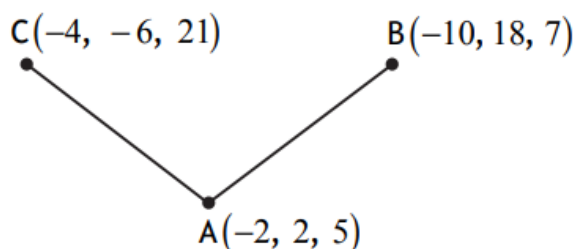The picture shows a model of a water molecule.
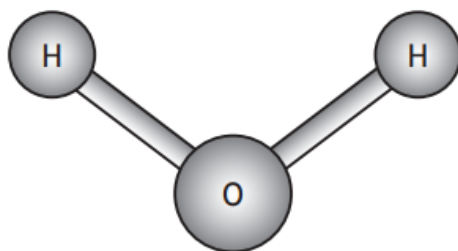
Relative to suitable coordinate axes, the oxygen atom is positioned at point $A(-2, 2, 5)$.

The two hydrogen atoms are positioned at points $B(-10, 18, 7)$ and $C(-4, -6, 21)$ as shown in the diagram below.

(a) Express $\overrightarrow{AB}$ and $\overrightarrow{AC}$ in component form.   2

(b) Hence, or otherwise, find the size of angle BAC.   4

Answers:

(a)
$$\begin{pmatrix} -8 \\ 16 \\ 2 \end{pmatrix} \quad \begin{pmatrix} -2 \\ -8 \\ 16 \end{pmatrix}$$

(b) $104 \cdot 3°$ or $1 \cdot 82$ radians