TP1  

from Organic Chemistry, 6e by L.G. Wade, Jr

1.1 Define isotopes.
   1. Atoms with the same number of neutrons, but a different number of electrons.
   2. Atoms with the same number of protons, but a different number of electrons.
   3. Atoms with the same number of protons, but a different number of neutrons.

1.2 What is the electronic configuration for Ca$^{+2}$?
   1. $1s^22s^22p^63s^2$
   2. $1s^22s^22p^63s^23p^6$
   3. $1s^22s^22p^63s^23p^64s^2$
   4. $1s^22s^22p^63s^23p^64s^24p^2$

1.3 How many nonbonding pairs of electrons are in NH$_2$OH?
   1. One pair of electrons
   2. Two pairs of electrons
   3. Three pairs of electrons
   4. Four pairs of electrons

1.4 How many bonds are in CH$_2$=CH$_2$?
   1. Two bonds
   2. Three bonds
   3. Four bonds
   4. Five bonds
   5. Six bonds
   6. Seven bonds

1.5 How does electronegativity change on the periodic table?
   1. Increase from left to right; increase from top to bottom.
   2. Increase from left to right; increase from bottom to top.
   3. Increase from right to left; increase from top to bottom.
   4. Increase from right to left; increase from bottom to top.

1.6 How many valence electrons does carbon have?
   1. Three valence electrons
   2. Four valence electrons
   3. Five valence electrons
   4. Six valence electrons
   5. Seven valence electrons

1.7 A compound has an EF of C$_2$H$_5$O and a MW of 90.121 g/mole. What is the MF?
   1. C$_3$H$_{10}$O$_2$
   2. C$_4$H$_8$O
   3. C$_4$H$_{10}$O$_2$
   4. C$_5$H$_6$O
   5. C$_6$H$_{10}$O$_2$
1.8 Identify the Arrhenius acid.
\[ \text{HNO}_3 + \text{H}_2\text{O} \rightarrow \text{H}_3\text{O}^+ + \text{NO}_3^- \]

1. HNO³
2. H₂O
3. H₃O⁺
4. NO₃⁻

1.9 Identify the Bronsted-Lowry base.
\[ \text{HCl} + \text{CH}_3\text{NH}_2 \rightarrow \text{CH}_3\text{NH}_3^+ + \text{Cl}^- \]

1. HCl
2. CH₃NH₂
3. CH₃NH₃⁺
4. Cl⁻

1.10 Identify the Lewis base.
\[ \text{CH}_3\text{O}^- + \text{CH}_3\text{Br} \rightarrow \text{CH}_3\text{OCH}_3 + \text{Br}^- \]

1. CH₃O⁻
2. CH₃Br
3. CH₃OCH₃
4. Br⁻

2.1 How many sigma and pi bonds are in a double bond?
1. Two sigma bonds
2. Two pi bonds
3. One sigma bond and one pi bond
4. Two gamma bonds
5. One sigma bond and one gamma bond

2.2 Give the bond angle for CH₄.
1. 90°
2. 104.5°
3. 107°
4. 109.5°
5. 120°
6. 180°

2.3 Give the bond angle for the triply bonded C in CH₃CN.
1. 90°
2. 104.5°
3. 107°
4. 109.5°
5. 120°
6. 180°
2.4 Give the hybridization for the carbon in H$_2$CO.
   1. sp
   2. sp$^2$
   3. sp$^3$
   4. sp$^4$

2.5 Give the hybridization for the nitrogen in NH$_4^+$.
   1. sp
   2. sp$^2$
   3. sp$^3$
   4. sp$^4$

2.6 Identify the type of isomer for CH$_3$OCH$_3$ and CH$_3$CH$_2$OH.
   ▪ Stereoisomer
     1. Conformational isomer
     2. Constitutional isomer
     3. Geometric isomer

2.7 Identify the compound that has hydrogen bonding.
   1. CH$_3$OCH$_3$
   2. CH$_3$CH$_2$OH
   3. CH$_3$CH$_3$
   4. CH$_3$Cl
   5. (CH$_3$)$_3$N

2.8 Explain why gasoline does not dissolve in water.
   1. Both are nonpolar.
   2. Both are polar.
   3. Gasoline is polar; water is nonpolar.
   4. Water is polar; gasoline is nonpolar.

2.9 Identify the general structure of CH$_3$CH$_2$OH.
   1. Ether
   2. Alcohol
   3. Aldehyde
   4. Ketone
   5. Ester

2.10 Identify the general structure of CH$_3$CH$_2$COOH.
   1. Ester
   2. Carboxylic acid
   3. Ether
   4. Alcohol
   5. Aldehyde
   6. Ketone
3.1 Give the common name for \((\text{CH}_3)_2\text{CHCH}_2\text{Cl}\).
   1. Sec-butyl chloride
   2. Tert-butyl chloride
   3. N-butyl chloride
   4. Iso-butyl chloride
   5. Neo-butyl chloride

3.2 Give the IUPAC name for \((\text{CH}_3)_2\text{CHCH}_2\text{Cl}\).
   1. 1-Chloro-2-methylpropane
   2. 1-Chloropropane
   3. 1-Chlorobutane
   4. 1-Chloro-3-methylpropane
   5. 2-Chlorobutane

3.3 Give the IUPAC name for \((\text{CH}_3\text{CH}_2)_2\text{CHCH}_3\).
   1. 2-Methylbutane
   2. 2-Ethylbutane
   3. 2-Methylpentane
   4. 3-Methylpentane
   5. Hexane

3.4 Identify the most stable conformation for ethane.
   1. Eclipsed
   2. Staggered
   3. Skew
   4. Anti

3.5 Identify the least stable conformation for butane.
   1. Gauche
   2. Totally eclipsed
   3. Eclipsed
   4. Anti

3.6 Name
   ![Diagram of cyclohexane with 3 methyl groups on the bottom]
   1. 3,3,5-Trimethylcyclohexane
   2. 3,5,5-Trimethylcyclohexane
   3. 1,3,3-Trimethylcyclohexane
   4. 1,1,3-Trimethylcyclohexane
3.7 Give the carbon-carbon bond angle for cyclopropane.
1. 45°
2. 60°
3. 90°
4. 120°
5. 150°
6. 180°

3.8 Identify the most stable conformation.
1. Cis-1,3-dimethylcyclohexane, both methyls axial
2. Cis-1,3-dimethylcyclohexane, both methyls equatorial
3. Trans-1,3-dimethylcyclohexane, one methyl axial and one methyl equatorial

A diequatorial conformation is much more stable than having groups axial.

3.9 Name
1. Bicyclo[6.4.3]nonane
2. [4.2.0]Cyclononane
3. Bicyclo[4.2.2]decane
4. Bicyclo[4.2.1]nonane

3.10 Name
1. Bicyclo[5.4]decane
2. Spiro[5.4]decane
3. Cyclo[5.4]decane