MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

1) Which of the following is an isoelectronic series?
   A) F\(^{-}\), Cl\(^{-}\), Br\(^{-}\), I\(^{-}\)
   B) Si\(^{2-}\), P\(^{2-}\), S\(^{2-}\), Cl\(^{2-}\)
   C) B\(^{3-}\), Si\(^{4-}\), As\(^{3-}\), Te\(^{2-}\)
   D) S, Cl, Ar, K
   E) O\(^{2-}\), F\(^{-}\), Ne, Na\(^{+}\)

2) Which of the following elements has an electron configuration different from the predicted one?
   A) Cu  B) Cl  C) Ti  D) Xe  E) Ca

3) The wavelength of a photon that has an energy of \(6.33 \times 10^{-18}\) J is ________ m.
   A) \(3.79 \times 10^{-7}\)
   B) \(2.38 \times 10^{23}\)
   C) \(9.55 \times 10^{15}\)
   D) \(3.10 \times 10^{-8}\)
   E) \(4.21 \times 10^{24}\)

4) What color of visible light has the longest wavelength?
   A) violet  B) green  C) red  D) blue  E) yellow

5) The energy of a photon of light is ________ proportional to its frequency and ________ proportional to its wavelength.
   A) inversely, inversely
   B) inversely, directly
   C) indirectly, not
   D) directly, directly
   E) directly, inversely
6) The lowest energy shell that contains f orbitals is the shell with $n =$
A) 4  B) 5  C) 1  D) 2

7) Which electron configuration represents a violation of Hund's rule for an atom?
A) 
\[
\begin{array}{c}
1s \\
\uparrow \uparrow \\
2s \\
\uparrow \downarrow \\
2p \\
\end{array}
\]
B) 
\[
\begin{array}{c}
1s \\
\uparrow \downarrow \\
2s \\
\uparrow \downarrow \\
2p \\
\end{array}
\]
C) 
\[
\begin{array}{c}
1s \\
\uparrow \downarrow \\
2s \\
\uparrow \downarrow \\
2p \\
\end{array}
\]
D) 
\[
\begin{array}{c}
1s \\
\uparrow \downarrow \\
2s \\
\uparrow \downarrow \\
2p \\
\end{array}
\]
E) 
\[
\begin{array}{c}
1s \\
\uparrow \\
2s \\
\uparrow \downarrow \\
2p \\
\end{array}
\]

8) The electron configuration of Ga is ________.
A) $1s^22s^22p^63s^23p^64s^23d^{10}4p^1$
B) $1s^22s^22p^63s^23p^64s^23d^{10}4d^1$
C) $1s^22s^22p^63s^23p^64s^23d^{10}4p^1$
D) [Ar]$4s^23d^{11}$
E) $1s^22s^22p^63s^23p^64s^24d^{10}4p^1$

9) The ________ contains only one orbital.
A) 5d  B) 6f  C) 3d  D) 1p  E) 4s
10) Of the following, which gives the correct order for electronegativity for Mg, Na, P, Si, and Ar?
   A) Na > Mg > Si > P > Ar
   B) Ar > Si > P > Na > Mg
   C) Si > P > Ar > Na > Mg
   D) Mg > Na > P > Si > Ar
   E) Ar > P > Si > Mg > Na

11) There are _______ orbitals in the third shell.
   A) 1       B) 9       C) 16       D) 4       E) 25

12) The electron configuration of the element _______ is [Kr]5s^14d^5.
   A) Cr       B) Tc       C) Mo       D) Nb       E) Mn
13) Which series is correctly arranged in order of increasing radius?
   A) $K^+ < Ca^{2+} < Ar < Cl^-$
   B) $Ca^{2+} < K^+ < Ar < Cl^-$
   C) $Ca^{2+} < K^+ < Cl^- < Ar$
   D) $Ca^{2+} < Ar < K^+ < Cl^-$
   E) $Cl^- < Ar < K^+ < Ca^{2+}$
Exam 3 (Ch 5, 6, 7)

All calculations & work must be shown! Good luck!

1. Calculate the standard heat of formation of acetaldehyde, CH₃CHO, given:
   CH₃CHO(g) + 5/2 O₂(g) -> 2H₂O(l) + 2CO₂(g)  \( \Delta H \text{ rxn} = -1194 \text{ KJ} \)
   CO₂(g) \( \Delta H^\circ = -393.5 \text{ kJ/mol} \)
   H₂O(l) \( \Delta H^\circ = -285.8 \text{ kJ/mol} \)

2. Calculate the value of \( \Delta H^\circ \) for the reaction 2C(s) + H₂(g) → C₂H₂(g) from the following information. All equations below must be RE-WRITTEN to prove Hess' Law.

   C(s)+O₂(g)→CO₂ (g) \( \Delta H^\circ = -393.5 \text{kJ} \)
   H₂ (g)+1/2O₂ (g)→H₂O(l) \( \Delta H^\circ = -285.8 \text{kJ} \)
   2C₂H₂(g) + 5O₂(g) → 4CO₂(g) + 2H₂O(l) \( \Delta H^\circ = -2598.8 \text{kJ} \)
3. Calculate the energy absorbed when 56.0 kg of hydrogen gas is produced in the decomposition of nitrogen trihydride.

\[ \text{N}_2(g) + 3\text{H}_2(g) \rightarrow 2\text{NH}_3(g) \Delta H = -91.8 \text{ kJ} \]

4. Calculate the frequency of light emitted when an electron transitions from \( n=4 \) to \( n=3 \).
5. Given the following quantum numbers: indicate the shape(s), the number of orbital(s), & the number of electrons depicted.

\[ n = 3, l = 2, ml = 1, 2 \]

\[ n = 4, l = 1, 3, ms = -\frac{1}{2} \]

6. Give the noble orbital diagram for Ag⁺