Answer Key
11/12/25

Exam 3 Test Prep

What is the electron configuration for S^{2-}?

$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6$

What is the condensed electron configuration for As^{2+}?

$[Ar]\ 4s^2\ 3d^{10}\ 4p^1$

What is the element with the electron configuration $1s^2\ 2s^2\ 2p^6$?

Ne

What is the element with the electron configuration for [Ar] $4s^2$?

Ca

What is the condensed electron configuration for chromium?

$[Ar]\ 4s^1\ 3d^5$

Given the following, determine which rule of electron configuration is being broken?

1s

= breaks Pauli exclusion; can't have 2 up arrows

1s

2s

= breaks Aufbau principle; must fill lower orbitals 1st

2p

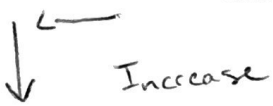
= breaks Hund's rule; put 1 e^- in each orbital before pairing occurs

If n = 2, then l can be _____

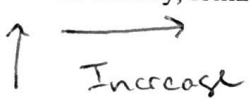
If n = 4 and l = 1, then m_l can be _____

What would be the quantum number for n, l, m_l, and m_s if you are given phosphorus?

What is the periodic trend for atomic radius and ionic radius?



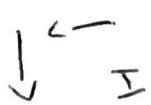
What is the periodic trend for electron affinity, ionization energy, and electronegativity?



Match the term with the correct definition

Atomic radius	Distance between the nucleus and a ring
Ionization energy	Energy to remove an electron from ground state of gaseous atom
Electron affinity	Addition of an electron to a gaseous atom (exothermic)
Electronegativity	Attract shared electrons

Which has the largest atomic radius? Na, Li, or S?



Na

Which has the largest atomic radius? K^+, Ar, Cl^-, or Ca^{2+}

K^+ loses e^- → Ca^{2+} > stronger pull by nucleus

Cl^-

↑ Adds $1e^-$ → more repulsion + less pull on p^+

Arrange elements in decreasing electron affinity: C, O, Na, F

Large → small ↑ → I

F > O > C > Na

Which element has the highest ionization energy? I, Na, or Cl

↑ → I

Cl

Arrange the following ions in order of increasing ionic radius: Li^+, B^{3+}, O^{2-}, F^-

↓ ← I

$B^{3+} < Li^+ < F^- < O^{2-}$

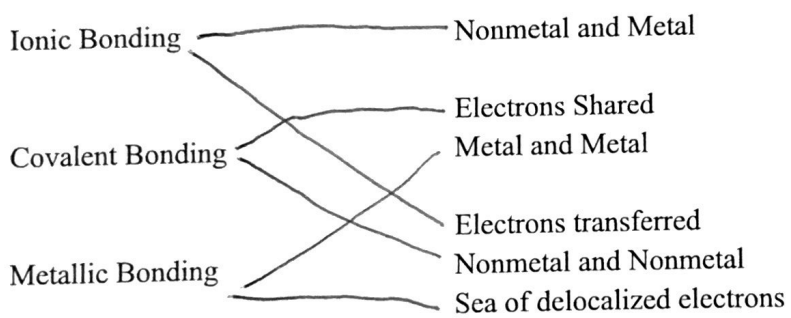
Li^+ = 1 ring

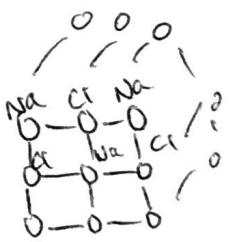
B^{3+} = 1 ring

↑ gained most e^- = largest

lost most e^- = smallest ↗

Match the terms:





What is a lattice structure? What affects lattice energy?

Lattice structure = pure crystalline solid

size + charge of ions affect lattice energy

- small = greater energy is needed to break bonds
- higher charge = greater energy needed to break bonds

Rank the following compounds in order of decreasing lattice energy? LiCl, SrSe, and KBr

Li^+Cl^- $Sr^{2+}Se^{2-}$ K^+Br^-

SrSe > LiCl > KBr

1) Highest charges

2) Size

↑ smaller than KBr

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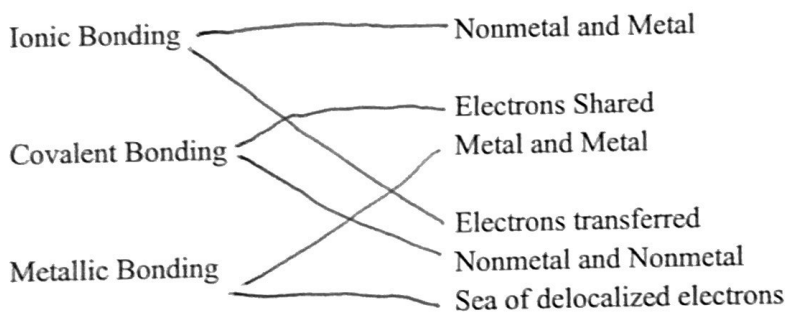

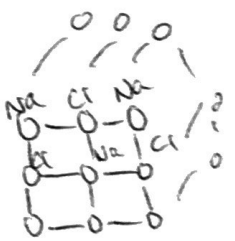

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2) Size

↑ smaller than KBr

What is an allotrope? What are the allotropes of carbon?

Allotrope = different forms of the same element (pure state)

Allotropes of carbon = Diamond, graphite, graphene

What are the exceptions to the octet rule?

H + He = 2e⁻

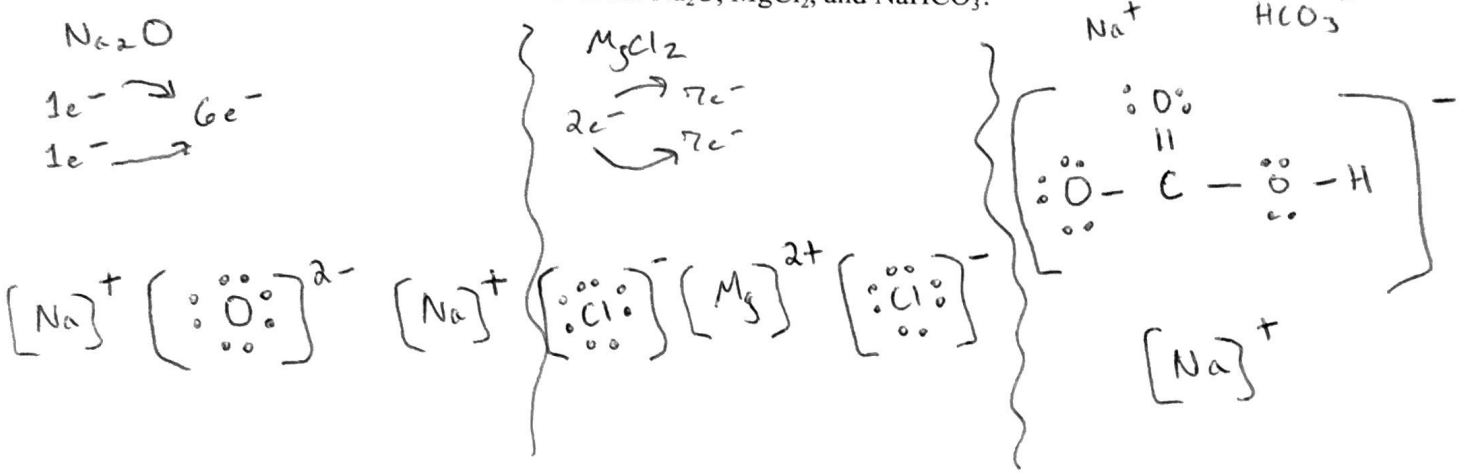
Li = 2e⁻

Be = 2e⁻ or 4e⁻ → 2 bonds

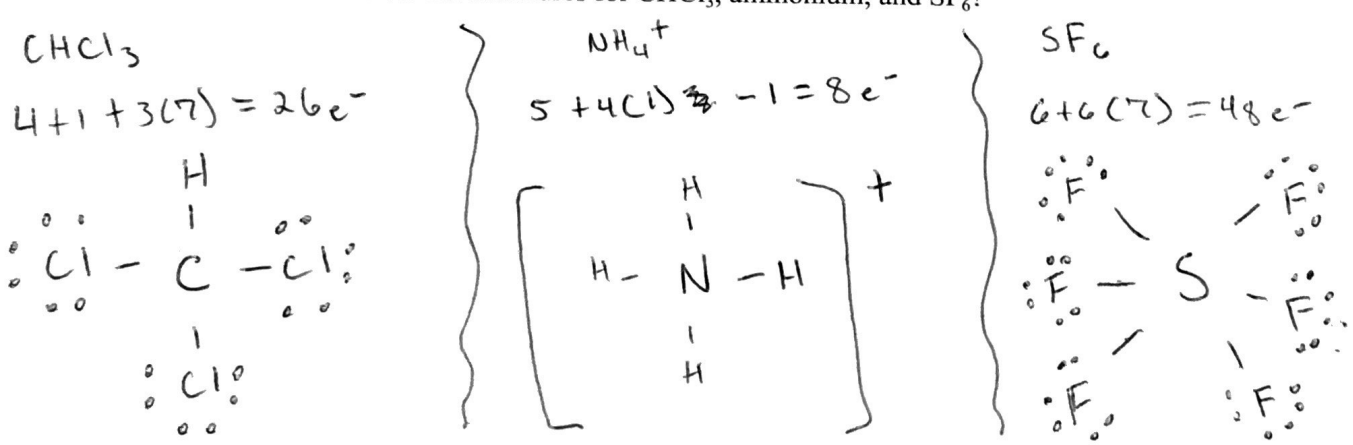
B = 6e⁻

S + P = 8, 10, or 12 e⁻

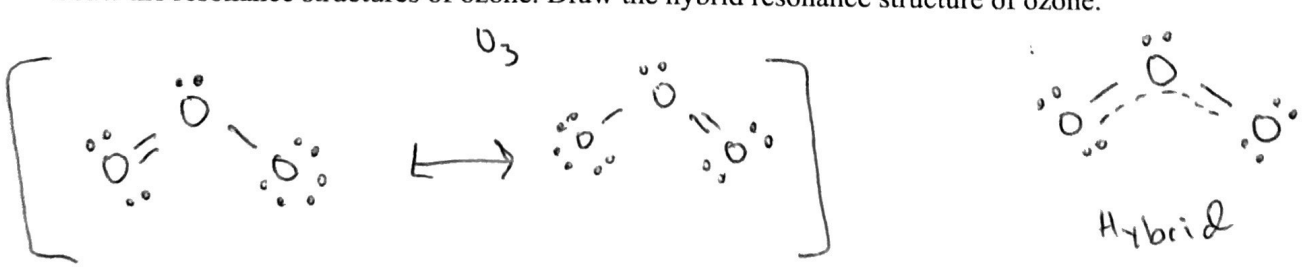
What are the lewis dot structures for Na_2O, $MgCl_2$, and $NaHCO_3$?



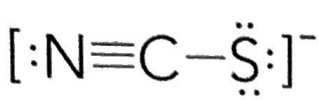
What are the lewis dot structures for $CHCl_3$, ammonium, and SF_6?

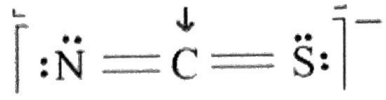


Draw the resonance structures of ozone. Draw the hybrid resonance structure of ozone.



Which is the more dominant structure?





N: 5 - 2 - 1/2 (6) = ∅

5 - (3 + 2) = ∅

C: 4 - 0 - 1/2 (8) = ∅

S: 6 - 6 - 1/2 (2) = -1

N: 5 - 4 - 1/2 (4) = -1

C: 4 - 0 - 1/2 (8) = ∅

S: 6 - 4 - 1/2 (4) = ∅

More dominant structure

- Place negative sign on the more electronegative element

Formal charge = valence e^- - nonbonding e^- - 1/2 (bonding e^-)

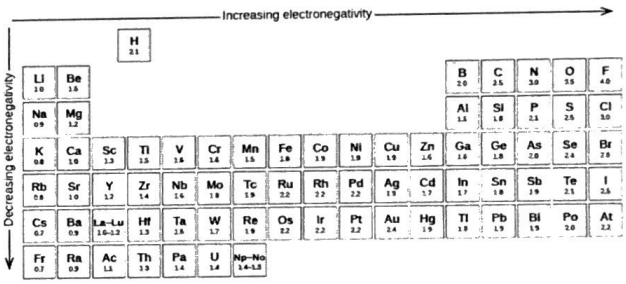
valence e^- - (# of bonds + nonbonding e^-)

Determine whether each compound is polar, nonpolar, and ionic by looking at electronegativity differences. Indicate partial positive and negative charges.

O-O 3.5 - 3.5 = 0 Nonpolar

$\overset{\delta^-}{O}\text{-}\overset{\delta^+}{H}$ 3.5 - 2.1 = 1.4 polar

$\overset{\delta^+}{Na}\text{-}\overset{\delta^-}{Cl}$ 3.0 - 0.9 = 2.1 Ionic



Memorize Ogletree's trick

Go left = -0.5

Go down = -1

< 0.4 Nonpolar

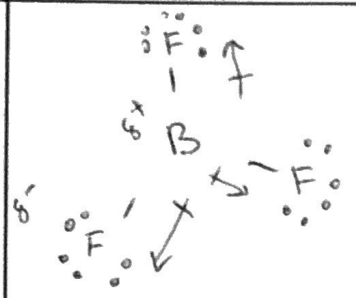
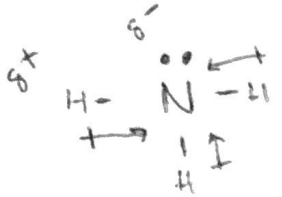
0.5 - 1.8 polar

> 1.8 Ionic

< 0.4 non polar

0.4 - 1.8 polar

> 1.8 Ionic

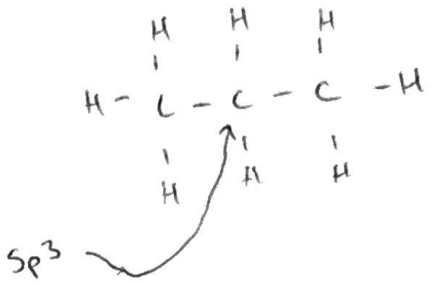
	BF_3 24e⁻	Ammonia NH_3 8e⁻
Lewis dot structure		
# e- domains	3	4
e- domain geometry	Trigonal planar	Tetrahedral
Molecular geometry	Trigonal Planar	Trigonal pyramidial
Bond Angle	120°	∠109.5°
Hybridization	sp^2	sp^3
Polar or Nonpolar Molecule	Nonpolar	Polar
Polar or Nonpolar Bonds	Polar	Polar
Electronegativity difference	4 - 2 = 2	3 - 2.1 = 0.9

Number of Electron Domains	Electron Domain Geometry	Molecular geometry	Bond angle	Hybridization
2	Linear	Linear	180°	sp
3	Trigonal Planar	Trigonal Planar	120°	sp^2
3	Trigonal Planar	Bent	∠120°	sp^2
4	Tetrahedral	Tetrahedral	109.5°	sp^3
4	Tetrahedral	Trigonal pyramidial	∠109.5°	sp^3
4	Tetrahedral	Bent	<<109.5°	sp^3

How many sigma and pi bonds are in C_3H_8? What is the hybridization of the second carbon?

No π bonds

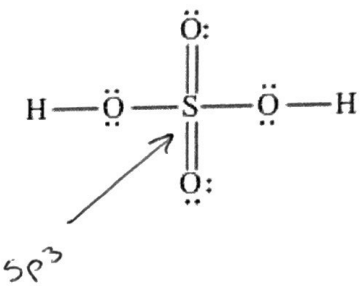
10 σ bonds



How many sigma and pi bonds are in sulfuric acid? What is the hybridization of the sulfur?

2 π bonds

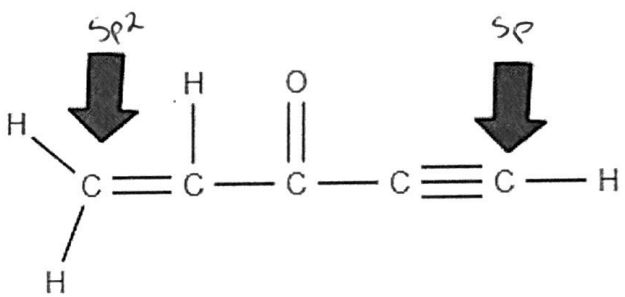
6 σ bonds



How many sigma and pi bonds are in this molecule? What is the hybridization of the carbons with the arrows?

4 π bonds

9 σ bonds



Triple = strongest + shortest

single = weakest + longest