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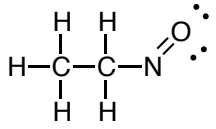
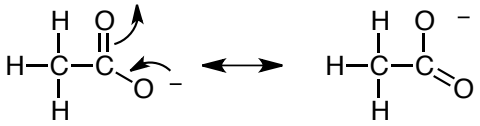
L. I. U.

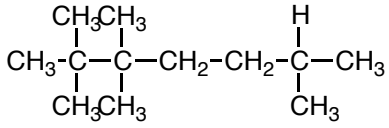
Chem. 121, Sect 012, Quiz 1 Fall, 2012, 50 points

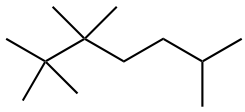
1. Write Lewis structures for the following compounds. Assign formal charges, if any, to the correct atom(s). Show all unpaired electrons and also show all possible resonance structures. (10 pts.) (a) C_2H_5NO (b) $CH_3CO_2^-$ (10 pts)

(a) 

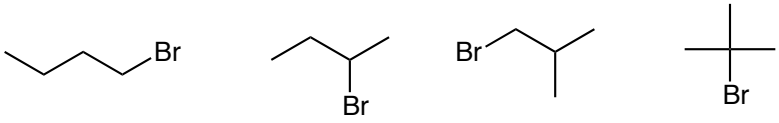
(b) 

2. For the following molecule, write (a) the expanded formula and (b) the bond line formula. (10 pts) $(CH_3)_3CC(CH_2)_2CH_2CH_2CH(CH_2CH_3)_2$

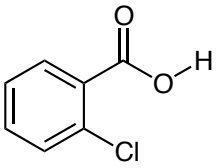
(a) 

(b) 

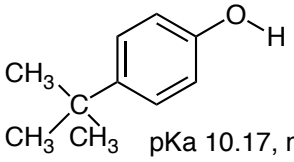
3. Write structural formulas for all the constitutional isomers of C_4H_9Cl



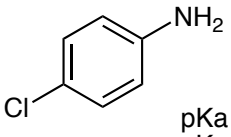
4. In Lab 2, the separation of an unknown mixture, one student had the three unknowns pictured below. He dissolved them in 30 mL *t*-butyl methyl ether and poured the solution containing all three compounds into his separatory funnel. (a) In step 1 he made a mistake. He used 1.5 M NaOH (pKa H_2O 15.7) instead of sodium bicarbonate ($Na^+ {}^-OCO_2H$, pKa $HOCO_2H$ 6.2). Show all reaction(s) that may have occurred in this step (b) In step 2, he added sodium bicarbonate and shook the separatory funnel as in step 1. Show any reactions that may have occurred in this step. (c) In step 3, he added 3.0 M aqueous HCl (pKa H_3O^+ -1) and shook the flask. Show any reaction(s) that may have occurred in this step. (d) His unknown in step 1 had a melting point of 88 - 118°C. Was this a pure compound? Explain briefly.



pKa 2.92, m.p. 140-141°C

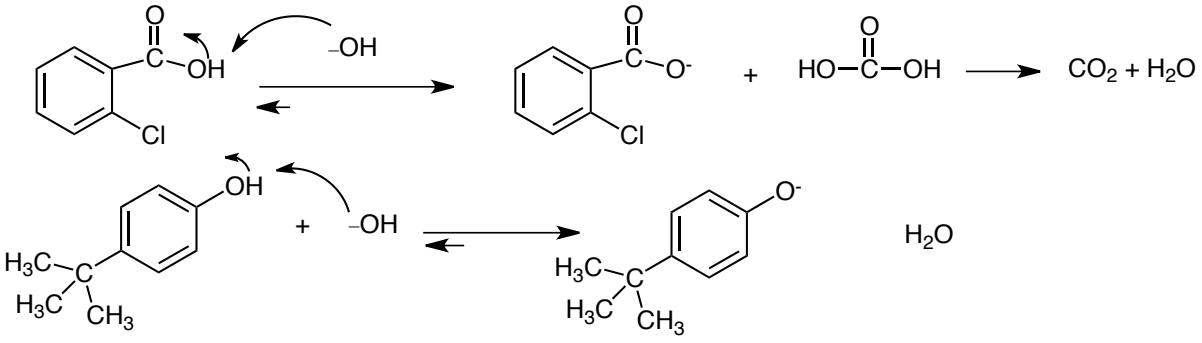


pKa 10.17, m.p. 101



pKa 36, m.p. 68-71
pKa conj. acid 11

Two compounds will be extracted into the sodium hydroxide layer as shown below.

(a) 

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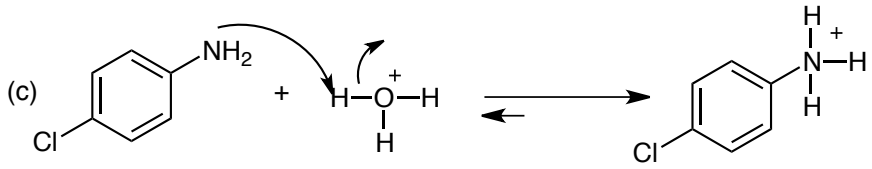
(b) There should be no compound extracted in step two with the sodium bicarbonate. The carboxylic acid has already been removed in step one.

(c) 

(d) No, the compounds isolated in step one were a mixture of the carboxylic acid and the phenol. You can tell that the compound is not pure since the melting point range is very broad and it is much lower than either of the two pure compounds.