

- Which of the following scientists is noted for his work with gases?
 - Planck
 - Bohr
 - Lewis
 - Rutherford
 - Boyle
- If one mole of nitrogen gas is placed in a rigid one liter container and the temperature is changed from -75.0°C to -10.0°C , then
 - the pressure of the gas sample will increase.
 - the pressure of the gas sample will be unchanged.
 - the pressure of the gas sample will decrease.
 - the initial pressure of the gas sample must be 1.00 atm.
 - two of the above are true.
- An gas sample is found to have a density of 3.16 g/L at STP. Which is the identity of the gas?
 - H_2
 - CO_2
 - N_2
 - Cl_2
 - CH_4
- A sample of nitrogen gas is heated from 25.0°C to 150.0°C . If the initial volume of the gas is 455 mL, what will the final volume be if pressure is kept constant?
 - 2730 mL
 - 321 mL
 - 556 mL
 - 646 mL
 - 752 mL

5. A sample of hydrogen gas is collected at STP. If it has a volume of 638 mL, how many moles of gas are present?
- A. 0.0284 mole
 - B. 0.0261 mole
 - C. 0.0244 mole
 - D. 14.3 moles
 - E. 35.1 moles
6. A photon of light has a wavelength of 525 nm. What is the energy of this photon?
- A. 3.79×10^{-28} J
 - B. 1.16×10^{-39} J
 - C. 5.71×10^8 J
 - D. 1.75×10^{-9} J
 - E. 3.79×10^{-25} J
7. Scientists have proposed that electromagnetic radiation (like energy) is _____, which means it only has certain allowed values.
- A. continuous
 - B. quantized
 - C. ionized
 - D. integrated
 - E. diffracted
8. Using the Bohr Model for the hydrogen atom, which of the following must be true when an electron moves from the state $n=2$ to $n=4$ in the hydrogen atom?
- A. 1.36×10^{-19} J is released
 - B. 1.88×10^{-1} J is released
 - C. 4.09×10^{-19} J is absorbed
 - D. 1.36×10^{-19} J is absorbed
 - E. 5.45×10^{-19} J is absorbed

9. Orbitals that have identical energies are said to be _____.
- A. in an excited state
 - B. degenerate
 - C. in the ground state
 - D. quantized
 - E. resonance structures
10. Which of the following atoms is most likely to disobey the octet rule?
A. carbon B. nitrogen C. potassium D. sulfur E. fluorine
11. _____ states that electrons should be spread out among degenerate orbitals before pairing them up.
- A. The Aufbau Principle
 - B. The Pauli Exclusion Principle
 - C. The Heisenberg Uncertainty Principle
 - D. The Mendeleev Principle
 - E. Hund's Rule
12. What is the ground state electron configuration for bromine?
- A. $[\text{Ar}] 4s^2 4p^5$
 - B. $[\text{Ar}] 4s^2 4d^{10} 4p^5$
 - C. $[\text{Ar}] 4s^2 3d^{10} 4p^5$
 - D. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 4p^5$
 - E. more than one of these is correct.
13. The quantum number that corresponds to the orbital is called:
- A. spin
 - B. principle
 - C. magnetic
 - D. angular momentum
 - E. degenerate

14. Which of the following is a possible set of quantum numbers the last electron placed in krypton?
- A. $n=4, l = 0, m_l = 0, m_s = \frac{1}{2}$
 - B. $n=4, l = 1, m_l = 2, m_s = \frac{1}{2}$
 - C. $n=4, l = 2, m_l = 2, m_s = \frac{1}{2}$
 - D. $n=4, l = 0, m_l = 2, m_s = \frac{1}{2}$
 - E. $n=4, l = 1, m_l = -1, m_s = \frac{1}{2}$
15. Which of the following elements has no unpaired electrons in its ground state?
- A. zinc
 - B. calcium
 - C. neon
 - D. none of these
 - E. all of these
16. What is the electron configuration for the chromium (III) ion?
- A. $[\text{Ar}] 4s^2 3d^4$
 - B. $[\text{Ar}] 4s^2 3d^7$
 - C. $[\text{Ar}] 4s^2 3d^3$
 - D. $[\text{Ar}] 3d^3$
 - E. $[\text{Ar}] 4s^2 3d^1$
17. How many valence electrons are in atom of gallium?
- A. 3
 - B. 6
 - C. 13
 - D. 22
 - E. 31
18. Which of the following atoms would have the greatest atomic radius?
- A. fluorine B. sulfur C. argon D. arsenic E. carbon

19. Which of the following is true concerning ionization energy?
- A. Removing one electron from a sodium atom requires more energy than removing two.
 - B. The first ionization energy of aluminum is lower than that of chlorine.
 - C. Noble gases are typically the easiest atoms from which to remove electrons.
 - D. Nonmetals ionize more easily than metals do.
 - E. The first ionization energy of potassium is greater than that of lithium.
20. Which of the following is true concerning ionic size?
- A. Anions are always larger than Cations.
 - B. Anions are always larger than their parent atoms.
 - C. Cations are always larger than their parent atoms.
 - D. Cations are always larger than Anions.
 - E. There is very little change in size when ions are formed.
21. Which of the following has the smallest electronegativity?
- A. Rb
 - B. Na
 - C. Al
 - D. Ga
 - E. N
22. What is the formal charge on the bromine atom in ClO_4^- (drawn with four single bonds)?
- A. +3
 - B. +2
 - C. 0
 - D. -2
 - E. -3
23. How many valence electrons does $\text{HC}_2\text{H}_3\text{O}_2$ contain?
- A. 8 B. 24 C. 16 D. 12 E. 32

24. How many bonding electrons (shared electrons) should be represented in a molecule of SO_2 ?
- A. 3
 - B. 4
 - C. 6
 - D. 8
 - E. 18
25. Which of the following would have the shortest bonds between carbon and oxygen atoms?
- A. CO
 - B. CO_2
 - C. CO_3^{2-}
 - D. all of the carbon to oxygen bond lengths are the same.
26. Which of the following represents a polar covalent bond?
- A. Cl-Cl
 - B. Si-Si
 - C. Ca-Cl
 - D. Cr-Br
 - E. P-Cl
27. Which of the following is a polar molecule
- A. O_2
 - B. CCl_4
 - C. NCl_3
 - D. CS_2
 - E. none of these is polar

FORM - B
1-E
2-A
3-D
4-D
5-A
6-E
7-B
8-C
9-B
10-D
11-E
12-C
13-C
14-E
15-E
16-D
17-A
18-D
19-B
20-B
21-A
22-A
23-B
24-C
25-A
26-E
27-C