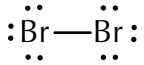
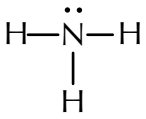
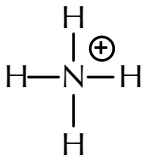
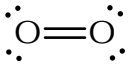
(a) bromide ion  bromine atom  bromine molecule 

(b) sodium atom Na *or* Na^0 *or* Na· sodium ion $Na^{\oplus}$

(c) ammonia  ammonium ion 

(d) oxygen atom  oxygen molecule 

(e) hydrogen atom H· hydrogen cation $H^{\oplus}$

hydrogen molecule H—H hydrogen anion 

(a) bromine atom $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^5$ (open shell)

(b) hydrogen anion $1s^2$ (closed shell)

(c) sodium atom $1s^2 2s^2 2p^6 3s^1$ (open shell)

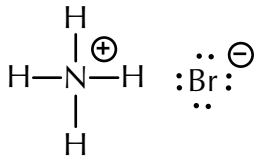
(d) bromide ion $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6$ (closed shell)

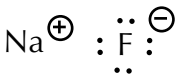
(e) oxygen atom $1s^2 2s^2 2p^4$ (open shell)

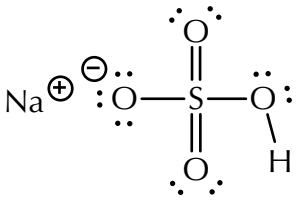
(f) hydrogen cation $1s^0$ (open shell)

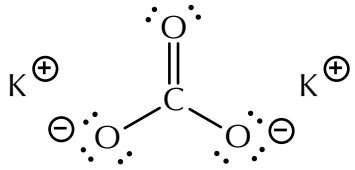
(g) sodium ion $1s^2 2s^2 2p^6$ (closed shell)

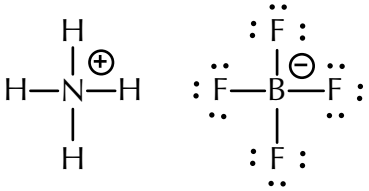
(h) hydrogen atom $1s^1$ (open shell)

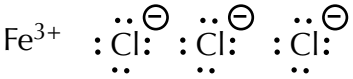
(a) 

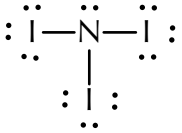
(b) 

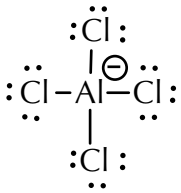
(c) 

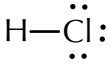
(d) 

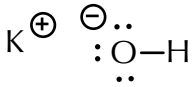
(e) 

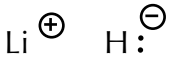
(f) 

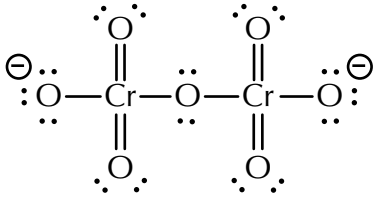
(g) 

(h) 

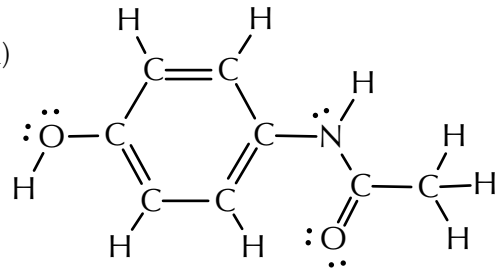
(i) 

(j) 

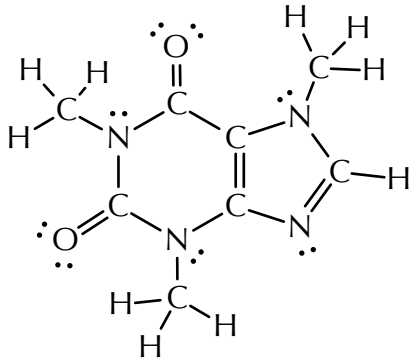
(k) 

(l) 

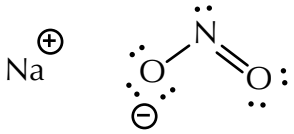
(a)



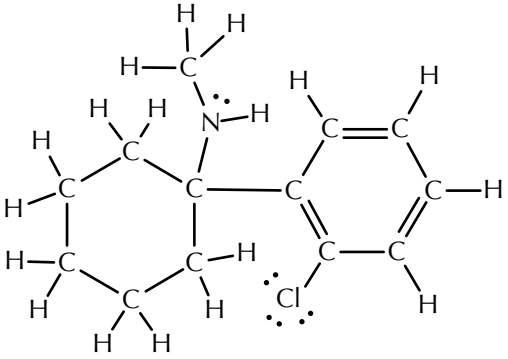
(b)



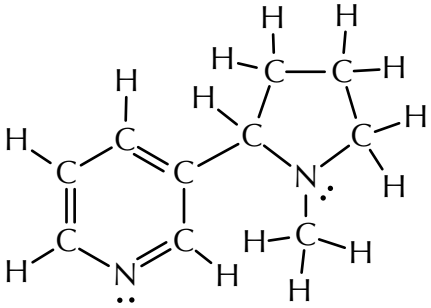
(c)



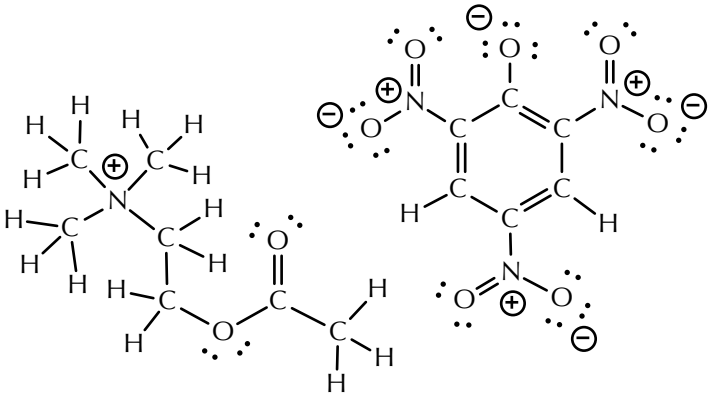
(d)

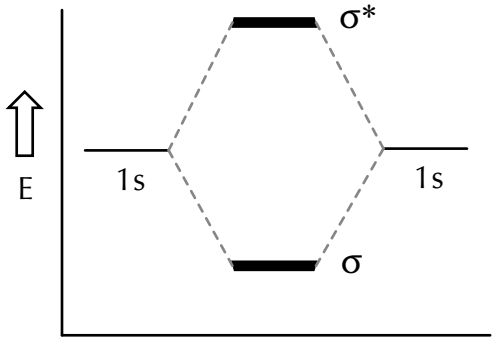


(e)



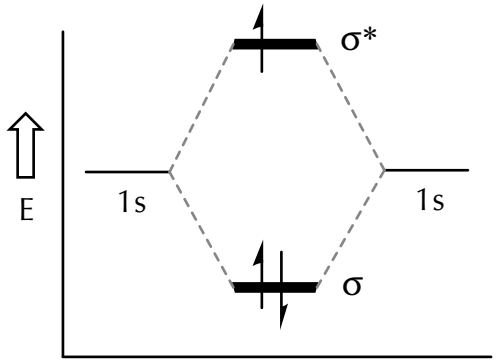
(f)





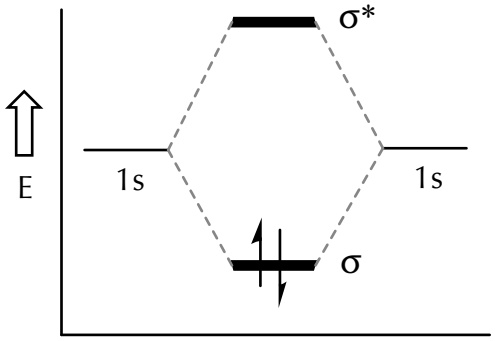
basic outline for
1s + 1s combination of
atomic orbitals
to give σ (bonding) and
σ* (antibonding)
molecular orbitals

(a) He_2^+ (has 3 electrons total)

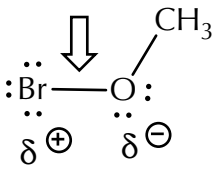


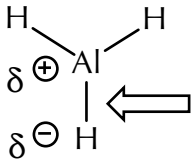
the net energy of 1 electron holds the 3-electron system together; He_2^+ is predicted to exist

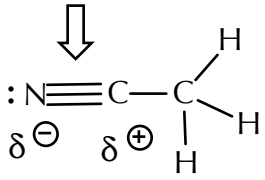
(b) HeH^+ (has 2 electrons total)

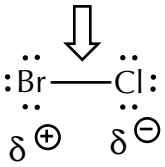


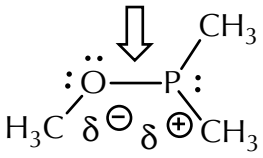
the net energy of 2 electrons holding the atoms together, the bonding diagram is identical to that of H_2 and so the equivalent bond distance is not surprising

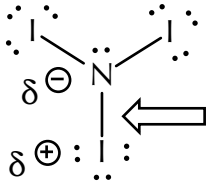
(a) 

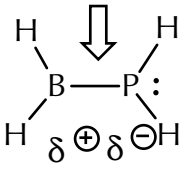
(b) 

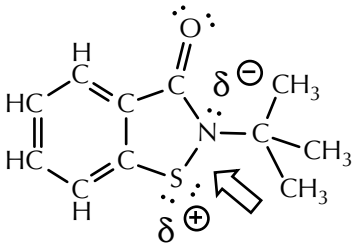
(c) 

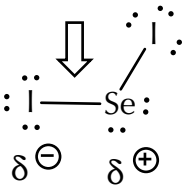
(d) 

(e) 

(f) 

(g) 

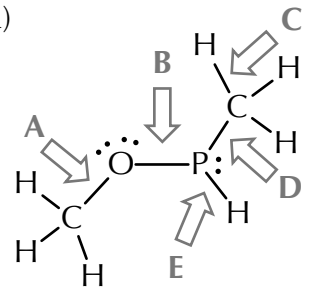
(h) 

(i) 

Pauling Scale
from Figure AP0119

H (2.20)							He
Li (0.98)	Be (1.57)	B (2.04)	C (2.55)	N (3.04)	O (3.44)	F (3.98)	Ne
Na (0.93)	Mg (1.31)	Al (1.61)	Si (1.90)	P (2.19)	S (2.58)	Cl (3.16)	Ar
K (0.82)	Ca (1.00)	Ga (1.81)	Ge (2.01)	As (2.18)	Se (2.55)	Br (2.96)	Kr (3.00)
Rb (0.82)	Sr (0.95)	In (1.78)	Sn (1.96)	Sb (2.05)	Te (2.10)	I (2.66)	Xe (2.60)

(a)

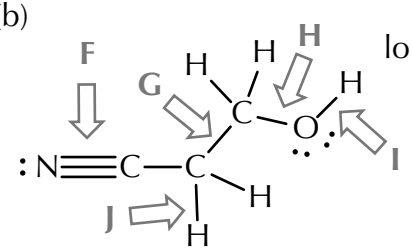


polar covalent: 2

		most polar	
longest	D		B
	B		A
	A		D
	E		C
shortest	C	least polar	E

PO ΔeN 1.25
CO ΔeN 0.89
CP ΔeN 0.36
CH ΔeN 0.35
PH ΔeN 0.01

(b)



polar covalent: 2

		most polar	
longest	G		I
	H		H
	F		F
	J		J
shortest	I	least polar	G

OH ΔeN 1.24
CO ΔeN 0.89
CN ΔeN 0.49
CH ΔeN 0.35
CC ΔeN 0

Pauling Scale
from Figure AP0119

H (2.20)							He
Li (0.98)	Be (1.57)	B (2.04)	C (2.55)	N (3.04)	O (3.44)	F (3.98)	Ne
Na (0.93)	Mg (1.31)	Al (1.61)	Si (1.90)	P (2.19)	S (2.58)	Cl (3.16)	Ar
K (0.82)	Ca (1.00)	Ga (1.81)	Ge (2.01)	As (2.18)	Se (2.55)	Br (2.96)	Kr (3.00)
Rb (0.82)	Sr (0.95)	In (1.78)	Sn (1.96)	Sb (2.05)	Te (2.10)	I (2.66)	Xe (2.60)