



Answer all the questions below as fully as you can then check your answers

1. Why does benzene require a halogen carrier such as FeBr_3 to react with bromine?

- A) Benzene is too reactive and would undergo uncontrolled reactions otherwise.
- B) The halogen carrier makes bromine more electrophilic.
- C) Benzene undergoes electrophilic addition, which requires a catalyst.
- D) The halogen carrier increases the solubility of bromine in benzene.

2. What type of reaction does benzene undergo with bromine in the presence of FeBr_3 ?

- A) Electrophilic addition
- B) Nucleophilic substitution
- C) Electrophilic substitution
- D) Free radical substitution

3. What is the role of FeBr_3 in the bromination of benzene?

A) Acts as a reducing agent

B) Donates electrons to benzene

C) Accepts an electron pair and polarises bromine

D) Acts as a nucleophile

4. Which of the following statements best explains why benzene does not decolorise bromine water?

A) Benzene is nonpolar and does not interact with bromine molecules.

B) Benzene's π -electrons repel bromine molecules.

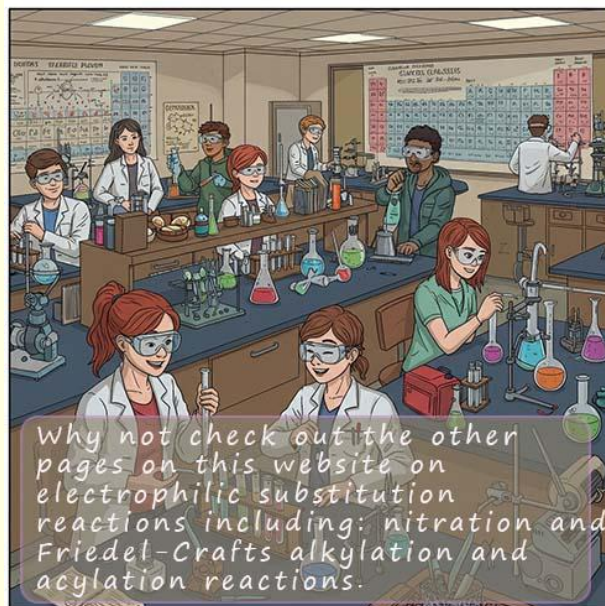
C) The delocalisation of π -electrons in benzene increases its stability.

D) The carbon-carbon bonds in benzene are all single bonds.

5. Explain why benzene undergoes electrophilic substitution rather than electrophilic addition.

6. Describe the role of FeBr_3 in the bromination of benzene.

7. Write a balanced equation for the reaction of benzene with bromine in the presence of FeBr_3 .



8. A student carries out an experiment to react bromine with benzene and cyclohexene. The results are as follows:

- Cyclohexene decolourises bromine water instantly.
- Benzene does not react with bromine water unless FeBr_3 is present.

Explain these observations in terms of bonding and reactivity.

9. Suggest an experiment to confirm the presence of hydrogen bromide (HBr) gas produced in the bromination of benzene.

Answers

1. Why does benzene require a halogen carrier such as FeBr_3 to react with bromine?

A) Benzene is too reactive and would undergo uncontrolled reactions otherwise.

B) The halogen carrier makes bromine more electrophilic.

C) Benzene undergoes electrophilic addition, which requires a catalyst.

D) The halogen carrier increases the solubility of bromine in benzene.

Answer: B -The halogen carrier makes bromine more electrophilic.

2. What type of reaction does benzene undergo with bromine in the presence of FeBr_3 ?

A) Electrophilic addition B) Nucleophilic substitution

C) Electrophilic substitution D) Free radical substitution

Answer: C - Electrophilic substitution

3. What is the role of FeBr_3 in the bromination of benzene?

A) Acts as a reducing agent B) Donates electrons to benzene

C) Accepts an electron pair and polarises bromine D) Acts as a nucleophile

Answer: C - Accepts an electron pair and polarises bromine

4. Which of the following statements best explains why benzene does not decolorise bromine water?

A) Benzene is nonpolar and does not interact with bromine molecules.

B) Benzene's π -electrons repel bromine molecules.

C) The delocalisation of π -electrons in benzene increases its stability.

D) The carbon-carbon bonds in benzene are all single bonds.

Answer: C - The delocalisation of π -electrons in benzene increases its stability.

5. Explain why benzene undergoes electrophilic substitution rather than electrophilic addition.

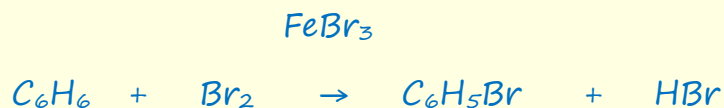
Answer: Benzene has a delocalised π -electron system, which makes it highly stable. Electrophilic addition would disrupt this delocalisation, requiring a high activation energy and leading to a less stable product. Electrophilic substitution preserves the delocalisation, making it energetically favourable.

6. Describe the role of FeBr_3 in the bromination of benzene.

Answer: FeBr_3 acts as a Lewis acid, accepting an electron pair from bromine to polarise the Br_2 molecule. This makes one bromine atom more electrophilic, allowing it to react with benzene.

7. Write a balanced equation for the reaction of benzene with bromine in the presence of FeBr_3 .

Answer: FeBr_3



8. A student carries out an experiment to react bromine with benzene and cyclohexene. The results are as follows:

- Cyclohexene decolourises bromine water instantly.
- Benzene does not react with bromine water unless FeBr_3 is present.

Explain these observations in terms of bonding and reactivity.

Answer:

Cyclohexene undergoes electrophilic addition because its π -electrons are localised in a double bond, making them more available for reaction. Benzene, however, has a delocalised π -electron system, making it more stable and less reactive towards electrophiles. The presence of FeBr_3 creates a stronger electrophile, enabling the reaction with benzene.

9. Suggest an experiment to confirm the presence of hydrogen bromide (HBr) gas produced in the bromination of benzene.

Answer:

Hold a piece of moist blue litmus paper above the reaction vessel. If HBr is present, the paper will turn red due to its acidic nature.