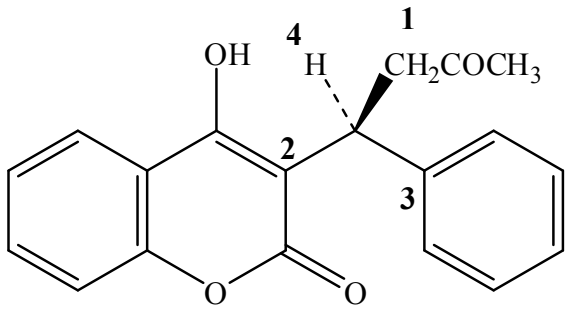
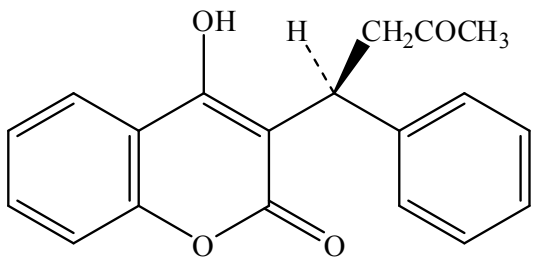
Marks 4

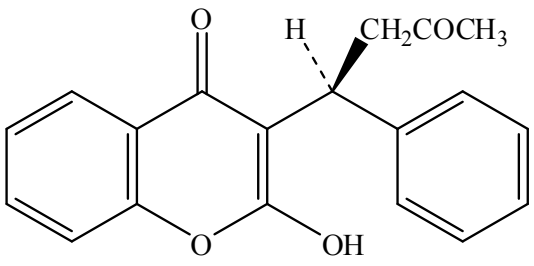
- Warfarin, whose structure is shown below, is a synthetic anticoagulant.



Give the molecular formula of warfarin.	**$C_{19}H_{16}O_4$**
What is the configuration at the stereogenic (chiral) carbon centre of warfarin?	**(*S*) (1 → 2 → 3 is anticlockwise)**

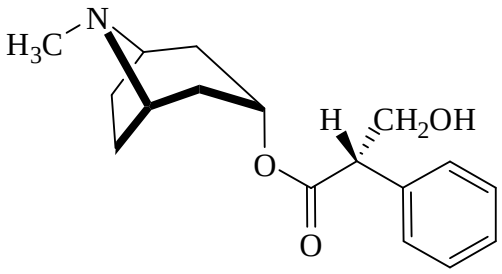
Draw the structures of two tautomers of warfarin.





Marks 7

- The tropane alkaloid (-)-hyoscyamine is found in certain plants of the *Solanaceae* family. It is an anticholinergic agent that works by blocking the action of acetylcholine at parasympathetic sites in smooth muscle, secretory glands and the central nervous system.



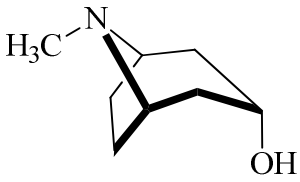
Give the molecular formula of (-)-hyoscyamine. **$C_{17}H_{23}O_3N$**

List the functional groups present in (-)-hyoscyamine.

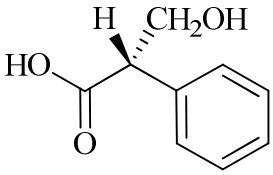
amine, alcohol, ester, aromatic ring (arene)

Hydrolysis of (-)-hyoscyamine results in two fragments, tropine and tropic acid. Draw each of these fragments.

tropine



tropic acid



What is the stereochemistry at the tropic acid stereocentre? Write (*R*) or (*S*). **(*S*)**

Is tropine optically active? Explain your answer.

No. It is a *meso*-isomer (*i.e.* has a plane of symmetry) and therefore optically inactive.

It is superimposable on its mirror image.