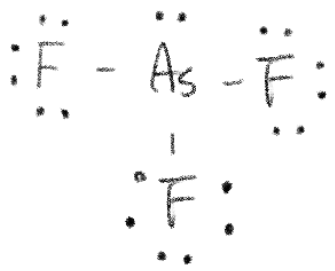
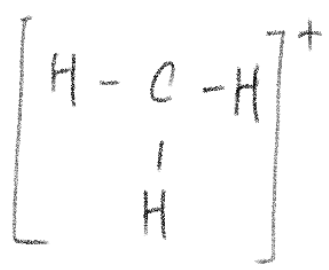
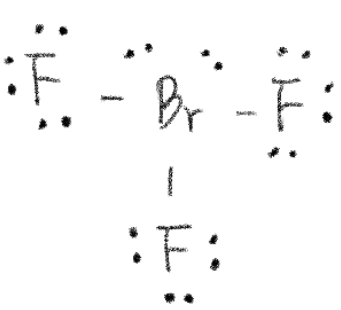
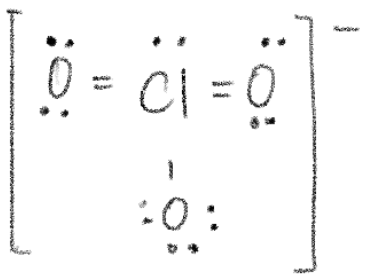
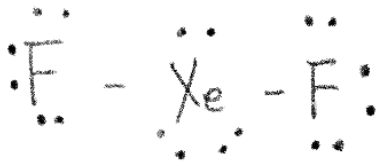
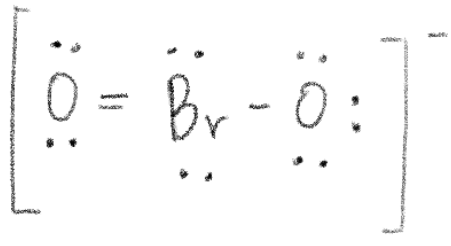
9.26

| | Lewis structure | electron domain | molecular geometries |
|---|---|---|---|
| (a) |  | terahedral | trigonal pyramidal |
| (b) |  | trigonal planar | trigonal planar |
| (c) |  | trigonal bipyramidal | T- shaped |
| (d) |  | tetrahedral | trigonal pyramid |
| (e) |  | trigonal bipyramidal | linear |
| (f) |  | tetrahedral | bent |

9.52

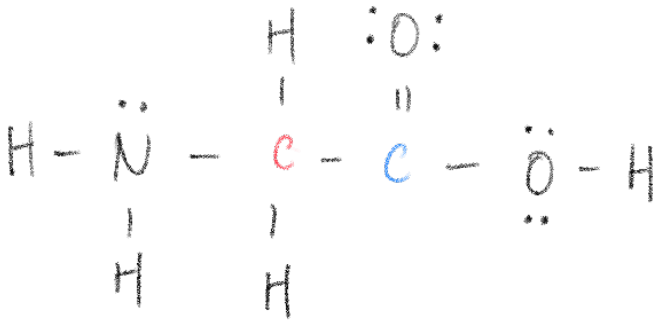
(a) $sp^3$

(b) $sp$

(c) $sp^2$

(d) $sp^3$

9.61



(a)

| | bond angle | hybridization |
|---|---|---|
| red C | 109.5° | $sp^3$ |
| blue C | 120° | $sp^2$ |

(b)

| | bond angle | hybridization |
|---|---|---|
| oxygen | 104.5 | $sp^3$ |
| nitrogen | 109.5° ↓ | $sp^3$ |

(c) 9 σ bonds, 1 π bond
(8 single bond, 1 double bond)

9.78

(a) paramagnetism is a form of magnetism whereby the substance is attracted by an external maghetic field, paramagnetic substance must have at least unpaired electron.

(b) substance will have unpaired substance and will be attracted by external nagnetic field if it is paramagnetic.

(c)

$O_2^+$

| | | | |
|---|---|---|---|
| $\pi_{2p}^*$ | $\uparrow$ | | |
| $\pi_{2p}$ | $\uparrow\downarrow$ | $\uparrow\downarrow$ | |
| $\sigma_{2p}$ | $\uparrow\downarrow$ | | |
| $\sigma_{2s}^*$ | $\uparrow\downarrow$ | | |
| $\sigma_{2s}$ | $\uparrow\downarrow$ | | |

unpaired electron: 1

$N_2^{2-}$

| | | | |
|---|---|---|---|
| $\pi_{2p}^*$ | $\uparrow$ | $\uparrow$ | |
| $\sigma_{2p}$ | $\uparrow\downarrow$ | | |
| $\pi_{2p}$ | $\uparrow\downarrow$ | $\uparrow\downarrow$ | |
| $\sigma_{2s}^*$ | $\uparrow\downarrow$ | | |
| $\sigma_{2s}$ | $\uparrow\downarrow$ | | |

unpaired electron: 2

$Li_2^{2+}$

| | | |
|---|---|---|
| $\sigma_{2s}$ | $\uparrow$ | |

unpaired electron: 1

$O_2^{2-}$

| | | | |
|---|---|---|---|
| $\pi_{2p}^*$ | $\uparrow\downarrow$ | $\uparrow\downarrow$ | |
| $\pi_{2p}$ | $\uparrow\downarrow$ | $\uparrow\downarrow$ | |
| $\sigma_{2p}$ | $\uparrow\downarrow$ | | |
| $\sigma_{2s}^*$ | $\uparrow\downarrow$ | | |
| $\sigma_{2s}$ | $\uparrow\downarrow$ | | |

unpaired electron: none

$O_2^+$, $N_2^{2-}$, $Li_2^+$ are paramagnetic

9.82

(a)

| | |
|---|---|
| — | $\sigma_{2p}^*$ |
| $\uparrow$ | $\pi 2p^*$ |
| $\uparrow\downarrow$ | $\pi 2p$ |
| $\uparrow\downarrow$ | $\sigma_{2p}$ |
| $\uparrow\downarrow$ | $\sigma_{2s}^*$ |
| $\uparrow\downarrow$ | $\sigma_{2s}$ |

$\Rightarrow$ (ii) explains the following best

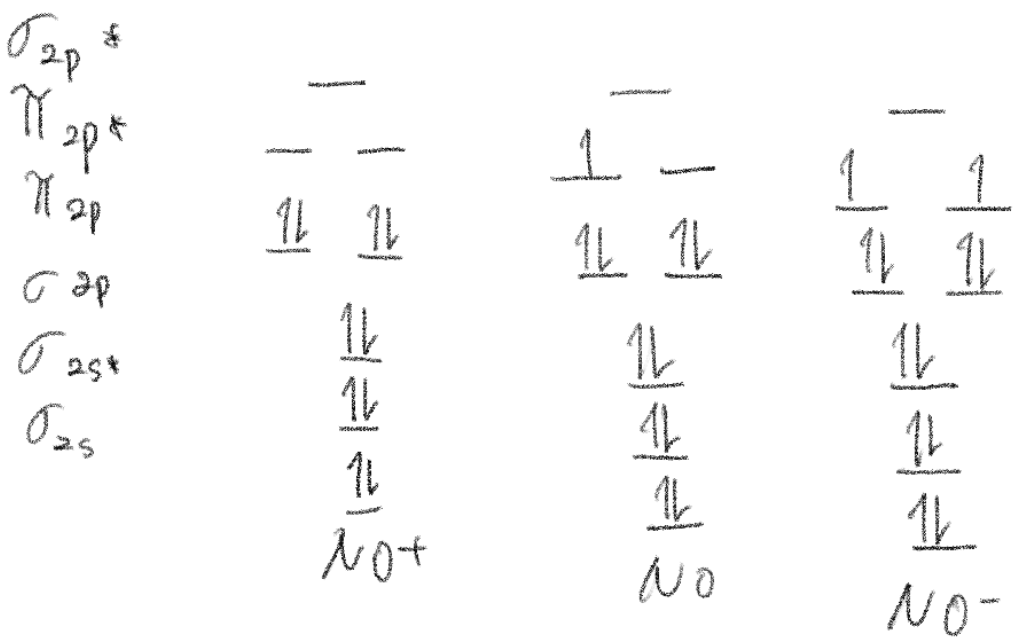
NO

(b)

$NO^+$ bond order : $\frac{8-2}{2} = 3$

$NO$ bond order : $\frac{8-3}{2} = 2.5$

$NO^-$ bond order : $\frac{8-4}{2} = 2$




∴ $NO^+$ is the strongest molecule

(c) $NO^+$ : $14e^-$ , Iso electronic with $N_2$

$NO^-$ : $16e^-$ , isoelectronic with $O_2$