

Polar or Nonpolar? Guide

ELECTRONEGATIVITY (PAULING)

H	B	C	N	O	F	Si	P	S	Cl	Br	I
2.20	2.04	2.55	3.04	3.44	3.98	1.90	2.19	2.58	3.16	2.96	2.66

STEP 1: IS EACH BOND POLAR?

- Subtract the electronegativities. Under 0.4: nonpolar covalent. 0.4 to about 1.8: polar covalent. Larger: mostly ionic.
- In a polar bond, the more electronegative atom gets a partial negative charge (δ^-) and the other atom is δ^+ .

STEP 2: DO THE BOND DIPOLES CANCEL?

- Draw the Lewis structure and find the shape (VSEPR).
- Nonpolar if the shape is symmetric with identical outer atoms: linear AX_2 , trigonal planar AX_3 , tetrahedral AX_4 , trigonal bipyramidal AX_5 , octahedral AX_6 , square planar AX_4E_2 or linear AX_2E_3 .
- Polar if the bonds are polar and the shape is not symmetric, because of lone pairs on the central atom or different outer atoms.

WORKED EXAMPLES



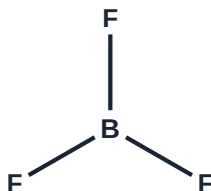
NONPOLAR

CO_2 : linear. The two $C=O$ dipoles point in opposite directions and cancel.



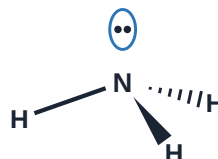
POLAR

H_2O : bent (2 lone pairs on O). The $O-H$ dipoles add up instead of cancelling.



NONPOLAR

BF_3 : trigonal planar with three identical $B-F$ bonds. Dipoles cancel.



POLAR

NH_3 : trigonal pyramidal (1 lone pair on N). Dipoles don't cancel.

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The full unit, Lewis Structures & VSEPR Mastery, is available in the WorksheetGalaxy TPT store.

Part A: Bond Polarity

Use the electronegativity table on the guide page. Find the difference, classify the bond, and name the δ^- atom.

BOND	ELECTRONEGATIVITY DIFFERENCE	BOND TYPE	PARTIAL NEGATIVE (Δ^-) ATOM
1. H-Cl			
2. C-H			
3. C-Cl			
4. O-H			
5. C-S			
6. N-H			
7. Cl-Cl			
8. C-O			

Part B: Polar or Nonpolar?

Draw the Lewis structure, name the shape, then decide if the molecule is polar.

FORMULA	LEWIS STRUCTURE	MOLECULAR SHAPE	POLAR BONDS? (YES/NO)	POLAR OR NONPOLAR?
9. CCl_3F				
10. TeF_6				
11. NHF_2				
12. BCl_2F				
13. KrF_4				
14. SiH_2Cl_2				
15. SbF_3				
16. OCSe				

Part C: Fix It

Each statement has a mistake. Write the correct statement and explain why.

17. CO_2 is polar because its $\text{C}=\text{O}$ bonds are polar.

CORRECTION _____

WHY? _____

18. A $\text{C}-\text{H}$ bond is very polar.

CORRECTION _____

WHY? _____

19. NHF_2 is nonpolar because its bond dipoles point in different directions.

CORRECTION _____

WHY? _____

20. BCl_2F is nonpolar because BCl_3 is nonpolar.

CORRECTION _____

WHY? _____

21. KrF_4 is polar because Kr has two lone pairs.

CORRECTION _____

WHY? _____