hybridised carbon? [2004]

Options:

A. Acetonitrile

B. Acetic acid

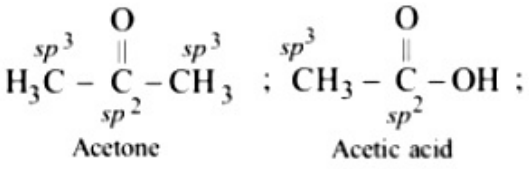
C. Acetone

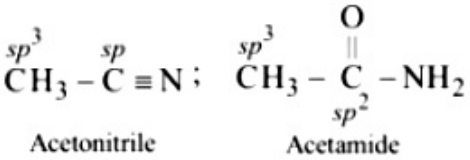
D. Acetamide

Answer: A

Solution:

Solution:





Question183

Which of the following will have a mesoisomer also? [2004]

Options:

A. 2,3 - Dichloropentane

B. 2,3 -Dichlorobutane

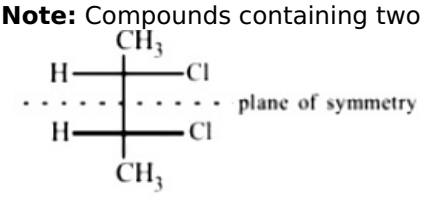
C. 2-Chlorobutane

D. 2-Hydroxypropanoic acid

Answer: B

Solution:

Solution:
Note: Compounds containing two similar chiral Catoms have plane of symmetry and can exist in meso form too.

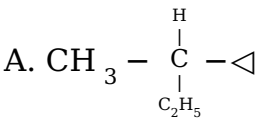


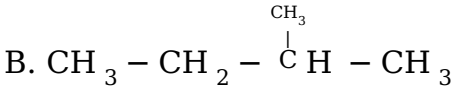
meso-2, 3-Dichlorobutane

Question184

Amongst the following compounds, the optically active alkane having lowest molecular mass is [2004]

Options:

A. 

B. 

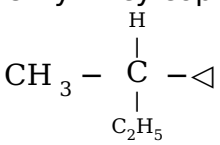
C. $CH_3 - CH_2 - CH_2 - CH_3$

D. $CH_3 - CH_2 - C \equiv CH$

Answer: A

Solution:

Only 2 -cylcopropylbutane has a chiral centre,



Question185

Which of the following compounds is not chiral? [2004]

Options:

A. 1 -chloro-2-methyl pentane

B. 2 -chloropentane

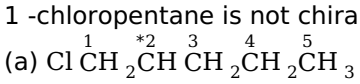
C. 1 -chloropentane

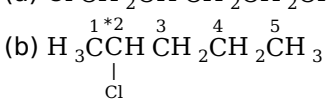
D. 3 -chloro-2-methyl pentane

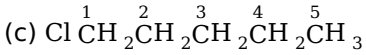
Answer: C

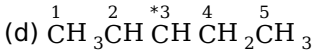
Solution:

Solution:
1 -chloropentane is not chiral while others are chiral in nature

(a) 

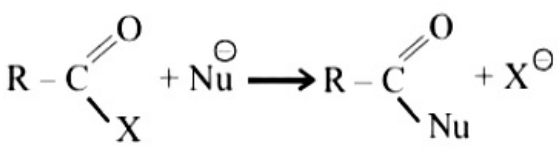
(b) 

(c) 

(d) 

Question186

The reaction



is fastest when X is [2005, 2004]

Options:

A. OCOR

B. OC_2H_5

C. NH_2

D. Cl

Answer: D

Solution:

Solution:
$-Cl$ is the best leaving group among the given options.

Question187

Consider the acidity of the carboxylic acids:
(1) PhCOOH
(2) o − $NO_2C_6H_4COOH$
(3) p - $NO_2C_6H_4COOH$
(4) m - $NO_2C_6H_4COOH$
Which of the following order is correct?
[2004]

Options:

A. 2 > 4 > 1 > 3

B. 2 > 4 > 3 > 1

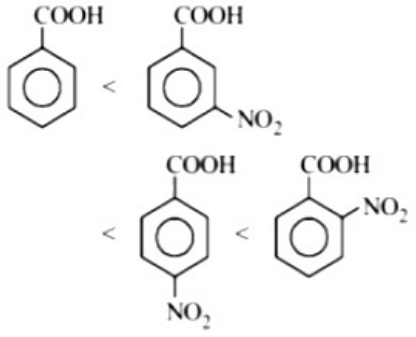
C. 1 > 2 > 3 > 4

D. 2 > 3 > 4 > 1

Answer: D

Solution:

Solution:
In carboxylic acids, presence of electron withdrawing substituent e.g. $-NO_2$ disperses the negative charge of the anion and stabilises it and hence increases the acidity of the parent acid.
Further o -isomer will have higher acidity than corresponding m -and p -isomers due to ortho and high inductive effect of $-NO_2$ group. Since nitro group at p position has more pronounced electron withdrawing than $-NO_2$ group at m -position, hence the correct order is:

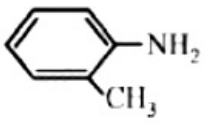


Question188

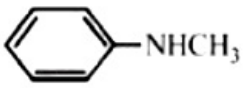
Which of the following is the strongest base? [2004]

Options:

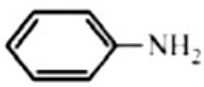
A.



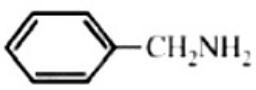
B.



C.



D.



Answer: D

Solution:

Solution:
Lone pair of electrons present on the nitrogen of benzyl amine is not involved in resonance.

Question189

The general formula $C_nH_{2n}O_2$ could be for open chain [2003]

Options:

A. carboxylic acids

B. diols

C. dialdehydes

D. diketones

Answer: A

Solution:

Solution:
$C_nH_{2n}O_2$ is general formula for carboxylic acid

Question190

The IUPAC name of $CH_3COCH(CH_3)_2$ is [2003]

Options:

A. 2 -methyl-3-butanone

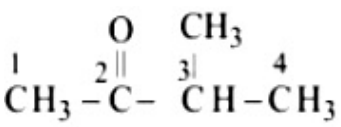
B. 4 -methylisopropyl ketone

C. 3 -methyl-2-butanone

D. Isopropylmethyl ketone

Answer: C

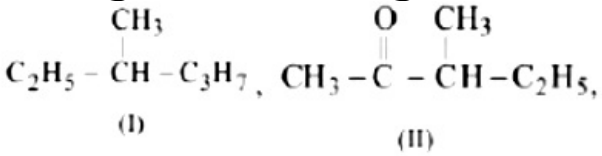
Solution:



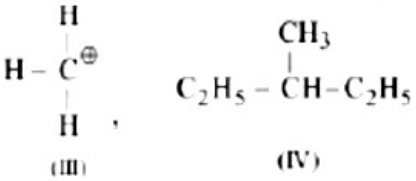
3-Methyl-2-butanone

Question191

Among the following four structures I to IV,



(I) (II)



(III) (IV)

it is true that
[2003]

Options:

A. only I and II are chiral compounds

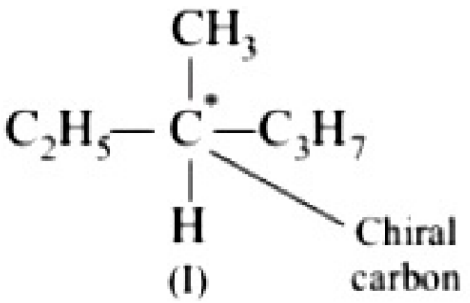
B. only III is a chiral compound

C. only II and IV are chiral compounds

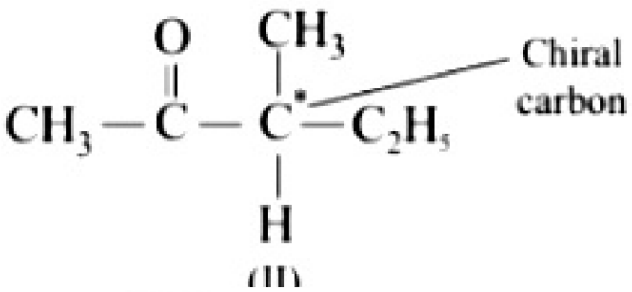
D. all four are chiral compounds

Answer: A

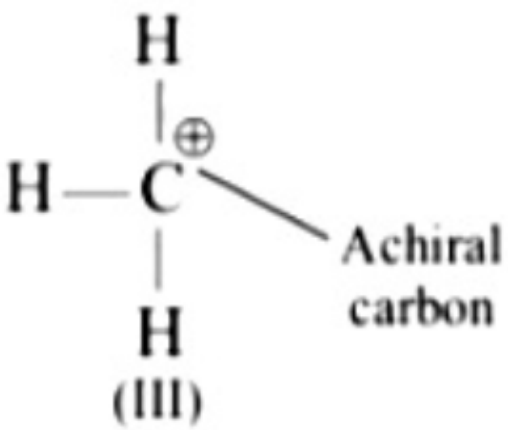
Solution:



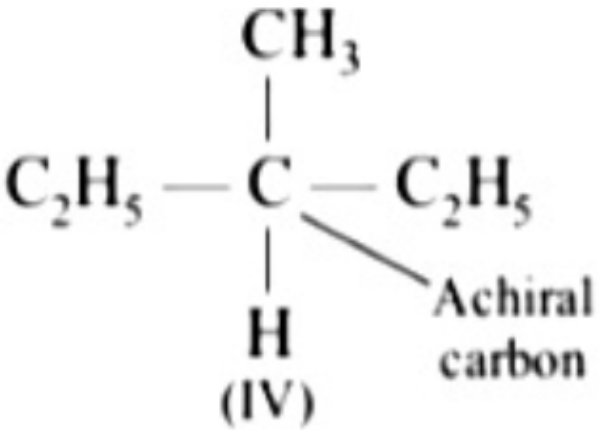
(I)



(II)



(III)



(IV)

Question192

In the anion $HCOO^-$ the two carbon-oxygen bonds are found to be of equal length. What is the reason for it? [2003]

Options:

A. The C = O bond is weaker than the C − O bond

B. The anion $HCOO^-$ has two resonating structures

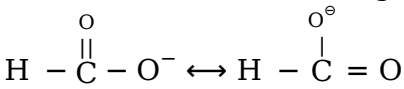
C. The anion is obtained by removal of a proton from the acid molecule

D. Electronic orbitals of carbon atom are hybridised

Answer: B

Solution:

$HCOO^-$ exists in following resonating structures



Hence in it both the carbon oxygen bonds are found equal.

Question193

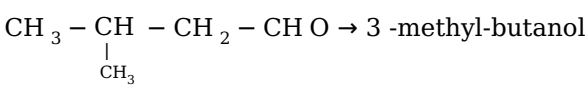
Which of the following compounds has wrong IUPAC name? [2002]

Options:

A.

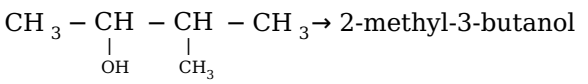
$CH_3 - CH_2 - CH_2 - COO - CH_2CH_3$ → ethyl butanoate

B.



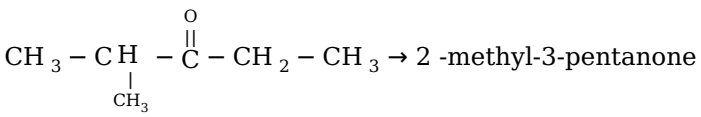
→ 3 -methyl-butanol

C.



→ 2-methyl-3-butanol

D.



→ 2 -methyl-3-pentanone

Answer: C

Solution:

According to IUPAC convention alcohols are having more priority than saturated carbons.As the IUPAC name of compound shown above is:
3 - methyl butan -2- ol

Question194

In which of the following species is the underlined carbon having sp^3 hybridisation?
[2002]

Options:

A. CH_3COOH

B. CH_3xCH_2OH

C. CH_3xCOCH_3

D. $CH_2 = xCH - CH_3$

Answer: B

Solution:

In molecules (a), (c) and (d), the carbon atom has a multiple bond, only (b) has sp^3 hybridisation.

Question195

A similarity between optical and geometrical isomerism is that
[2002]

Options:

A. each forms equal number of isomers for a given compound

B. if in a compound one is present then so is the other

C. both are included in stereoisomerism

D. they have no similarity

Answer: C

Solution:

Both differ in the arrangement of group in space, therefore grouped under sterio-isomerism.

Question196

Which of the following does not show geometrical isomerism?
[2002]

Options:

A. 1,2 - dichloro-1-pentene

B. 1,3 -dichloro- 2 -pentene

C. 1,1 -dichloro-1-pentene

D. 1,4 -dichloro- 2 -pentene

Answer: C

Solution:

(a) $Cl\overset{1}{C}H = \underset{\underset{Cl}{|}}{\overset{2}{C}}\overset{3}{C}H_2\overset{4}{C}H_2\overset{5}{C}H_3$

(b) $Cl\overset{1}{C}H_2\overset{2}{C}H = \overset{\overset{Cl}{|}}{\overset{3}{C}} - \overset{4}{C}H_2\overset{5}{C}H_3$

(c) $Cl_2\overset{1}{C} = \overset{2}{C}H\overset{3}{C}H_2\overset{4}{C}H_2\overset{5}{C}H_3$

(d) $Cl\overset{1}{C}H_2\overset{2}{C}H = \overset{3}{C}H\underset{\underset{Cl}{|}}{\overset{4}{C}H}\overset{5}{C}H_3$

Question197

Racemic mixture is formed by mixing two [2002]

Options:

A. isomeric compounds

B. chiral compounds

C. meso compounds

D. enantiomers with chiral carbon

Answer: D

Solution:

A mixture of equal amount of two enantiomers is called a racemic mixture.

Question198

Following types of compounds (as I, II)

$\underset{(I)}{CH_3}CH = CHCH_3 \quad CH_3\underset{\underset{\underset{(II)}{CH_2CH_3}}{|}}{C}HOH$

are studied in terms of isomerism in:

[2002]

Options:

A. chain isomerism

B. position isomerism

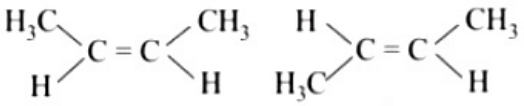
C. conformers

D. stereoisomerism

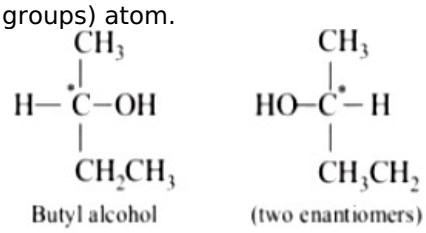
Answer: D

Solution:

Solution:
Stereoisomerism, isomers differ in the arrangement of groups in space. The two structures show stereoisomerism. Structure I shows geometrical isomerism as it contains two different atoms or groups H and CH_3 attached to each carbon containing double bond.



cis-butene trans-butene Structure II shows optical isomerism as it contains a chiral carbon (attached to four different groups) atom.



Question199

Arrangement of $(CH_3)_3C-$, $(CH_3)_2CH-$ CH_3- CH_2- when attached to benzyl or an unsaturated group in increasing order of inductive effect is [2002]

Options:

A. $(CH_3)_3C- < (CH_3)_2CH- < CH_3-CH_2-$

B. $CH_3-CH_2- < (CH_3)_2CH- < (CH_3)_3C-$

C. $(CH_3)_2CH- 4(CH_3)_3C- < CH_3-CH_2-$

D. $(CH_3)_3C- < CH_3CH_2- < (CH_3)_2CH-$

Answer: B

Solution:

Solution:
$-CH_3$ group has $+I$ effect, as number of $-CH_3$ group increases, the inductive effect increases. Therefore the correct order is

$CH_3 - CH_2 - < (CH_3)_2CH - < (CH_3)_3C -$

Question200

The functional group, which is found in amino acid is [2002]

Options:

A. - COOH group

B. NH_2 group

C. $-CH_3$ group

D. both (a) and (b).

Answer: D

Solution:

Solution:
Amino acids contain $-NH_2$ and $-COOH$ groups, e.g glycine H_2NCH_2COOH .
