Marks
3

- Consider the melting points of the following solids, which all have the halite crystal structure type.

solid	AgCl	KBr	KCl	NaCl
m.p. (°C)	455	734	770	801

Rationalise the order of the melting points of KBr, KCl and NaCl in terms of the size of the constituents and the strength of the interactions holding them together.

The Ag^+ ion is intermediate in size between Na^+ and K^+. Why does AgCl have a melting point considerably lower than both KCl and NaCl?

- Complete the table below showing the Lewis structures and the predicted shapes of the following species.

Marks 8

Species	Lewis Structure	Approximate F-X-F bond angle(s)	Name of molecular shape
SiF_4			
SF_4			
XeF_3^+			
XeF_3^-			

• Explain, with the aid of a diagram labelling all the key components, how sodium stearate ($C_{17}H_{35}COONa$) can stabilise long-chain non-polar hydrocarbons ("grease") in water.	**Marks 3**

- Consider the complex $K_4[Mn(CN)_6]$. Describe and contrast the origin, strength and directionality of the chemical bonds in this compound (a) between C and N; (b) between the manganese and cyanide ions; and (c) between the complex and the potassium counterions.

6

Marks

- The ionic solids NaCl, LiF, KF and LiCl, all have the same crystal structure. Assuming only electrostatic interactions are involved, use the information below to organise these four ionic solids in order of increasing energy of the crystal lattice. **2**

ion	radius (10^{-12} m)	ion	radius (10^{-12} m)
Li^+	76	F^-	133
Na^+	102	Cl^-	181
K^+	138		

Working

Increasing energy of the crystal lattice →

- Explain why CsCl, NaCl and ZnS have different crystal structures. **1**

• In the spaces provided, explain the meaning of the following terms. You may use an example, equation or diagram where appropriate.	**Marks 5**
(a) antibonding orbital	
(b) paramagnetic	
(c) ionic bond	
(d) nuclear fission	
(e) electron affinity	