Bond Energies

Chapter 8. (47, 49, 51), 53 ⟹ Solved using Hess's Law

$\Delta H^\circ = \sum \Delta H_{products} - \sum \Delta H_{reactants}$

8.57 S–F bond energy?

Data given $\Delta H\{S(g), F(g), SF_4(g), SF_6(g)\}$

① ΔH° = bond energy total = $[278.8 + 4(79.0)] - -775 = 1370$ kJ

① $SF_4(g) \rightarrow S(g) + 4F(g)$

S-F energy = $\frac{1370}{4 \text{ mol SF bonds}} = \boxed{342.5 \text{ kJ/mol}}$

② ΔH° = bond energy total = $(278.8 + 6(79.0)) - -1209 = 1962$ kJ

② $SF_6(g) \rightarrow S(g) + 6F(g)$

S-F energy = $\frac{1962}{6 \text{ mol SF bonds}} = \boxed{327.0 \text{ kJ/mol}}$ → same value of table 8.4 answer b)

c) What does ° mean in ΔH°?, therefore $S(g)$ & $F(g)$ are not at °, and not zero then.

8.97

$H_2O(g) \rightarrow H(g) + OH(g)$ $\quad \Delta H = 467$ kJ

ionization $H(g) \rightarrow H^+(g) + e^-$ $\quad \Delta H = 1312$ kJ

electron affinity $OH + e^- \rightarrow OH^-(g)$ $\quad \Delta H = -180$ kJ

$H_2O(g) \rightarrow H^+(g) + OH^-(g)$ $\quad \Delta H =$ kJ

Lewis Structures

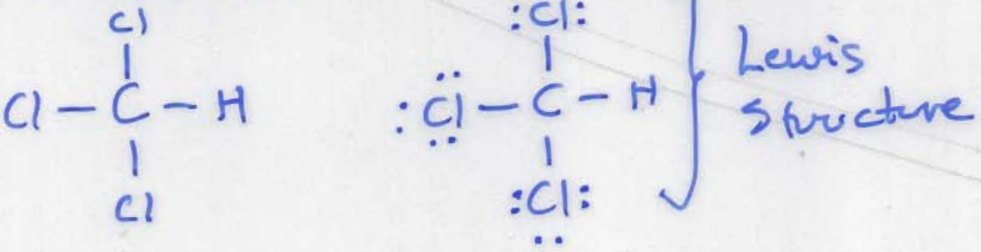
① Count available valence electrons in molecule.

② Draw skeletal structure.

③ Fulfill octet rule. (2 e^- per bond)

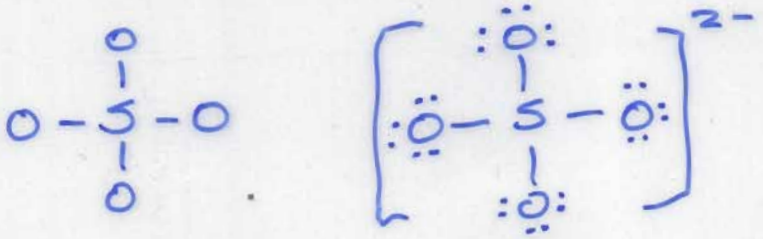
8.61 c) $CHCl_3$

$4+1+3(7) = 26\ e^-$



8.62 SO_4^{2-} (usually wrong in other textbooks)

$2+6+4(6) = 32$ valence e^-



8.101 In general $[:\ddot{X}-\ddot{X}-\ddot{X}:]^-$

Br, I are

Br: [Ar] $4s^2 4p^5$ $5s^0$ $\underline{\underline{4d^0}}$ > "free parking space"

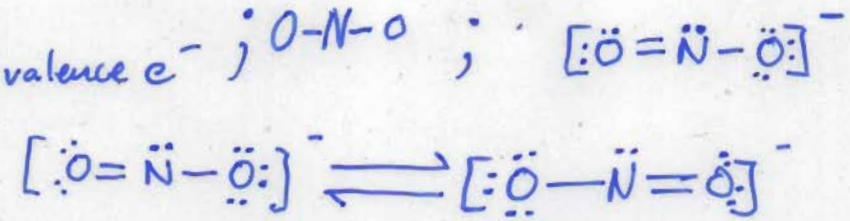
I: [Kr] $5s^2 5p^5$ $\underline{\underline{5d^0}}$

Fl: [He] $2s^2 2p^6$ $\underline{\underline{2d^0}}$

8.65 Resonance structures occur when you have multiple bonds that can be in various positions.

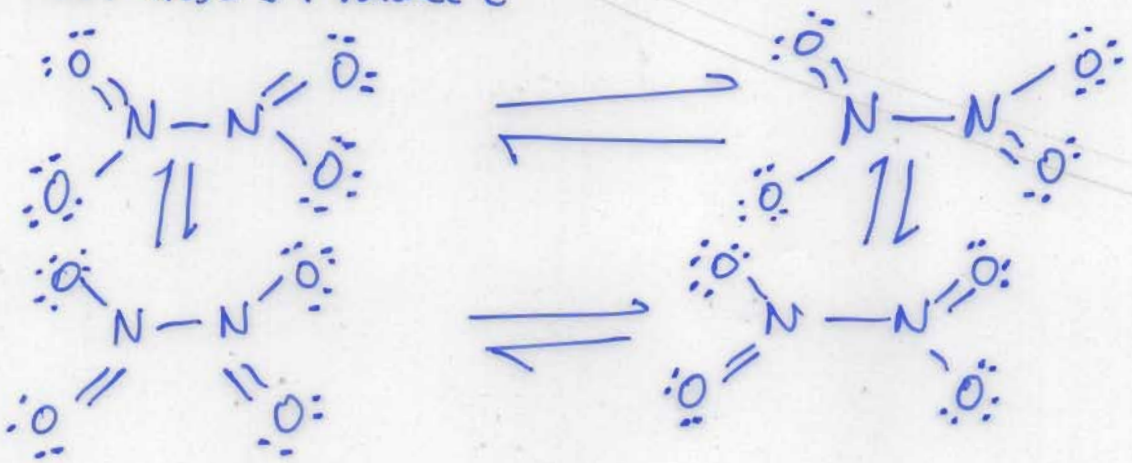
a.) NO_2^-

$5+2(6)+1 = 18$ valence e^- ; O-N-O ;



N_2O_4

$2(5)+4(6) = 34$ valence e^-



8.67 C_6H_6

$6(4)+6(1) = 30$ valence e^- = A

B = $6(8)+6(2) = 60$

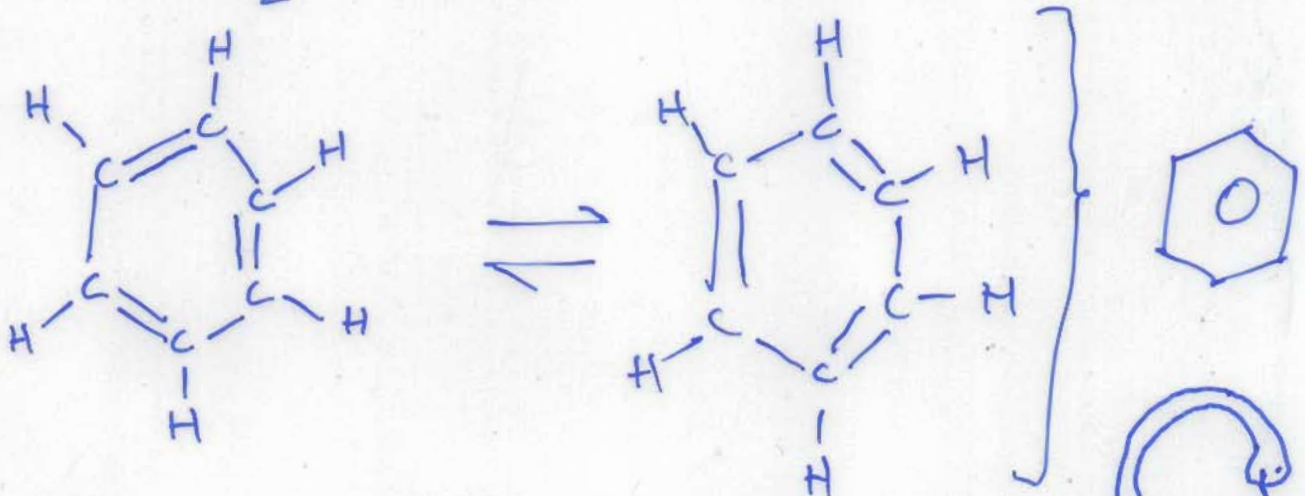
bonds = $\frac{60-30}{2} = 15$

How many bonds?

A = # valence e^- ± charge.

B = # e^-, octet.

bonds = $|B-A|/2$



Kekule's DREAM or nightmare.