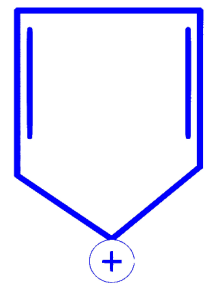
General Organic Chemistry

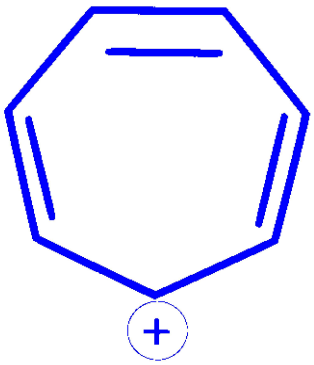
Question1

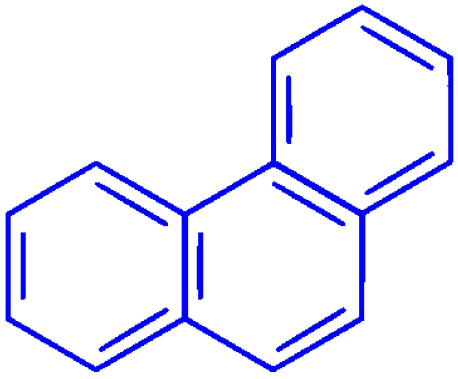
Which of the following is not an aromatic compound

KCET 2025

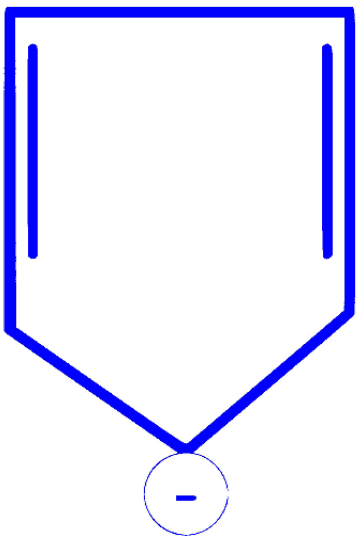
Options:

A. 

B. 

C. 

D.



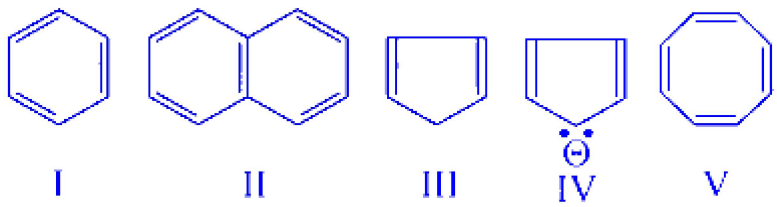
Answer: A

Solution:

1 is antiaromatic as it has $4\pi e^-$.

Question2

Among the following.



The set which represents aromatic species is

KCET 2023

Options:

A. I, II and III

B. III, IV and V

C. II and III

D. I, II and IV

Answer: D

Solution:

Compounds I, II and IV have continuous delocalisation of π-electrons and have $(4n + 2\pi)$ electrons.

On the other hand compound III does not shows conjugation and compound V has $4n\pi$ electrons. Thus, compounds given in only I, II and IV are aromatic.

Question3

Arrange benzene, n-hexane and ethyne in decreasing order of their acidic behaviour.

KCET 2021

Options:

A. Benzene $>$ n-hexane $>$ Ethyne

B. n-hexane $>$ Benzene $>$ Ethyne

C. Ethyne $>$ n-hexane $>$ Benzene

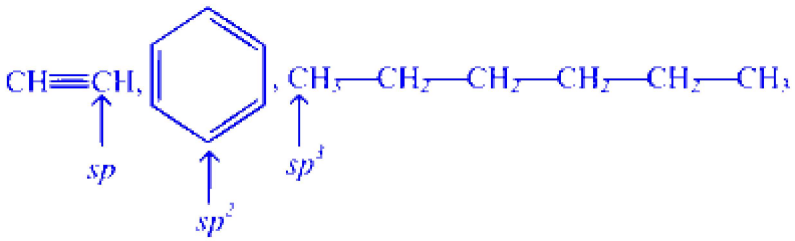
D. Ethyne $>$ Benzene $>$ n-hexane

Answer: D

Solution:

The decreasing order of acidic behaviour is ethyne > benzene > n-hexane

Because carbon in ethyne, benzene and n-hexane are sp, sp^2 and sp^3 hybridised respectively.



∴ The carbocation formed after the removal of 'H' is more stable in sp hybridised carbon atom because of high electronegativity due to more s-character.

Question4

Which of the following is the strongest base?

KCET 2020

Options:

A. CH_3COO^-

B. Cl^-

C. OH^-

D. CH_3O^-

Answer: D

Solution:

We know, an anion is strongest base, if its conjugate acid is weakest.

Here, CH_3COO^- will have conjugate acid CH_3COOH.

Cl^- will have conjugate acid HCl.

OH^- will have conjugate acid HOH.

CH_3O^- will have conjugate acid CH_3OH.

Since, out of above four, CH_3OH will be the weakest acid and hence, CH_3O^- will be strongest base.

Question5

Resonance effect is not observed in

KCET 2019

Options:

A. $CH_2 = CH - CH = CH_2$

B. $CH_2 = CH - C \equiv N$

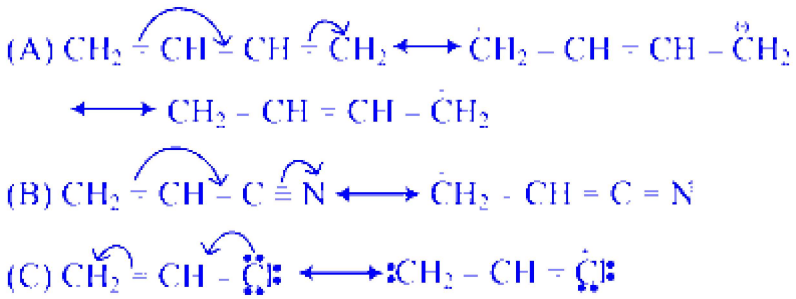
C. $CH_2 = CH - Cl$

D. $CH_2 = CH - CH_2 - NH_2$

Answer: D

Solution:

Resonance effect. is not observed in $CH_2 = CH - CH_2 - NH_2$ because polarity is not developed within a molecule due to the interaction of two π-bonds. As a result, the molecule does not undergo conjugation. Options (a), (b) and (c) shows resonance effect.



Question6

Which of the following is more basic than aniline?

KCET 2018

Options:

A. Diphenylamine

B. Triphenylamine

C. p-nitroaniline

D. Benzylamine

Answer: D

Solution:

Let's analyze each option by considering the availability of the nitrogen's lone pair for accepting a proton:

Aniline: $C_6H_5NH_2$

In aniline, the lone pair on nitrogen is partially delocalized into the benzene ring. This delocalization makes the lone pair less available for protonation, so aniline is less basic compared to amines where the lone pair is fully localized.

Diphenylamine: $C_6H_5NHC_6H_5$

Here, the nitrogen is bonded to two phenyl groups. The lone pair can be delocalized into both aromatic rings, decreasing its availability even more than in aniline. This makes diphenylamine less basic.

Triphenylamine: $N(C_6H_5)_3$

In triphenylamine, the nitrogen is bonded to three phenyl groups, which further delocalizes the lone pair into the aromatic rings. As a result, the lone pair is even less available, making triphenylamine even less basic.

Benzylamine: $C_6H_5CH_2NH_2$

In benzylamine, the nitrogen is attached to a methylene group (CH_2) before connecting to the benzene ring. This extra methylene group breaks the conjugation between the benzene ring and the amine, keeping the lone pair localized on the nitrogen. Being more localized, the lone pair is more available to accept a proton, which increases its basicity compared to aniline.

Because benzylamine has a localized lone pair on the nitrogen, it is more basic than aniline.

Thus, the answer is:

Option D: Benzylamine.

Question7

In which of the following, homolytic bond fission takes place?

KCET 2017

Options:

A. Free radical chlorination of methane

B. Addition of HBr to double bond

C. Alkaline hydrolysis of ethyl chloride

D. Nitration of benzene

Answer: A

Solution:

In the process of free radical chlorination of methane, homolytic bond fission occurs during the initiation step. Here's a breakdown of the process:

Initiation:

The reaction begins with the homolytic cleavage of a chlorine molecule (Cl_2) into two chlorine radicals ($2Cl^{\bullet}$) under the influence of light:

$$Cl_2 \xrightarrow{\text{Light}} 2Cl^{\bullet}$$

Propagation:

In the first propagation step, a chlorine radical reacts with a methane molecule (CH_4), resulting in the formation of hydrogen chloride (HCl) and a methyl radical ($\dot{C}H_3$):

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

This methyl radical then reacts with another chlorine molecule, producing chloromethane (CH_3Cl) and a new chlorine radical:

$$CH_3 + Cl_2 \longrightarrow CH_3Cl + Cl^{\bullet}$$

Termination:

Termination occurs when two radicals combine to form a stable molecule, halting the chain reaction. Possible termination steps include:

$$2Cl^{\bullet} \longrightarrow Cl_2$$
$$Cl^{\bullet} + \dot{C}H_3 \longrightarrow CH_3Cl$$
$$2\,\dot{C}H_3 \longrightarrow CH_3CH_3$$

In this mechanism, homolytic fission is a critical step that begins the chain reaction, allowing the formation of radicals necessary for further reaction steps.
