Practice Exam 2
Wade, Chapter 1, 15 Multiple Choice Questions

Question 1	For a given element, how do its isotopes differ?
Hint	Review Section 1-2 on the principles of atomic structure.
a.	Same number of protons and neutrons, different number of electrons
Coaching	Incorrect.
b.	Same number of protons and electrons, different number of neutrons
Coaching	Incorrect. Determines what element the atom is.
c.	**Same number of protons, different number of neutrons (electrons don't matter)**
Coaching	**CORRECT.**
d.	Same nuclear mass, but different number of electrons.
Coaching	Incorrect.
e.	Same number of protons, but different number of electrons
Coaching	Incorrect.

Question 2	What is the maximum number of electrons possible for a set of p-orbitals?
Hint	Review Section 1-2 on the electronic structure of the atom.
a.	2
Coaching	Incorrect. This is the number of electrons fitting into an s-AO.
b.	4
Coaching	Incorrect.
c.	**6**
Coaching	**CORRECT.**
d.	8
Coaching	Incorrect.
e.	10
Coaching	Incorrect. This is the number of electrons fitting a set of d-AOs.

Question 3	Identify the ground state electron configuration of boron.
Hint	Review Section 1-2 on electron configurations of atoms.
a.	**$1s^2\ 2s^2\ 2p_x^1\ 2p_y^0\ 2p_z^0$**
Coaching	**CORRECT.**
b.	$1s^2\ 2s^1\ 2p_x^1\ 2p_y^1\ 2p_z^0$
Coaching	Incorrect.
c.	$1s^2\ 2s^1\ 2p_x^1\ 2p_y^0\ 2p_z^1$
Coaching	Incorrect.
d.	$1s^2\ 2s^1\ 2p_x^0\ 2p_y^1\ 2p_z^1$
Coaching	Incorrect.
e.	$1s^2\ 2s^0\ 2p_x^1\ 2p_y^1\ 2p_z^1$
Coaching	Incorrect.

Question 4 In what atomic orbital is the unpaired electron of a sodium atom?

Hint Review Section 1-2 on the electronic configuration of atoms.

a. **3s**
Coaching **CORRECT.**

b. $3p_x$
Coaching Incorrect.

c. $3p_y$
Coaching Incorrect.

d. $3p_z$
Coaching Incorrect.

e. 3d
Coaching Incorrect.

Question 5	What electron configuration does a magnesium atom attain when it engages in ionic bonding?
Hint	Review Section 1-3 on bond formation and the octet rule.
a.	He configuration.
Coaching	Incorrect.
b.	**Ne configuration.**
Coaching	**CORRECT.**
c.	Ar configuration.
Coaching	Incorrect.
d.	Kr configuration.
Coaching	Incorrect.
e.	Xe configuration.
Coaching	Incorrect.

Question 6	What is the total number of nonbonding electron pairs in ethanol, CH_3CH_2OH?
Hint	Review Section 1-4 on Lewis structures.
a.	0
Coaching	Incorrect.
b.	1
Coaching	Incorrect.
c.	**2**
Coaching	**CORRECT.**
d.	3
Coaching	Incorrect.
e.	4
Coaching	Incorrect.

Question 7	What is the typical valence of the oxygen atom (e.g. in alcohols and ethers)?
Hint	Review Section 1-5 on multiple bonding and common bonding patterns.
a.	1
Coaching	Incorrect.
b.	**2**
Coaching	**CORRECT. Yes, O usually forms two bonds.**
c.	3
Coaching	Incorrect.
d.	4
Coaching	Incorrect.
e.	5
Coaching	Incorrect.

Question 8	Which equation defines the electrical dipole moment?
Hint	Review Section 1.6 on electronegativity and bond polarity.
a.	dipole moment = charge^2 x distance
Coaching	Incorrect.
b.	**dipole moment = charge x distance**
Coaching	**CORRECT.**
c.	dipole moment = dipole x moment
Coaching	Incorrect. Just kidding.
d.	dipole moment = charge^2 x volume
Coaching	Incorrect.
e.	dipole moment = charge x volume
Coaching	Incorrect.

Question 9	Which molecule contains the O-atom with the largest partial charge?
Hint	Review Section 1.6 on electronegativity and bond polarity.
a.	CH_3OH
Coaching	Incorrect.
b.	CH_3OCH_3
Coaching	Incorrect.
c.	HOH
Coaching	Incorrect. Close.
d.	**H_2CO**
Coaching	**CORRECT. The carbonyl is by far the most polar bond.**
e.	HOOH
Coaching	Incorrect.

Question 10	What is the formal charge on the N-atom in nitromethane, CH_3NO_2, in the most important resonance forms of this molecule?
Hint	Review Section 1-7 on formal charges.
a.	-2
Coaching	Incorrect.
b.	-1
Coaching	Incorrect.
c.	0
Coaching	Incorrect.
d.	**+1**
Coaching	**CORRECT.**
e.	+2
Coaching	Incorrect.

Question 11	How many resonance forms are needed to correctly describe the symmetry of the nitrate anion? (Consider only resonance forms that have an octet at N and formal charges that do not exceed +1.)
Hint	Review Section 1-9 on resonance.
a.	1
Coaching	Incorrect.
b.	2
Coaching	Incorrect.
c.	**3**
Coaching	**CORRECT.**
d.	4
Coaching	Incorrect.
e.	5
Coaching	Incorrect.

Question 12	Consider the dianion formed by deprotonation of acetate anion, H-$[CH_2CO_2]^{2-}$. Which one of the following statements best describes the charge distribution in the dianion?
Hint	Review Section 1-9 on resonance.
a.	The charge remains localized at one O- and one C-atom
Coaching	Incorrect.
b.	The charge becomes localized at both O-atoms
Coaching	Incorrect.
c.	The charge becomes delocalized between the C-atom and one of the O-atoms
Coaching	Incorrect.
d.	The charge becomes delocalized between the C-atom and both of the O-atoms
Coaching	Incorrect.
e.	**The charge becomes delocalized between the C-atom and both of the O-atoms but the charge is much higher on O than on C**
Coaching	**CORRECT.**

Question 13 Imagine the line-angle formula resulting by drawing two six-membered rings such that they share one carbon atom. What is the molecular formula of the molecule represented by this line-angle formula?

Hint Review Section 1-10 on structural formulas.

a. $C_{11}H_{18}$
Coaching Incorrect.

b. $C_{11}H_{19}$
Coaching Incorrect.

c. $C_{11}H_{20}$
Coaching CORRECT.

d. $C_{11}H_{21}$
Coaching Incorrect.

e. $C_{11}H_{22}$
Coaching Incorrect.

Question 14	Which of the following compounds is the most acidic one?
Hint	Review Sections 1-13 on Broensted acids and bases.
a.	CH_3OH
Coaching	Incorrect.
b.	**$CH_3OH_2^+$**
Coaching	**CORRECT! The conjugate acid of the weaker base is the stronger acid.**
c.	CH_3NH_2
Coaching	Incorrect.
d.	$CH_3NH_3^+$
Coaching	Incorrect. The conjugate acid of the stronger base is the weaker acid.
e.	CH_4
Coaching	Incorrect. The pK_a of methane is above 40!

Question 15	Which one of the acids H-X is strongest?
Hint	Review Section 1-14 on Lewis acids and bases.
a.	H-F
Coaching	Incorrect.
b.	H-Cl
Coaching	Incorrect.
c.	H-Br
Coaching	Incorrect.
d.	**H-I**
Coaching	**CORRECT.**
e.	This option is not used
Coaching	Incorrect.