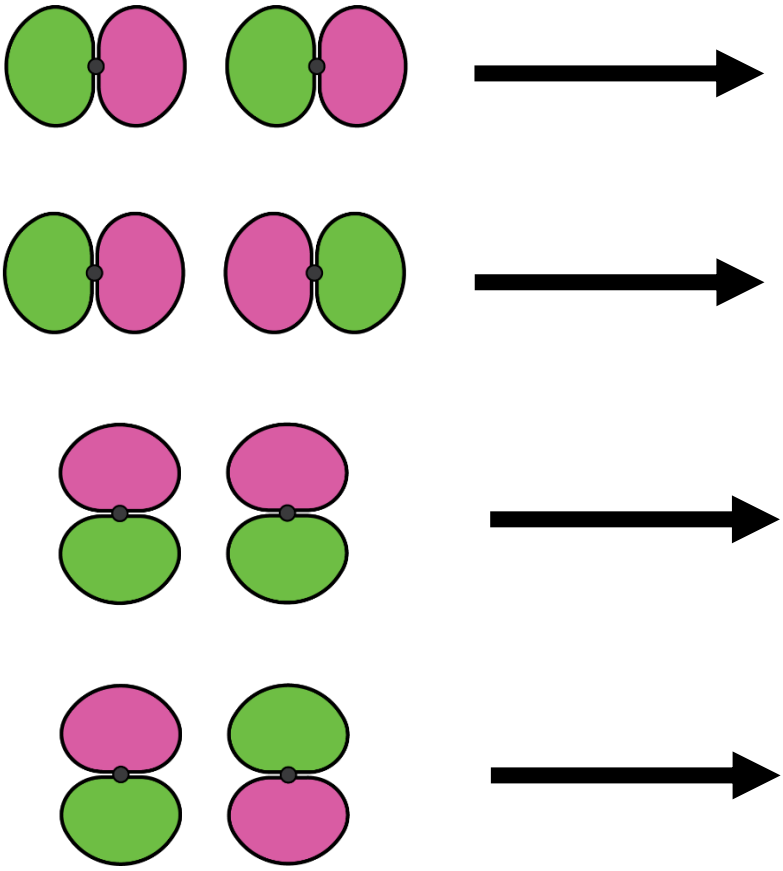
Bonding in Solids

Chapter 26 Molecular Orbital Theory

Chapter 27 Solids

1. Given the molecular orbitals of the s-orbitals, identify if the molecular orbital is bonding or antibonding.

2. Given the atomic orbitals, please draw the resultant molecular orbital and identify if it is bonding or antibonding. If antibonding, draw the node (dashed line).



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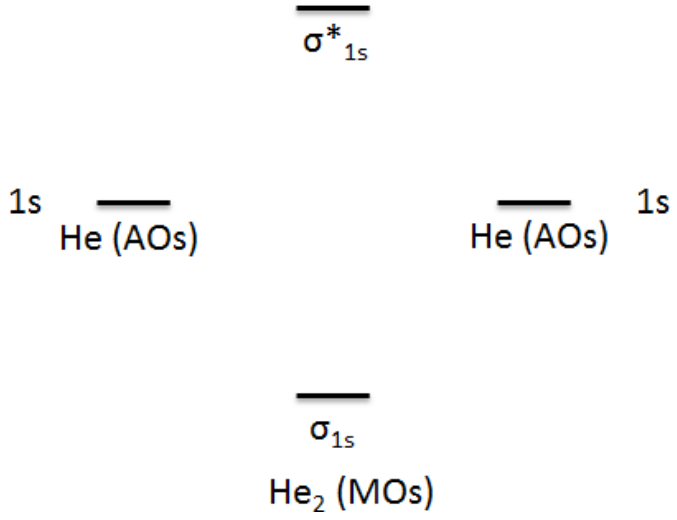
3. Complete the following MO diagrams for the diatomic molecules, anions, and cations indicated. Calculate their bond order. Classify the species as paramagnetic or diamagnetic.

a. He_2

Paramagnetic or Diamagnetic?

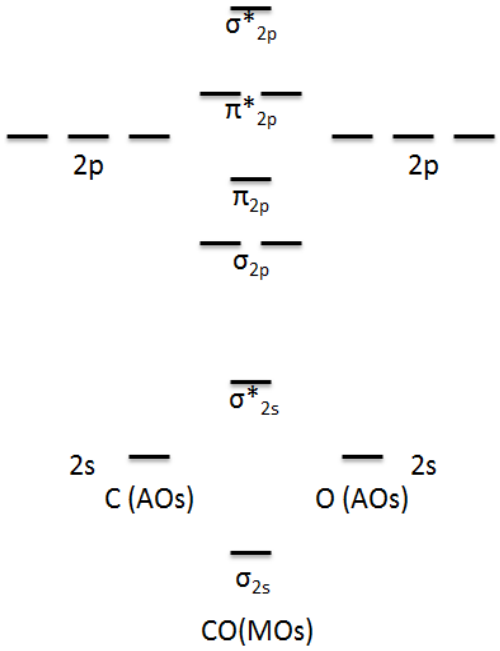
BOND ORDER:



b. CO

Paramagnetic or Diamagnetic?

BOND ORDER:



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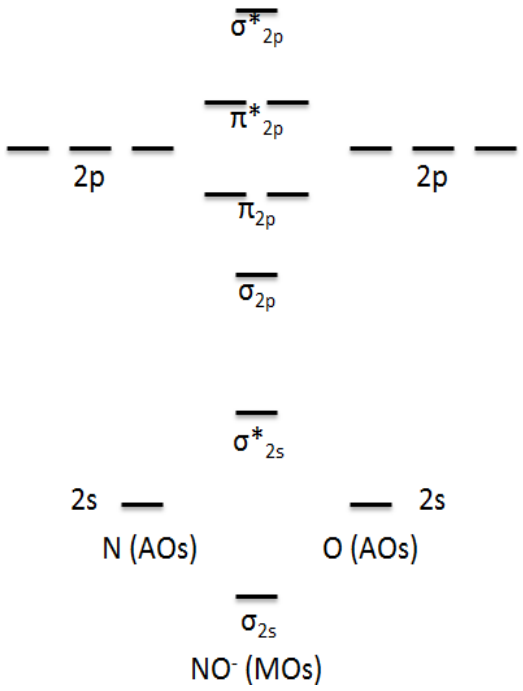
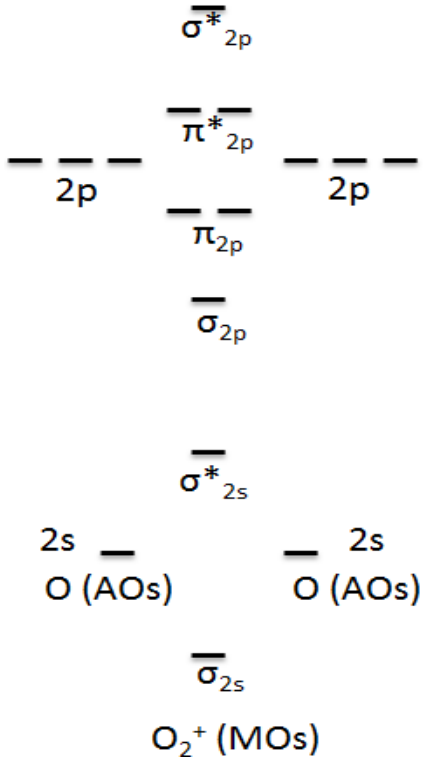
c. anion NO^-
Paramagnetic or Diamagnetic?

BOND ORDER:



d. cation O_2^+
Paramagnetic or Diamagnetic?

BOND ORDER:



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4. Fun with solid materials!

a. Please describe the properties of the following categories of solid materials (include MP, BP, hardness, conductive/insulative properties):

Molecular/Atomic solids:

Ionic solids:

Metallic solids:

Network-covalent solids:

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b. Classify the following materials in the chart below:

	Molecular/ Atomic solid	Ionic solid	Metallic solid	Network-covalent solid
H_2O (s)				
C (diamond)				
NaCl				
Talc				
CH_3CH_2OH (s)				
ZnS				
C (buckyball)				
Asbestos				
Ar (s)				
Quartz (crystalline SiO_2)				
C (graphite)				
PbF_2				

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GROUP ACTIVITY

NAMES: _____

ACCESS IDS: _____

(Such as abc12@psu.edu, NOT your 9 digit number)

Instructions:

- In a group of 4 or less, complete all parts of the following activity.
- You may finish outside of class.
- Please write legibly or we can't give you full credit.
- Every member needs to submit **their own copy** to Canvas by **11:59 PM** the day of your assigned Recitation.

Question 1: Please draw the molecular orbital diagrams for N_2, F_2, and Ne_2. Make sure to include the labels for each molecular orbital. Use your data sheet to help in the ordering and labelling of the orbitals.

- Calculate the **bond order** for each compound and **draw a Lewis structure** based on your calculated bond order.
- Which diatomic molecule is **least** likely to exist?

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