TUTORIAL SHEET UV-VIS SPECTROSCOPY

1. An unknown compound (0.01 g) was dissolved in ethanol in a 250 mL volumetric flask and its UV spectrum was measured using 1cm cells: The absorbance at the maximum of one absorption band was found to be 2.2. The compound was known to have a relative molecular mass of 186. Calculate ε at this λ_{max}. At another λ_{max}, A was found to be 1.2 for the same solution. Calculate ε for this absorption band too.
2. What types of electronic transition are possible for each of the following compounds?
    a. Cyclopentene
    b. Acetaldehyde
    c. Dimethyl ether
    d. Methyl vinyl ether
    e. Triethylamine
    f. Cyclohexane
3. Chloromethane, bromomethane and iodomethane has absorption maxima at 172 nm, 204 nm and 258 nm respectively. What type of transition is responsible for each band? How can the trend be explained?
4. When p-nitrophenol is dissolved in water, the color is yellow, but NaOH is added, the color deepens in intensity and moves to longer wavelength. Explain this and name the shift.
5. What is/are the products of reaction between benzyl chloride and benzaldehyde in the presence of triphenylphosphine and NaOH? Can you qualitatively use UV-Visible spectroscopy to analyze the products?
6. For $[Cr(H_2O)_6]Cl_3$ and $[Cr(NH_3)_6]Cl_3$, one complex is violet while the other yellow Match the expected color with each complex and explain your identifications.
7. Although Nickel and Platinum belong to the same group, $[NiCl_4]^{2-}$ is green and $[PtCl_4]^{2-}$ is orange. Explain.
8. A tetrahedral complex absorbs at 545 nm. What is the respective octahedral crystal field splitting (Δ_o)? What is the color of the complex?