I. MULTIPLE CHOICES (30 points): Write the letter that corresponds to the best answer in each of the following questions. Transfer your answers on the Scantron form. Answers on the form are final.

Electronegativity Values for Some Elements

<table>
<thead>
<tr>
<th>Element</th>
<th>Electronegativity</th>
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<tbody>
<tr>
<td>H</td>
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<tr>
<td>Li</td>
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<tr>
<td>Be</td>
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<tr>
<td>B</td>
<td>2.04</td>
</tr>
<tr>
<td>C</td>
<td>2.55</td>
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<tr>
<td>N</td>
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<tr>
<td>Se</td>
<td>2.55</td>
</tr>
<tr>
<td>Br</td>
<td>2.96</td>
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</table>

\[ \text{S} + 2\text{I} \rightarrow \text{I}_2 + 2\text{e}^- \quad (13 \text{ pr.}) \]

1. Draw the Lewis structure of AsCl₅. What is the molecular geometry of AsCl₅?
   (a) linear    (b) trigonal planar    (c) tetrahedral    (d) bent    (e) Trigonal pyramidal

2. Draw the Lewis structure of OCl₂. What is the molecular geometry of OCl₂?
   \[ 6 + 14 = 20 \text{ e}^- \quad (10 \text{ pr.}) \]
   (a) linear    (b) trigonal planar    (c) tetrahedral    (d) bent    (e) Trigonal pyramidal

3. Which of the molecules below has at least one polar bond?
   (a) OCl₂    (b) PF₃    (c) AsH₃    (d) CH₄
   \[ \Delta EN < 0.4 \]
   \[ -2.19 \]
   \[ 2.18 \]
   \[ 2.18 \]
   \[ \text{Hydrocarbon} \]
   \[ \text{N}_0 \]

4. Which of the molecules below is polar?
   (a) OCl₂    (b) PF₃    (c) AsH₃    (d) CH₄
   \[ \Delta EN = 1.79 \]
   \[ \text{polar bond} \]
   \[ \text{unsym.} \]

5. Choose the molecule below that contains at least one polar bond, but is nonpolar.
   (a) SiH₄    (b) H₂O    (c) CCl₄    (d) HCl
   \[ \Delta EN = 0.35 \]
   \[ \text{polar bond} \]
   \[ \text{unsym.} \]
   \[ \text{polar} \]
   \[ \text{nonpolar} \]

6. Which of the following molecules is/are polar?
   (a) HCN    (b) PCl₅    (c) CS₂    (d) a and b    (e) a and c
   \[ \text{polar} \]
   \[ \text{nonpolar} \]
7. Which of the following molecules is/are nonpolar?

(a) \( \text{H} - \text{C} - \text{C} - \text{O} - \text{H} \)

(b) \( :\text{O} = \text{C} = :\text{O} \)

(c) \( \text{PF}_3 \) (See question 4 above)

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8. Arrange \( \text{NH}_3, \text{CH}_4, \text{PH}_3 \) in order of increasing intermolecular forces of attraction. \( \text{H}_2 \text{O} \) is polar.

(a) \( \text{NH}_3 < \text{CH}_4 < \text{PH}_3 \)  
(b) \( \text{CH}_4 < \text{PH}_3 < \text{NH}_3 \)

(c) \( \text{PH}_3 < \text{CH}_4 < \text{NH}_3 \)  
(d) \( \text{NH}_3 < \text{PH}_3 < \text{CH}_4 \)

9. Which of the following molecules will exhibit hydrogen-bonding in the liquid state?

(a) \( \text{CH}_4 \)  
(b) \( \text{PH}_3 \)

(c) \( \text{CH}_3\text{NH}_2 \)  
(d) \( \text{C}_2\text{H}_4 \)

10. Which of the following liquids will boil at the highest temperature?

(a) \( \text{NH}_3 \)  
(b) \( \text{PH}_3 \)

(c) \( \text{AsH}_3 \)  
(d) \( \text{SbH}_3 \)

11. Which of the following compounds will have the lowest vapor pressure?

(a) \( \text{H}_2\text{O} \)

(b) \( \text{C}_2\text{H}_4 \)

(c) \( \text{C}_2\text{H}_5\text{OH} \)

(d) \( \text{C}_2\text{H}_6 \)

12. How many atoms are there in 1.5 moles of magnesium? (Note: Avogadro’s number equals 6.022 x 10^23 particles)

(a) 2.49 x 10^25  
(b) 9.03 x 10^23  
(c) 4.01 x 10^23  
(d) 2.49 x 10^24  
(e) 9.03 x 10^25

13. Which of the following samples contain the largest number of atoms?

(a) 0.50 mol \( \text{O}_2 \)  
(b) 1.10 mol \( \text{Al} \)  
(c) 1.08 g \( \text{B} \)  
(d) 1.20 g \( \text{C} \)

14. What is the molar mass of \( \text{OCl}_2 \)?

(a) 51.45 g/mol  
(b) 86.91 g/mol  
(c) 44.07 g/mol  
(d) 98.13 g/mol

\[ \text{MM}_{\text{OCl}_2} = 16 + (35.45)^2 \approx 96.9 \]