
AP WORKSHEET: Electronic Configuration Summary

1. Give full **and** abbreviated (noble gas core method) electronic configurations for the following. (8)

(a) Br FULL _____

NOBLE GAS CORE _____

(b) Cr FULL _____

NOBLE GAS CORE _____

(c) Fe FULL _____

NOBLE GAS CORE _____

(d) S²⁻ FULL _____

NOBLE GAS CORE _____

2. For each of the following sets of orbitals, indicate which orbital is **higher** in energy. (4)

(a) 1s, 2s _____

(b) 2p, 3p _____

(c) 4s, 3d_{yz} _____

(d) 3p_x, 3p_y, 3p_z _____

3. Indicate the block (s, p or d) in which each of the following elements found. (5)

BLOCK

(a) Sc _____

(b) P _____

(c) Fr _____

(d) Ni _____

(e) As _____

4. An **atom** has two electrons with principal quantum number (n) = 1, eight electrons with principal quantum number (n) = 2 and seven electrons with principal quantum number (n) = 3. From these data, supply the following values (if insufficient information is given, say so).

(a) The mass number. (2) _____

(b) The atomic number. (1) _____

(c) The electron configuration. (2) _____

5. Identify the element from the electron configurations of **atoms** shown below. (3)

(a) [Ne] $3s^2 3p^2$ _____

(b) [Ar] $4s^2 3d^7$ _____

(c) [Xe] $6s^2$ _____

6. Give the symbol of the atom or ion represented by the following sets of atomic numbers and electronic configurations. (4)

Atomic #	Electronic Configuration	Symbol of Atom or Ion
(a) 8	$1s^2 2s^2 2p^4$	_____
(b) 11	$1s^2 2s^2 2p^6$	_____
(c) 14	$1s^2 2s^2 2p^6 3s^2 3p^2$	_____
(d) 22	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^2$	_____

7. Give the electron configurations for the following transition metal ions. (3)

(a) Sc^{3+} _____

(b) Cr^{2+} _____

(c) Ni^{3+} _____

8. Consider the element Scandium, atomic # 21.

(a) If the electronic configuration of the element were constructed "from scratch", into which orbital (and into which shell) would the final electron be placed? (1) _____

(b) When scandium forms an ion with a charge of +1, from which orbital (and from which shell) would the electron be removed? (1) _____

9. Of the following species (Sc , Ca^{2+} , Cl , S^{2-} , Ti^{3+}), which are isoelectronic? (1)

10. Identify the element that is composed of atoms where the **last** electron; (5)

(a) Enters and fills the 4s sub-shell _____

(b) Enters but does not fill the 4s sub-shell _____

(c) Is the first to enter the 2p sub-shell _____

(d) Is the penultimate to enter the 4p sub-shell _____

(e) Is the second to enter the 4d sub-shell _____

11. Write the full electronic configuration for argon. (1)

12. Identify two positive **and** two negative ions that are isoelectronic with argon. (4)

(a) Two Positive ions _____

(b) Two Negative ions _____

13. Using the electrons in boxes notation complete the electronic configurations of the following elements. (3)

1s	2s	2p	3s	3p	3d	4s	4p	Element
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	V

1s	2s	2p	3s	3p	3d	4s	4p	Element
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Ar

1s	2s	2p	3s	3p	3d	4s	4p	Element
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Zn

14. State the number of **unpaired** electrons in each of the electronic configurations in question 13. (3)

of unpaired electrons

(a) V _____

(b) Ar _____

(c) Zn _____

15. Write three **possible sets** of quantum numbers for the highest energy electrons in the aluminum atom. (3)

	n	l	m_l	m_s
Electron # 11				
Electron # 12				
Electron # 13				

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16. Calculate the wavelength of the energy released when an electron in a hydrogen atom falls back to the first shell after being promoted to the fourth shell. (4)

$$R_H = 2.178 \times 10^{-18} \text{ J}, h = 6.626 \times 10^{-34} \text{ J sec}, c = 3.00 \times 10^8 \text{ m sec}^{-1}$$

17. How would you expect the magnitude of the energy released in a similar process (4th shell → 1st shell transition) in question 16 to vary for a He⁺ ion? Explain your answer. (2)

18. Which atomic theory is violated by the following sets of quantum numbers representing beryllium's outer shell electrons? Explain your answer. (2)

n	l	m_l	m_s
2	0	0	+ 1/2
2	0	0	+ 1/2

19. Identify the following atoms as either paramagnetic or diamagnetic. (3)

(a) Ga _____

(b) Cr _____

(c) Ni _____