Assignment 3 (1468740)

Question **12345678910111213141516171819202122232425262728293031323334 35**

1. Question DetailsChang9 7.EOCP.120. [707942]
An electron in a hydrogen atom is excited from the ground state to the n = 4 state. Comment on the correctness of the following statements (true/false).

(a) n = 4 is the first excited state.

- true
- false

(b) It takes more energy to ionize (remove) the electron from n = 4 than from the ground state.

- true
- false

(c) The electron is farther from the nucleus (on average) in n = 4 than in the ground state.

- true
- false

(d) The wavelength of light emitted when the electron drops from n = 4 to n = 1 is longer than that from n = 4 to n = 2.

- true
- false

(e) The wavelength the atom absorbs in going from n = 1 to n = 4 is the same as that emitted as it goes from n = 4 to n = 1.

- true
- false

2. Question DetailsLairdUChem1 1.TB.024. [941713]
Which of the following sets of quantum numbers is not possible? (Select all that apply.)

- n: 2, l: 0, m_l :1, m_s : -1/2
- n: 3, l: 0, m_l :0, m_s : +1/2
- n: 2, l: 0, m_l:0, m_s: -1/2
- n: 3, l: 0, m_l :1, m_s: -1/2
- n: 4, l: 0, m_l :-2, m_s: +1/2

3. Question DetailsLairdUChem1 1.TB.026. [941735]
What is the maximum number of electrons in a atom that can have the following set of quantum numbers?
n = 4 l = 3 m_l = -2 m_s = +1/2

- 10
- 6
- 0
- 1
- 2

4. Question DetailsLairdUChem1 1.TB.027. [941727]
A possible set of quantum numbers for the last electron added to complete an atom of gallium Ga in its ground state is:

- n: 4, l: 0, m_l :0, m_s: -1/2
- n: 3, l: 0, m_l :1, m_s : +1/2
- n: 3, l: 1, m_l :0, m_s : -1/2
- n: 4, l: 1, m_l :0, m_s: +1/2

5. Question DetailsLairdUChem1 1.TB.032. [941744]
How many orbitals are allowed in a subshell if the angular momentum quantum number for electrons in that subshell is 3?

- 9
- 5
- 3
- 1
- 7

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6. Question DetailsLairdUChem1 1.EOCP.045. [941700]
Calculate the total number of electrons that can occupy the following orbitals.

(a) one *s* orbital	(b) three *p* orbitals	(c) five *d* orbitals	(d) seven *f* orbitals
one	three	five	six
two	six	nine	seven
three	nine	ten	twelve
six	twelve	fifteen	fourteen

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7. Question DetailsLairdUChem1 2.EOCP.005. [1003650]
The atomic number of an element is 73. Is this element diamagnetic or paramagnetic?

- paramagnetic
- diamagnetic

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8. Question DetailsLairdUChem1 2.EOCP.011. [1003640]
Write the ground-state electron configurations for the following elements.

Zn	[Ar] $4s^2\ 3d^{10}$
Sn	[Kr] $5s^2\ 4d^{10}\ 5p^2$
Na	[Ne] $3s^1$
Hg	[Xe] $4f^{14}\ 5d^{10}\ 6s^2$
Br	[Ar] $4s^2\ 3d^{10}\ 4p^5$
Ni	[Ar] $4s^2\ 3d^8$

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9. Question DetailsLairdUChem1 2.EOCP.012. [1003643]
Write the ground-state electron configurations for the following elements.

(a) I

[Kr] $5s^2\ 4d^{10}\ 5p^5$

(b) Se

[Ar] $3d^{10}\ 4s^2\ 4p^4$

(c) Cs

[Xe] $6s^1$

(d) Si

[Ne] $3s^2\ 3p^2$

(e) Fe

[Ar] $4s^2\ 3d^6$

(f) Zr

[Kr] $4d^2\ 5s^2$

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10. Question DetailsLairdUChem1 2.EOCP.056. [1003648]
The electron configurations described in this chapter all refer to gaseous atoms in their ground states. An atom may absorb a quantum of energy and promote one of its electrons to a higher-energy orbital. When this happens, we say that the atom is in an excited state. The electron configurations of some excited atoms are given. Identify these atoms and write their ground-state configurations.

(a) $1s^1 2s^1$

name	helium -or- He
ground state configuration	[He]

(b) $1s^2 2s^2 2p^2 3d^1$

name	nitrogen -or- N
ground state configuration	[He] $2s^2\ 2p^3$

(c) $1s^2 2s^2 2p^6 4s^1$

name	sodium -or- Na
ground state configuration	[Ne] $3s^1$

(d) $[Ar] 4s^1 3d^{10} 4p^4$

name	arsenic -or- As

ground state configuration	[Ar] $4s^2\ 3d^{10}\ 4p^3$

11. Question DetailsLairdUChem1 2.PracticeEx.07. [1063672]

Practice Exercise 2.7

(a) Which of the following atoms should have a larger first ionization energy: O or S?

O

(b) Which of the following atoms should have a smaller second ionization energy: Fr or Ra?

Ra

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12. Question DetailsLairdUChem1 2.Supp.3-02. [951416]
Which of the following is the electronic configuration for a chlorine atom?

- $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6$
- $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^5$
- $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2\ 3d^{10}\ 4p^5$
- $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^4$

Solution or Explanation
This is the only configuration that has precisely 17 electrons.

13. Question DetailsLairdUChem1 2.Supp.3-08. [951493]
The electronic configurations for a sodium atom is

- $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^1$
- $1s^2\ 2s^2\ 2p^6\ 3s^1$
- $1s^2\ 2s^2\ 2p^6\ 3s^2$
- $1s^2\ 2s^2\ 2p^5\ 3s^2$

Solution or Explanation
Both $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^1$ and $1s^2\ 2s^2\ 2p^6\ 3s^1$ have single electrons in the outer shell, but only B has 11 electrons.

14. Question DetailsLairdUChem1 2.Supp.4-02. [952623]
Select the equation that depicts the first ionization of calcium.

- $Ca\ (g) \rightarrow Ca^+\ (g) + e^-$
- $Ca^+(g) \rightarrow Ca\ (g)$
- $Ca\ (g) \rightarrow Ca^-\ + e^-$
- $Ca\ (g) + e^- \rightarrow Ca^-\ (g)$

Solution or Explanation
Ionization energy is the amount of energy required to remove one electron from a neutral gaseous atom.

15. Question DetailsLairdUChem1 2.Supp.4-03. [952338]
Select the equation that depicts the second ionization of calcium.

- $Ca^+(g) + e^- \rightarrow Ca\ (g)$
- $Ca\ (g) \rightarrow Ca^+(g) + e^-$
- $Ca^+(g) + e^- \rightarrow Ca^{2+}\ (g)$
- $Ca^+(g) \rightarrow Ca^{2+}(g) + e^-$

Solution or Explanation
The second ionization energy is the energy associated with the loss of an electron by a gaseous 1+ ion.

16. Question DetailsLairdUChem1 2.Supp.4-04. [952014]
Which of the following lists the six elements in order of increasing first ionization energy?

- Li < B < Be < C < O < N
- Li < B < Be < C < N < O
- Li < Be < B < C < O < N
- Li < Be < B < C < N < O

Solution or Explanation
Ionization energy varies across a period with specfic irregularites due to electron configurations.

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17. Question DetailsLairdUChem1 2.Supp.4-05. [951568]
Which of the elements below has the lowest ionization energy?

- Na
- Be
- K
- Cl

Solution or Explanation
Generally, the element that is farthest left and lowest on the table has the lowest ionization energy.

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18. Question DetailsLairdUChem1 2.Supp.4-06. [951752]
Which of the elements below has the lowest ionization energy?

- Na
- K
- Li
- Rb

Solution or Explanation
Generally, the element that is farthest left and lowest on the table has the lowest ionization energy.

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19. Question DetailsLairdUChem1 2.Supp.4-07. [952294]
Which of the elements below would demonstrate a large jump in ionization energy between the third and fourth ionization energies?

- Si
- Mg
- Rb
- Al

Solution or Explanation
Aluminum likes to lose three electrons; once these are gone, the removal of a fourth electron requires a lot of energy. Sodium and Magnesium would lose one and two electrons, respectively, and would resist losing any more. Silicon can lose up to four electrons, so we would not expect a big jump between four and five.

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20. Question DetailsLairdUChem1 2.Supp.4-12. [952024]
The amount of energy associated with completely removing a single electron from a gaseous atom in its ground state is the

- electron affinity.
- first ionization energy.
- electronic discharge energy.
- ionic charge.

Solution or Explanation
Ionization energy is the energy required to remove an electron from a neutral gaseous atom.

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21. Question DetailsLairdUChem1 2.Supp.4-13. [951869]
The energy required to remove the least tightly-held electrons from a mole of gaseous atoms is called the

- ionic charge.
- electron affinity.
- electronegativity.
- ionization energy.

Solution or Explanation
Ionization energy has units of kJ/mol.

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22. Question DetailsLairdUChem1 2.TB.019. [953688]
How many *valence electrons* does a carbon atom have?

- 6
- 1
- 3
- 2
- 4

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23. Question DetailsLairdUChem1 2.TB.020. [952731]
How many *valence electrons* does a tin (Sn) atom have?

- 36
- 4
- 2
- 14
- 50

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24. Question DetailsLairdUChem1 2.TB.021. [953629]
How many electrons are in the 4*p* orbitals of selenium?

- 0
- 5
- 2
- 6
- 4

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25. Question DetailsLairdUChem1 2.TB.055. [953731]
Which element will display an unusually large jump in ionization energy values between I_3 and I_4, its third and fourth ionization energies?

- Na
- Al
- P
- Si
- Mg

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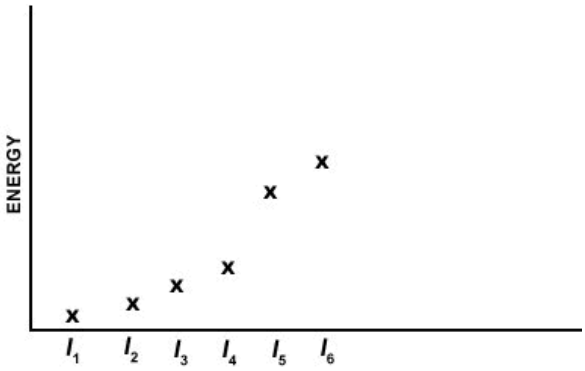
26. Question DetailsLairdUChem1 2.TB.058. [952757]
Which of the elements listed below has the following pattern for its first six ionization energies? (I_1 = first ionization energy, I_2 = second ionization energy, etc.)



- Al
- Se
- Si
- Ca
- P

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27. Question DetailsLairdUChem1 2.TB.083. [953303]
For Mg atoms a very large jump in the magnitudes of the ionization energies will occur between the second and the third ionization energies.

- True
- False

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28. Question DetailsChang9 7.EOCP.124. [708118]
Shown below are portions of orbital diagrams representing the ground-state electron configurations of certain elements. Which of them violate the Pauli exclusion principle? Which of them violate Hund's rule?

(a) 

- violates the Pauli exclusion principle
- violates the Hund's rule
- violates both Pauli exclusion principle and Hund's rule
- does not violate Pauli exclusion principle or Hund's rule

(b) 

- violates the Pauli exclusion principle
- violates the Hund's rule
- violates both Pauli exclusion principle and Hund's rule
- does not violate Pauli exclusion principle or Hund's rule

(c) 

- violates the Pauli exclusion principle
- violates the Hund's rule
- violates both Pauli exclusion principle and Hund's rule
- does not violate Pauli exclusion principle or Hund's rule

(d) 

- violates the Pauli exclusion principle
- violates the Hund's rule
- violates both Pauli exclusion principle and Hund's rule
- does not violate Pauli exclusion principle or Hund's rule

(e) 

- violates the Pauli exclusion principle
- violates the Hund's rule
- violates both Pauli exclusion principle and Hund's rule
- does not violate Pauli exclusion principle or Hund's rule

(f) 

- violates the Pauli exclusion principle
- violates the Hund's rule
- violates both Pauli exclusion principle and Hund's rule
- does not violate Pauli exclusion principle or Hund's rule

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29. Question DetailsBurdgeChem2 6.EOCP.090. [1416041]
Use the Aufbau principle to obtain the ground-state electron configuration of cadmium.

[Kr] $5s^2$ $4d^{10}$

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30. Question DetailsBurdgeChem2 6.TB.010. [1415558]
Calculate the energy, in joules, required to excite a hydrogen atom by causing an electronic transition from the n = 1 to the n = 4 principal energy level. Recall that the energy levels of the H atom are given by

$E_n = -2.18 \times 10^{-18}\ J(1/n^2)$

- 2.07×10^{-29} J
- 2.25×10^{-18} J
- 2.04×10^{-18} J
- 3.27×10^{-17} J
- 2.19×10^{5} J

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31. Question DetailsBurdgeChem2 6.TB.012. [1414173]
Calculate the frequency of the light emitted by a hydrogen atom during a transition of its electron from the n = 6 to the n = 3 principal energy level. Recall that for hydrogen $E_n = -2.18 \times 10^{-18}\ J(1/n^2)$.

- 1.64×10^{15} /s
- 3.65×10^{14} /s
- 2.74×10^{14}/s
- 9.13×10^{13} /s
- 1.82×10^{-19} /s

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32. Question DetailsBurdgeChem2 6.TB.015. [1415150]
The second line of the Balmer series occurs at a wavelength of 486.1 nm. What is the energy difference between the initial and final levels of the hydrogen atom in this emission process?

- 4.09×10^{-19} J
- 2.44×10^{18} J
- 1.07×10^{-48} J
- 4.09×10^{-28} J
- 4.09×10^{-22} J

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33. Question DetailsBurdgeChem2 6.TB.039. [1412678]
Which element has the following ground-state electron configuration?
$[Kr]5s^24d^{10}5p^3$

- Sb
- Sn
- Te
- Pb
- Bi

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34. Question DetailsBurdgeChem2 6.TB.062. [1415908]
Each shell (principal energy level) of quantum number *n* contains *n* subshells.

- True
- False

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35. Question DetailsBurdgeChem2 6.TB.061. [1416189]
A neon atom in its ground state will be diamagnetic.

- True
- False

Assignment Details

Name (AID): **Assignment 3 (1468740)**

Submissions Allowed: **5**

Category: **Homework**

Code:

Locked: **Yes**

Author: **Hammond, Nicholas (** hmnd@bu.edu **)**

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