

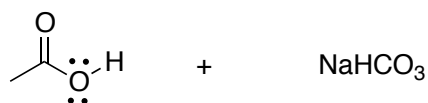
Organic Chemistry

CHM 223

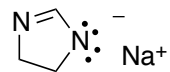
Take Home Problem Set

Name: _____

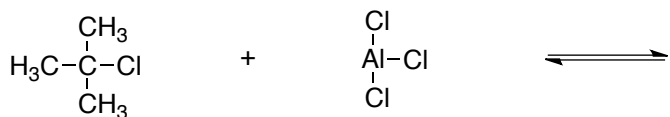
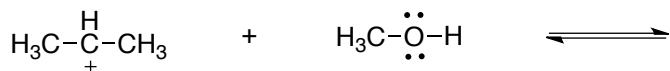
1. Write an equation for the equilibrium reaction of acetic acid with sodium bicarbonate. Show all products formed and a mechanism using arrows to show electron flow (you'll have to draw the Lewis structure of bicarbonate before you do this). Determine the pK_a of each acid and conjugate acid (from the chart below) and indicate if the equilibria lies to the left or right by drawing the appropriate equilibrium arrows.



2. In each set of three bases, label which is the strongest and which is the weakest base.



3. Complete the equation for the reaction between each Lewis acid-base pair. In each equation, label which starting material is the Lewis acid and which is the Lewis base; use curved arrows to show the reaction mechanism. (Make sure all the appropriate lone-pairs of electrons are drawn before you begin.)



	Acid	Formula	pK _a	Conjugate Base	
	Ethane	CH ₃ CH ₃	51	CH ₃ CH ₂ ⁻	
	Ethylene	CH ₂ =CH ₂	44	CH ₂ =CH ⁻	
	Ammonia	NH ₃	38	NH ₂ ⁻	
	Hydrogen	H ₂	35	H ⁻	
	Acetylene	HC≡CH	25	HC≡C ⁻	
	Ethanol	CH ₃ CH ₂ OH	15.9	CH ₃ CH ₂ O ⁻	
	Water	H ₂ O	15.7	HO ⁻	
	Methylammonium ion	CH ₃ NH ₃ ⁺	10.64	CH ₃ NH ₂	
	Bicarbonate ion	HCO ₃ ⁻	10.33	CO ₃ ²⁻	
	Phenol	C ₆ H ₅ OH	9.95	C ₆ H ₅ O ⁻	
	Ammonium ion	NH ₄ ⁺	9.24	NH ₃	
	Hydrogen sulfide	H ₂ S	7.04	HS ⁻	
	Carbonic acid	H ₂ CO ₃	6.36	HCO ₃ ⁻	
	Acetic acid	CH ₃ COOH	4.76	CH ₃ COO ⁻	
	Benzoic acid	C ₆ H ₅ COOH	4.19	C ₆ H ₅ COO ⁻	
	Phosphoric acid	H ₃ PO ₄	2.1	H ₂ PO ₄ ⁻	
	Hydronium ion	H ₃ O ⁺	-1.74	H ₂ O	
Sulfuric acid	H ₂ SO ₄	-5.2	HSO ₄ ⁻		
Hydrogen chloride	HCl	-7	Cl ⁻		
Hydrogen bromide	HBr	-8	Br ⁻		
Hydrogen iodide	HI	-9	I ⁻		