1. Which of these following complexes will not follow the 18-electron rule, and why?

 [Cp2LuMe], [(C6H6)2Mo], [(bpy)NiCl2], (bpy = 2, 2’-bipyridine), and [TiMe4].

 **2 Marks**

1. You have a set of different ligands of the PR3 type, and a large supply of (CO)5W(thf), with which to make a series of complexes (CO)5W(PR3). How could you estimate the relative ordering of the electron-donor power of the different PR3 ligands? **3 Marks**
2. Series of PR3 had been prepared to use in homogeneous catalysed processes, (For Example: R = H, Me, Pri, -OMe, Ph, -OPh, MePh2 and But). Explain with details how the R groups can play important roles in catalytic reactivity? **3 Marks**
3. Determine whether associative or dissociative substitution is more likely for the following species: Mn(CO)5, PtCl2(PPh3)2, IrCl(CO)(PPh3)2 and Pt(PPh3)4?

**2 Marks**

1. For each of the following pairs of metal complexes, which should have the *highest* average carbonyl IR stretching frequency, and why? **4 Marks**
2. CpFeBr(CO)2 -or- CpRuCl(CO)(PMe3)
3. MnCl(CO)5 -or- Cr(CO)6
4. Consider the following two substitution reactions. Sketch out the most likely reaction steps to produce the most stable product (substitute only one ligand with that shown). Briefly & clearly state your reasoning/explanation for each reaction and the final product shown.  **6 Marks**



