

# Chemistry 351

## Quiz #2

September 11, 2019

Name: \_\_\_\_\_

Student Number: \_\_\_\_\_

Section Number: \_\_\_\_\_

TA: \_\_\_\_\_

### INSTRUCTIONS:

This quiz consists of 4 questions on 3 pages. Please make certain that your quiz is complete.

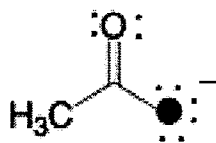
Write your name, student number, and section number **on both the quiz and answer sheet. Be certain to bubble in your PID digits on the answer sheet. The absence of any of these identification items will result in the deduction of 2 points from your score.**

Question 1 and Question 2 are each worth 1 point. Question 3 is worth 2 points. Question 4 is worth 6 points.

Write your answer to Question 1 on the enclosed answer sheet. **Write your answers to Questions 2-4 in the space provided on this quiz.**

When you complete the quiz, insert your answer sheet into your quiz and then hand both in on the bench in front of the lecture hall in the spot indicated by your section number.

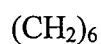
Question 1 refers to the following molecule:



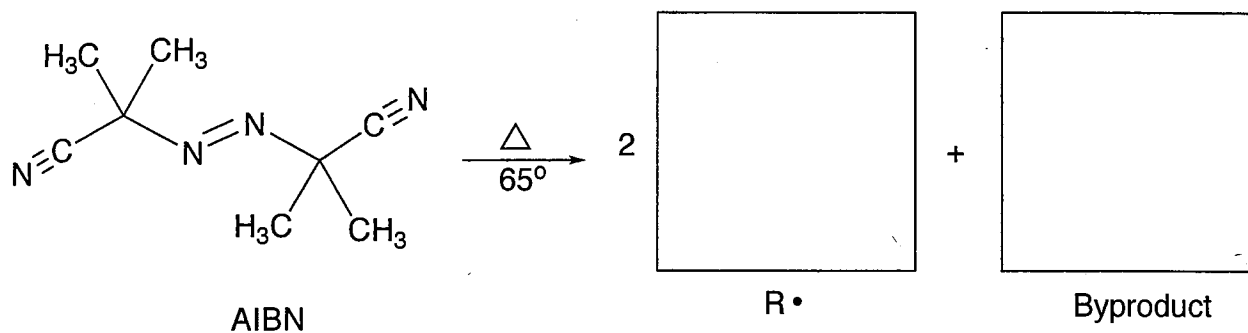
1. What is the hybridization of the shaded oxygen atom?

- a.  $sp^3$  and  $sp^2$     b.  $sp^3$  and  $sp^1$     c.  $sp^2$  and  $sp^1$     d.  $sp^3$     e.  $sp^2$     f.  $sp^1$

2. In the space provided below, draw the line structure (do not show hydrogen atoms) that corresponds to the following condensed formula:



3. 2 pts. Azobisisobutyronitrile (abbreviated as AIBN) is a free radical initiator used in the free radical bromination of  $\text{CH}_4$ . AIBN undergoes a reaction that gives two radicals of identical structure ( $\text{R}\cdot$ ) that react with  $2\text{Br}_2$  to generate  $2\text{RBr}$  along with  $2\text{Br}\cdot$  at a temperature lower than required to homolyze  $\text{Br}_2$  thermally to  $2\text{Br}\cdot$  in the absence of AIBN.

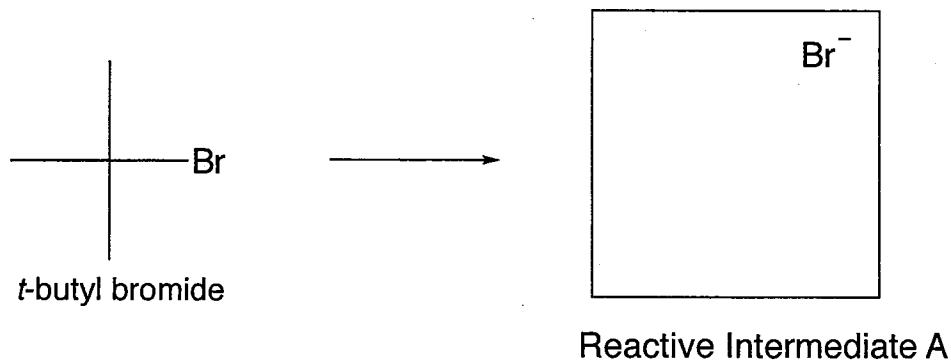


a. In the AIBN structure above, insert 4 arrows that show the flow of electrons when AIBN fragments upon heating to  $65^\circ\text{C}$ .

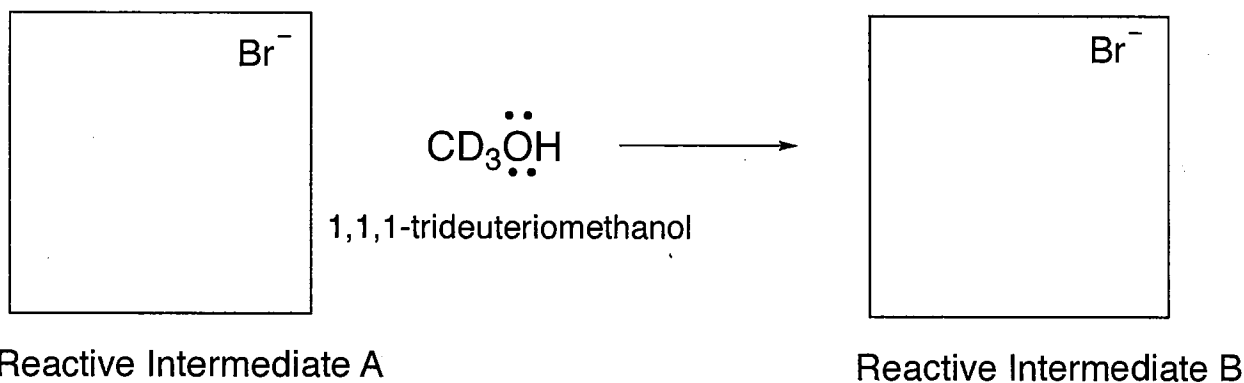
b. In the labeled boxes above, provide the structure of the two structurally identical radicals ( $\text{R}\cdot$ ) and the Byproduct formed upon fragmentation of AIBN. (Hint: The Byproduct is an inert gas.)

4. 6 pts. In the reaction of 1,1,1-trideuteriomethanol ( $\text{CD}_3\text{OH}$ ) with *t*-butyl bromide ( $(\text{CH}_3)_3\text{CBr}$ ):

a. Draw the arrow(s) in the *t*-butyl bromide shown below that show the flow of electrons resulting in formation of Reactive Intermediate A. In the labeled box, provide the structure of Reactive Intermediate A.



b. Draw the arrow(s) that show the flow of electrons in the reaction of Reactive Intermediate A with 1,1,1-trideuteriomethanol ( $\text{CD}_3\text{OH}$ ) resulting in formation of Reactive Intermediate B. In the labeled box below, provide the structure of Reactive Intermediate B.



c. Draw the arrow(s) that show the flow of electrons in the fragmentation of Reactive Intermediate B resulting in the formation of Product A and HBr. In the labeled box below, provide the structures of Product A.

