

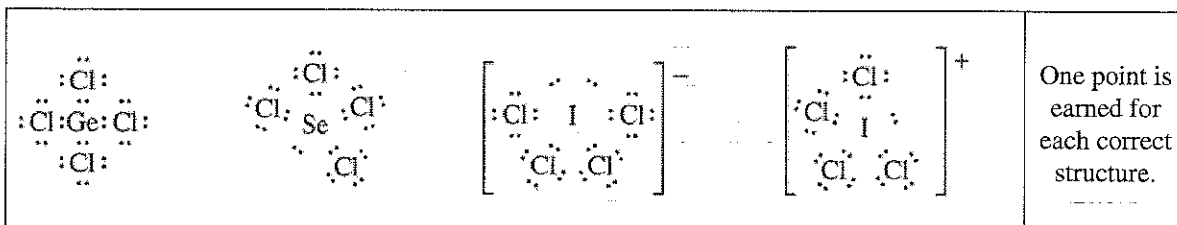
AP[®] CHEMISTRY
2006 SCORING GUIDELINES (Form B)

Question 6



6. The species represented above all have the same number of chlorine atoms attached to the central atom.

(a) Draw the Lewis structure (electron-dot diagram) of each of the four species. Show all valence electrons in your structures.



(b) On the basis of the Lewis structures drawn in part (a), answer the following questions about the particular species indicated.

(i) What is the Cl – Ge – Cl bond angle in GeCl_4 ?

109.5°	One point is earned for the correct angle.
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(ii) Is SeCl_4 polar? Explain.

<p>Yes. The SeCl_4 molecule is polar because the lone pair of nonbonding electrons in the valence shell of the selenium atom interacts with the bonding pairs of electrons, causing a spatial asymmetry of the dipole moments of the polar Se-Cl bonds. The result is a SeCl_4 molecule with a net dipole moment.</p>	<p>One point is earned for the correct answer.</p>
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(iii) What is the hybridization of the I atom in ICl_4^- ?

d^2sp^3 or sp^3d^2	One point is earned for the correct hybridization.
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(iv) What is the geometric shape formed by the atoms in ICl_4^+ ?

See-saw (or distorted tetrahedral or disphenoidal)	One point is earned for the correct shape.
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