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It's Important to Know!

BP301T — Pharmaceutical Organic Chemistry II

B.Pharm Semester 3 · Unit 2 — Phenols, aromatic amines and aromatic acids

Unit II: Phenols, aromatic amines and aromatic acids

Phenols

Phenols have a hydroxyl group directly attached to an aromatic ring. They are more acidic than ordinary alcohols because the phenoxide ion is stabilised by resonance. Electron-withdrawing substituents tend to increase acidity, while electron-donating substituents tend to decrease it. Phenols undergo electrophilic substitution readily and can form ethers and esters.

Qualitative tests may use colour formation or reactions of the hydroxyl group. The reagent, expected observation and limitation of each test are set out in the current practical manual. The syllabus examples include phenol, cresols, resorcinol and naphthols. Their uses and hazards must be confirmed from authoritative sources.

Aromatic amines and diazonium salts

Aromatic amines contain nitrogen attached directly or indirectly to an aromatic system. Lone-pair delocalisation can lower the basicity of an aryl amine compared with an aliphatic amine. Substituents change basicity through inductive and resonance effects.

Primary aromatic amines can form diazonium salts under cold acidic conditions. Diazonium groups can be replaced by selected atoms or groups, and can couple with activated aromatic compounds to form azo compounds. Temperature control is important because many diazonium salts are unstable. Exact reaction scope should be checked against the prescribed text for each substrate.

Aromatic acids

Benzoic acid is an aromatic carboxylic acid. Its acidity reflects stabilisation of the carboxylate ion. Electron-withdrawing groups generally increase acidity, and electron-donating groups generally reduce it. Important reactions include salt formation, esterification, decarboxylation under suitable conditions and electrophilic substitution on the ring.

Unit II: Frequently asked questions

Q: Why are phenols more acidic than alcohols?

A: Phenoxide ion is resonance-stabilised, whereas an alkoxide ion lacks the same delocalisation.

Q: What is diazotisation?

A: Diazotisation is conversion of a primary aromatic amine into a diazonium salt under cold acidic conditions with a nitrosating system.

Q: How do substituents affect benzoic acid acidity?

A: Electron-withdrawing groups usually stabilise the carboxylate ion and increase acidity, while electron-donating groups usually have the opposite effect.

Unit II: Key takeaways

- Phenol acidity is linked to phenoxide resonance stabilisation.
- Aromatic amine basicity changes with resonance, induction and substitution.
- Diazonium salts are useful intermediates but require careful temperature control.
- Benzoic acid acidity depends on substituent effects and carboxylate stability.
- Named-compound uses and tests require verified references.

Unit II: Practical correlation

Practical correlation: qualitative identification. An identification scheme should combine solubility, acid-base behaviour and a confirmatory reaction rather than rely on one colour test. The exact scheme for a named compound is set out in the current practical manual.