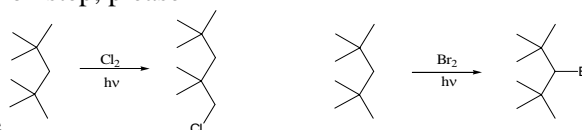


Practice Midterm Exam

Name: KEY

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1	/30
2	/30
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4	/30

1. (30 pts.) 2,2,4,4-tetramethylpentane (shown below) gives a different major product for photochemical chlorination than photochemical bromination. (a) Draw the mechanistic steps for one of these reactions (include only one possible termination step, please show each balanced reaction on a separate line, and include all arrows for movement of electrons); (b) circle the step that determines the regiochemical outcome; and (c) briefly explain the difference between chlorination and bromination.



(a)

initiation:

$$\text{Br}-\text{Br} \xrightarrow{h\nu} 2 \text{ Br}^\cdot$$

propagation:

(b)

$$\text{Br}^\cdot + \text{C}_5\text{H}_{12} \rightarrow \text{C}_5\text{H}_{11}^\cdot + \text{H-Br}$$

$$\text{C}_5\text{H}_{11}^\cdot + \text{Br}_2 \rightarrow \text{C}_5\text{H}_{11}\text{Br} + \text{Br}^\cdot$$

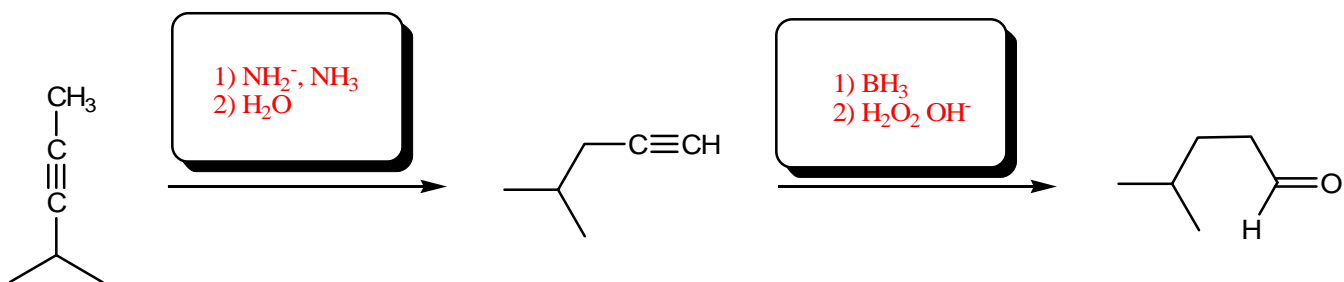
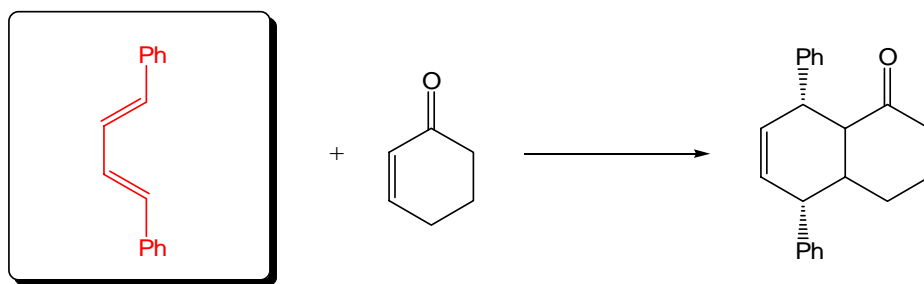
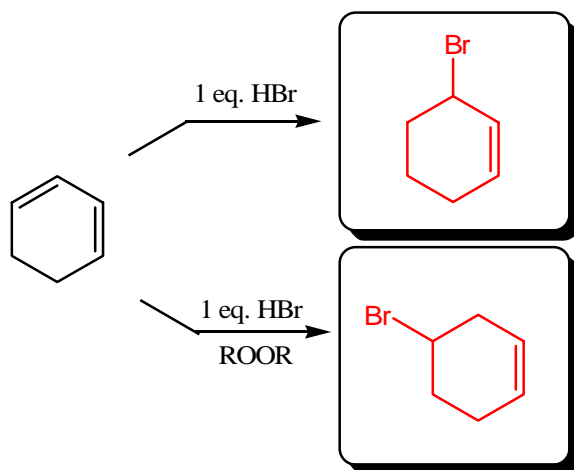
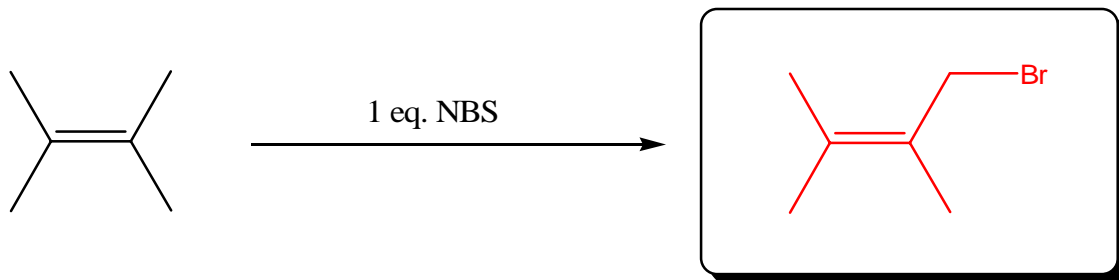
termination: (eg.)

$$2 \text{ C}_5\text{H}_{11}^\cdot \rightarrow \text{C}_{10}\text{H}_{22}$$

(c) As shown from Δ^\ddagger H-abstraction w/ Br^\cdot is more selective, taking only the H that leads to the more stable radical.

Cl^\cdot H-abst. is less selective and the major product will depend on both the substitution pattern & the # of equivalent H atoms.

2. (30 pts.) Provide the missing reactants, reagents, and products.



3. (30 pts.) Determine the structure represented by each of the following NMR spectra. Show your work. Next to each signal write what you can determine about the molecular fragment that it represents. Write your answer in the box and assign each peak by placing the appropriate chemical shift next to each nucleus.

(a) $C_6H_{10}O$

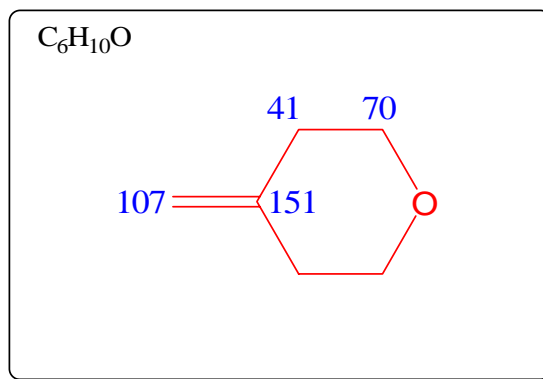
δ ^{13}C NMR

151 s

107 t

70 t

41 t



(b) $C_5H_8O_2$

δ ^{13}C NMR

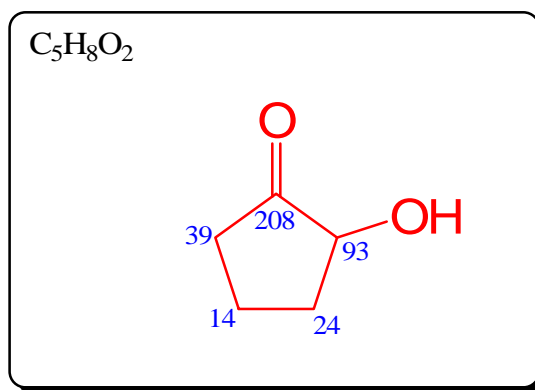
208 s

93 d

39 t

24 t

14 t



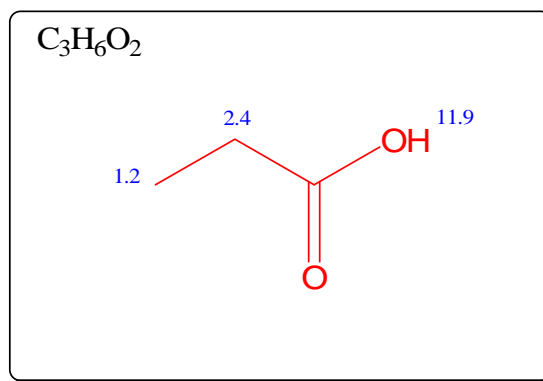
(c) $C_3H_6O_2$

δ 1H NMR

11.9 broad s, 1H (exchanges)

2.4 q, 2H

1.2 t, 3H



4.

