Covalent Bonds

UNIT TWO: BONDING

BIBERDORF

Important Information

No Office Hours for Dr. McCord this week.

Q08 – Q11 are due Friday (9/25) at 9 AM.

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Ionic Review

* transferring e⁻
* metal + non-metal
* lattice energy

↑ charge, ↑ LE (strong)
↓ charge, ↓ LE (weak)
↑ radius, ↓ LE (weak)
↓ radius, ↑ LE (strong)

$LE \propto \frac{charge}{radius}$

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Question

What type of bond will calcium and iodine form? Please draw the corresponding molecule.

A. Ionic

B. Covalent

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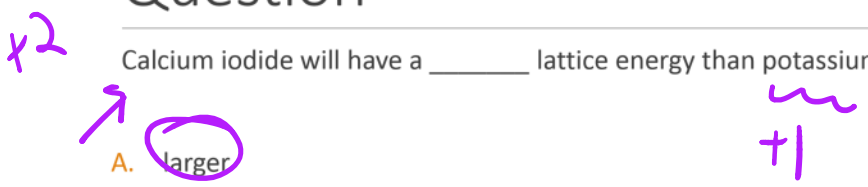
Question

Calcium iodide will have a _____ lattice energy than potassium iodide.

A. larger

B. smaller



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Covalent Bond

* Share e^-
* two non-metals
* evaluate CB with bond length/strength
  - ↳ formal charge

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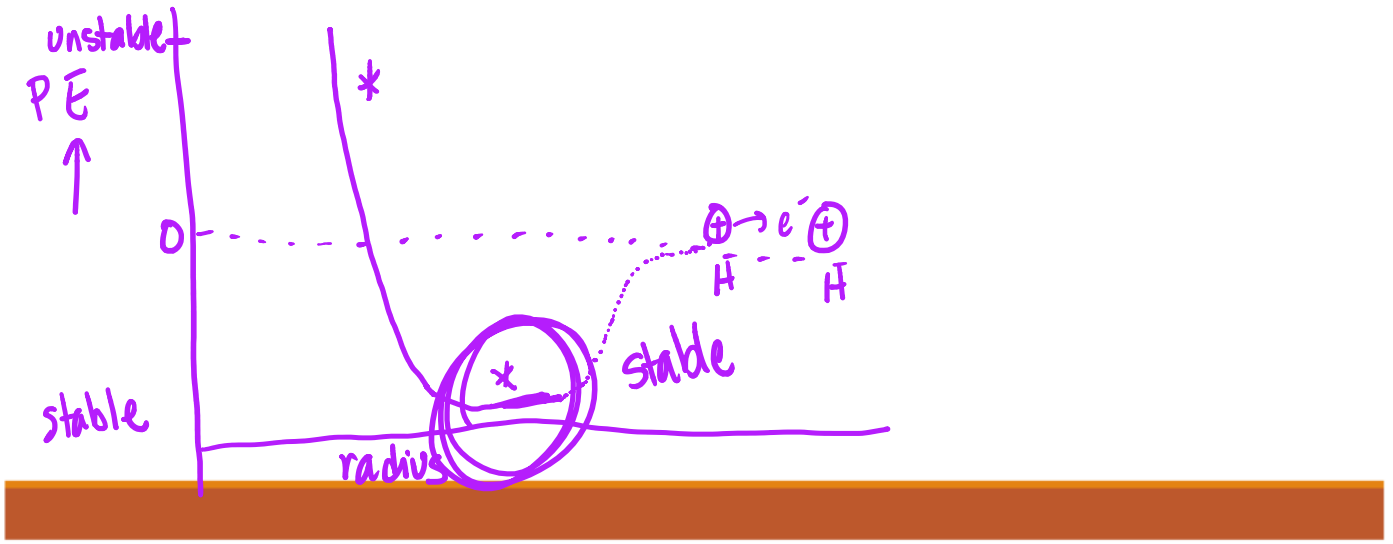
Potential Energy Diagram

Covalent Bond Formation



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Question

Will two atoms form a covalent bond if their resulting energy level is higher than their corresponding original energy levels?

A. Yes

B. No

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Types of Covalent Bonds

X– X single 2e⁻

X=X double 4e⁻

X≡X triple 6e⁻

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Bond Length vs. Bond Strength

length: single > double > triple

strength: single < double < triple

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Lewis Structures

↳ visual representation of a molecule

↓

covalent

1. Put "C" in the center (electropositive)
2. Radicals are unlikely
3. make molecules symmetrical
4. make your formal charges "0" or "1"

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Question

Draw the Lewis structures for O_2, P_2, and At_2. Which molecule will have the longest bond?

A. O_2

B. P_2

C. At_2

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Question

Draw the Lewis structures for O_2, P_2, and At_2. Which molecule will have the strongest bond?

A. O_2

B. P_2

C. At_2

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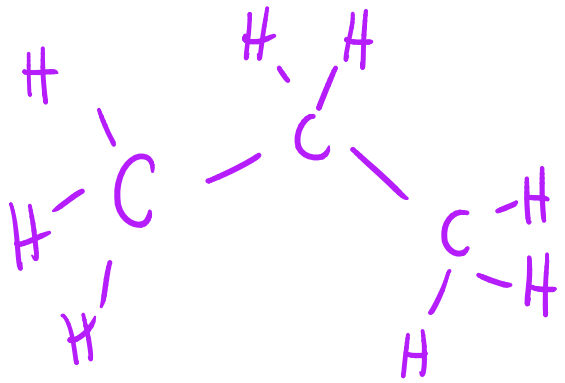
$CH_3CH_2CH_3$

Question

What is the Lewis structure for propane?



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Line Drawings

↳shorthand notation for Lewis Structures

1. Draw Lewis
2. convert all "C" to points (dots)
3. erase all Hydrogens connected to C

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Question

What is the line drawing for CH_3COOH?

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Evaluating Lewis Structures

Formal Charges

↳ charge on each atom within a molecule

↳ want FC = Ø or 1

FC = valence e^- − actual e^-

FC = want − have

↑ touching

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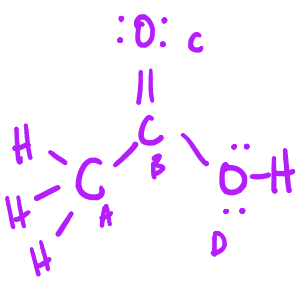
Formal Charges of Acetic Acid



A: 4-4=0

B: 4-4=0

C: 6-6=0

D: 6-6=0

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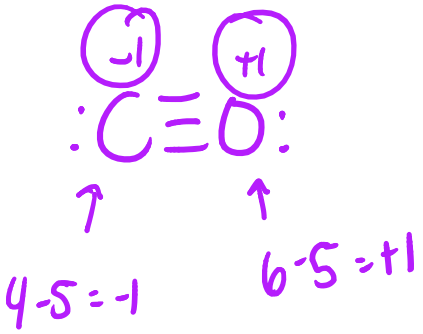
Question

What are the formal charges on carbon and oxygen in carbon monoxide, respectively?

A. 0, 0
B. -1, 0
C. 0, -1
D. +1, -1
E. -1, +1



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Octet Rule

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Octet Rule Exceptions

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Question

What is the Lewis Structure for sulfur hexafluoride?

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Question

What is the Lewis Structure for boron trichloride?