Name: ________________________________________

1. (3 points) -Br is a(n) (activating/deactivating) __________ substituent and is (ortho,para / meta) __________ directing. Therefore, the product of the following reaction is:

\[
\text{Br} \quad \overset{\text{SO}_3, \text{H}_2\text{SO}_4}{\longrightarrow} \quad \text{H}_2\text{SO}_4
\]

2. (3 points) –OCH\text{2CH}_3\text{Br} is a(n) (activating/deactivating) __________ substituent and is (ortho,para / meta) __________ directing. Therefore, the product of the following reaction is:

\[
\text{OCH}_2\text{CH}_3 \quad \overset{\text{HNO}_3, \text{H}_2\text{SO}_4}{\longrightarrow} \quad \text{H}_2\text{SO}_4
\]

3. (3 points) –C(O)CH\text{3} is a(n) (activating/deactivating) __________ substituent and is (ortho,para / meta) __________ directing. Therefore, the product of the following reaction is:

\[
\text{O} \quad \overset{\text{Cl}_2, \text{FeCl}_3}{\longrightarrow} \quad \text{FeCl}_3
\]
4. (1 points) Which of the following compounds reacts most *slowly* during nitration?

I. \( \text{OCH}_2\text{CH}_3 \)

II. \( \text{OH} \)

III. \( \text{O} \)

IV. \( \text{NH}^+\text{CH}_3 \)

V. \( \text{CH}_3 \)

5. BONUS (2 points): Which of the following is the best method for accomplishing this synthesis?

\[ \text{I} \quad \text{II} \quad \text{III} \]

I. \( \text{CH}_3\text{CH}_2\text{CH}_2\text{Cl}/\text{AlCl}_3 \)

II. \( \text{CH}_3\text{CH}_2\text{CCl}/\text{AlCl}_3 \; ; \; \text{Zn(Hg)/HCl/heat} \)

III. \( \text{CH}_3\text{CH}_2\text{CCl}/\text{AlCl}_3 \; ; \; \text{NH}_2\text{NH}_2/O^\ominus, \text{heat} \)

a) I
b) II
c) III
d) either I or II
e) either II or III