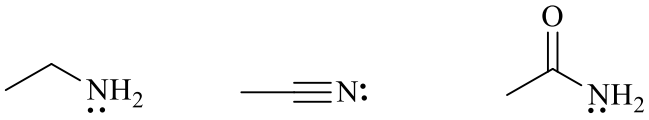
Marks 5

- Consider the three nitrogen-containing compounds **P**, **Q** and **R**.



P **Q** **R**

What is the hybridisation at *N* in compound **P**?

***sp*^{3}**

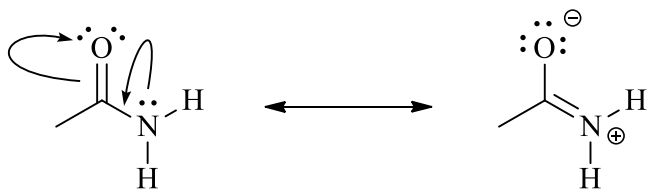
What is the hybridisation at *N* in compound **Q**?

sp

Use this information to decide which of **P** or **Q** is more basic. Explain your reasoning.

P is more basic. The s*p*^{3} hybridised N has more *p* orbital character (75%) compared to s*p* (50%). P therefore has a more diffuse lone pair that is more available for protonation. Conversely, the lone pair in Q is more tightly bound and Q is therefore a weaker base.

Show curly arrows and another structure to show how compound **R** is stabilised by resonance.



Which is more basic, compound **P** or compound **R**? Why?

P is more basic.

The 'lone pair' in R contributes to the resonance structure and is partially delocalised into the carbonyl group and is therefore unavailable for protonation.