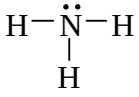
• Draw a Lewis structure and thus determine the geometry of the ICl_4^- ion. (The I is the central atom.)	**Marks 2**

Marks 9

- Complete the table below showing the number of valence electrons, the Lewis structure and the VSEPR predicted shape of each of the following species.

Formula	Number of valence electrons	Lewis structure	Geometry of species
e.g. NH_3	8		trigonal pyramidal
CH_4			
CO_2			
PF_5			
NO_3^-			

Which one of the species above displays resonance, and how many resonance forms are possible?

	Marks
• What is the bond order of the nitrogen-oxygen bonds in the nitrate ion, NO_3^-? Explain your answer.	**2**
• The observed geometry of the atoms attached to the N atom in H_2NCOCH_3 is trigonal planar. Explain this observation.	**2**

	Marks
• The observed geometry of the N atom in H_2NCOCH_3 is trigonal planar. Draw a Lewis structure consistent with this observation and explain this observation.	**2**

Marks 7

- Glycine, NH_2CH_2COOH, the simplest of all naturally occurring amino acids, has a melting point of 292 °C. The pK_a of the acid group is 2.35 and the pK_a associated with the amino group is 9.78. Draw a Lewis structure that indicates the charges on the molecule at the physiological pH of 7.4.

Use your structure to illustrate the concept of resonance.

Describe the hybridisation of the two carbon atoms and the nitrogen atom in glycine and the molecular geometry of the atoms surrounding these three atoms.

Glycine has an unusually high melting point for a small molecule. Suggest a reason for this.

Do you expect glycine to be water soluble? Give a reason for your answer.