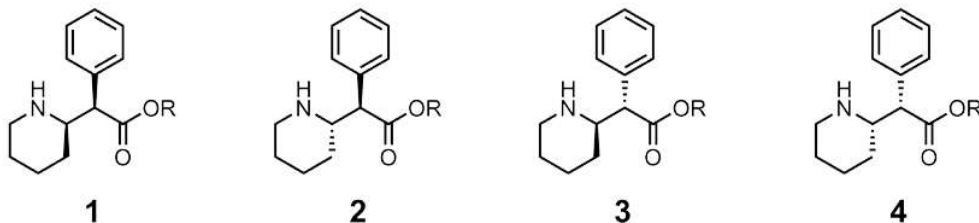


Ritalin is present in the tablets as the hydrochloride salt.

- (d) On the structure of Ritalin in the answer booklet, circle the atom that is protonated in the hydrochloride salt (the HCl salt).
- (e) (i) The tablets contain 10.00 mg of the hydrochloride salt which corresponds to 8.647 mg of Ritalin. Using this information calculate the molar mass of Ritalin (include your working).
- (ii) Hence suggest an identity for the hydrocarbon group R.
- (f) For each of the following IR stretching frequencies from this scheme, draw the functional group responsible and indicate with an arrow which of the bonds are vibrating.
- (i) 1655 cm^{-1} (ii) 1715 cm^{-1} (iii) 1740 cm^{-1} (iv) 2260 cm^{-1}
- (v) 3000 cm^{-1} (very broad) (vi) 3180 and 3390 cm^{-1} (sharp)

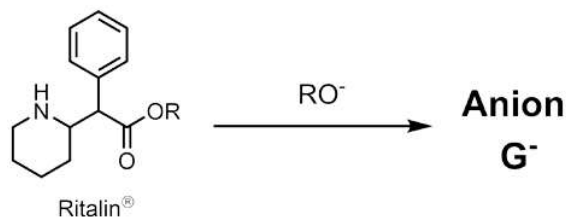
Stereoisomers of a molecule are isomers that have the same connectivity between the atoms but a different three-dimensional arrangement in space. The effectiveness of a drug depends on its three-dimensional shape.

This synthesis leads to the production of a mixture of four stereoisomers of Ritalin, shown below. Some of these isomers are more effective than others.



- (g) By ticking the appropriate box or boxes in the answer booklet, indicate which of these isomers are enantiomers (non-superimposable mirror images).

Some of the less effective stereoisomers can be converted into the more effective ones by deprotonation of Ritalin with the alkoxide base RO^- to give **Anion G⁻** as shown below. Upon reprotonation a different stereoisomer can be formed.



- (h) Draw the structure of **Anion G⁻**.
- (i) By ticking the appropriate box or boxes in the answer booklet, indicate which of these isomers could be interconverted via the intermediary of **Anion G⁻**.