SCH 4U1-a

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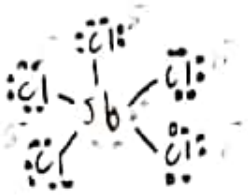
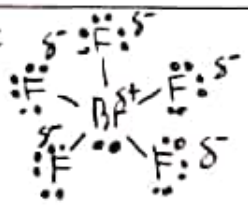
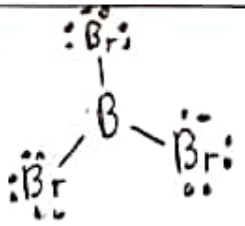
CHAPTER 4 TEST:
VSEPR THEORY, POLARITY, AND INTERMOLECULAR FORCES

Knowledge /20	Inquiry /15	Communication /10

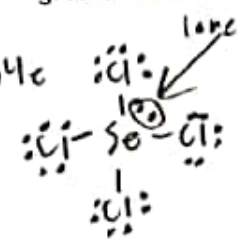
INQUIRY (15 Marks)

1. Complete the table for each of the following molecules: (15 marks)

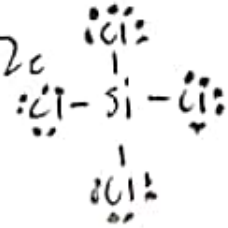
Chemical Formula	Lewis Structure (indicate dipoles if applicable)	Electron Geometry (General Formula)	VSEPR shape	Polarity of Molecule	Hybridization of Central Atom
$SbCl_5$	40e 	AX_5	trigonal bi-pyramidal	non polar	sp^3d
BrF_5	42e 	AX_5E	square pyramidal	polar	sp^3d^2
BBr_3	24e 	AX_3	trigonal planar	non polar	sp^2

COMMUNICATION (10 Marks)

1. Use the concept of structure and intermolecular forces to explain (in point form) why boiling point of $SeCl_4$ is greater than $SiCl_4$. Draw a Lewis structure to aid in your explanation (3 marks)

(1) 34e 

- SeCl4 has a lone pair of electrons on the central atom
- forms "seesaw" shape making the molecule more polar
- Cl will attract more electrons and cause negative dipole
- therefore SeCl4 can form dipole-dipole bond which are stronger intermolecular forces

(2) 32e 

- SiCl4 is non-polar and can only form LDF bonds
- therefore SeCl4 will form stronger intermolecular bonds and have a higher boiling point

2. Complete the following chart to compare the physical or chemical properties you would expect for Al (s) and Al_2O_3 (s). (4 marks total - ½ mark each box)

Solid	Type of Solid	Conductivity in solid state (yes/no)	Solubility in Water (yes/no)	Description of what structure looks like
Al (s)	metallic crystal structure	yes	no	- a "electron sea" - electrons can move freely and conduct electricity - malleable, ductile and shiny
Al_2O_3 (s)	ionic crystal structure	no	yes	- lattice structure that breaks in clean lines when hit - hard and brittle

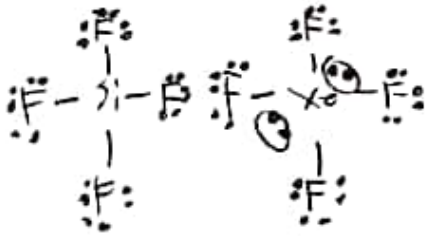
3. Compare SiF_4 and XeF_4 on the various aspects of molecular shape and related properties given, and choose the letter below that matches the property given. (3 marks - ½ mark for each blank)

(a) If the answer is only SiF_4

(b) If the answer is only XeF_4

(c) If the answer is both SiF_4 and XeF_4

(d) If the answer is neither SiF_4 nor XeF_4



d i. Polar molecule

c ii. Symmetrical shape

b iii. Contains lone pairs

a iv. Has a larger bond angle

c v. Would not dissolve in water

d vi. The presence of double or triple bonds