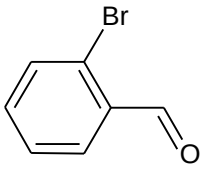
Nomenclature, Structure, and Properties of Aldehydes & Ketones

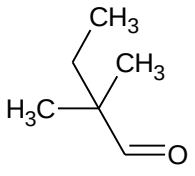
1. Write a structural formula for each of the following compounds:
    a. *m*-chlorobenzaldhyde
    b. 2,2-dibromohexanal
    c. 3-ethylcycloheptanone
    d. 1-phenyl-2-butanone

2. Name each of the following compounds

a. $CH_3CH_2\overset{\overset{O}{\|}}{C}CH_2CH_3$

b. $(C_6H_5)_2C{=}O$

c. 

d. 

3. Give an example of each of the following:
    a. cyanohydrin
    b. enolate
    c. hemiacetal
    d. imine

4. Arrange the following in order of decreasing boiling point. Explain why you have arranged them in such an order: 4-heptanone, 2,4-dimethyl-3-pentanone, heptanal.

Synthesis of Aldehydes and Ketones

5. Write an equation for the synthesis of 2-hexanone by hydration of an alkyne.

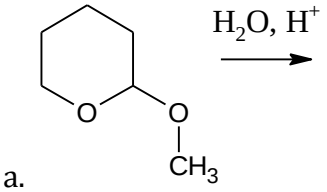
6. Write an equation for the synthesis of pentanal from an alcohol.

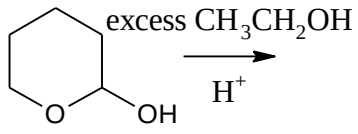
Reactions of Aldehydes and Ketones

7. Write an equation for the reaction, if any, of *p*-bromobenzaldehyde with each of the following reagents, and name the organic product:
    a. Tollens reagent
    b. cyanide ion
    c. methyl amine (CH_3NH_2)

8. What simple chemical test can distinguish between the following pair of compounds: benzyl alcohol and benzaldhyde.

9. Complete each of the following equations:

a. 

b. 

Reactions with Grignard Reagents and Other Nucleophiles

10. Write an equation for the reaction of each of the following with methylmagnesium bromide, followed by hydrolysis with aqueous acid:

a. acetaldehyde

b. acetophenone

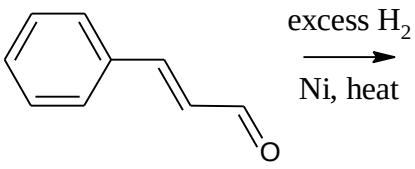
11. Using a Grignard reagent and the appropriate aldehyde or ketone, show how each of the following can be prepared:

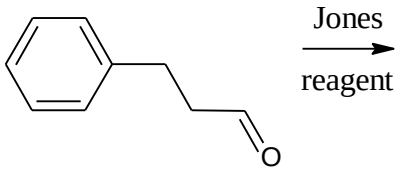
a. 2-methyl-2-pentanol

b. 3-butene-2-ol

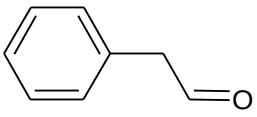
Oxidations and Reductions

12. Give the structure of each product:

a. 

b. 

Enols, Enolates, and the Aldol Reaction

13. Write the structural formulas of all possible enols of 

14. Write the steps in the mechanism for the aldol condensation of butanal.