Chem 106, Exam 2. J-Term 2005

Name_____

Show all work for credit

Useful information: Formal Charge = $E_{valence} - (E_{nonbonding} + \#_{bonds})$,

Bond Order = $\frac{E_{bonding} - E_{antibonding}}{2}$

(1)(8 points) Calculate the lattice energy for NaH using the information below.

$Na(s) + 1/2H_{2(g)} \text{ ----> } NaH_{(s)} \quad \Delta H = -60 kJ$

$Na_{(s)} \text{ ---> } Na_{(g)} \quad \Delta H = 107.3 \, kJ/mole$

E_{i1} = 495.8 kJ/mole for Na

E_{EA} = -72.8 kJ/mol

BDE = 435.9 kJ/mol for H-H bonds

(2)(4 points) Indicate the polarity of each bond with δ^+ and δ^-.

(a) P-Cl

(b) Te-Br

(c) N-Si

(d As-Ga

(3)(4 points) Place the following in order of increasing first ionization energy

Ge, Ca, Al , O, S

(4)(12 points) Draw the best Lewis dot structures for the following compounds

(a) SF_6

(b) IBr_4^-

(c) NF_3

(d) SiS_2

(e) AlF_3

(f) NO_3^-

(5)(12 points) Draw the VSEPR geometry for the following compounds and indicate the name of the geometry

(a) SF_6

(b) IBr_4^-

(c) NF_3

(d) SiS_2

(e) AlF_3

(f) NO_3^-

(6)(5 points) Give the hybridization of the orbitals of the central atom in each of the following compounds.
(a) SF_6

(b) IBr_4^-

(c) NF_3

(d) AlF_3

(e) NO_3^-

(7)(4 points) Draw a valence bond sketch for each of the following compounds
(a) NF_3

(b) SiS_2

(c) AlF_3

(d) NO_3^-

(8)(2 points) What is an advantage of using Valence Bond Theory to describe bonding in a compound instead of Molecular Orbital Theory?

(9)(2 points) What is an advantage of using Molecular Orbital Theory to describe bonding in a compound instead of Valence Bond Theory?

Use the attached molecular orbital diagrams to answer the following questions
(10)(6 points) Write out the molecular orbital electron configuration for the following species.

(a) NO^+

(b) O_2

(c) B_2

(11)(3 points) What is the bond order in each of the following species?

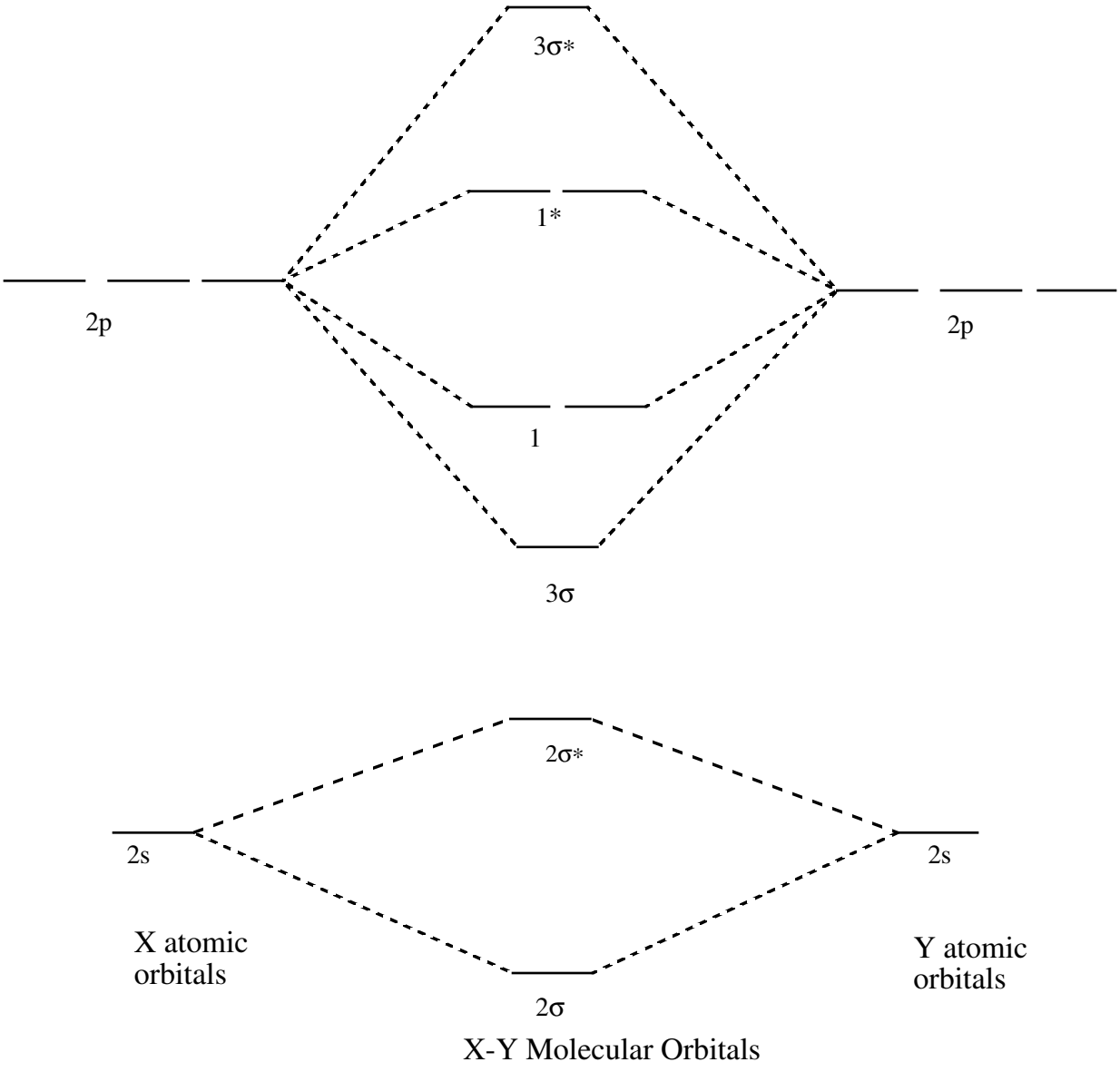
(a) NO^+

(b) O_2

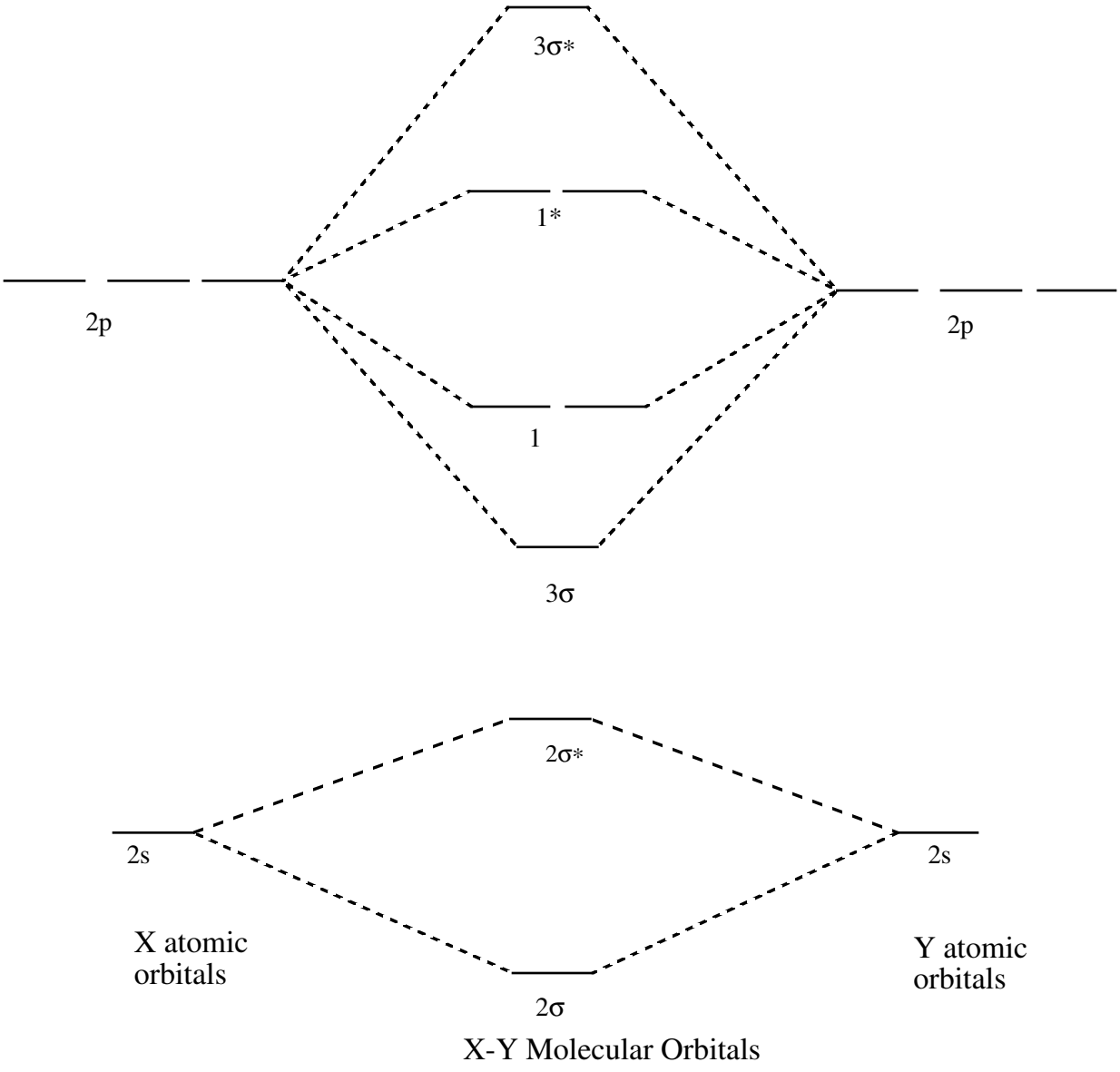
(c) B_2

(12)(6 points) Arrange the following in order of bond length (shortest to longest) and indicate the reason.

C_2^{2-}, C_2, and C_2^+



Valence Electron Molecular Orbital Diagram for the molecule X-Y



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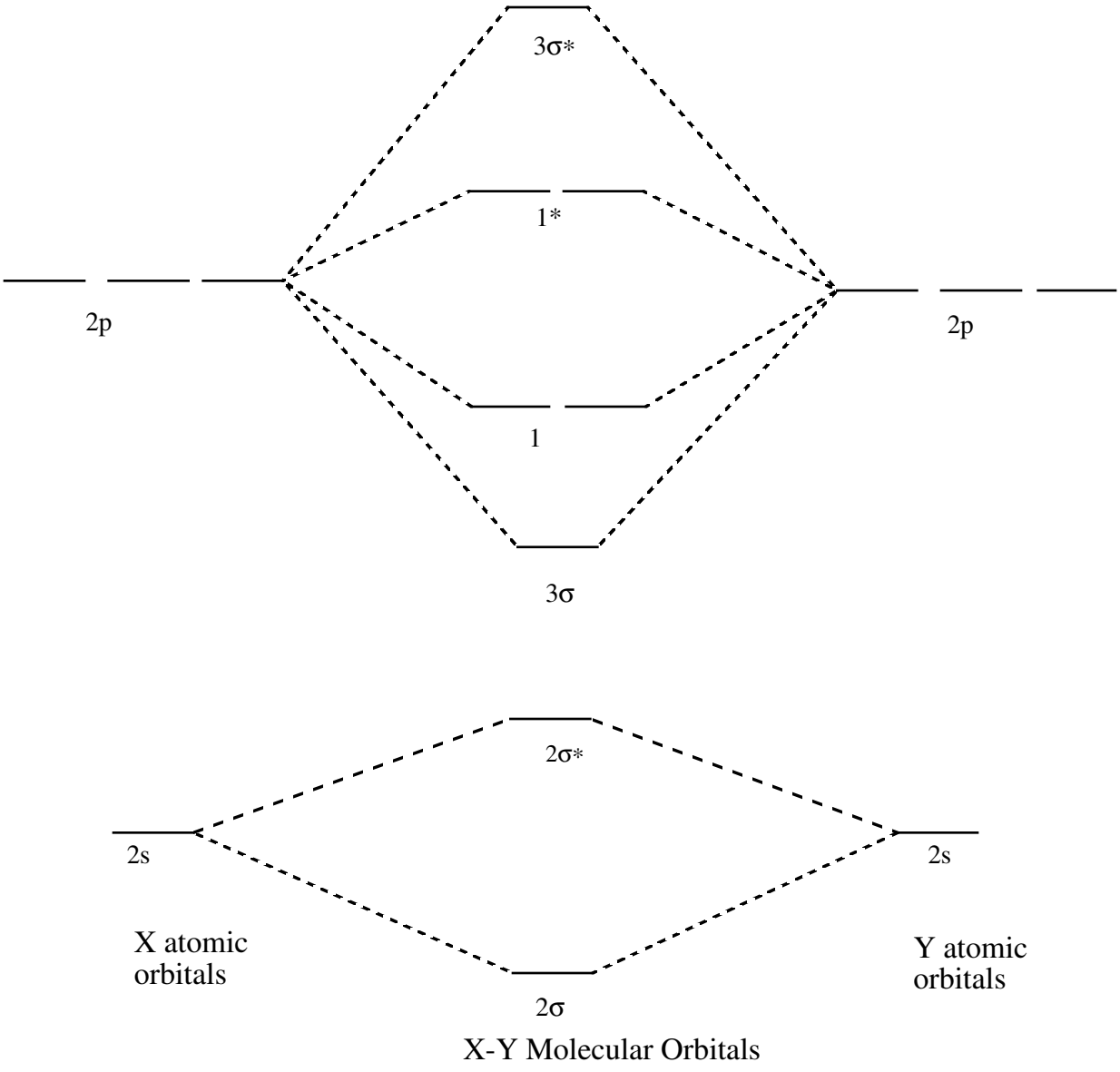

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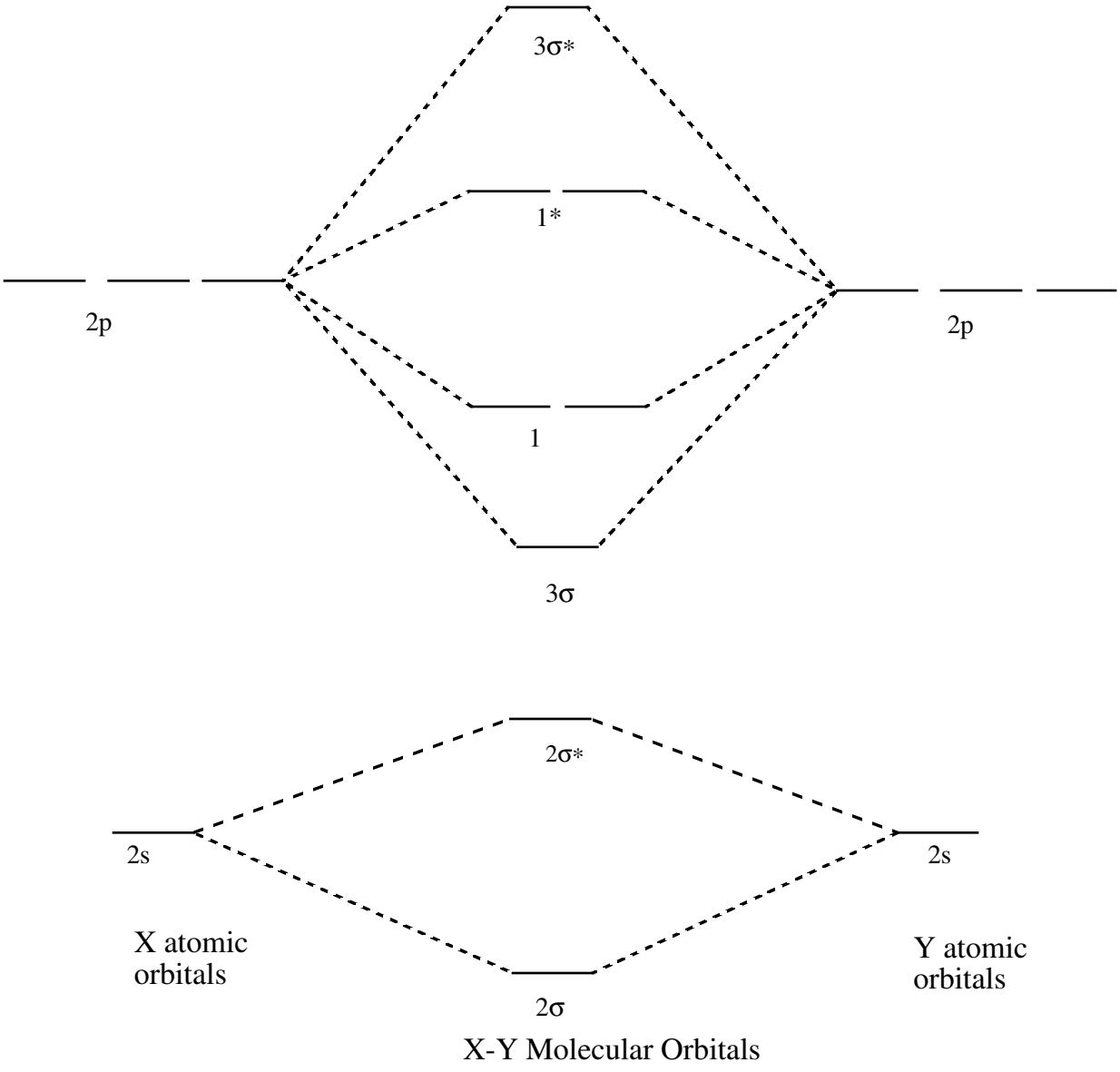

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