

Name \_\_\_\_\_ Date \_\_\_\_\_

## Worksheet 22.1: Lewis acids and bases and their roles in organic reactions

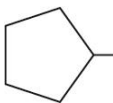
1 Identify the Lewis acid and Lewis base in the following reactions (forward reaction only):

- a  $\text{NH}_3 + \text{BCl}_3 \rightarrow \text{H}_3\text{NBCl}_3$
- b  $(\text{CH}_3)_3\text{CBr} + \text{OH}^- \rightarrow (\text{CH}_3)_3\text{OH} + \text{Br}^-$
- c  $2\text{H}_2\text{O} \rightleftharpoons \text{H}_3\text{O}^+ + \text{OH}^-$
- d  $\text{H}_2\text{C}=\text{CH}_2 + \text{H}_2\text{O} \rightarrow \text{C}_2\text{H}_5\text{OH}$
- e  $\text{HNO}_3 + \text{H}_2\text{SO}_4 \rightleftharpoons \text{NO}_2^+ + \text{H}_2\text{O} + \text{HSO}_4^-$
- f  $\text{Fe}^{3+} + 6\text{CN}^- \rightarrow [\text{Fe}(\text{CN})_6]^{3-}$
- g  $\text{AlCl}_3 + \text{Cl}_2 \rightarrow \text{AlCl}_4^- + \text{Cl}^+$

2 Draw the structural formula of the major organic product in each of the following reactions. Name the type of reaction.

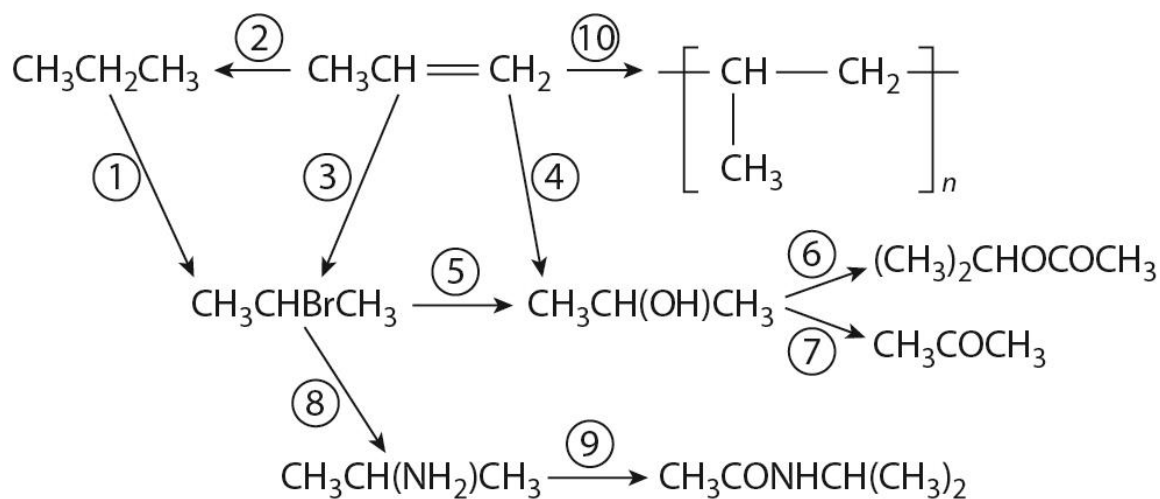
- a  $\text{CH}_3\text{CH}=\text{CH}_2 + \text{HBr} \rightarrow$
- b  $\text{CH}_3\text{CH}_2\text{CH}_2\text{Br} + \text{KOH}(\text{aq}) \rightarrow$
- c  $\text{CH}_3\text{CHOHCH}_3$  with acidified potassium dichromate(VI)
- d 2-chloro-2-methylbutane with KCN

e ethanedioic acid with excess  $\text{LiAlH}_4$

f  Br with  $\text{NH}_3$  in a 1 : 1 mole ratio

g  $\text{C}_6\text{H}_6$  with concentrated  $\text{HNO}_3$  and  $\text{H}_2\text{SO}_4$ .

3 Complete the following reaction sequence with



a reagents and reaction conditions for each of the steps 1–7;

b name of the types of reaction for steps 8–10;

c Draw the mechanisms for each of the steps 1, 3 and 5.