Lab Report: UV Protectors Sunscreens

NAME:_____

PARTNER'S NAME:_____

LAB SECTION:_____

DATE:_____

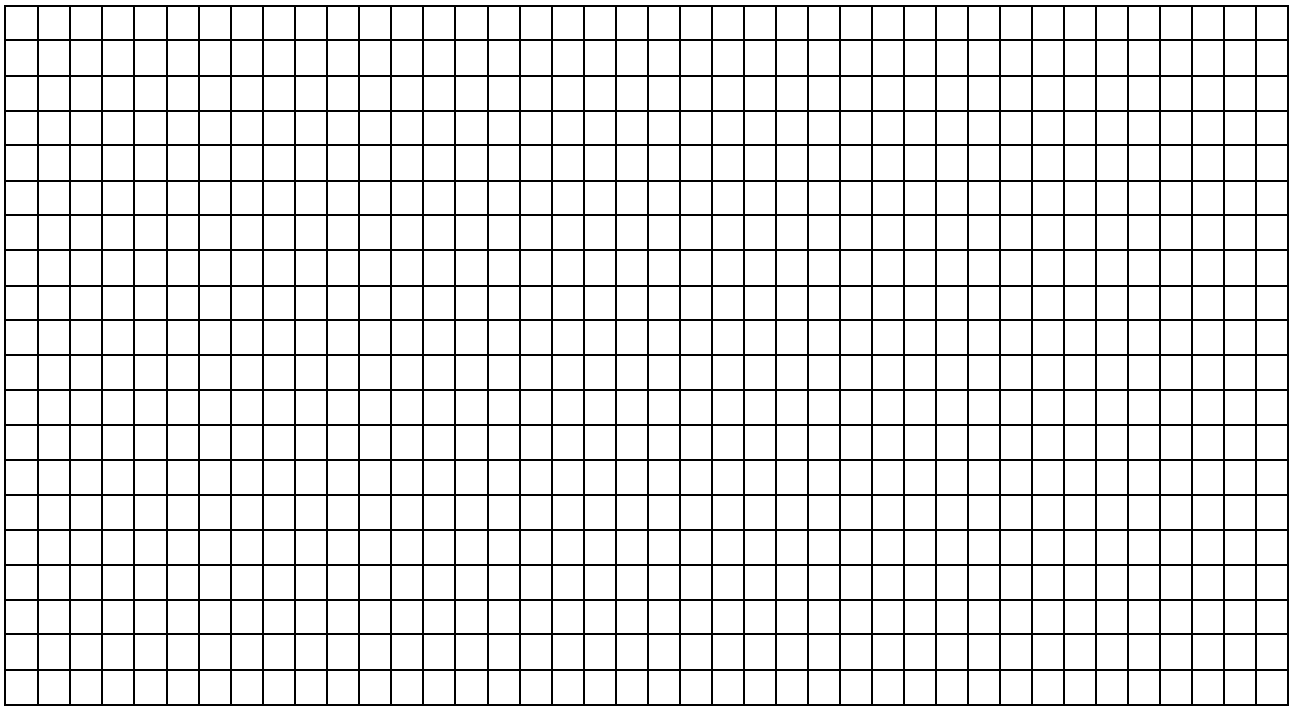
% SCORE:

	Points possible	Points received
Lab Notebook		
Abstract		
Absorbance plot		
UV Spectra analysis		
Dibenzalacetone isomer comparison		
Questions		
Conclusions		

A. ABSTRACT:

B. PLOT THE ABSORBANCE AT 312 NM VS. THE LOG$_{10}$ (SPF).

1. Compare both sunscreen types (Coppertone vs Non-Brand) by plotting absorbance data versus Log (SPF) and adding by hand a line of best fit for each data set. Label axes and use at least 1/2 of the available graph space. Note which data belongs to which suncreen type in a key



2. Equation 1 page 26 suggests a linear relationship between absorbance and Log (SPF). Does your data show this relationship for either sunscreen?

C. SPECTROSCOPIC ANALYSIS

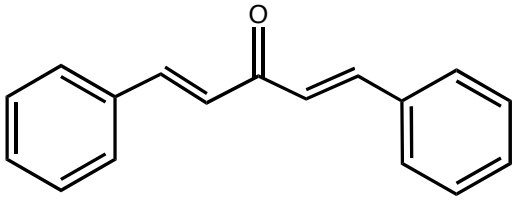
1. Complete the table below from class data

Compound	Final Molarity (M)	Absorbance	λmax (nm)	ε (molar extinction coefficient)
2-Ethylhexyl-p-cinnamate	1.14×10^{-5}			
2-Ethylhexyl-p-cinnamate	2.28×10^{-5}			
2-Ethylhexyl salicylate	1.20×10^{-4}			
2-Ethylhexyl salicylate	6.00×10^{-5}			
Oxybenzone	7.00×10^{-5}			
Oxybenzone	3.50×10^{-5}			
Octocrylene	7.00×10^{-5}			

2. Show a calculation of the molar extinction coefficient (ε) using the Beer-Lambert law and the UV data you obtained in lab.

D COMPARE 3 POSSIBLE DIBENZALACETONE STEREOISOMERS.

Complete the tables below. Using WebMO, determine the heats of formation and the relative planarity of the isomers of dibenzalacetone.



Trans,trans isomer of dibenzalacetone

Property	Cis-Cis	Cis-Trans	Trans-Trans
Heats of formation (kJ/mol)			
Relative stability based on H_f (1 = most stable, 3=least)			
Relative planarity of computer structure (1 = most planar)			
λmax, known values	287 nm	295 nm	330 nm
ε, known values	11,000	20,000	34,300
MP °C (lit value)	<25	60-61 °C	110-111°C

E QUESTIONS

1. Electronic transitions between which orbitals are commonly involved in UV absorption?

2. When the absorption wavelength of the molecule increases, what happens to the energy difference between the ground state and excited state orbitals involved in the absorption?

3. For the sunscreen compound 2-ethylhexyl salicylate which functional groups do you think are responsible for absorbance of UV light? Explain your answer.

4. Should every compound have a unique molar extinction coefficient? Should the molar extinction coefficient change if a solution is diluted?

5. Would you design a sunscreen with a molar extinction coefficient of 2.0×10^5 or 2.0×10^2 ? Explain your answer

F. DISCUSSION

1. Using class UV data, can you make any conclusions about the efficacy of brand name and non-brand sunscreen? Can you make any conclusions on which compound from the Table on page 32 is the active ingredient in the NoAd or Coppertone suncreen? Support your answers with data.

2. What trend do you observe in the known wavelength and the observed planarity in computer calculated dibenzalacetone isomers? Can you offer an explanation for the trend?