AP

Atomic [redacted]g Remediation

Multiple Choice

Atomic structure: 5.3% or 2-3 questions

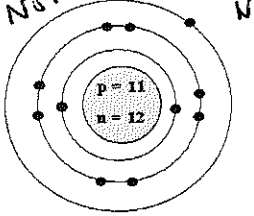
19.3% or 9 -10 questions

Written: Shows up in small doses in the written section. Rarely an entire question devoted mostly to atomic structure, but rather smaller parts of bigger questions. In my experience atomic trends is the most highly tested. Atomic trends as related to coulombs law and consequently bonding is the usual approach.

I. (#2-1) Sub atomic structure (topic)
II. How an atom acquires mass?
   a. (#2-1a) I can model how and why different atoms of the same element have different masses.
III. How atoms acquire a charge?
   a. (#2-1b) I can model how an atom acquires a charge.
      i. I can understand why an atom acquires a charge.
      ii. I can determine an atom's most common charge and why. (octet rule)
   b. (#2-1c) What is the energy involved during the gaining or losing of an electron.
      i. Removing an electron requires an input of energy(work). Endothermic
      ii. Adding an electron does not require an input of energy (work) exothermic

Atomic structure:

1. (#2-1) Every element after Uranium (atomic weight 92) _ on the periodic table is synthetic. Does not exist on earth naturally. Plutonium (Pu atomic weight 94) is a common fuel used in nuclear weapons. Which of the following is correct?
I. The number of protons equal 94 and cannot change without changing the element. Yes
II. The number of neutrons vary naturally giving an average atomic weight equaling 244.05 No, Not Natural. Not in Nature.
III. The number of neutrons could change altering the identity of the atom. NO



2. When lead ions are ingested into the human body, the lead replaces calcium ions from human bones. What property of both substances might be responsible for them reacting in a similar way? Charge +2

3. a. An atom of phosphorus acquires a charge of -3 via a chemical process called Reduction
   b. Write out this process. $3e + P \rightarrow P^{-3}$

I.(#2-2) Modeling Atoms

a. (#2-2a) I can create and interpret a Lewis dot structure
   i. Simple structure showing valence electrons only.
b. (#2-2b) I can create and interpret a Bohr diagram
   i. Electrons form energy levels where electrons can shift between energy levels when appropriate energy is provided.
c. (#2-2c) I can model atoms with electron configurations.
d. (#2-2d) I can model atoms with orbital diagrams.
e. (#2-4e) I can model/manipulate atoms electronic structure via a PES diagram.

1. (#2-2) Which of the following statements is true regarding this model of an atom?

See 1st page

I. The notation Na-11 correctly identifies the mass number of the atom. No
II. This atom has a - 1 charge due to additional outer electron. No $p^+ = e^-$
III. This atom will likely form a +1 charge in nature. Y, 1 valence e^-

2. Write out the electron configuration for K.

$1s^2 2s^2 2p^6 3s^2 3p^6 4s^1$

3. write out the electron configuration for Na^{+1}

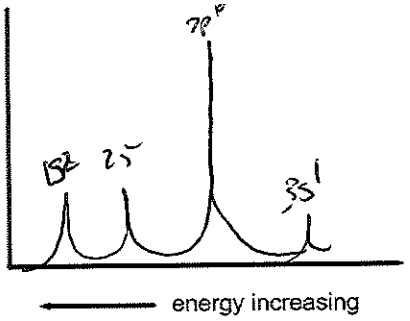
$1s^2 2s^2 2p^6$

4. Write out the ~~short hand~~ orbital diagram for Oxygen.

$1s^2 2s^2 2p^4$

1↿⇂ 1↿⇂ 1↿ 1↿

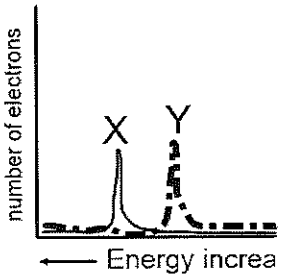
5. In the area below, draw what you think might be an approximate PES diagram for Na.



6. (#2-4) The diagram above is the PES diagram for the $1s^1$ electron for both Ne and F. Which of the following is correct?

a. X = Ne due to increased effective nuclear charge.
b. Y = Ne due to a full energy shell causing decreased Coulombic attraction.
c. X = F due to a decrease electron repulsion
d. Y = F due increased effective nuclear charge.

X = Ne (more p^+)
Y = F



(#2-3) How do the properties of protons, electrons and the electron shells contribute to the periodic trends?

a. #2-3a: Student can relate atomic structure and coulombs law to atomic radius

b. #2-3b: Student can relate atomic structure and coulombs law to ionization energy

c. (#2-3e) I can determine whether an atom is more or less reactive then another justified by coulombs law and orbital structure.

d. (#2-3f) I can label the various parts of the periodic table. (atomic number, metals, non-metals, metalloids) (Honors)

e. (#2-3g) I can interrelate the property of one atom to another atom based upon location on the periodic table.

Atomic trends are the most common way AP tests your knowledge of atomic structure

1. (#2-3) Student hypothesis: The amount of energy needed to remove an electron from Calcium is less then the amount of energy needed to remove an electron from K atom.

Nullify: Ca has more p^+, therefore more Coulombic attraction.

2. (#2-3) Student hypothesis: The amount of energy needed to remove an electron from Calcium ion is less than the amount of energy needed to remove an electron from Ne atom. (changed to Ar)

Nullify, Ca^{2+} has more p^+ so more Coulombic attraction

3. (#2-3) Student hypothesis: The amount of energy needed to remove an electron from F^{-1} is more then the energy needed to remove an electron from F^{-1} because F^{-1} is isoelectric with a noble gas and is therefore more stable. Justify or nullify all aspects of this statement.

Nullify F^- requires Less energy. Same p^+ but e^- are further away.

4. The 1st ionization energy of Ca = X 2nd = 5X 3rd = 100X,
   a. why is there such a drastic increase in the 3rd ionization energy? e^- is 1 energy level closer?
   b. How does the data support the fact that only Ca^{2+} exist in nature and not Ca^{3+}? Very large energy Needed to Ca^{3+}

5. (#2-3) Which is true relative to the data provided.

Element Name	Atomic radius
K	X
K^{+1}	Y

a. X is greater then Y due to Coulombic electron repulsion.
(b.) X is greater then Y due to 1 additional electron energy shell.
c. Y is greater then X due to greater effective nuclear charge
d. Y is greater then X due to an additional electron energy shell.

Name: _____ Class: _____ Date: _____ ID: A

Atomic Multiple choice Homework

Multiple Choice
Identify the letter of the choice that best completes the statement or answers the question.

____ 1. The most abundant isotopes and oxygen are H-1, H-2, O-16, O-17, respectively. Using these isotopes onl what is the number of different possible values for the molecular mass of water?
a. 2
b. 3
c. 4
d. 6
e. 8

____ 2. Different oxides of manganese are compared below.

Compound number	observed color	% by mass of manganese	% by mass of oxygen
1	black	63.19	36.81
2	dark green	77.50	22.50

Which pair of values when substituted for X and Y in the fraction below gives a result illustrates the Law Multiple proportions? ((63.19/X) / (77.50/Y))
a. X= 54.94, Y = 16.00
b. X= 54.94, Y= 54.94
c. X= 16.00, Y= 16.00
d. X= 22.50, Y= 36.81
e. X= 36.81, Y= 22.50

____ 3. Drawn above is a dot diagram. All of the following can be inferred from the dot diagram above EXCEPT:
a. a group 16 element
b. has two half filled p-orbitals
c. has at least 10 kernal electrons
d. can accept two electrons to become an ion with charge of 2-
e. has at least four electrons with (l) quantum number of 1.

____ 4. Can be used to predict that a gaseous carbon atom in its ground state is paramagnetic
a. Heisenberg uncertainty principle
b. Pauli exclusion principle
c. Hund's rule (principle of maximum multiplicity)
d. Shielding effect
e. Wave nature of matter

____ 5. Explains the experimental phenomenon of electron diffraction
a. Heisenberg uncertainty principle
b. Pauli exclusion principle
c. Hund's rule (principle of maximum multiplicity)
d. Shielding effect
e. Wave nature of matter

___ 6.

Indicates that an atomic orbital can hold no more than two electrons

a. Heisenberg uncertainty principle
b. Pauli exclusion principle
c. Hund's rule (principle of maximum multiplicity)
d. Shielding effect
e. Wave nature of matter

___ 7. . Predicts that it is impossible to determine simultaneously the exact position and the exact velocit of an electron

a. Heisenberg uncertainty principle
b. Pauli exclusion principle
c. Hund's rule (principle of maximum multiplicity)
d. Shielding effect
e. Wave nature of matter

___ 8.

Which of the following sets of quantum numbers (n, l, m_l, m_s) best describes the valence electr of highest energy in a ground-state gallium atom (atomic number 31)?

a. 4,0,0, 1/2
b. 4,0, 1,1/2
c. 4,1,1,1/2
d. 4,1,2,1/2
e. 4,2,0,1/2

___ 9. (99-1)What is the most electronegative element of the above?

a. O
b. La
c. Rb
d. Mg
e. N

___ 10. (99-2)Which element exhibits the greatest number of different oxidation states?

a. O
b. La
c. Rb
d. Mg
e. N

___ 11. (99-3)Which of the elements above has the smallest ionic radius for its most commonly found ion

a. O
b. ~~La~~
c. ~~Rb~~
d. Mg
e. N

2 energy levels, most protons

___ 12. (99-4)An impossible electronic configuration

a. $1s^2\ 2s^2 2p^5\ 3s^2 3p^5$
b. $1s^2\ 2s^2 2p^6\ 3s^2 3p^6$
c. $1s^2\ 2s^2 2p^6 2d^{10}\ 3s^2 3p^6$
d. $1s^2\ 2s^2 2p^6\ 3s^2 3p^6 3d^5$
e. $1s^2\ 2s^2 2p^6\ 3s^2 3p^6 3d^3\ 4s^2$

____ 13. (99-5)The ground-state configuration for the atoms of a transition element

a. $1s^2\ 2s^2 2p^5\ 3s^2 3p^5$
b. $1s^2\ 2s^2 2p^6\ 3s^2 3p^6$
c. $1s^2\ 2s^2 2p^6 2d^{10}\ 3s^2 3p^6$
d. $1s^2\ 2s^2 2p^6\ 3s^2 3p^6 3d^5$
e. $1s^2\ 2s^2 2p^6\ 3s^2 3p^6 3d^3\ 4s^2$

____ 14. (99-6)The ground-state configuration of a negative ion of a halogen

a. $1s^2\ 2s^2 2p^5\ 3s^2 3p^5$
b. $1s^2\ 2s^2 2p^6\ 3s^2 3p^6$
c. $1s^2\ 2s^2 2p^6 2d^{10}\ 3s^2 3p^6$
d. $1s^2\ 2s^2 2p^6\ 3s^2 3p^6 3d^5$
e. $1s^2\ 2s^2 2p^6\ 3s^2 3p^6 3d^3\ 4s^2$

____ 15. (99-7)The ground-state configuration of a common ion of an alkaline earth element

a. $1s^2\ 2s^2 2p^5\ 3s^2 3p^5$
b. $1s^2\ 2s^2 2p^6\ 3s^2 3p^6$
c. $1s^2\ 2s^2 2p^6 2d^{10}\ 3s^2 3p^6$
d. $1s^2\ 2s^2 2p^6\ 3s^2 3p^6 3d^5$
e. $1s^2\ 2s^2 2p^6\ 3s^2 3p^6 3d^3\ 4s^2$

____ 16. (99-33)Which of the following conclusions can be drawn from J. J. Thomson's cathode ray experiments?

a. Atoms contain electrons
b. Practically all the mass of an atom is contained in its nucleus
c. Atoms contain protons, neutrons, and electrons.
d. Atoms have a positively charged nucleus surrounded by an electron cloud.
e. No two electrons in one atom can have the same four quantum numbers

____ 17. Which is the correct comparison of the Cl^0 atom is greater than the radius of Cl^- ion?

I. The radius of the Cl^0 atomis greater than the radius fo Cl^- ion
II. The mass fo the Cl^0 atom is abuot 1 atom is about 1 amu greater than the mass of the Cl^- ion.
III. The Cl^0 atom contains fewer electrons thatn the Cl^- ion.

a. I only
b. III only
c. II and III only
d. I and III only
e. I, II, III

____ 18. What is the number of shared pairs of electrons in a molecule of trans-1,2-dichlorethene, $C_2H_2Cl_2$

a. 2
b. 4
c. 5
d. 6
e. 8