1. Propose a catalytic cycle for the formation of Phosphorated Fluorene Derivatives 4:

Hints: Active catalyst is $\text{Zn(NO}_3\text{)}_2$; $\text{Zn(NO}_3\text{)}_2$ is the source of $\text{NO}_3^-\text{only}$ (Zn$^{2+}$ doesn’t involve in the catalytic cycle)

2. Propose catalytic cycles for the formation of 2-Vinylbenzofurans 6 (EWG = -COR):

Hints: Involves two catalytic cycles, $\text{CuL}_1^+$ is the active catalyst for both the cycles; Product from the first catalytic cycle is