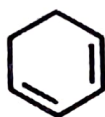


BT 501: Quiz 1.

(20 MARKS, 4 marks for each question). You may refer any book except your neighbors answer book. Total time: 30 minutes

1. *Calculation of Concentrations by Absorbance:* Suppose a molecule displays an extinction coefficient of $30,000 \text{ M}^{-1} \text{ cm}^{-1}$, and that you wish to determine its concentration from the absorbance. You have two solutions, with actual optical densities of 0.3 and 0.003 in a 1-cm cuvette. What are the concentrations of the two solutions?
2. Which molecule absorbs at the longest wavelength, 1,3-hexadiene or 1,4-hexadiene? (3)

Which absorbs at the longest wavelength?



1,3 hexadiene

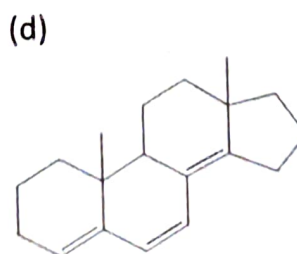
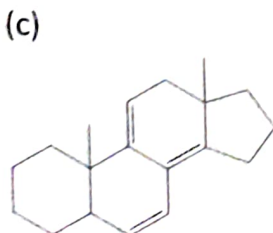
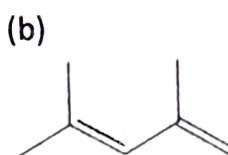
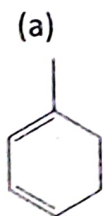


1,4 hexadiene

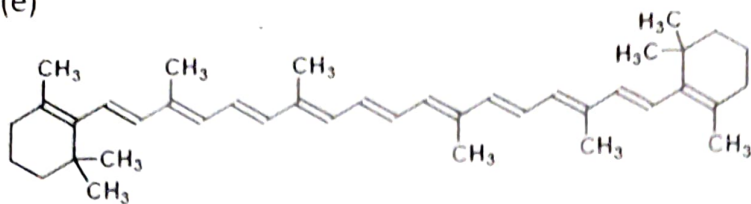
Which among the following electronic transition(s) are mainly accountable for UV-VIS spectroscopy of organic compounds (3)

- a) $\sigma \rightarrow \sigma^*$
- b) $n \rightarrow \sigma^*$
- c) $n \rightarrow \pi^*$ and $\pi \rightarrow \pi^*$.

3. Carefully examine the following Figure 1, and Answer the following questions (3 X 1 = 3 marks)

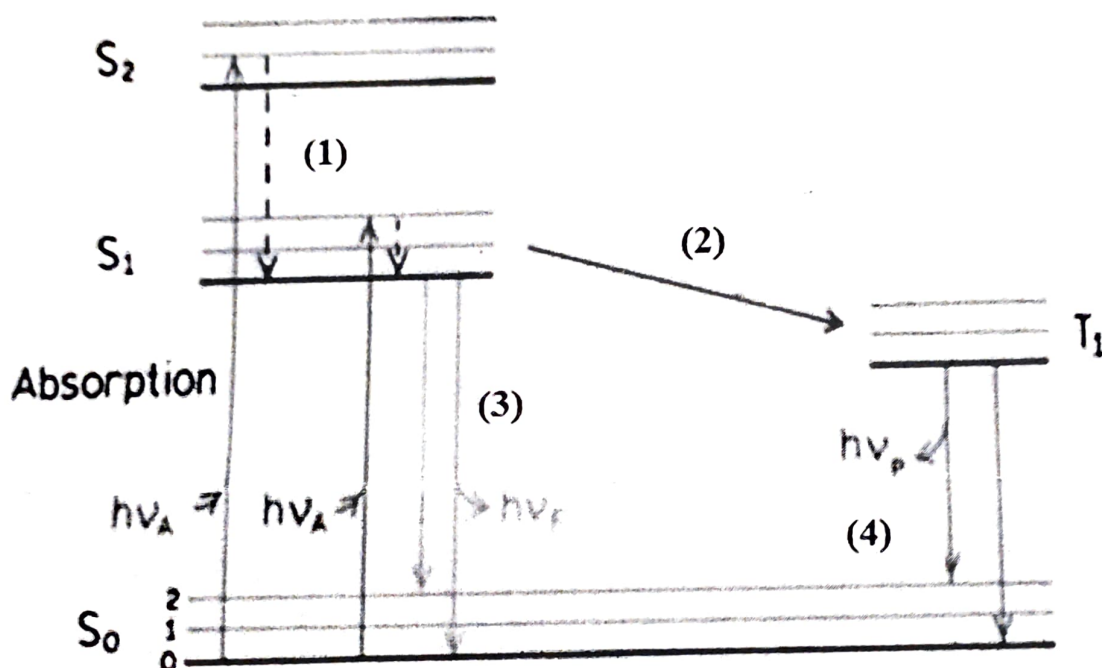


(e)



3. The calculated λ_{\max} of compound (c) is greater than compound (d); TRUE or FALSE. Why?
4. Compound (e) has an observed λ_{\max} of 453. Color of this compound will be _____
5. For compounds (a) to (d); Write the decreasing order of λ_{\max} (largest value first and smallest last).

4. Reference to the following Jablonski diagram;



- A) Re-draw the diagram in your answer sheet and label 1, 2, 3 and 4 appropriately.
 - B) Comment on the intensity of fluorescence and phosphorescence peaks. What could be the reason for the difference in intensity, if any?
 - C) Green fluorescent protein, GFP is an excellent fluorophore with a molar absorption coefficient of $\sim 30000 \text{ M}^{-1} \text{ cm}^{-1}$ at 395 nm. Three variants of GFP, GFP-1, GFP-2 and GFP-3 have quantum yields 0.69, 0.79 and 0.89 respectively. Do you foresee any change in their respective fluorescent life times? If yes Why?
5. Which of the following molecules will show an infrared (vibrational) spectrum. Why?
- A. Oxygen
 - B. Nitrogen
 - C. Hydrogen Bromide
 - D. Carbon dioxide