

pK Values of common chemical functional groups in HPLC - PRIMER

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In HPLC, understanding the pK (dissociation constant) of a compound's functional groups is essential for predicting how it will behave under different pH conditions. The pK is the pH at which 50% of a functional group is protonated (charged) and 50% is deprotonated (uncharged).

This information helps you:

- Choose the right mobile phase pH
- Predict retention behavior
- Optimize separation and peak shape



Approximate pK Values of Common Functional Groups

Weak Acids

Functional Group	Approx. pK
Sulfonic Acid	< 1
Phosphate Ester	~2
Carboxylic Acid	2.5–5
Guanine	2.2, 9.4
Uracil	~8
Sulfonamide	7–9
Phenol	8–10

Weak Bases

Functional Group	Approx. pK
Pyridine	~5
Aniline	~5
Amine (Primary/Secondary)	7–10
Imidazole	~7



Why This Matters in HPLC

- Below the pK: The group is mostly protonated (acidic groups are neutral, basic groups are positively charged).

- Above the pK: The group is mostly deprotonated (acidic groups are negatively charged, basic groups are neutral).

This affects how the compound interacts with the stationary phase and mobile phase, influencing retention time, peak shape, and selectivity.



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