

Name: _____ Date: _____

Photoluminescence (Sek. II/upper secondary)
Luminous colours – fluorescence and phosphorescence

Basic experiment (E1) and analysis assignments (A1-A4) for all groups

E1 Prepare the following solutions:

- a) approx. 1 mg of fluorescein sodium salt in 30 mL water,
- b) approx. 5 mg of aesculin in 30 mL water, and
- c) dissolve the content of a β -carotene capsule in 30 mL n-heptane.

Irradiate the solutions in the dark with a violet LED torch and note down your observations.

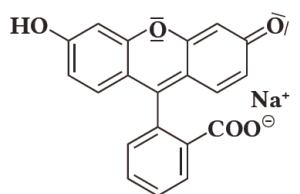
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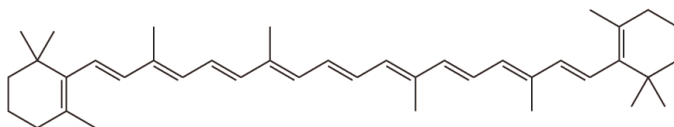
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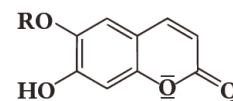
A1 Compare the structural features of the three molecules. Then assess to what extent intramolecular rotation and intramolecular vibration are possible within the respective molecule's chromophore.



fluorescein sodium salt
[Fluoresceine]



β -carotene

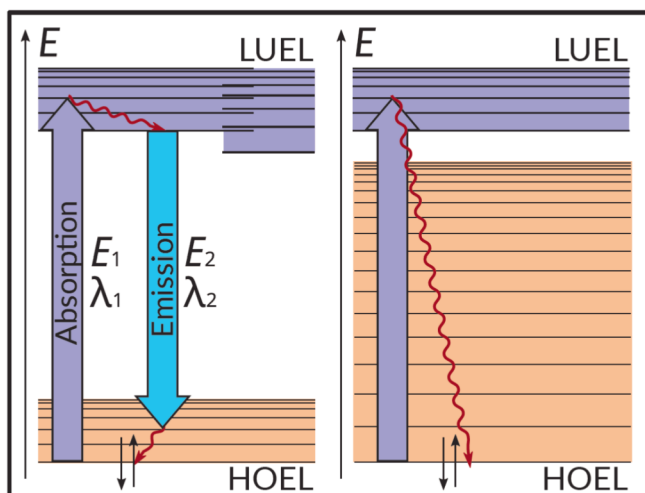


Esculin
R = glucose

A2 Conduct some research into the reasons why β -carotene does not show any fluorescence while chlorophyll does (refer to the German computer animation 'Ein Fall für Zwei'). Moreover, check to what extent your findings are applicable to your observations in E1.

A3 Compare the two given energy level diagrams and assign them to the β -carotene, the aesculin, and the fluorescein molecule. Give reasons for your decisions.
Hint: The horizontal lines represent the allowed molecular vibrational states within the same energy level.

A4 The two following pairs are taken from the energy level diagram on the left (cf. A3). Fill in the box with either '>' or '<'.



$$E_1 \boxed{} E_2 \quad \lambda_1 \boxed{} \lambda_2$$