



Birzeit University
Chemistry Department
CHEM133

3rd Hour Exam

1st Sem. 2024-2025

Time: 40 min.

Instructor: Dr. Hijazi Abu Ali

● Student Name: _____

● Student No.: _____ Section No.: _____

Important note: There are (12) equally graded questions, please answer all of them.

E	D	C	B	A	Q
					1
					2
					3
					4
					5
					6
					7
					8
					9
					10
					11
					12

GOOD LUCK

Please read each question carefully before you answer, and choose the best fit answer.

1. What type of chemical bond holds the atoms together within a water molecule?

- A) Ionic bond
B) Nonpolar covalent bond
C) Polar covalent bond
D) Coordinate covalent bond

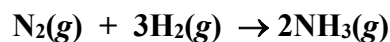
2. The number of lone electron pairs in the NO_2^- ion is ____.

- A) 4 B) 5 C) 6 D) 7 E) 8

3. The number of resonance structures for the SeO_2 molecule that satisfy the octet rule is

- A) 1 B) 3 C) 2 D) 4 E) None of these

4. Calculate (in kJ) the standard enthalpy change ΔH° for the reaction written below, using the bond energies given.



<u>Bond:</u>	<u>Bond energy (kJ/mol):</u>
$\text{N}\equiv\text{N}$	945
$\text{H}-\text{H}$	432
$\text{N}-\text{H}$	391

- A) -969 kJ B) -204 kJ C) -105 kJ D) 204 kJ E) 595 kJ

5. Which one of the following statements about atomic structure and quantum numbers is incorrect?

- A) In a given atom, the maximum number of electrons having principal quantum number $n = 3$, is 18.
B) The number of orbitals in a given f subshell is 7.
C) For $n = 4$, the largest possible value of l is 3.
D) For $n = 4$, the largest possible value of m_l is 2.
E) The following set of quantum numbers for a single orbital is not allowed: $n = 3, l = 1, m_l = -2$.

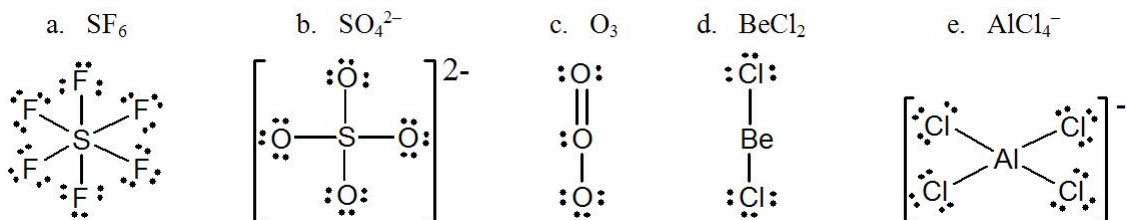
6. Which of the following atoms has paramagnetic properties?

- A) Li^+ B) Be C) P D) Ne E) Xe

7. Select the correct set of quantum numbers (n, l, m_l, m_s) for the highest energy electron in the ground state of potassium, K.

- A) 4, 1, -1, $\frac{1}{2}$ B) 4, 1, 0, $\frac{1}{2}$ C) 4, 0, 1, $\frac{1}{2}$ D) 4, 0, 0, $\frac{1}{2}$ E) 4, 1, 1, $\frac{1}{2}$

8. In which one of the following structures does the central atom have a formal charge of +2?



- A) a B) b C) c D) d E) e

9. What is the molecular shape of ClF_4^- as predicted by the VSEPR theory?

- A) square planar B) square pyramidal C) see-saw
D) distorted octahedral E) distorted tetrahedral

10. Use VSEPR theory to predict the electron group arrangement around iodine, the central atom in the ion IF_2^- .

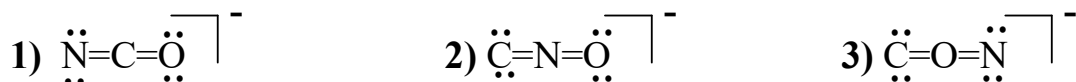
- A) trigonal bipyramidal B) distorted octahedral C) distorted tetrahedral
D) trigonal planar E) distorted bent

11. Consider the following two molecules: CO_2 and CO_3^{2-} :

- 1) The C-O bond energy in CO_2 is higher than the C-O bond energy in CO_3^{2-}
- 2) The C-O bond order in CO_2 is less than the C-O bond order in CO_3^{2-}
- 3) The C-O bond length in CO_2 is less than the C-O bond length in CO_3^{2-}
- 4) The C-O bond in CO_2 is stronger than the C-O bond in CO_3^{2-}
- 5) The CO_3^{2-} ion is polar

- A) 1, 2 and 5 are correct B) 2, 3 and 4 are correct C) 1, 3 and 4 are correct
D) 2, 4 are correct

12. Three possible structures of the cyanate anion, NCO^- are shown. Calculate the formal charges on each of the nine atoms and choose the best correct answer.



- A) Structure 2 is the most stable and favorable B) Structure 1 is the most stable and favorable
C) Structure 3 is the most stable and favorable D) The formal charge on the N atom in Structure 2 is -1
E) The oxidation number on the N atom in Structure 1 is -2