

1) Determine if the following bonds are polar or nonpolar or ionic

| | | | | | |
|-----|------|------|-----|-------|-----|
| C-C | Mg-O | O-O | O=O | Fe-Cl | B-F |
| P-O | C-H | Al-N | O-H | Li-I | N-H |

2) Determine which of the following will have the longest bond:

- a) C-Cl C-F b) H-O H-S
 c) H-H Br-Br d) Si=O Si-O
 e) Si=O C=O

3) What is the energy change when the following actions occur:

| | |
|------------------------------|--------------------------------|
| Forming 2 moles C=C bonds | Breaking 3.5 mole C-F bonds |
| Forming 0.75 moles O-H bonds | Breaking 0.75 mole N=O bonds |
| Forming 2 moles C=O bonds | Breaking 2 moles C=O bonds |
| Forming 4 moles C-O bonds | Breaking 0.50 moles S-Cl bonds |
| Forming 2.5 moles N-F bonds | Breaking 0.75 moles C-C bonds |

TABLE 8.4 Average Bond Enthalpies (kJ/mol)

Single Bonds

| | | | | | | | |
|-------|-----|------|-----|------|-----|-------|-----|
| C-H | 413 | N-H | 391 | O-H | 463 | F-F | 155 |
| C-C | 348 | N-N | 163 | O-O | 146 | | |
| C-N | 293 | N-O | 201 | O-F | 190 | Cl-F | 253 |
| C-O | 358 | N-F | 272 | O-Cl | 203 | Cl-Cl | 242 |
| C-F | 485 | N-Cl | 200 | O-I | 234 | | |
| C-Cl | 328 | N-Br | 243 | | | Br-F | 237 |
| C-Br | 276 | | | S-H | 339 | Br-Cl | 218 |
| C-I | 240 | H-H | 436 | S-F | 327 | Br-Br | 193 |
| C-S | 259 | H-F | 567 | S-Cl | 253 | | |
| | | H-Cl | 431 | S-Br | 218 | I-Cl | 208 |
| Si-H | 323 | H-Br | 366 | S-S | 266 | I-Br | 175 |
| Si-Si | 226 | H-I | 299 | | | I-I | 151 |
| Si-C | 301 | | | | | | |
| Si-O | 368 | | | | | | |

Multiple Bonds

| | | | | | |
|-----|------|-----|-----|----------------|-----|
| C=C | 614 | N=N | 418 | O ₂ | 495 |
| C≡C | 839 | N≡N | 941 | | |
| C=N | 615 | N=O | 607 | S=O | 523 |
| C≡N | 891 | | | S=S | 418 |
| C=O | 799 | | | | |
| C≡O | 1072 | | | | |

4) Draw the following molecules in 3D

| | | | | |
|--------------------------------|-------------------------------|------------------------------------|-------------------------------|-----------------------------------|
| AsH ₃ | OF ₂ | CH ₃ OH | C ₂ H ₄ | CH ₃ I |
| SO ₃ | SO ₄ ⁻² | SeF ₄ | SiCl ₄ | BF ₃ |
| CS ₂ | C ₆ H ₆ | C ₆ H ₅ COOH | P ₄ | CH ₃ COCH ₃ |
| H ₂ SO ₄ | SCl ₄ | | | |

5) Name the geometry around each center from the compounds in (4)

6) Determine the hybridization around each center in (4). Do you notice any trend in hybridization vs. geometry?

7) Determine if the compounds in (4) are polar or nonpolar.

8) Draw the MO diagrams for each of the following compounds, determine the bond order, and determine if it is paramagnetic or diamagnetic:

| | | | | |
|----------------|-----------------|-----------------|----|------------------|
| F ₂ | Be ₂ | NO ⁻ | SO | SO ⁺² |
|----------------|-----------------|-----------------|----|------------------|