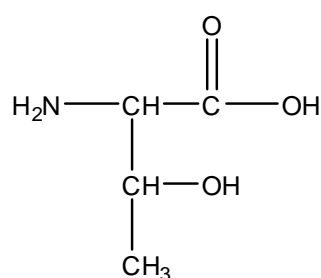
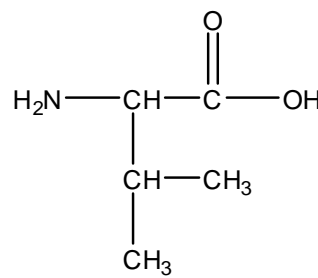


## Question One- Amino acids

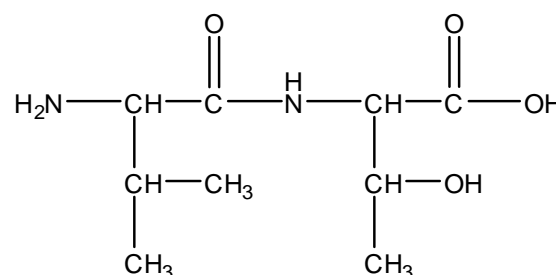
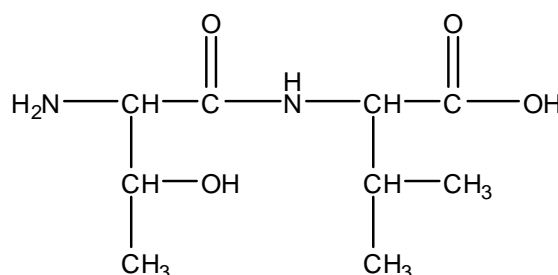


Threonine



Valine

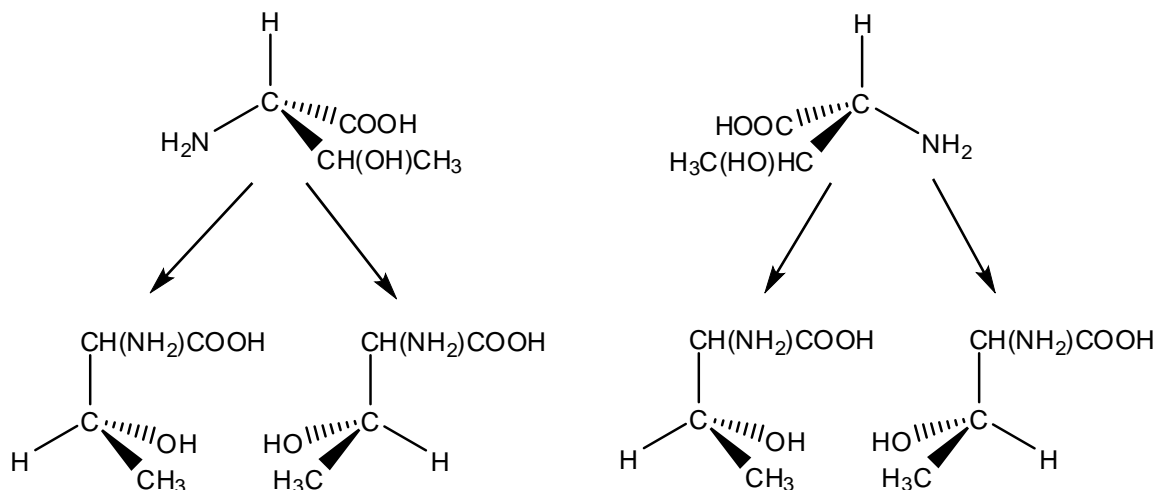
- i) Draw two possible dipeptide made from threonine and valine



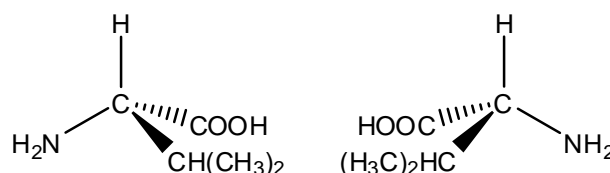
- ii) Discuss why Threonine has 4 possible enantiomers while Valine has two. Also discuss the similarity and difference in physical and chemical properties between enantiomers.

Threonine has two chiral carbon, each chiral carbon has two possible arrangements.  $2^2 = 4$ , therefore there are 4 possible enantiomers. However for Valine, since there is only one chiral carbon, therefore only two possible arrangement.

For Threonine

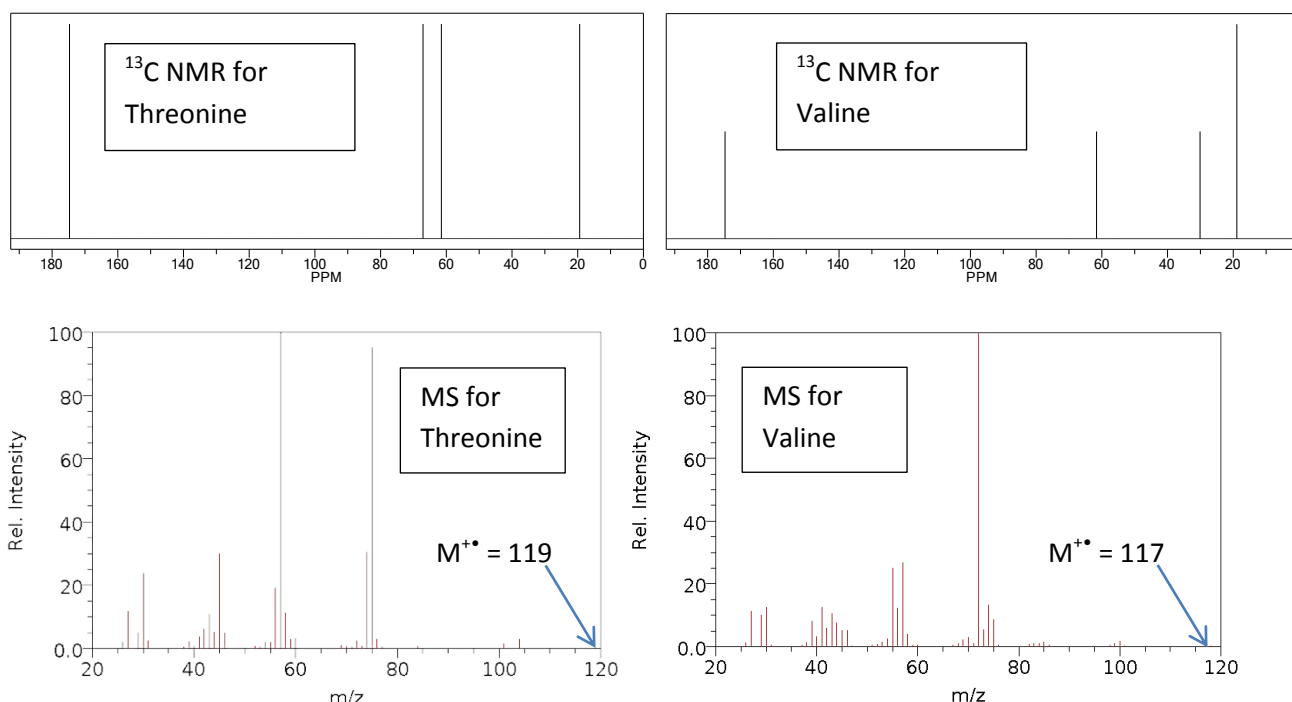


For Valine



(Similarities and difference referred to previous answers)

- iii) The spectrums of the two amino acid is mixed up, label each spectrum with the type of spectrum as well as the amino acid



- iv) Describe the possible similarities and differences in the IR spectrum between Valine and Threonine. Explain why the IR spectrum of the two would be confusing to distinguish.

Because both amino acids contain amine as well as carboxylic acid, therefore they both would have an N-H peak around  $3500 - 3100 \text{ cm}^{-1}$ , OH (acid)  $3600 - 2500 \text{ cm}^{-1}$ , C-H  $3100 - 2800 \text{ cm}^{-1}$ , C=O  $1850 - 1600 \text{ cm}^{-1}$  C-O  $1250 - 1050 \text{ cm}^{-1}$ .

However, for Threonine should have an extra peak of alcohol around  $3700 - 3200 \text{ cm}^{-1}$  region. However, it would be hard to distinguish the two as it will probably overlap with the N-H which makes it confusing.