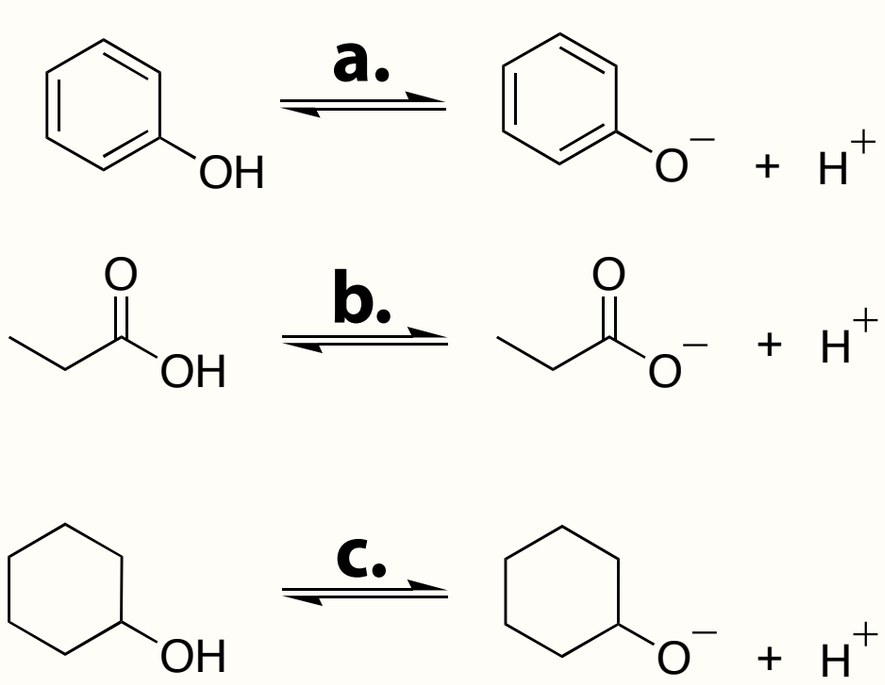
Self Test Question

Rank the following acids in order of increasing acidity.



A. a, c, b, e, d
B. e, c, a, b, d
C. c, e, a, d, b
D. b, a, c, d, e
E. d, b, a, c, e

There are a number of structural features which effect the pKa of an acid: a) Electronegativity; b) The strength of the bond to the acidic hydrogen atom; c) Inductive effects; d) Resonance delocalization in conjugate base. Remember that the ionization of an acids (HA) to a proton (H+) and conjugate base (B-) is a chemical reaction and therefore governed by the rules of thermodynamics - those factors which stabilize the conjugate base, the product of this reaction, will increase the equilibrium of this process and result in a *smaller* pKa (i.e. a more acidic HA). Similarly, factors which facilitate the breaking of the X-H bond will also increase the acidity of HA.

The answer to the question above of **B**:

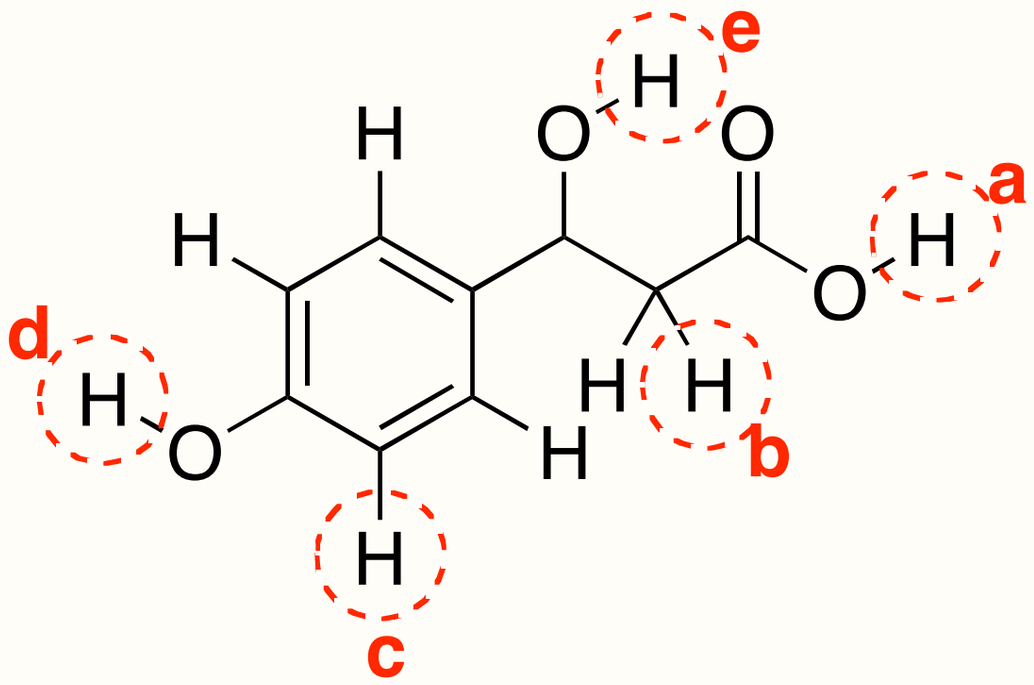
e Amines (**e**) are the least acidic acids of the group drawn above: amide anions (R2N-) are the least stable of the conjugate bases drawn above since nitrogen, being less electronegative than oxygen, is less able to bear the negative charge. N-H bonds are also stronger than O-H bonds.

a vs. **c** phenols (**a**) are more acidic than alcohols (**c**) because the phenoxide anion generated upon proton loss is stabilized by resonance (charge can be distributed throughout the aromatic ring - draw this to confirm). The the negative charge on the alkoxide anion generated upon ionization of an alcohol is localized at the oxygen atom.

d vs. **b** by virtue of a weaker S-H bond, thiocarboxylic acids are more acidic that carboxylic acids (**b**). Both carboxylic acids are more acidic than the other acids because of the resonance stability present in the carboxylate ions generated upon proton loss.

Self Text Question

Which is the *most* acidic proton in the molecule below?



A. a

B. b

C. c

D. d

E. e

The answer is **A** followed by **D**, **E**, **B** and **C** in that order. See previous slide for details.