Oakton Community College

Skillbuilder 1

1

Monosubstituted (one group attached) benzene rings are indicated in condensed formulas by using the C_6H_5 formula. Draw the structural formulas for the following condensed formulas.

$C_6H_5CH(CH_3)_2$

$(C_6H_5)_2CHCO_2H$

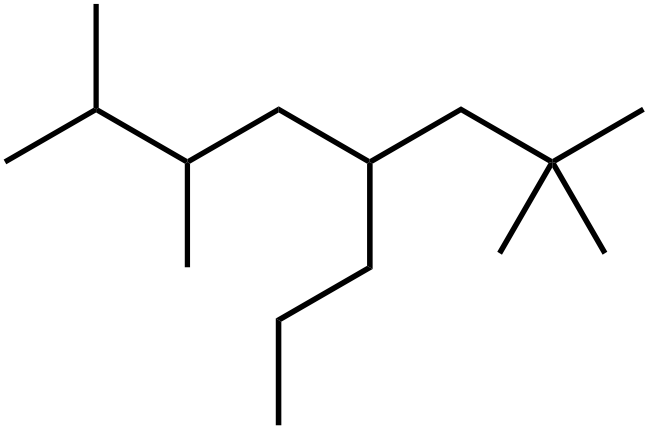
$CH_3CH_2CH(C_6H_5)CH_2CH_3$

2

Draw a Lewis structure for a Bronsted acid with the molecular formula, HBrO3. Bromine may have an expanded octet.

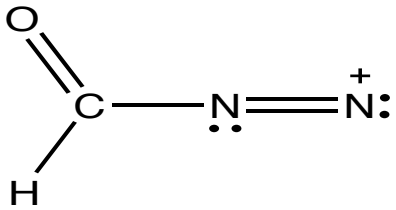
3

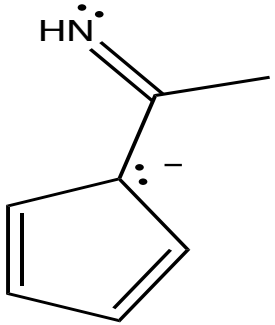
Provide an IUPAC name for the alkane below.



4

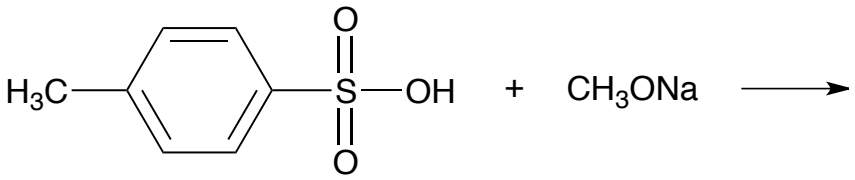
Resonance is a stabilizing phenomenon that delocalizes charge over two or more atoms. Draw **two** resonance structures for each Lewis structure below. You must include all electron lone-pairs and charges.



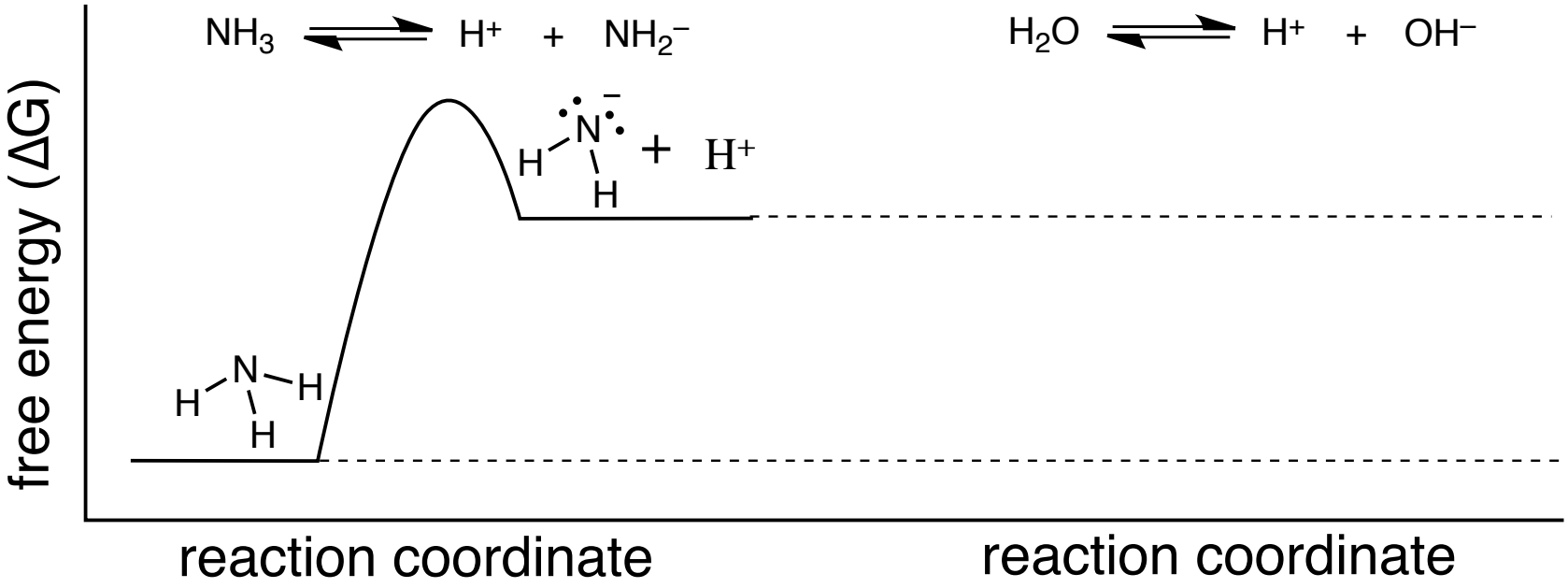


5

In a neutralization reaction, a strong acid reacts with a strong base to yield a product called a salt. **First**, complete the neutralization reaction below including the Lewis structure for the two products. Include all electron lone-pairs and charges. **Second**, label the conjugate acid and base on each side.

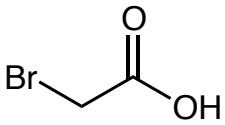


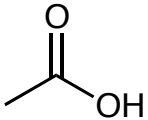
Complete the missing energy profile on the right using the left as a guide. ***Hint: water is a stronger acid than ammonia.***

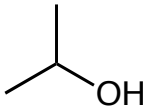


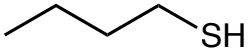
Rank each set of acids in order of *increasing acidity* (1 = weakest acid; 5 = strongest acid). Write your rank numbers left to right for each set. For example, "A: 1, 5, 4, 3, 2". You do not need to redraw the structures.

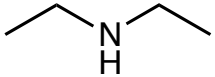
A:











B:

HCl

NH_3

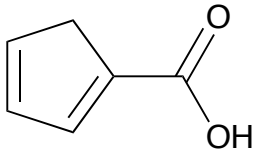
HBr

H_2S

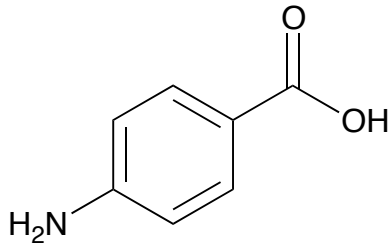
H_2O

8

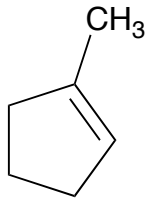
Organic ions with <8 carbon atoms are typically soluble in aqueous solutions. Neutral organic molecules are typically soluble in neutral organic solvents such as CH_2Cl_2. For the molecules below, list whether it will be soluble in HCl(aq), NaOH(aq) or CH_2Cl_2. Some compounds will be soluble in two or three of these solvents; you must list all. *You do not need to redraw the molecule; just list the letter.*



A:

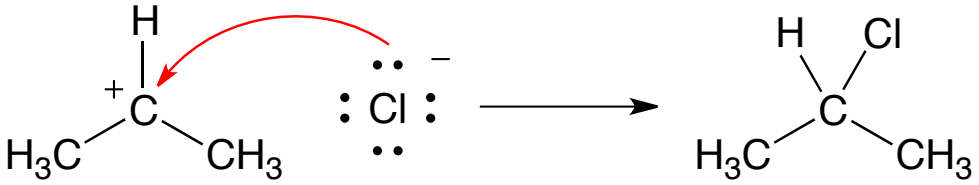


B:



C:

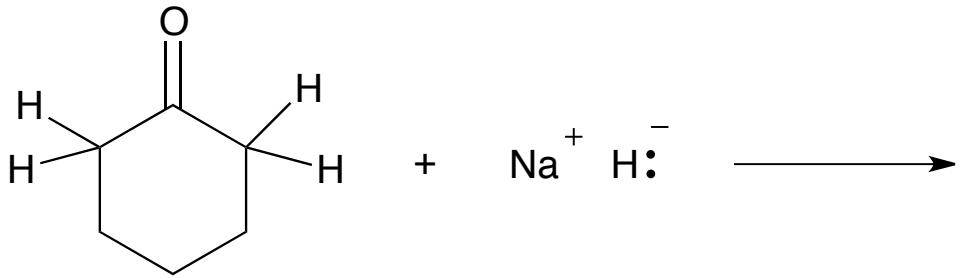
Carbocations react can react with chloride ions to form alkyl chlorides. The mechanism (curved arrow notation) is show below.



Using this information, draw a mechanism to show how the following alkyl chloride can be formed.

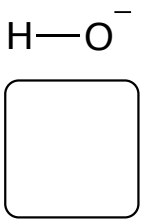
10

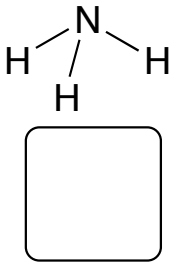
Sodium hydride (NaH) is a strong Bronsted base. It is strong enough to remove a proton (deprotonate) adjacent to a carbonyl group (C=O). Draw the products for the following reaction, including both resonance structures of the conjugate base.

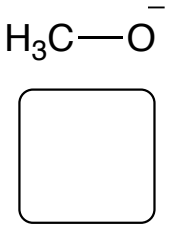


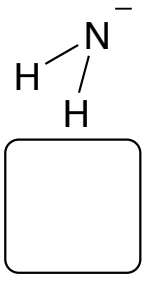
The relative strength of bases can be inferred by comparing the relative strengths of their conjugate acids. Rank the following bases in order of Increasing basicity.

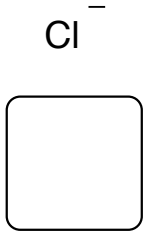
Acid	pKa
HCl	-3.7
H_3O+	-2
CH_3OH_2+	-1.8
NH_4+	9
H_2O	15.7
CH_3OH	16
NH_3	36



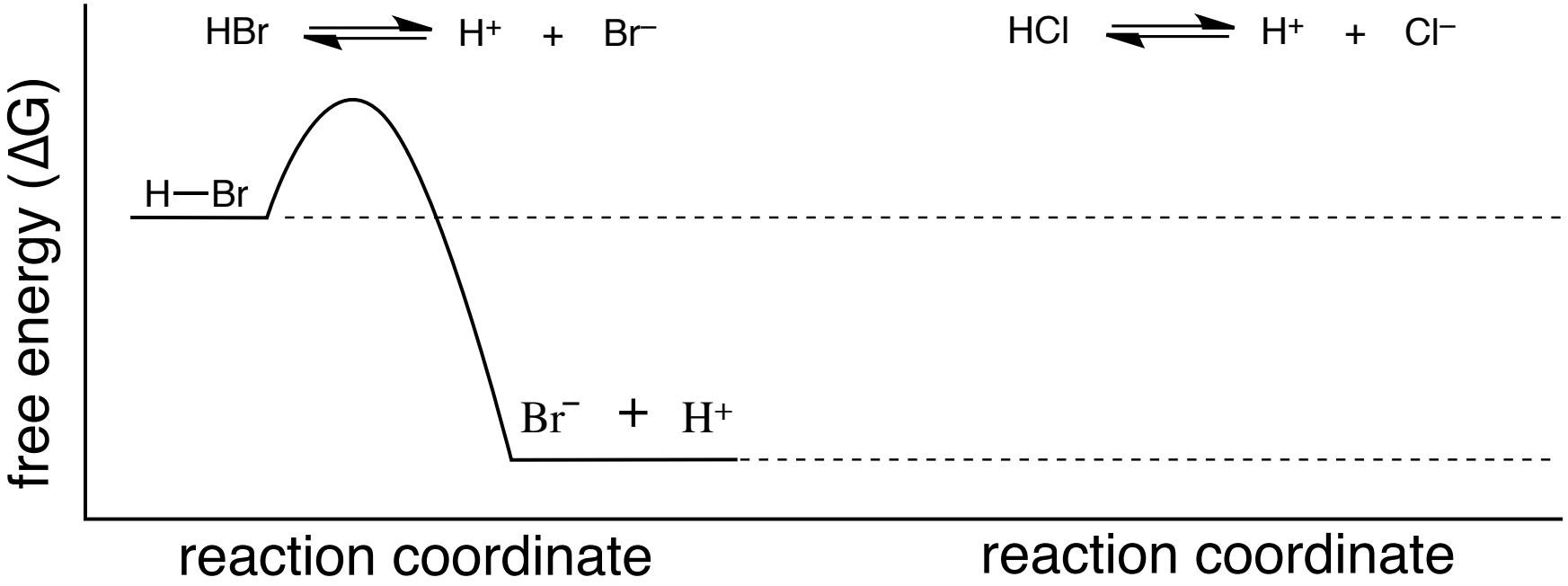




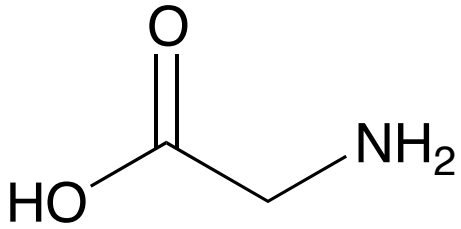




First, redraw the diagram below. **Second**, complete the missing energy profile on the right using the left as a guide.



Below is the structure of glycine, an amino acid. **First**, draw three *possible* conjugate bases of glycine. *You must include all electron lone-pairs and charges*. **Second**, circle the most stable conjugate base. **Third**, circle the most acidic proton(s) in glycine.



Dimethyl sulfoxide (DMSO) is by-product of paper making and has a number of uses including a polar organic solvent. It also increases the permeability of many cosmetics to skin. **First,** draw a Lewis structure of DMSO using the condensed formula below where all atoms obey the octet rule. **Second**, draw a resonance structure of DMSO, where the central sulfur atom has an expanded octet. Show all electron lone-pairs and charges in both structures.

$(CH_3)_2SO$

First, draw the structural formulas for each condensed formulas below. **Second**, draw bond dipole arrows for every polar covalent bond in each molecule. **Third**, circle the molecule with the largest molecular dipole moment.

Phosgene: Cl_2CO

Formaldehyde: H_2CO

First, draw an example of two s-orbitals overlapping to form a strong bond. **Second**, draw an example of two s-orbitals overlapping to form a weak bond.

First, draw a valence bond diagram of two p-orbitals overlapping to form a sigma bond. **Second**, draw a valence bond diagram of two p-orbitals overlapping to form a pi-bond.