School of Chemistry and Biochemistry, TIET, Patiala
Applied Chemistry (UCB008)
Tutorial Sheet (UV-Vis spectroscopy)

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1. What is mean by electronic, vibrational and rotational transitions? Which of these transitions require more and the lesser energy?

2. What is the difference between an atomic absorption and a molecular absorption spectrum and why does this difference exist?

3. What is the range of UV and visible region in EMR spectrum?

4. What happens on absorption of UV and infrared radiation by a molecule?

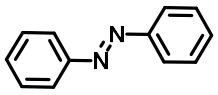
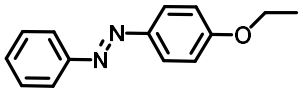
5. Draw relative energies of various types of molecular orbitals. Show various transitions in case of alkanes (C-C), alkenes (C=C), carbonyl (C=O) and conjugated alkenes (C=C-C=C).

6. What do you understand by the terms: chromophore, auxochrome, bathochromic shift, hypsochromic shift, hyperchromic shift and hypochromic shift?

7. Give the possible transitions in the following molecules:
(a) Methanol (b) Benzoic acid (c) Pyridine (d) Ethane

8. State the importance of the wavelength of maximum absorption λ_{max}. Arrange the following molecules in order of increasing λ_{max}.

(i) (a) C_6H_6 **(b)** $CH_2=CH_2-CH_2-CH_2=CH_2$ **(c)** C_6H_5CHO **(d)** $C_6H_5CH=CH-CH=CH_2$

(ii) (a)  (b) 

9. **(i)** Naphthalene and anthracene are colorless, but tetracene is orange. Why?
(ii) β-carotene is orange. Why?

10. **(i)** Aniline shows blue shift in acidic medium. Explain.
(ii) p-Nitrophenol shows red shift in alkaline medium. Explain.

11. Draw the diagram for UV-Vis spectrophotometer. Name the light source used for visible and UV radiations. Compare the materials from which cuvettes must be made for UV and visible work. What is the role of photomultiplier tube?

12. Why **σ** to **σ*** transition is not observed by general UV-Vis spectrophotometer?

13. Why with change in the concentration of $\mathbf{H^+}$ ions in an aqueous solution there is a change in the colour of phenolphthalein and methyl orange indicators.
