

CH301H – Principles of Chemistry I: Honors
Fall 2011, Unique 51040

Quiz 2

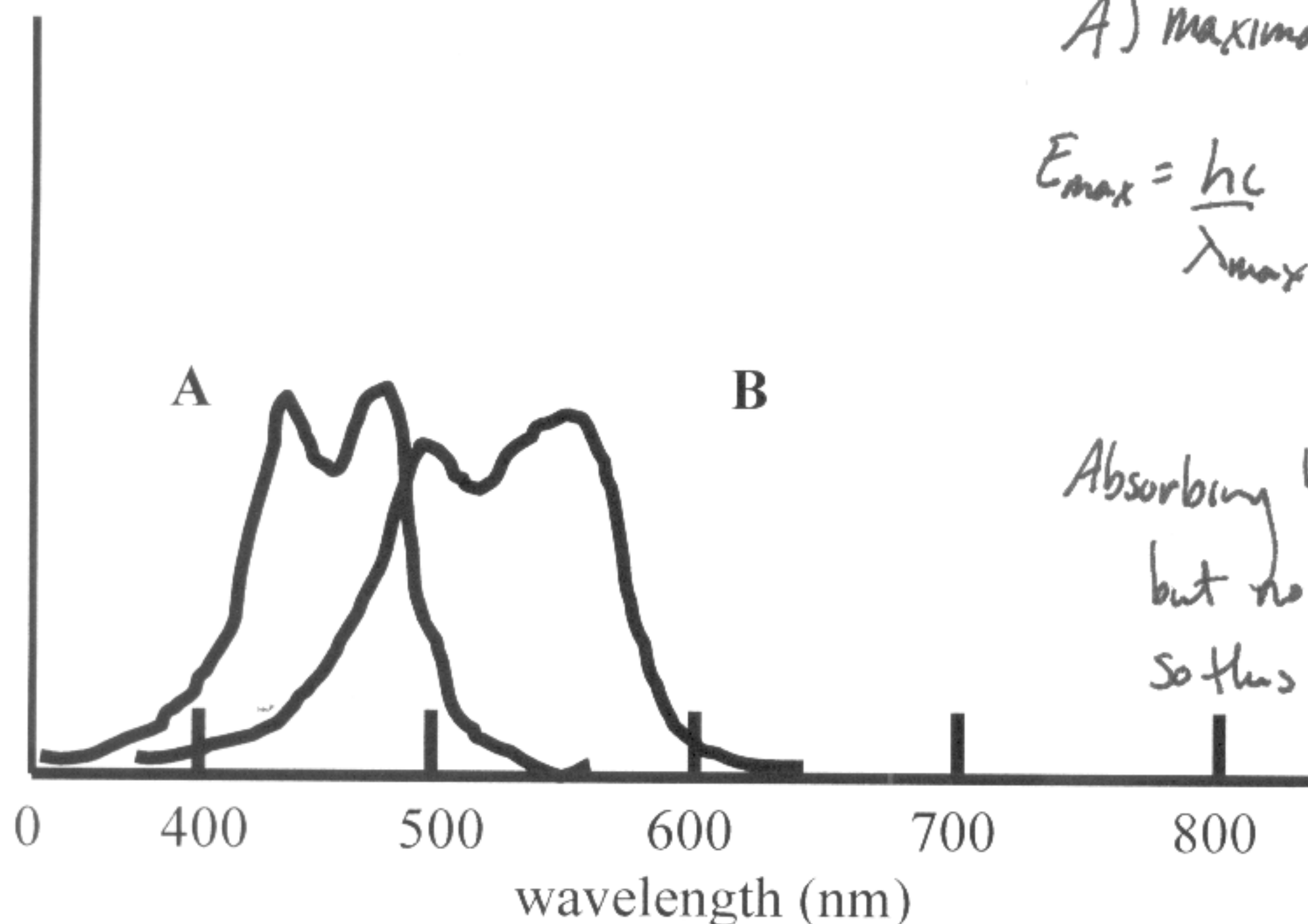
Carotenoids are a class of small molecules that are found in many plants, fruits, and vegetables. Carotenoids are characterized by absorbing strongly in the visible region of the spectrum. Below are the absorption spectra of two carotenoids (labeled A and B), each of which is found in common foods. For each spectrum, a) estimate the maximum absorption wavelength(s); b) determine the maximum absorption energies; c) name the color that an object absorbing at these wavelengths would appear to our eyes; and d) take a guess at which food contains this molecule. Below are some constants you might find useful.

$$q = 1.602 \times 10^{-19} \text{ C}$$

$$\epsilon_0 = 8.854 \times 10^{-12} \text{ C}^2 \text{ J}^{-1} \text{ m}^{-1}$$

$$h = 6.626 \times 10^{-34} \text{ Js}$$

$$c = 3.0 \times 10^8 \text{ m s}^{-1}$$



A) maxima at $\sim 425 \text{ nm}$
 $\sim 490 \text{ nm}$

$$E_{\text{max}} = \frac{hc}{\lambda_{\text{max}}} = 4.68 \times 10^{-19} \text{ J (425 nm)}$$

$$4.06 \times 10^{-19} \text{ J (490 nm)}$$

Absorbing blue light + a little green,
but no yellow, orange, or red,
so this will appear orangish
-carrot.

B) maxima at $\sim 500 \text{ nm}$, 550 nm
 $E_{\text{max}} = 3.98 \times 10^{-19} \text{ J (500 nm)}$
 $3.61 \times 10^{-19} \text{ J (550 nm)}$

This is absorbing a lot of green, yellow, and orange, and most of the blue. The only thing that is left is red. Tomato