

Name: _____

Period: _____

Seat#: _____

*"No human investigation can be called real science if it cannot be demonstrated mathematically."
- Leonardo da Vinci (1452 - 1519)*

1) Write the electron configurations of the following elements using the shorthand notation for the noble gas cores.

a. phosphorus
b. nickel
c. osmium
d. lead
e. titanium

2) Which orbital is filled following (after) these orbitals?

a. 3d	b. 4s	c. 5p	d. 5f
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3) How many electrons can be accommodated in:

a. A d subshell	b. A set of f orbitals	c. The n = 4 shell	d. The 7s orbital	e. A p _x orbital
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4) Are the following ground state electron configurations OK or is there something WRONG with each one? Explain why they are OK or why they are WRONG.

Configurations	OK or Wrong?	Explain						
a. <table style="display: inline-table; vertical-align: middle; margin-right: 20px;"> <tr><td style="text-align: center;">3d</td></tr> <tr><td style="text-align: center;">□ □ □ □ □</td></tr> </table> <table style="display: inline-table; vertical-align: middle; margin-right: 20px;"> <tr><td style="text-align: center;">4s</td></tr> <tr><td style="text-align: center;">↑↓</td></tr> </table> <table style="display: inline-table; vertical-align: middle;"> <tr><td style="text-align: center;">4p</td></tr> <tr><td style="text-align: center;">□ □ □</td></tr> </table>	3d	□ □ □ □ □	4s	↑↓	4p	□ □ □	a.	
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5) How many unpaired electrons are there in:

a. A Nitrogen atom	b. An iodine atom	c. A nickel (II) cation	d. An oxide ion
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Dougherty Valley HS Chemistry - AP
Atomic Structure – Configurations and Periodicity

6) **SKIP** - Which of the following sets of quantum numbers describe an impossible situation? Explain why.

	Quantum #s	X if impossible	Explain why impossible
a.	$n = 2, l = 1, m_l = 2, m_s = +\frac{1}{2}$		
b.	$n = 5, l = 2, m_l = 1, m_s = -\frac{1}{2}$		
c.	$n = 6, l = 5, m_l = 0, m_s = 0$		
d.	$n = 3, l = 3, m_l = 1, m_s = -\frac{1}{2}$		
e.	$n = 4, l = 2, m_l = 1, m_s = +\frac{1}{2}$		

7) Arrange the following elements in increasing order of whichever trends specified.

a. S, Ge, P, and Si	atomic size	_____ < _____ < _____ < _____
b. Na^+ , K^+ , Cl^- , and Br^-	increasing size	_____ < _____ < _____ < _____
c. Be, Ca, N, and P	ionization energy	_____ < _____ < _____ < _____

8) Which item in each of the following pairs would you expect to have the higher electron affinity? Explain why.

a.	Cl or Cl^-	
b.	Na or K	
c.	Br or I	

9) Which elements fit the following descriptions?

a. the smallest alkaline earth metal	b. has a valence shell configuration $4f^{14} 5d^{10} 6s^1$	c. the halogen with the lowest ionization energy	d. has 13 more electrons than argon
e. the smallest non metal	f. the Group 4A element with the largest ionization energy	g. its $3+$ ion has the electron configuration $[\text{Kr}] 4d^{10}$	

10) Given the following series of ionic radii, estimate the atomic radius of Neon. Do you think it is a fair estimate? Why or why not?

C^{4-} 260 pm;	N^{3-} 171 pm;	O^{2-} 126 pm;	F^- 119 pm;
Na^+ 116 pm;	Mg^{2+} 86 pm;	Al^{3+} 68 pm;	