

PRELIMINARY CONCEPTS

1.- Consider the following isoelectronic species: Ar, K⁺, Ca²⁺, Cl⁻ and S²⁻. Which one is the smallest? And the biggest? And the one with highest charge density?

X	Ca ²⁺ is the smallest, S ²⁻ is the biggest and Ca ²⁺ has the highest charge density
	S ²⁻ is the smallest, Ca ²⁺ is the biggest and S ²⁻ has the highest charge density
	K ⁺ is the smallest, Cl ⁻ is the biggest and Ar has the highest charge density
	S ²⁻ is the smallest, Ca ²⁺ is the biggest and S ²⁻ has the highest charge density

2.- Which of the following statements is false:

	Only three quantum numbers are needed to define the orbital of an electron (n, l, m).
	The energy of an electronic orbital is determined by only two quantum numbers (n, l).
X	Magnetic quantum number, m _l , defines the shape and orientation of orbitals.
	Spin quantum number describes the electron magnetic field when it rotates about its own axis.

3.- Which of the following molecules would yield more CO₂ when fully burning 1mol)

	CH ₄
	C ₂ H ₆
X	C ₄ H ₉ Cl
	CH ₂ O

4.- The electronic configuration of a certain atom is 1s²2s²2p⁶3s¹. Which of the following statements is false?

X	It tends to form anions
	It is a metal
	It is located at the third period in the periodic table
	It is bigger than lithium

5.- 100ml of 0.2M solution of HBr are mixed with 250ml of HCl 0.1M. Assuming volumes are additive, which are the concentrations of the ions in solution?

	[H ⁺]=[Cl ⁻]= [Br ⁻]
X	[H ⁺]>[Cl ⁻]> [Br ⁻]
	[H ⁺]>[Br ⁻]> [Cl ⁻]
	[H ⁺]>[Br ⁻]= [Cl ⁻]

6.- The chemical formula of potassium permanganate is:

	K ₂ MnO ₂
	KMnO ₂
	K ₂ MgO ₃
X	KMnO ₄

7.- Consider a solution of HNO₃ =0.1N and a solution of HCl 0.1N. When titrating these solutions with NaOH up to neutralization, at the equivalence point:

	Both solutions have the same acidic pH
	The first one have higher pH
	The second one would higher pH
X	Both solution would the same pH

8.- Consider a nuclide of mass m_X composed of N neutrons (m_N) and Z protons (m_Z). Which of the following statements is correct:

	$m_X = m_N + m_Z$
X	$m_X < m_N + m_Z$
	$m_X > m_N + m_Z$
	$m_X - m_N - m_Z$ is the binding energy per nucleon

9.- Which of the following statements about NH_3 is true:

	It is an acid
X	It is a base
	It is a buffer
	It is a solid

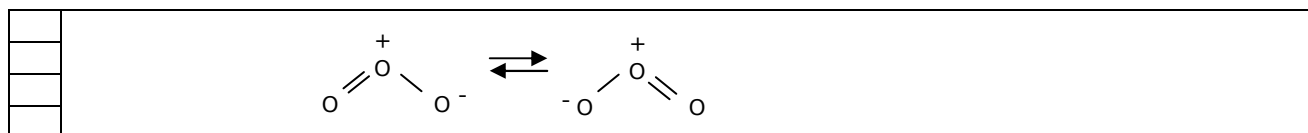
10.- Write in decreasing order the radius of the following atoms and ions: K, K^+ , Mg, Al, Al^{3+} .

	$Al > Mg > K > K^+ > Al^{3+}$
X	$K > Mg > Al > K^+ > Al^{3+}$
	$Al^{3+} > K^+ > Mg > K > Al$
	$Al > K > Mg > K^+ > Al^{3+}$

11.- Which of the following compounds has more polar bonds and which is more polar? CH_4 , CCl_4 , CF_4 , CH_3Cl

	CCl_4 : highest bond polarity and CF_4 : highest polarity.
	CH_3Cl : highest bond polarity and CCl_4 : highest polarity.
X	CF_4 : highest bond polarity and CH_3Cl : highest polarity.
	CF_4 : highest bond polarity and CF_4 : highest polarity.

12.- Write the Lewis structure of ozone (O_3)



13.- SO_2 and H_2O molecules are both angular but bond angle in the former is 119° and 109° in the later. Could you explain why?

	Because sulfur has larger radius than oxygen
	Because of the hydrogen bonds in water molecule
X	Because sulfur has only one lone pair of electrons while oxygen has two
	Because oxygen has only one lone pair of electrons while sulfur has two

14.- Let us call x the axis that contains the two nucleus of a diatomic molecule. Which of the following is true?

X	The bonding MO formed by combination of two p_x has one nodal plane
	The antibonding MO formed by combination of two s has two nodal planes
	The bonding π_x has one nodal plane
	The overlapping between two p_x has cylindrical symmetry

15.- Which of the following molecules presents the highest paramagnetism? Li_2 , B_2 , N_2 , Ne_2^+

	Li_2
X	B_2
	N_2
	Ne_2^+