Table 1.2 Relative Strengths of Some Common Acids and Their Conjugate Bases

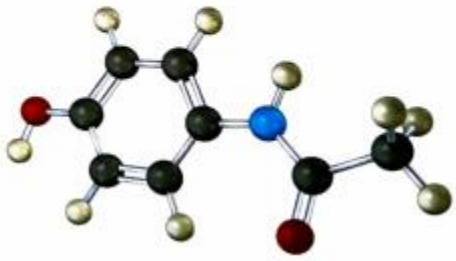
	Acid	Name	pK_a	Conjugate base	Name	
Weaker acid	CH_3CH_2OH	Ethanol	16.00	$CH_3CH_2O^-$	Ethoxide ion	Stronger base
	H_2O	Water	15.74	HO^-	Hydroxide ion	
	HCN	Hydrocyanic acid	9.31	CN^-	Cyanide ion	
	$H_2PO_4^-$	Dihydrogen phosphate ion	7.21	HPO_4^{2-}	Hydrogen phosphate ion	
	CH_3CO_2H	Acetic acid	4.76	$CH_3CO_2^-$	Acetate ion	
	H_3PO_4	Phosphoric acid	2.16	$H_2PO_4^-$	Dihydrogen phosphate ion	
	HNO_3	Nitric acid	−1.3	NO_3^-	Nitrate ion	
Stronger acid	HCl	Hydrochloric acid	−7.0	Cl^-	Chloride ion	Weaker base

Problem 1.22 Is either of the following reactions likely to take place according to the pK_a data in Table 1.2?

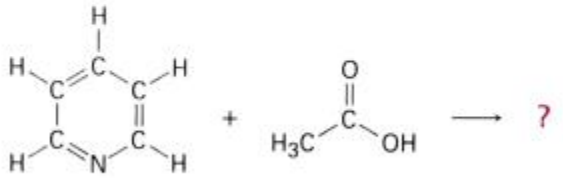
(a) $HCN + CH_3CO_2^- Na^+ \longrightarrow Na^+ {}^-CN + CH_3CO_2H$

(b) $CH_3CH_2OH + Na^+ {}^-CN \longrightarrow CH_3CH_2O^- Na^+ + HCN$

1.30 The following model is that of acetaminophen, a pain reliever sold in drugstores under a variety of names, including Tylenol. Identify the hybridization of each carbon atom in acetaminophen, and tell which atoms have lone pairs of electrons (gray = C, red = O, blue = N, ivory = H).

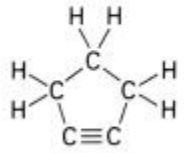


1.63 Predict the structure of the product formed in the reaction of the organic base pyridine with the organic acid acetic acid, and use curved arrows to indicate the direction of electron flow.



Pyridine **Acetic acid**

1.64 Why do you suppose no one has ever been able to make cyclopentyne as a stable molecule?



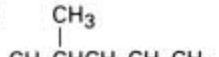
Cyclopentyne

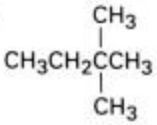
Problem 2.13 Looking along the C2–C3 bond of butane, there are two different staggered conformations and two different eclipsed conformations. Draw them.

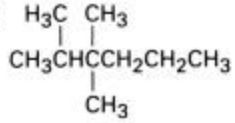
Problem 2.14 Which of the butane conformations you drew in Problem 2.13 do you think is the most stable? Explain.

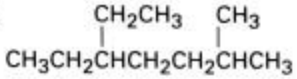
2.42 Draw all monobromo derivatives of pentane, $C_5H_{11}Br$.

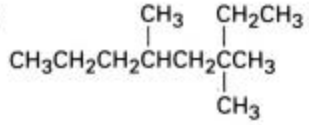
2.45 Give IUPAC names for the following alkanes:

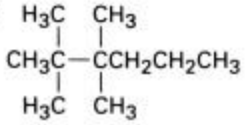
(a) 

(b) 

(c) 

(d) 

(e) 

(f) 

2.46 Draw structures for the following substances:

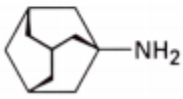
(a) 2-Methylheptane
(b) 4-Ethyl-2-methylhexane
(c) 4-Ethyl-3,4-dimethyloctane
(d) 2,4,4-Trimethylheptane
(e) 1,1-Dimethylcyclopentane
(f) 4-Isopropyl-3-methylheptane

2.56 Which is more stable, *cis*-1,3-dimethylcyclohexane or *trans*-1,3-dimethylcyclohexane? Draw chair conformations of both, and explain your answer.

2.57 Draw *trans*-1,2-dimethylcyclohexane in its more stable chair conformation. Are the methyl groups axial or equatorial?

2.69 Draw 1,3,5-trimethylcyclohexane using a hexagon to represent the ring. How many cis–trans stereoisomers are possible?

2.73 Amantadine is an antiviral agent that is active against influenza A infection. Draw a three-dimensional representation of amantadine showing the chair cyclohexane rings.



Amantadine