

Aromatic Ring Reactivity Ranking

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Response: To determine the increasing order of ease of Friedel-Crafts acylation, we need to compare the reactivity of the aromatic rings toward electrophilic aromatic substitution (EAS) based on the substituents attached to them:

1. Compound A (Isopropylbenzene / Cumene):

- The isopropyl group ($-\text{CH}(\text{CH}_3)_2$) is an **activating group**.
- It activates the benzene ring relative to benzene via **inductive (+I) effect** and **hyperconjugation**.

2. Compound B (Propiophenone):

- The propanoyl group ($-\text{C}(=\text{O})\text{CH}_2\text{CH}_3$) is a **strongly deactivating group**.
- It withdraws electron density from the benzene ring through both **resonance (-M)** and **inductive (-I)** effects.
- Deactivated rings undergo Friedel-Crafts acylation with great difficulty (or not at all) compared to benzene.

3. Compound C (Methoxybenzene / Anisole):

- The methoxy group ($-\text{OCH}_3$) is a **strongly activating group**.
- The lone pairs on the oxygen atom donate electron density directly into the ring through **resonance (+M)**, which outweighs its weak inductive (-I) effect.
- This makes anisole significantly more reactive towards electrophilic substitution than alkylbenzenes like compound **A**.

Reactivity Order:

- **Least reactive: B** (Deactivated ring due to $-\text{COR}$)
- **Moderately reactive: A** (Activated ring due to alkyl group)
- **Most reactive: C** (Strongly activated ring due to $-\text{OCH}_3$ resonance donation)

Increasing order of ease of acylation: **B < A < C**

The correct option is **(3)**.
