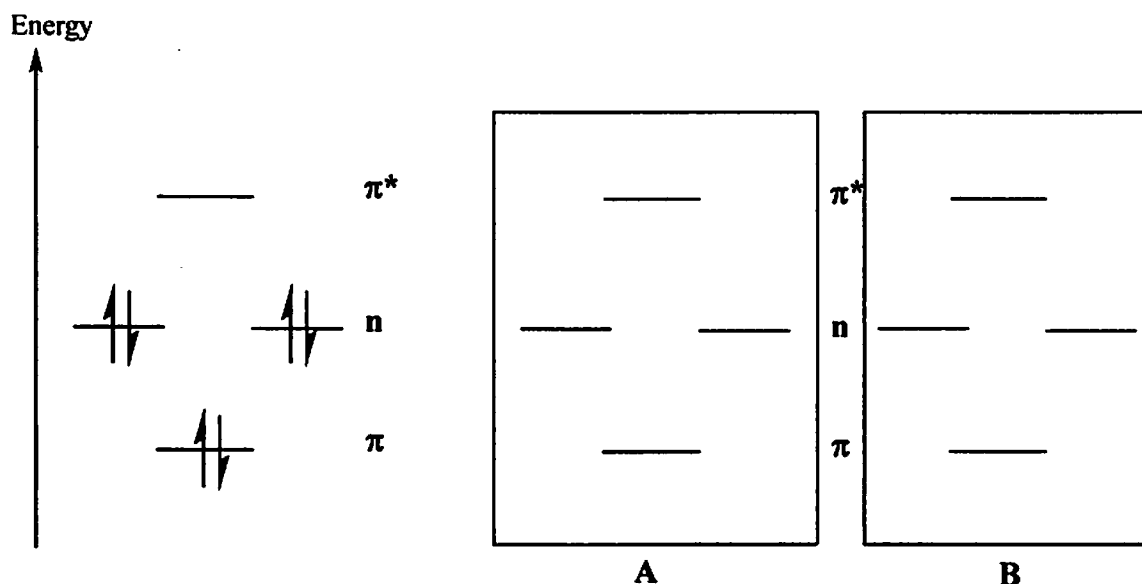


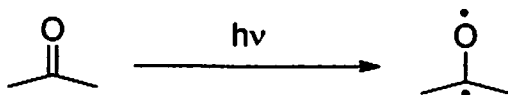
1-5) A section of the molecular orbital diagram for a simple ketone is shown below.



- i) What does the * (asterisk) signify in the level label?
- ii) What does the letter “n” stand for in the level label?
- iii) Draw in box **A** the electrons after an *allowed* $n \rightarrow \pi^*$ transition.
- iv) Draw in box **B** the electrons after an *allowed* $\pi \rightarrow \pi^*$ transition.
- v) Although not drawn, there are σ (and σ^*) levels, would you expect the σ levels to be ABOVE or BELOW the π level?

6-7) In molecular spectroscopy, there is a famous diagram that illustrates the electronic states of a molecule and the transitions between them. The states are arranged vertically by energy and grouped horizontally by spin multiplicity. Non-radiative transitions are indicated by squiggly arrows and radiative transitions by straight arrows. The vibrational ground states of each electronic state are indicated with thick lines, the higher vibrational states with thinner lines. What are the FIRST and LAST names of the scientist whom the diagram is named after?

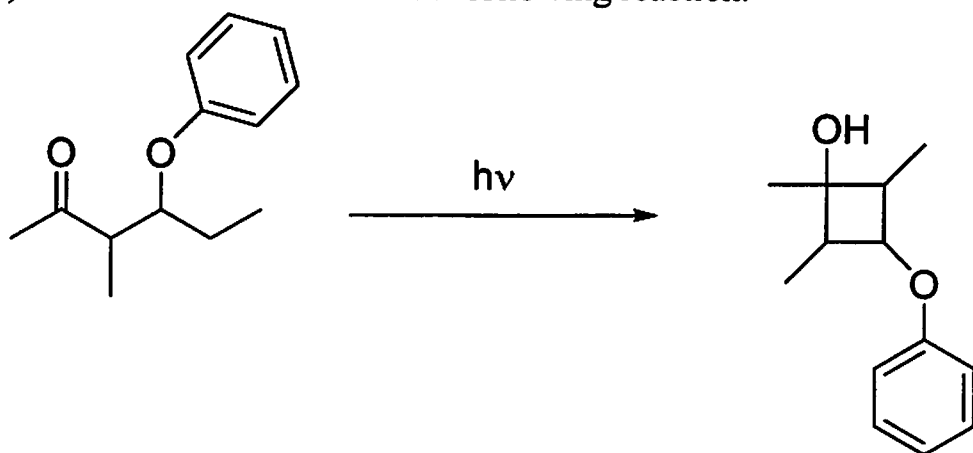
8-11) Photochemical excitation of carbonyl compounds is typically via $n \rightarrow \pi^*$ transition, and we often represent the photochemically excited state as the below diradical.



i) draw curly arrows to account for this transformation.

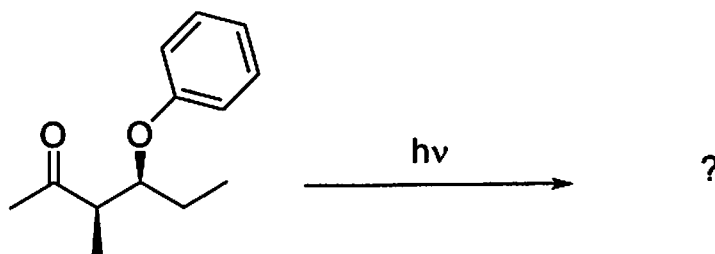
ii) List two limitations or drawbacks of using this Lewis structure to represent the excited state.

12-16) Provide a mechanism for the following reaction.



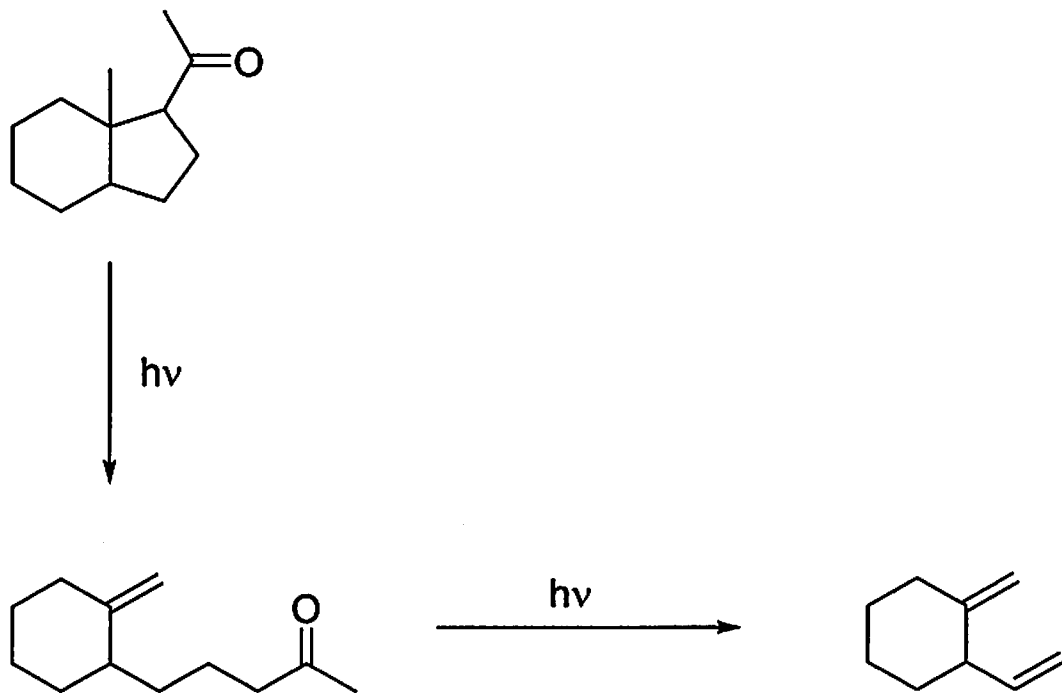
17) Indicate the location of the two chiral centers in the above starting material.

18) If the same reaction was performed on the below single enantiomer, how many different stereoisomers of product would be formed?

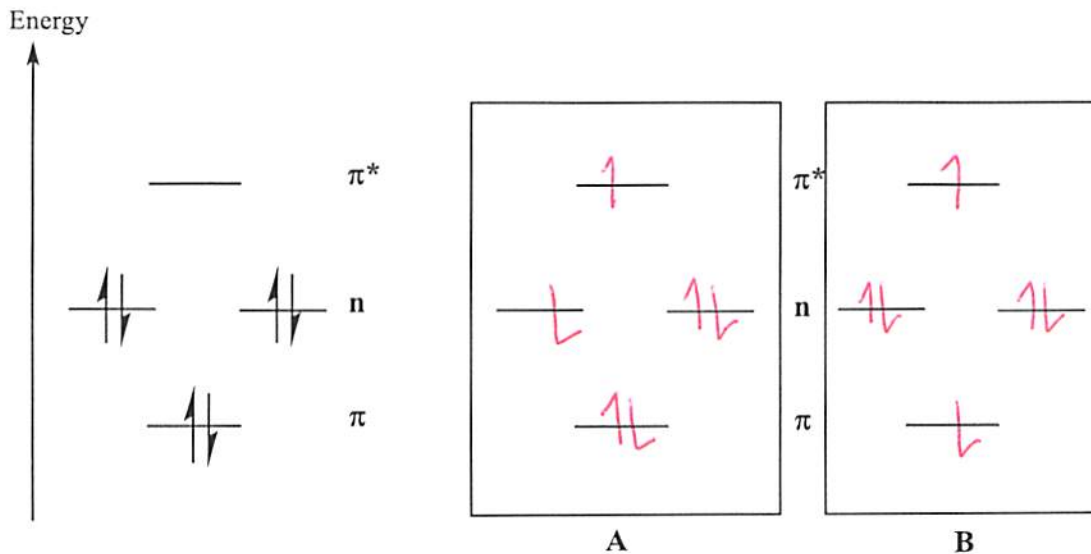


(2 BONUS POINTS – assign R or S to each chiral center in this starting material).

19-25) Provide mechanisms for both parts of the following transformation.



1-5) A section of the molecular orbital diagram for a simple ketone is shown below.

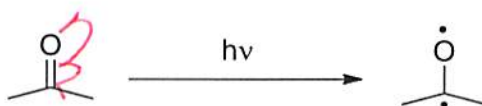


- i) What does the * (asterisk) signify in the level label? *Anti-bonding*
- ii) What does the letter "n" stand for in the level label? *Non-bonding*
- iii) Draw in box A the electrons after an *allowed* $n \rightarrow \pi^*$ transition. ✓
- iv) Draw in box B the electrons after an *allowed* $\pi \rightarrow \pi^*$ transition. ✓
- v) Although not drawn, there are σ (and σ^*) levels, would you expect the σ levels to be ABOVE or BELOW the π level? *Below*

6-7) In molecular spectroscopy, there is a famous diagram that illustrates the electronic states of a molecule and the transitions between them. The states are arranged vertically by energy and grouped horizontally by spin multiplicity. Non-radiative transitions are indicated by squiggly arrows and radiative transitions by straight arrows. The vibrational ground states of each electronic state are indicated with thick lines, the higher vibrational states with thinner lines. What are the FIRST and LAST names of the scientist whom the diagram is named after?

Aleksander Jablonski

8-11) Photochemical excitation of carbonyl compounds is typically via $n \rightarrow \pi^*$ transition, and we often represent the photochemically excited state as the below diradical.



i) draw curly arrows to account for this transformation.

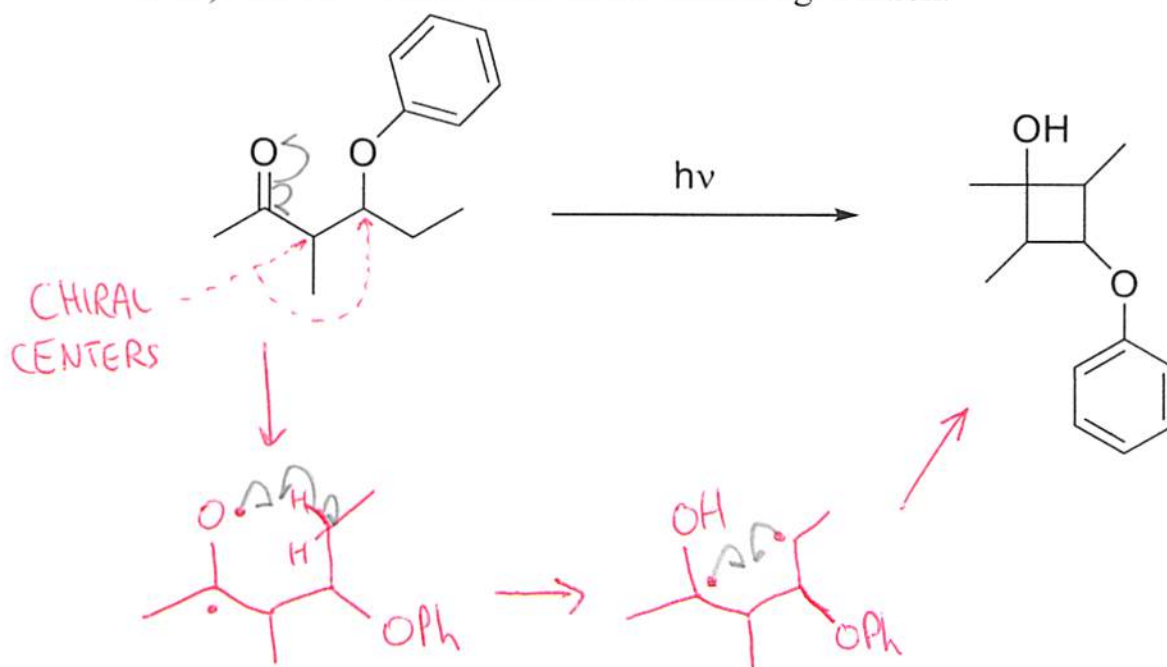
Above

ii) List two limitations or drawbacks of using this Lewis structure to represent the excited state.

a) It is not accurate since it implies that the π electrons have moved, whereas in reality it is $n \rightarrow \pi^*$ movement

b) The above Lewis structure has no information about spin multiplicity of the excited state.

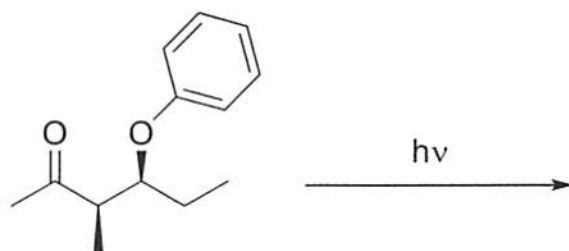
12-16) Provide a mechanism for the following reaction.



17) Indicate the location of the two chiral centers in the above starting material.

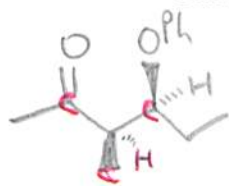
Above

18) If the same reaction was performed on the below single enantiomer, how many different stereoisomers of product would be formed?



Product has 4 chiral centers. Two are fixed, two are created, but with no stereochemical control.
 ?
 So $2^2 = 4$.

(2 BONUS POINTS – assign R or S to each chiral center in this starting material).



Rads-20-TWQ3

19-25) Provide mechanisms for both parts of the following transformation.

