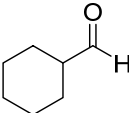
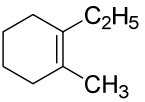


2. REDUCTION

1. Predict products of the following reactions (VS).

- a)  $\xrightarrow{\text{NaBH}_4, \text{CH}_3\text{CH}_2\text{OH}}$
- b) $\text{CH}_3\text{C}(=\text{O})\text{CH}_2\text{CH}_2\text{C}(=\text{O})\text{CH}_3 \xrightarrow[2. \text{H}^+, \text{H}_2\text{O}]{1. \text{LiAlH}_4, (\text{CH}_3\text{CH}_2)_2\text{O}}$
- c)  $\xrightarrow{\text{H}_2, \text{PtO}_2, \text{CH}_3\text{CH}_2\text{OH}}$
- d) $\text{CH}_3\text{CH}_2\text{CH}_2\text{C}\equiv\text{CCH}_2\text{CH}_3 \xrightarrow{\text{H}_2, \text{Pt}}$
- e) $\text{CH}_3\text{CH}_2\text{CH}_2\text{C}\equiv\text{CCH}_2\text{CH}_3 \xrightarrow{\text{H}_2, \text{Lindlar catalyst}}$

2. Fill in the table below (MS2, CS5, March).

Reducing agent	Examples	Application	Properties	Limitations/advantages
H ₂ /catalyst				
Metal hydrides				
Dissolving metals				
Nitrogen compounds				
Carbon compounds				
Silicon compounds				

3. In the table below, provide conditions for catalytic reduction of specific functional groups (MS2, CS5, March).

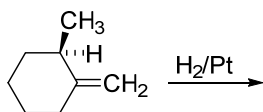
Functional group	Reduction product	Common catalysts	Typical reaction conditions
RCOOH	RCH ₂ OH		
RC≡N	RCH ₂ NH ₂		
	RCH ₂ NH ₂		
RNO ₂	RNH ₂		

4. For the hydride donor reagents in the table, provide the expected reduction products for specific functional groups (MS2, CS5, March).

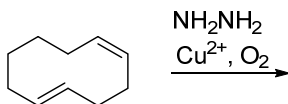
Hydride donor	Acyl chloride	Aldehyde or ketone	Ester	Amide	Carboxylate salt
NaBH ₄					
NaBH ₃ CN					
B ₂ H ₆					
DIBALH					
AlH ₃					
LiAlH ₄					
LiAlH(OtBu) ₃					

5. Predict products of the following reactions (CS5).

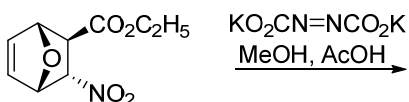
a)



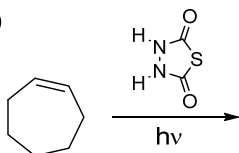
b)



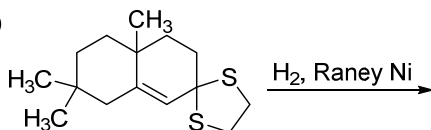
c)



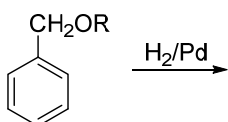
d)



e)

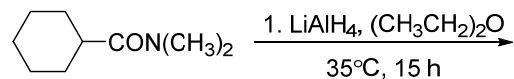


f)

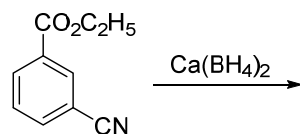


6. Predict products of the following reactions (CS5).

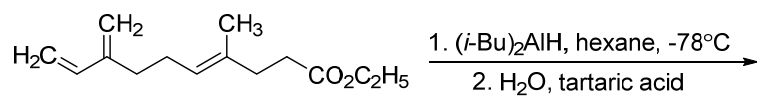
a)

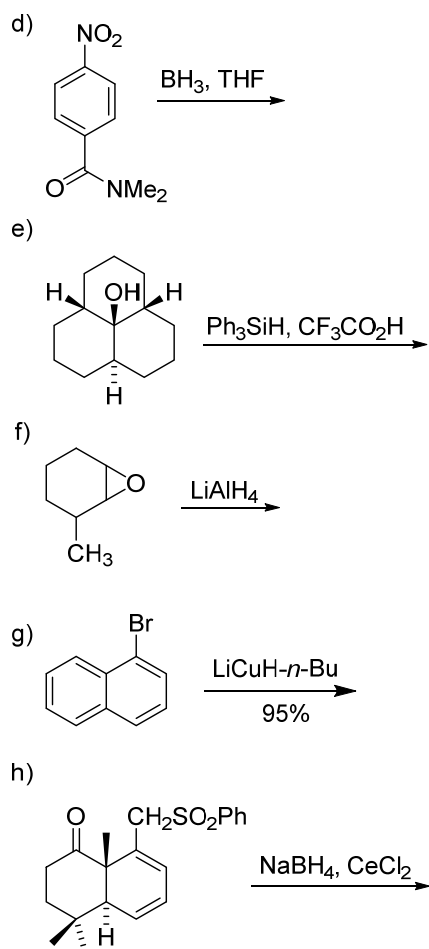


b)



c)





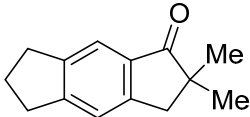
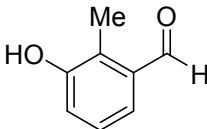
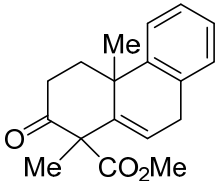
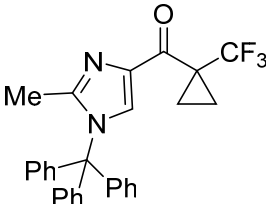
7. Fill in the table (MS2, CS5, March).

Type of catalyst/abbreviation	Formula/composition
Lindlar catalyst	
Rosenmund catalyst	
DIBALH (other abbreviations:.....)	
LTEAH	
SBAH (other other abbreviations/names:.....)	

8. Find examples of the following reactions reported in original literature (SciFinder).

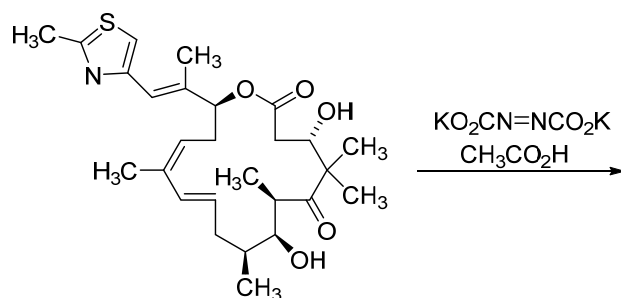
- Leuckart-Wallach reduction
- Eschweiler-Clarke methylation

9. For the substrates below, propose the preferred reduction method (Clemmensen vs. Wolff-Kishner) and draw the structure of the product (MS2, CS5, March).

Conditions and modifications (DOI)	Substrate(s)	Product(s)
10.1021/ja00466a038		
10.15227/orgsyn.033.0017		
10.15227/orgsyn.053.0086		
10.1021/op9000274		

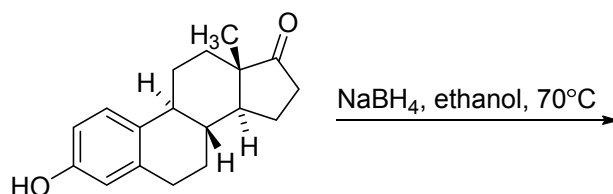
10. On the basis of the reference, provide the product of the following reaction.

K. Biswas, H. Lin, J. T. Njgardson, M. D. Chappell, T.-C. Chou, Y. Guan, W. P. Tong, L. He, S. B. Horwitz, and S. J. Danishefsky, *J. Am. Chem. Soc.*, **2002**, *124*, 9825.



11. On the basis of the reference below, discuss the result and mechanism of the following reaction.

Aditya, A., Nichols, D. E., Loudon, G. M., *J. Chem. Educ.* **2008**, *85*, 1535



12. On the basis of the reference below, discuss the products of the stepwise catalytic hydrogenation of undeca-1,7-diyne.

Dobson, N.A., Eglinton, G., Krishnamutri, M., Raphael, R. A., Willis, R. G., *Tetrahedron*, **1961**, 16, 16.

13. On the basis of the references, discuss the properties and applications of the reducing agents investigated by the authors.

a) Mahoney, W. S., Brestensky, D. M, Stryker, J. M., *J. Am. Chem. Soc.* **1988**, 110, 291;

b) Brown, H. C., Heim, P., *J.Org. Chem.* **1973**, 38, 912.