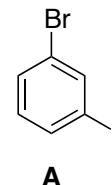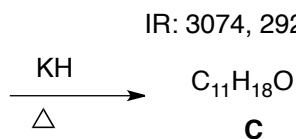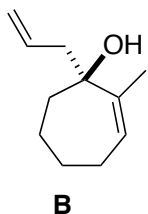1. (10 points) Using any piece that contributes three or fewer carbons to the final product, and any monosubstituted benzene derivative that contributes at most seven carbons to the final product, outline a synthesis of **A**.

A

2. (10 points) Deduce the structure of **C**, and draw an arrow-pushing mechanism for its formation.
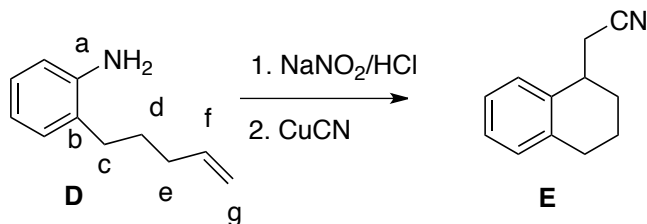

B

IR: 3074, 2927, 2862 , 1700, 1640 cm^{-1}

$\xrightarrow[\triangle]{KH}$ $C_{11}H_{18}O$

C

^{13}C NMR
215.7, s
137.2, d
116.2, t
49.3, d
43.3, t
40.1, d
34.5, t
32.3, t
25.9, t
24.2 t
12.9, q

^{1}H NMR
1.0-1.1 d, J=8.2 Hz, 3H
1.5-2.0 m, 8H
2.3-2.4, m, 2H
2.6, m, 1H
2.8, m, 1H
5.0, m, 2H
5.71, ddt, J = 15.6, 11.2, 7.1 Hz, 1H

3. (10 points)Draw an arrow-pushing mechanism for the conversion of **D** to **E**.

D

$\xrightarrow[\text{2. CuCN}]{\text{1. NaNO}_2/\text{HCl}}$

E

bb bf