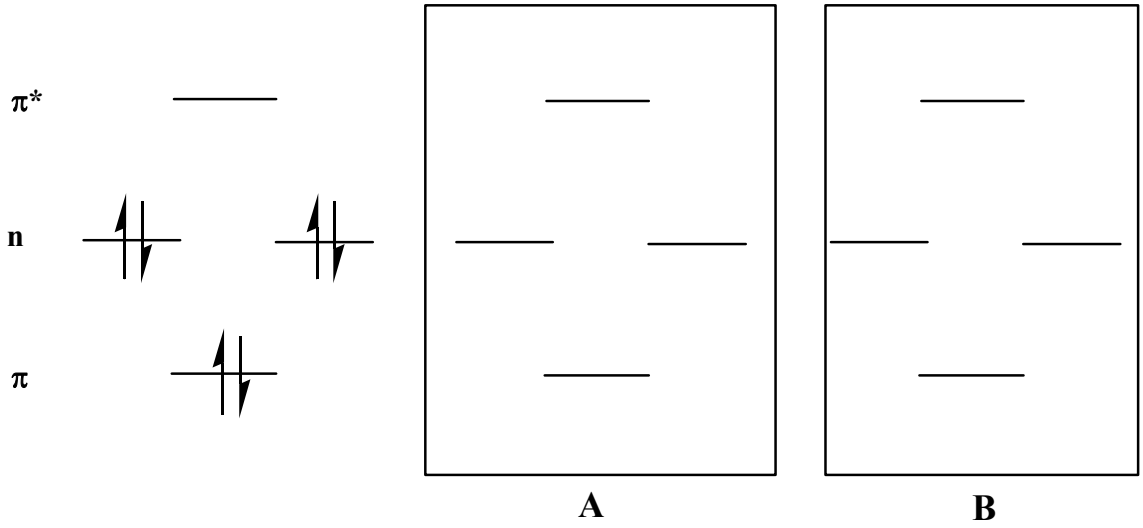
Spring 2009 TWQ 4 (25points) **Name**_____

1-2) Photochemistry is dominated by two main rules. (One deals with the geometries of ground and excited states – the other deals with electron spin inversion upon excitation). State these two rules.

3-6) For each transition, draw a molecule which would easily undergo such a photochemical transition.

$\pi \rightarrow \pi^*$ **$n \rightarrow \sigma^*$** **$\sigma \rightarrow \sigma^*$** **$n \rightarrow \pi^*$**

7-12) A section of the molecular orbital diagram for acetone is shown below.



7-8) Draw in box A the electrons after an allowed $\pi \rightarrow \pi^*$ transition.

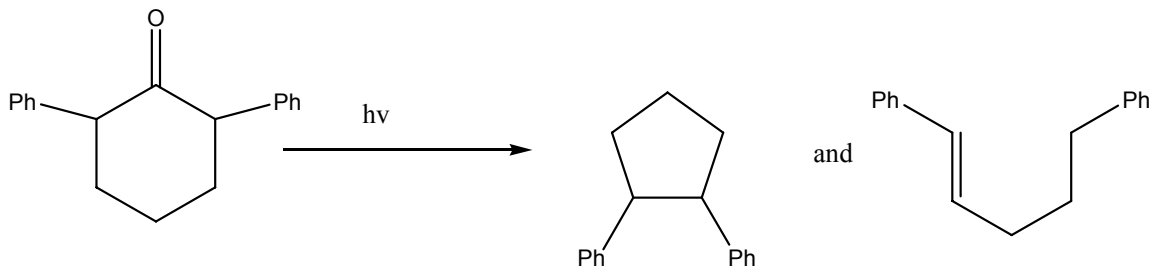
9-10) Draw in box B the electrons after an allowed $n \rightarrow \pi^*$ transition.

11) Which transition requires overall the least energy ?

12) Which transition could be accomplished with the longest wavelength of irradiation ?

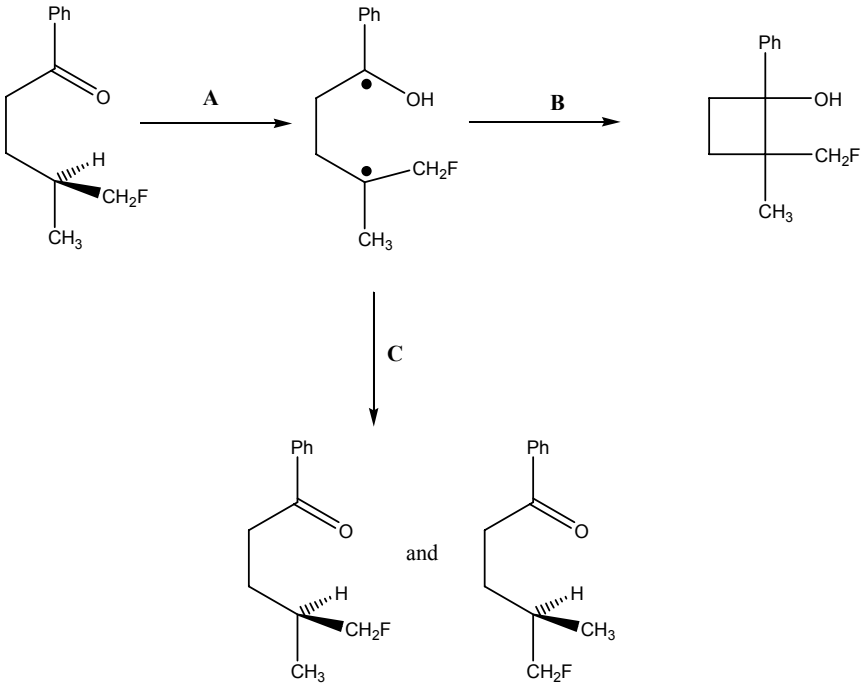
13) Which transition would you predict to have the larger absorption constant (**ε**) ?

14-18) Draw a curly arrow mechanism for the following transformation which produces two products.



(*Bonus point – is this a **Norrish I**, or **Norrish II** reaction, or **neither**?*)

19-25) For the following reaction scheme:



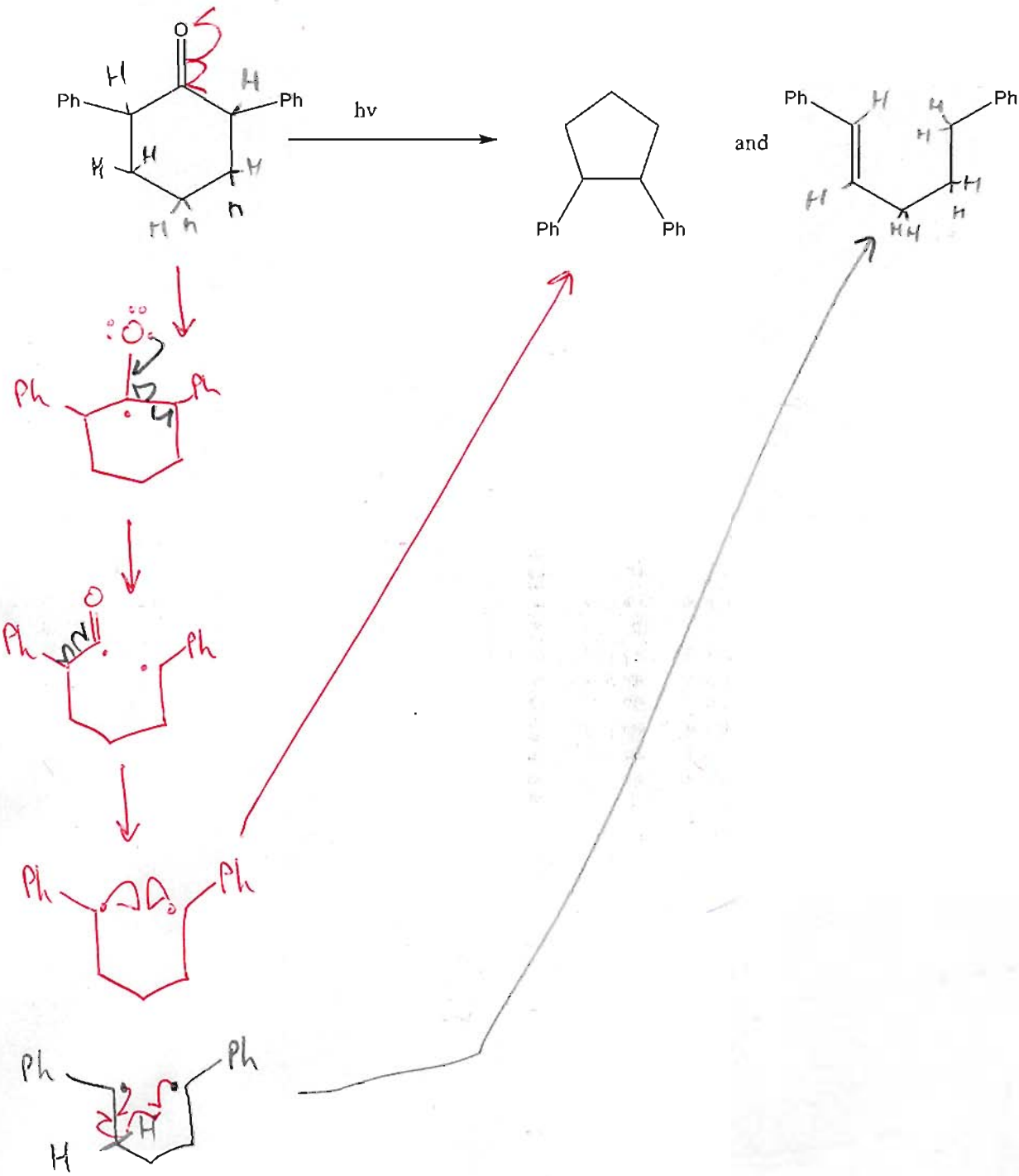
19-20) Draw the mechanism for step A.

21) Draw the mechanism for step B.

22-24) Draw the mechanism for step C and explain why both enantiomers are produced.

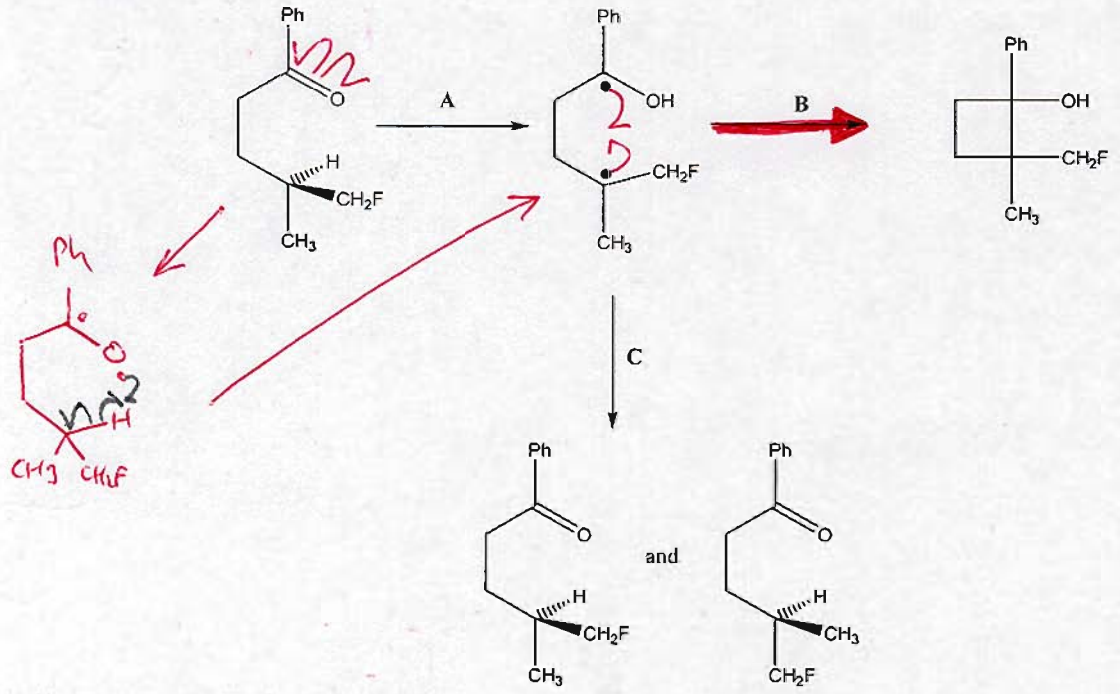
25) What name (starting with "R") is given to a solution that contains both enantiomers of a compound ?

14-18) Draw a curly arrow mechanism for the following transformation which produces two products.



(*Bonus point – is this a* ***Norrish I****, or* ***Norrish II*** *reaction, or* ***neither****?*)

19-25) For the following reaction scheme:

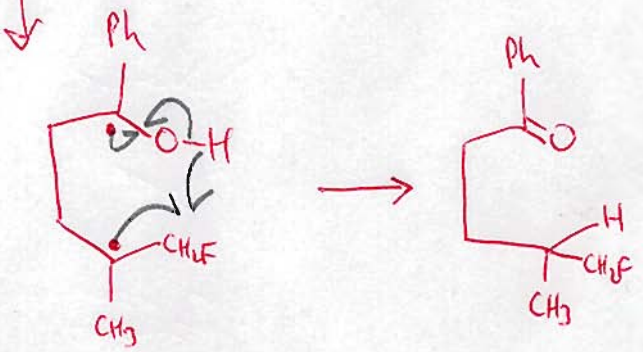


19-20) Draw the mechanism for step A.

21) Draw the mechanism for step B.

22-24) Draw the mechanism for step C and explain why both enantiomers are produced.

25) What name (starting with "R") is given to a solution that contains both enantiomers of a compound ? Racemic



Both enantiomers are produced because the  radical is planar (C is sp^2), and free rotation of the single bonds allows the abstracted hydrogen to connect to either lobe of the p orbital of the radical.