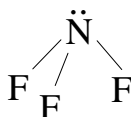


1. State the primary bond that forms between the following atoms:

- a) Sodium and chlorine b) Sodium and lithium c) Iodine and bromine

/3

2. Nitrogen trifluoride, NF_3 , is a covalently bonded compound commonly used in production of electronic parts. The bonding and shape of NF_3 is shown in the diagram below.



- a) The set of two electrons shown above the N is called a 'lone pair'.
State whether the lone pair electrons are bonding or non-bonding electrons. /1
- b) State how the lone pair causes the molecule to have a trigonal pyramidal shape. /1
- c) On the diagram of a periodic table below, draw an arrow to show the trend of increasing electronegativity. /1

1 H hydrogen 1.007 84(7)																	2 He helium 4.002 603(2)	
3 Li lithium 6.941(2)	4 Be beryllium 9.012 2(3)(2)											5 B boron 10.811(7)	6 C carbon 12.010 7(8)	7 N nitrogen 14.006 4(2)	8 O oxygen 15.999 4(2)	9 F fluorine 18.998 403(2)	10 Ne neon 20.1797(7)	
11 Na sodium 22.989 769 2(2)	12 Mg magnesium 24.3050(6)											13 Al aluminium 26.981 538 6(8)	14 Si silicon 28.0855(3)	15 P phosphorus 30.973 762(2)	16 S sulfur 32.06(5)	17 Cl chlorine 35.453(2)	18 Ar argon 39.948(1)	
19 K potassium 39.0983(1)	20 Ca calcium 40.078(4)	21 Sc scandium 44.955 912(6)	22 Ti titanium 47.867(1)	23 V vanadium 50.941 5(1)	24 Cr chromium 51.9961(6)	25 Mn manganese 54.938 045(3)	26 Fe iron 55.845(2)	27 Co cobalt 58.933 195(5)	28 Ni nickel 58.6934(2)	29 Cu copper 63.546(3)	30 Zn zinc 65.409(4)	31 Ga gallium 69.723(1)	32 Ge germanium 72.64(1)	33 As arsenic 74.921 6(2)	34 Se selenium 78.96(3)	35 Br bromine 79.904(1)	36 Kr krypton 83.798(2)	
37 Rb rubidium 85.4678(3)	38 Sr strontium 87.62(1)	39 Y yttrium 88.905 8(2)	40 Zr zirconium 91.224(2)	41 Nb niobium 92.906 38(3)	42 Mo molybdenum 95.94(2)	43 Tc technetium [98]	44 Ru ruthenium 101.07(2)	45 Rh rhodium 102.905 5(2)	46 Pd palladium 106.42(1)	47 Ag silver 107.8682(2)	48 Cd cadmium 112.411(8)	49 In indium 114.818(3)	50 Sn tin 118.710(3)	51 Sb antimony 121.757(3)	52 Te tellurium 127.6(3)	53 I iodine 126.905 47(3)	54 Xe xenon 131.29(4)	
55 Cs caesium 132.905 451(3)	56 Ba barium 137.327(2)	57-71 lanthanoids		72 Hf hafnium 178.49(2)	73 Ta tantalum 180.947 88(2)	74 W tungsten 183.84(1)	75 Re rhenium 186.207(1)	76 Os osmium 190.23(2)	77 Ir iridium 192.22(2)	78 Pt platinum 195.084(3)	79 Au gold 196.966 569(4)	80 Hg mercury 200.59(2)	81 Tl thallium 204.3833(2)	82 Pb lead 207.2(1)	83 Bi bismuth 208.980 401(1)	84 Po polonium [209]	85 At astatine [210]	86 Rn radon [222]
87 Fr francium [223]	88 Ra radium [226]	89-103 actinoids		104 Rf rutherfordium [261]	105 Db dubnium [262]	106 Sg seaborgium [266]	107 Bh bohrium [264]	108 Hs hassium [277]	109 Mt meitnerium [268]	110 Ds darmstadtium [271]	111 Rg roentgenium [272]							

- d) Hence explain why an N–F covalent bond will have a partial negative end and a partial positive end. /2
- e) Write the name for covalent bonds which have a partial negative end and a partial positive end. /1
- f) On the diagram of NF_3 above, draw δ symbols to show the partial negative and positive ends of the bonds. /1
- g) On the diagram of NF_3 above, draw arrows to show the bond dipoles (the direction the negative charges are pulled). /1
- h) Hence state why NF_3 is a polar molecule. /1
- i) State how molecules of NF_3 are attracted to each other. /1
- j) Name the interaction that attracts molecules of NF_3 together /1

