

TABLE 8-2 Scale of Acidities

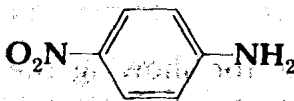


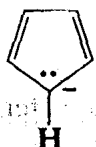
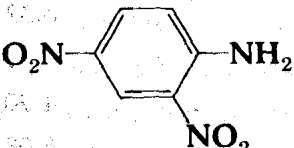
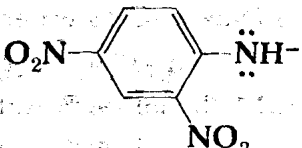
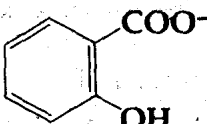
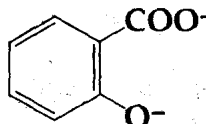
Conjugate acid	pK_a	Conjugate base
Cyclohexane	45	$C_6H_{11}^-$
CH_3-CH_3	42	$CH_3CH_2^-$
CH_4	40	$:CH_3^-$
Benzene	37	$C_6H_5^-$
Ethylene	36	$CH_2=CH:-$
NH_3	36	$\ddot{N}H_2^-$
ϕCH_3	35	$\phi CH_2:-$
$CH_2=CH-CH_3$	35	$CH_2=CH-CH_2:-$
ϕ_3CH	32	$\phi_3C:-$
ϕNH_2	27	$\phi \ddot{N}H^-$
$HC\equiv CH$	25	$HC\equiv C:-$
ϕ_2NH	23	$\phi_2\ddot{N}:^-$
CH_3COCH_3	20	$CH_3COCH_2:-$
<i>t</i> -BuOH	19	<i>t</i> -BuO ⁻
	18.5	
C_2H_5OH (ROH)	17	$C_2H_5O^-$
$RCONHR'$	~16	$RCONR'^-$
CH_3OH	16	CH_3O^-
H_2O	15.7	HO^-
	15	
	15	
$(ROOC)_2CH_2$	13.5	$(ROOC)_2\ddot{C}H^-$
	13.4	

TABLE 8-2 Scale of Acidities (Continued)

Conjugate acid	pK_a	Conjugate base
	13.4	
$(NC)_2CH_2$	11.2	$(NC)_2\overset{\ominus}{C}H$
CH_3COCH_2COOR	10.2	$CH_3CO\overset{\ominus}{C}HCOOR$
RNH_3^+ $R_2NH_2^+$ R_3NH^+	~ 10	$\left\{ \begin{array}{l} R\ddot{N}H_2 \\ R_2\ddot{N}H \\ R_3\ddot{N} \end{array} \right.$
CH_3NO_2	10.2	$:\overset{\ominus}{C}H_2NO_2$
HCO_3^-	10.2	CO_3^{--}
$\phi-OH$	10	$\phi-O^-$
	9.6	
	9.3	
NH_4^+	9.2	$:NH_3$
HCN	9.1	$:CN^-$
	9.0	
$(CH_3)_3N^+$ -	8.0	$(CH_3)_3N^+$ -
	7.2	
H_2CO_3	6.5	HCO_3^-
$O_2NCH_2COOCH_3$	5.8	$O_2N-\overset{\ominus}{C}H-COOCH_3$
	5.2	

TABLE 8-2 Scale of Acidities (Continued)

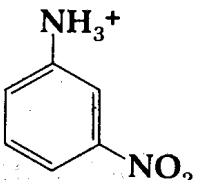
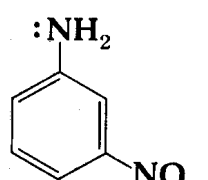
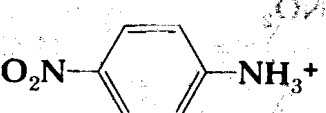
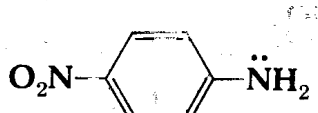
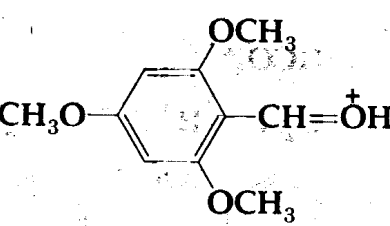
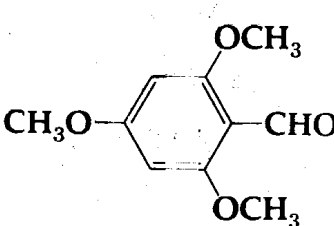
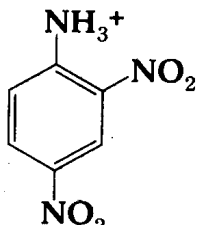
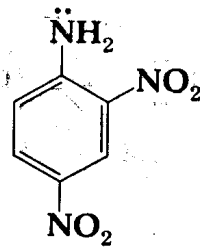
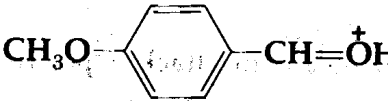
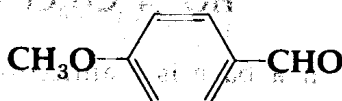
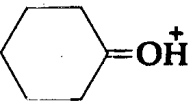
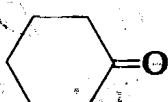
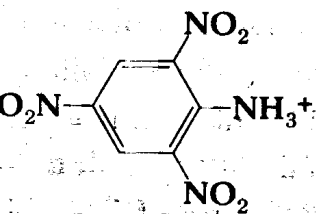
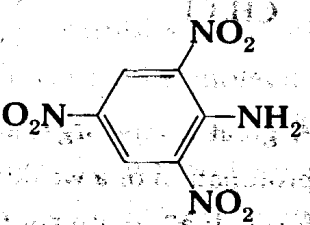
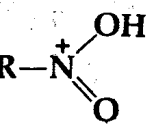
Conjugate acid	pK _a	Conjugate base
$\phi\text{-}\overset{\text{H}}{\text{N}}(\text{CH}_3)_2^+$	5.1	$\phi\ddot{\text{N}}(\text{CH}_3)_2$
$\phi\text{-NH}_3^+$	4.6	$\phi\text{-}\ddot{\text{N}}\text{H}_2$
RCOOH	4.5 ± 0.5	RCOO ⁻
2,4-Dinitrophenol	4.0	(NO ₂) ₂ φ-O ⁻
HCOOH	3.7	HCOO ⁻
CH ₂ (NO ₂) ₂	3.6	-:CH(NO ₂) ₂
ClCH ₂ COOH	2.8	ClCH ₂ COO ⁻
	2.5	
$\text{R-CH} \begin{matrix} \text{COOH} \\ \text{NH}_3^+ \end{matrix}$	2.4	$\text{R-CH} \begin{matrix} \text{COO}^- \\ \text{NH}_3^+ \end{matrix}$
Cl ₂ CHCOOH	1.3	ClCHCOO ⁻
	1.0	
φ ₂ NH ₂ ⁺	1.0	φ ₂ ñH
Cl ₃ CCOOH	0.9	Cl ₃ CCOO ⁻
2,4,6-Trinitrophenol	0.4	(NO ₂) ₃ φO ⁻
CF ₃ COOH	0	CF ₃ COO ⁻
CH ₃ CONH ₃ ⁺	0.3	CH ₃ CONH ₂
HNO ₃	-1.4	NO ₃ ⁻
φCONH ₃ ⁺	-2	φCONH ₂
CH ₃ OH ₂ ⁺	-2	CH ₃ OH
	-2.1	
(CH ₃) ₂ OH ⁺	-3.8	(CH ₃) ₂ O

TABLE 8-2 Scale of Acidities (Continued)

Conjugate acid	pK _a	Conjugate base
$t\text{-BuOH}_2^+$	-4	$t\text{-BuOH}$
$\text{C}^+\text{-CH}$	~ -4 (?)	$\text{C}=\text{C}$
	-4.5	
$(\text{CH}_3)_2\text{SH}^+$	-5.2	$(\text{CH}_3)_2\text{S}$
	-5.5	
$\text{CH}_3\text{-C}(\text{OH})_2^+$	-6.2	$\text{CH}_3\text{-COOH(R)}$
ϕOH_2^+	-6.7	ϕOH (or ϕOR)
	-6.8	
$\phi\text{CH=OH}^+$	-7.1	ϕCHO
	-9.4	
$\text{R-C}\equiv\text{NH}^+$	~ -10	RCN
	~ -11	R-NO_2
H_2SO_4	?	HSO_4^-
HBF_4	?	BF_4^-
FSO_3H	?	FSO_3^-
HClO_4	~ -20	ClO_4^-
HPF_6	-20	PF_6^-
$\text{SbF}_5 \cdot \text{FSO}_3\text{H}$ (strongest acid)	< -20	$\text{SbF}_5 \cdot \text{FSO}_3^-$