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.

<table>
<thead>
<tr>
<th>H</th>
<th>Electronegativity Values for Some Elements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Li</td>
<td>0.98</td>
</tr>
<tr>
<td>Na</td>
<td>0.90</td>
</tr>
<tr>
<td>K</td>
<td>0.82</td>
</tr>
</tbody>
</table>

6 + 14 = 20 e
(10 pt.)

1. Draw the Lewis structure of OCl₂. What is the molecular geometry of OCl₂?
   (a) bent      (b) Trigonal pyramidal      (c) linear      (d) trigonal planar      (e) tetrahedral

2. Draw the Lewis structure of AsCl₃. What is the molecular geometry of AsCl₃?
   (a) bent      (b) Trigonal pyramidal      (c) linear      (d) trigonal planar      (e) tetrahedral

3. Which of the following molecules is/are polar?
   (a) HCN   (b) PCl₅   (c) CS₂   (d) a and b   (e) a and c
   polar Cl - P - Cl
   Cl - S = C = S: nonpolar (sym.)
   Cl - Cl: sym. so nonpolar

4. Which of the molecules below has at least one polar bond?
   (a) AsH₃   (b) CH₄   (c) OCl₂   (d) PF₃
   ΔEN = 0.02
   ΔEN = 0.4
   ΔEN = 1.79
   Hydrocarbon: nonpolar
   Nonpolar

5. Which of the molecules below is polar? See #1.
   (a) AsH₃   (b) CH₄   (c) OCl₂   (d) PF₃

6. Choose the molecule below that contains at least one polar bond, but is nonpolar.
   (a) SiH₄   (b) H₂O   (c) CCl₄   (d) HCl
   ΔEN = 0.35
   ΔEN > 0.4
   ΔEN > 0.4
   polar bond, unsym. so polar
   nonpolar
   polar bond, but sym. so nonpolar
   nonpolar
   polar
   unsym. so polar
7. Which of the following molecules is/are nonpolar?
   (a) \( \text{H} \) \( \text{C} \) \( \text{H} \)
   (b) \( \text{O}=\text{C}=\text{O} \)
   (c) \( \text{PF}_3 \) (See question 5 above)
   (d) Both a and b
   (e) Both b and c

8. Arrange \( \text{NH}_3 \), \( \text{CH}_4 \) and \( \text{PH}_3 \) in order of increasing intermolecular forces of attraction.
   (a) \( \text{PH}_3 < \text{CH}_4 < \text{NH}_3 \)
   (b) \( \text{NH}_3 < \text{PH}_3 < \text{CH}_4 \)
   (c) \( \text{NH}_3 < \text{CH}_4 < \text{PH}_3 \)
   (d) \( \text{CH}_4 < \text{PH}_3 < \text{NH}_3 \)
   (e) \( \text{NH}_3 \) is polar and forms H-bonding, \( \text{CH}_4 \) and \( \text{PH}_3 \) are nonpolar, but \( \text{PH}_3 \) is heavier, so higher IMFs

9. Which of the following molecules will exhibit hydrogen-bonding in the liquid state?
   (a) \( \text{CH}_3\text{NH}_2 \)
   (b) \( \text{C}_2\text{H}_4 \)
   (c) \( \text{CH}_4 \)
   (d) \( \text{PH}_3 \)

10. Which of the following liquids will boil at the highest temperature?
    (a) \( \text{SbH}_3 \)
    (b) \( \text{AsH}_3 \)
    (c) \( \text{PH}_3 \)
    (d) \( \text{NH}_3 \)

11. Which of the following compounds will have the lowest vapor pressure?
    (a) \( \text{H}_2\text{O} \)
    (b) \( \text{CH}_3\text{OH} \)
    (c) \( \text{CH}_3\text{Cl} \)
    (d) \( \text{CH}_2\text{Cl}_2 \)

12. How many atoms are there in 1.5 moles of magnesium? (Note: Avogadro’s number equals \( 6.022 \times 10^{23} \) particles)
    (a) \( 2.49 \times 10^{25} \)
    (b) \( 9.03 \times 10^{23} \)
    (c) \( 4.01 \times 10^{23} \)
    (d) \( 2.49 \times 10^{24} \)
    (e) \( 9.03 \times 10^{25} \)

13. Which of the following samples contain the largest number of atoms?
    (a) \( 0.50 \text{ mol} \text{O}_2 \)
    (b) \( 1.10 \text{ mol} \text{Al} \)
    (c) \( 1.08 \text{ g} \text{B} \)
    (d) \( 1.20 \text{ g} \text{C} \)

14. What is the molar mass of \( \text{OCl}_2 \)?
    (a) \( 51.45 \text{ g/mol} \)
    (b) \( 86.91 \text{ g/mol} \)
    (c) \( 44.07 \text{ g/mol} \)
    (d) \( 98.13 \text{ g/mol} \)