1. Provide at least two reasonable mechanisms for non-selective ethylene oligomerization. Explain briefly your rationale.

2. What is the main difference between a S-F and Poisson distribution of oligomers?

3. Detail with a simple reaction scheme how low-valent chromium may form higher valent states during its redox dynamism.

4. Draw the detailed mechanistic proposal of the Rosenthal’s bimetallic tetramerization cycle.

5. Predict and draw the structures (closo, nido, etc.) for the following borane derivatives.

\[
\text{Si}_2\text{B}_7\text{H}_{13} \quad \text{B}_2\text{H}_{11}, \quad \text{C}_2\text{B}_{10}\text{H}_{12}, \quad \text{NB}_9\text{H}_{12}, \quad \text{B}_3\text{H}_7\text{[Ru(CO)]}_2, \quad \text{[(arene)Fe]_2B}_4\text{H}_8, \quad \text{B}_6\text{H}_{11}(\text{\textsuperscript{\textcircled{	ext{c}}}})
\]

6. Calculate the number of skeletal pairs, predict and draw the structure for:

\[
\text{B}_4\text{H}_6\text{[(Fe(arene)]_2} \quad \text{B}_6\text{H}_{10} \quad \text{N}_2\text{B}_3\text{H}_3
\]

7. Predict the M-M bond order in:

\[
\text{Mo}_6\text{Cl}_{12} \quad \text{and} \quad \text{[Re}_3\text{Br}_{12}]^{3-}
\]

8. Predict the structures for the following clusters according to both EAN and PSEPT formalisms (show your reasoning briefly and schematically):

\[
\text{[Ru}_5\text{(CO)}_{13}]^{2-}, \quad \text{Os}_6\text{(CO)}_{18},
\]

9. Predict the number of correlation valence electrons for the following structures.
10. The following Os carbonyl cluster may be obtained via condensation of smaller clusters

Calculate the formula and the number of skeletal pairs.

11. Draw the structure of $1,2\text{-B}_4\text{N}_2\text{H}_4$