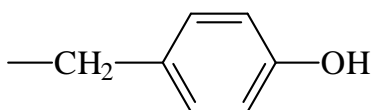
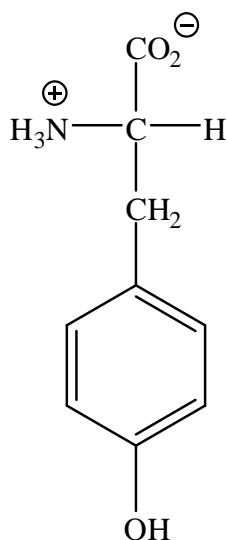


- L-Tyrosine is a naturally occurring amino acid with the following side-chain.



The  $pK_a$  values of tyrosine are 2.20 ( $\alpha$ -COOH), 9.19 ( $\alpha$ -NH<sub>3</sub><sup>⊕</sup>) and 10.47 (sidechain). Draw the Fischer projection of L-tyrosine indicating the correct charge state at physiological pH.



What is the absolute stereochemistry of L-tyrosine? Write (*R*) or (*S*).

**S**

What is the value of the pI of L-tyrosine?

$$pI = \frac{1}{2} (2.20 + 9.19) = 5.70$$

What does pI represent?

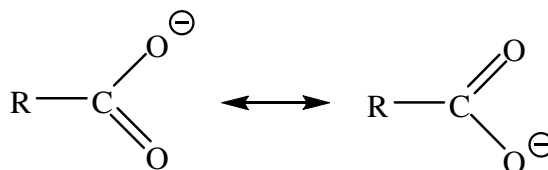
**pI represents the isoelectric point - the pH at which there is no net charge on the molecule.**

**Marks  
6**

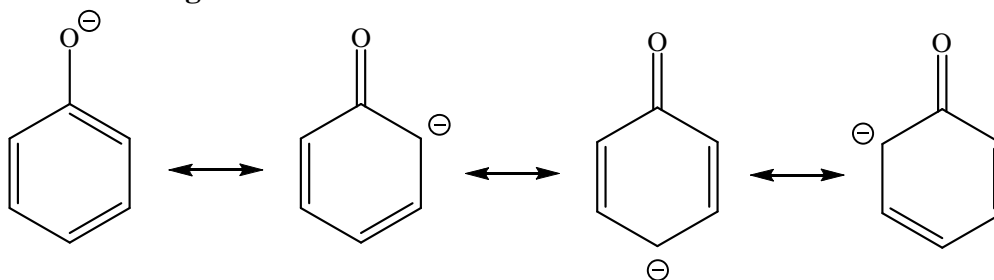
Account for the difference in acidity of the carboxylic acid group and the phenol.

**Acid strength is dependent on the stability of the conjugate base.**

**The carboxylate anion is resonance stabilised, with the charge being spread over the electronegative O atoms:**



**The phenoxide anion is resonance stabilised also, but the charge in the resonance contributors is spread over the C atoms in the ring. C is not as electronegative as O, so these contributors are not as significant as that with the charge on the O.**



**Resonance stabilisation is not as great as for carboxylate and therefore phenol is weaker acid than carboxylic acid.**