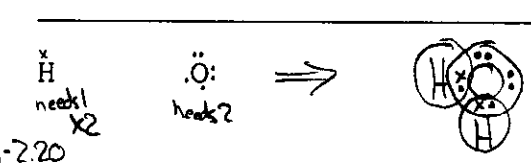
SCH 3U Ionic vs Covalent Bonding

1. For each of the following determine if the bonding will be ionic or covalent. Back up this choice with a ΔEN calculation. Then proceed to complete each question as done on the worksheets in class.

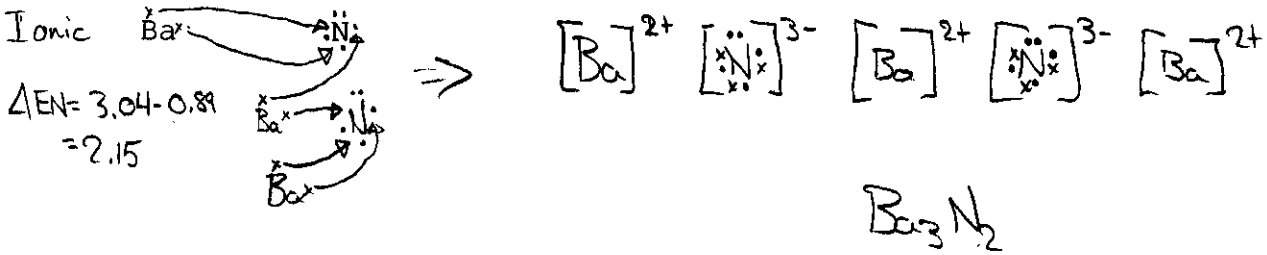
Covalent



two single covalent bonds H_2O

ΔEN = 3.44 - 2.20
= 1.24

Ionic



Ba_3N_2

ΔEN = 3.04 - 0.89
= 2.15

Ionic 

$[Ca]^{2+}$ $[:\ddot{O}:]^{2-}$

CaO

$\Delta EN = 3.44 - 1.00$
$= 2.44$

Covalent $\cdot\dot{C}\cdot$ needs 4

$:\ddot{O}:$ needs 2 X2

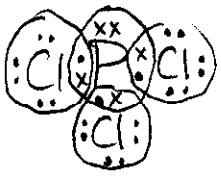
two double covalent bonds

CO_2

$\Delta EN = 3.44 - 2.55$
$= 0.89$

Covalent $\cdot\ddot{P}\cdot$ needs 3

$:\ddot{C}l:$ needs 1 X3



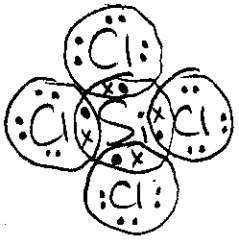
three single covalent bonds

PCl_3

$\Delta EN = 3.16 - 2.19$
$= 0.97$

2. For the two chemical formula $SiCl_4$ and $HSiCl_3$ come up with a correct Lewis dot diagram. Use that Lewis dot diagram to draw a stick structure for each molecule. Be sure to show lone pairs on your stick structures. Add bond polarizations to your stick structure diagrams and use this to determine the net molecular polarization for each molecule - show your answer.

$SiCl_4$ Lewis dot diagram



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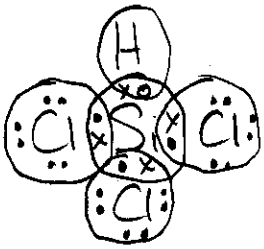
$HSiCl_3$ Lewis dot diagram



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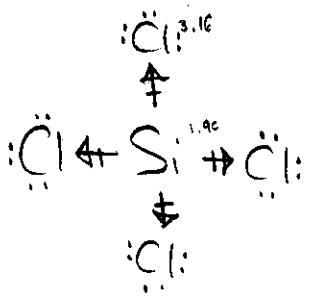
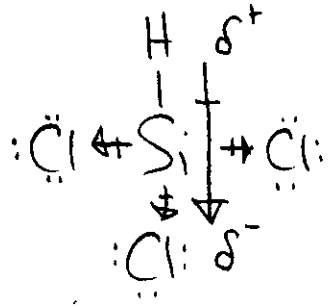
$SiCl_4$ stick structure etc.



non-polar (due to symmetry)

3

$HSiCl_3$ stick structure etc.



3

3. Which of the above compounds has the highest melting point or boiling point and why?

$HSiCl_3$ has the highest melting point and boiling point because of stronger intermolecular forces due to net molecular polarization

4. Draw a detailed diagram for a water molecule that clearly explains all aspects of the polarity of this molecule.