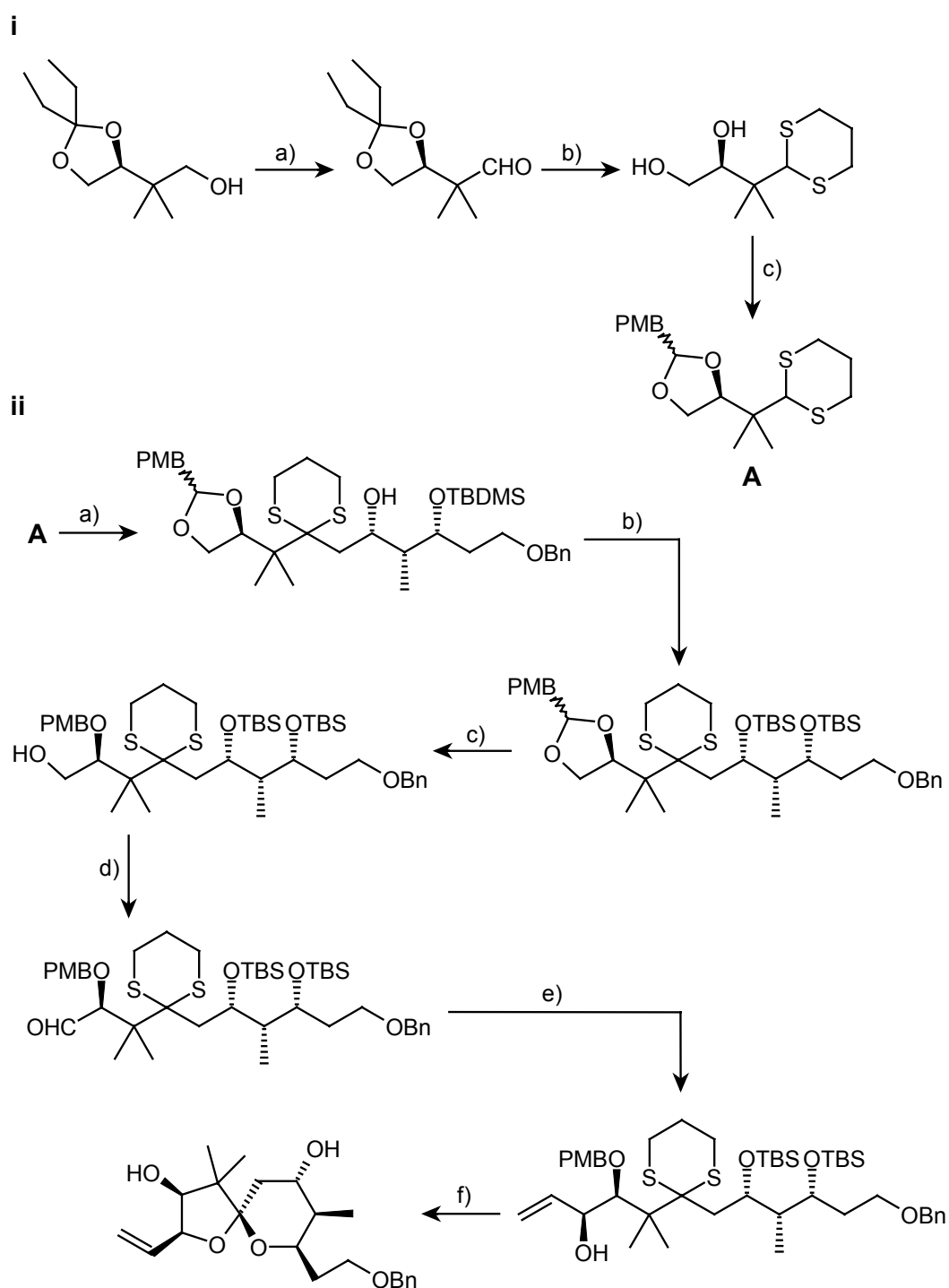




**Exercises in  
Organic Chemistry  
- Solutions -**

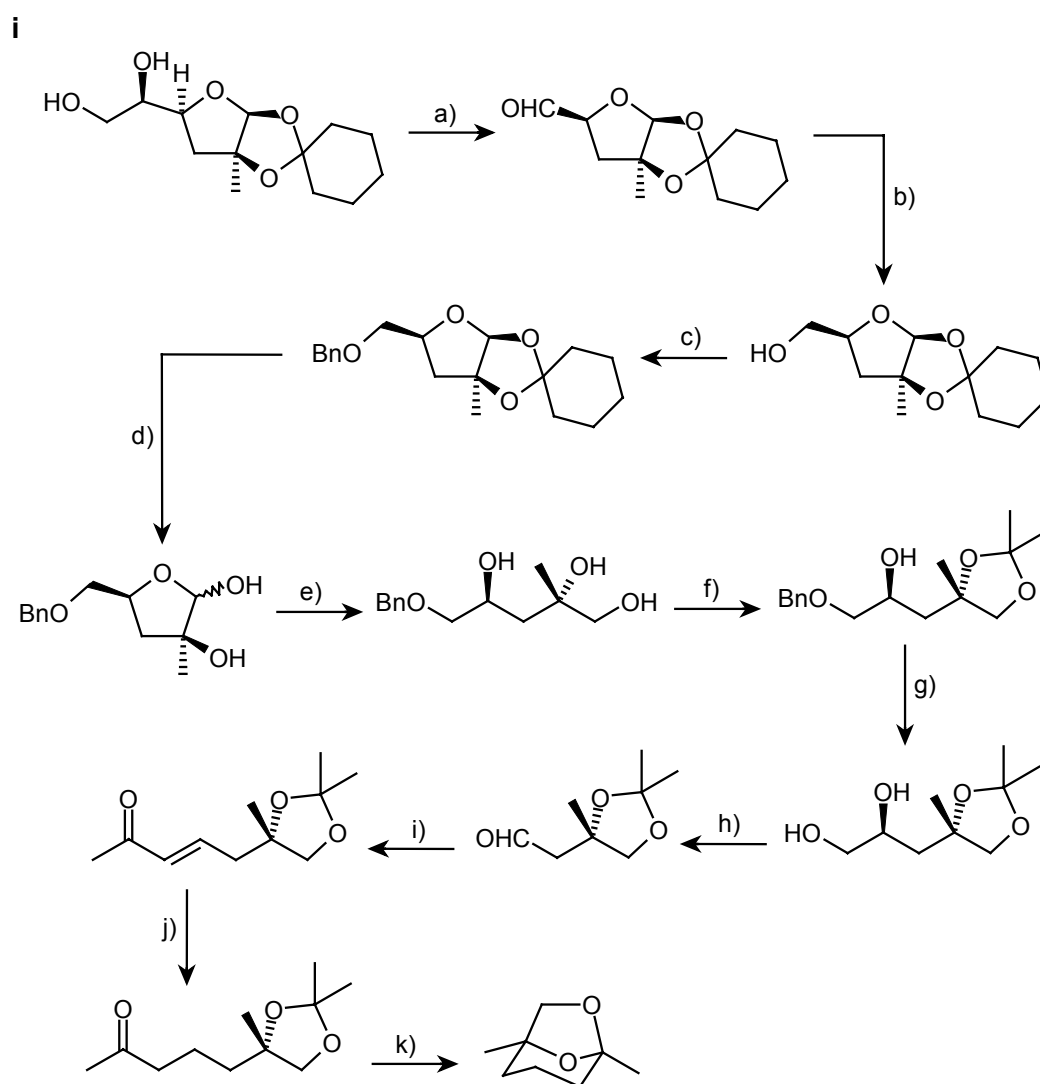


## Exercise 1.



**Bibliography:** Smith III, A.B.; Duan, J.J.-W.; Hull, K.G.; Salvatore, B.A. *Tetrahedron Lett.* **1991**, *32*, 4855.

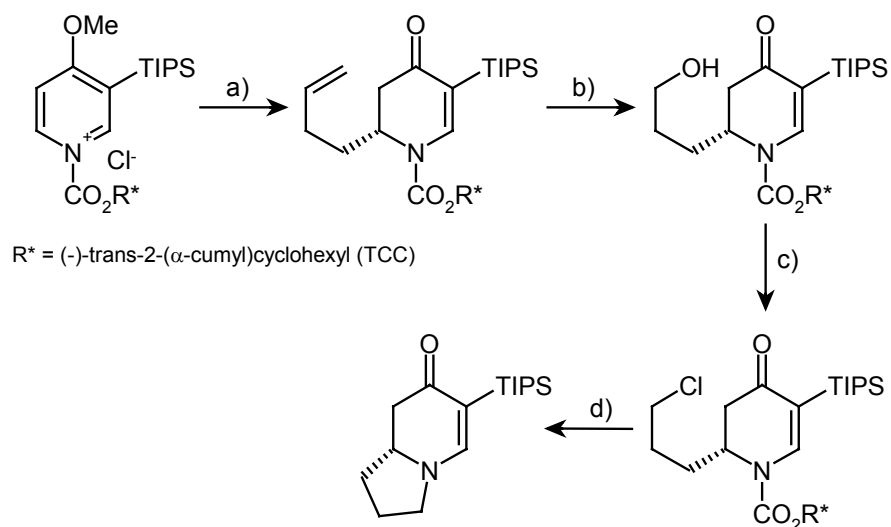
**Exercise 2.**



**Bibliography:** *ApSimon*, Vol. 4, 154.

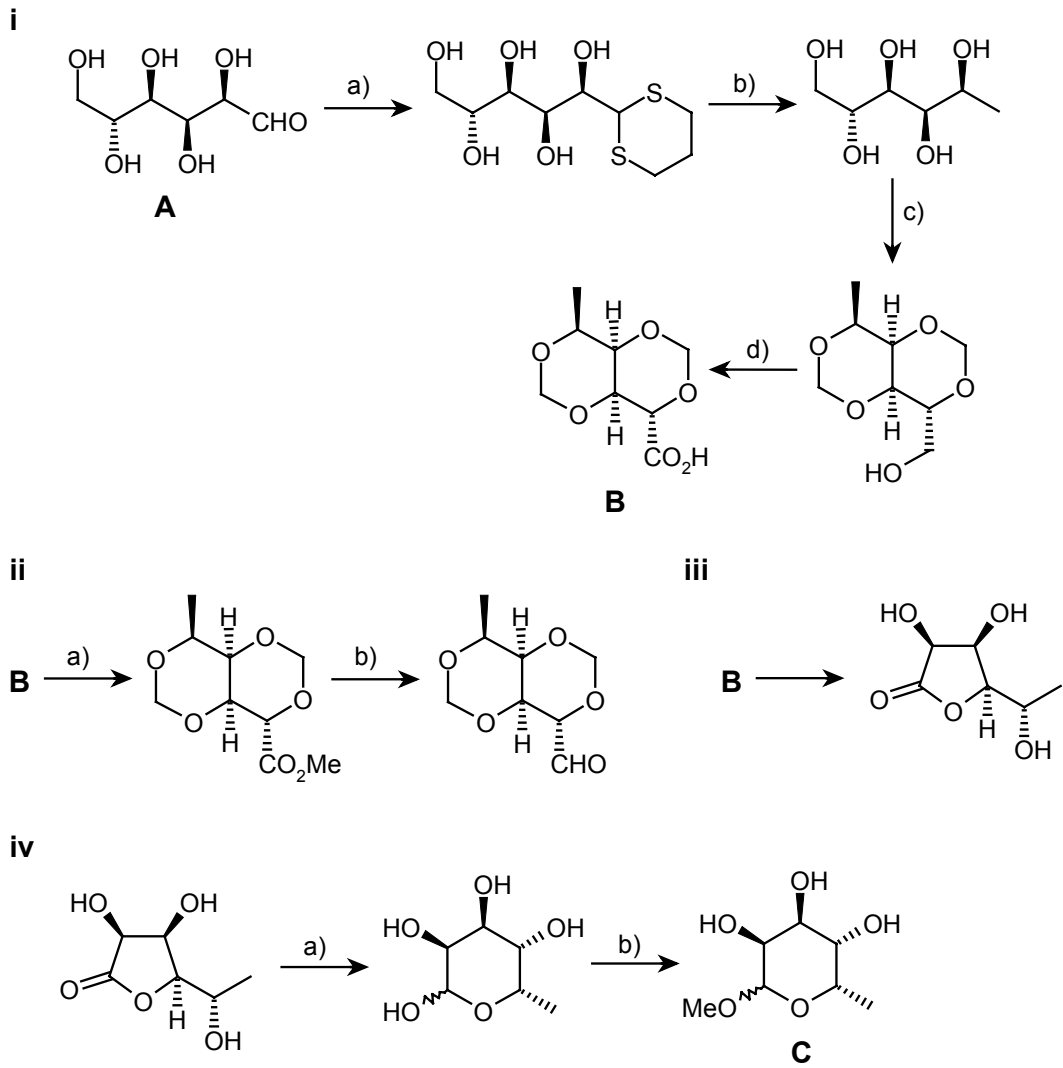
**Exercise 3.**

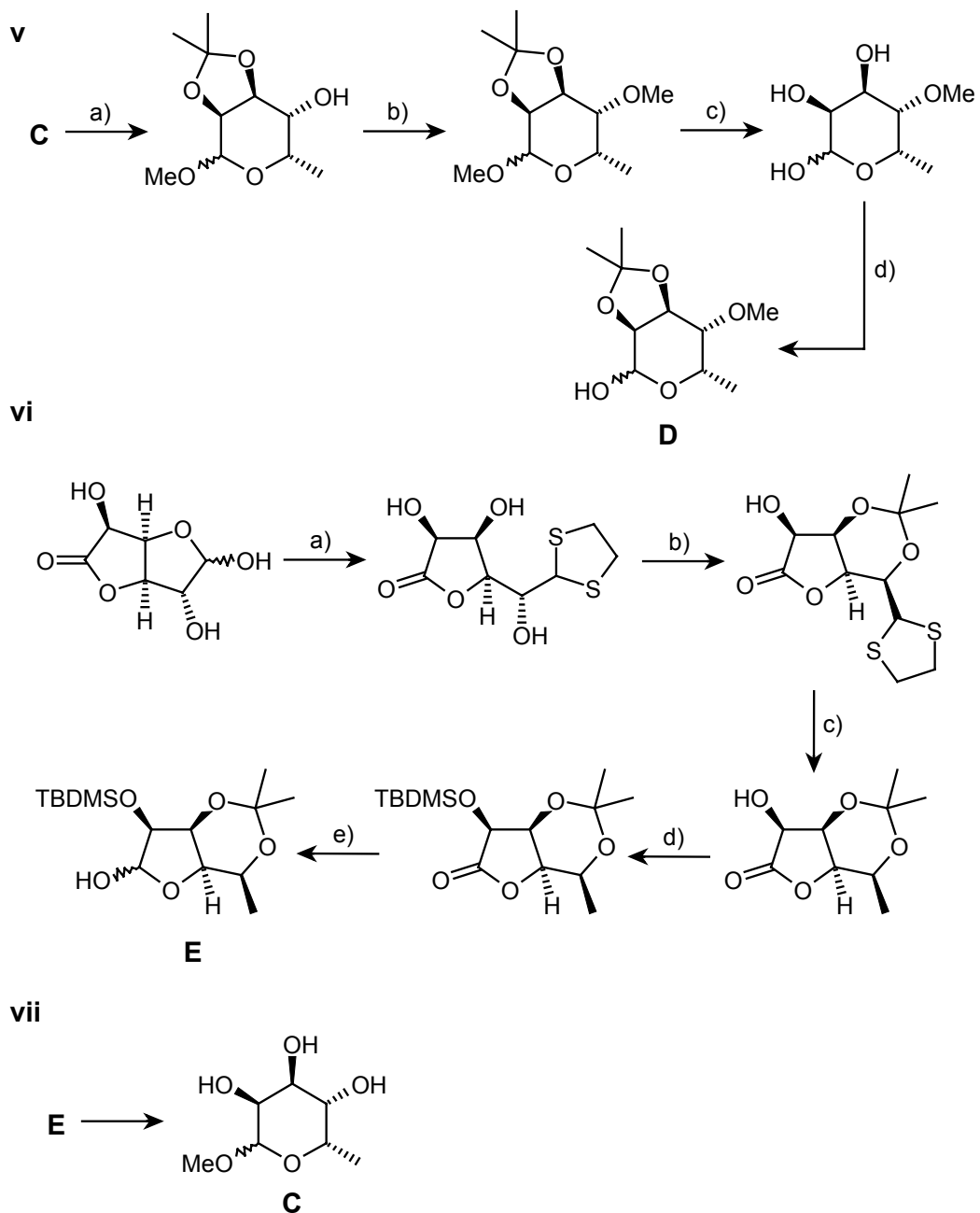
i



**Bibliography:** Comins, D.L.; Chen, X. y Morgan, L.A. *J. Org. Chem.* **1997**, *62*, 7435.

**Exercise 4.**

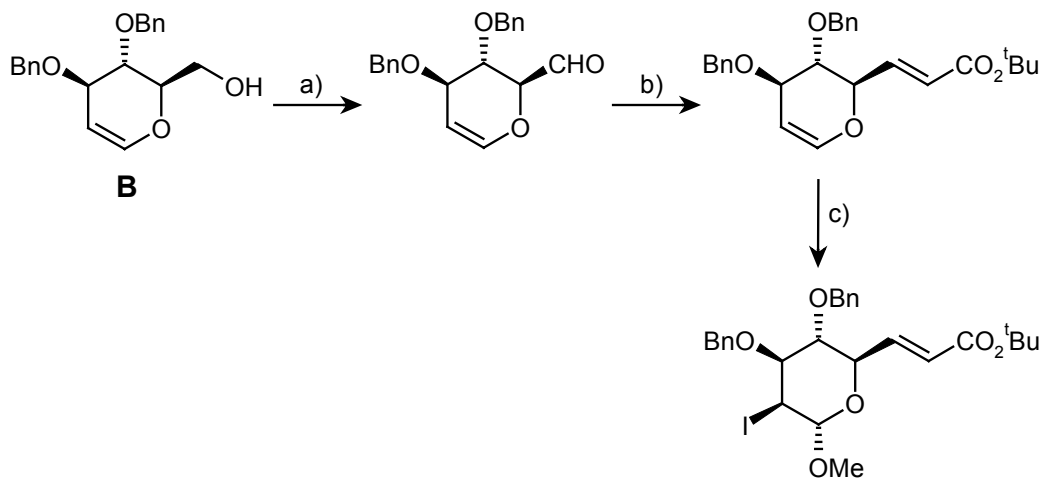




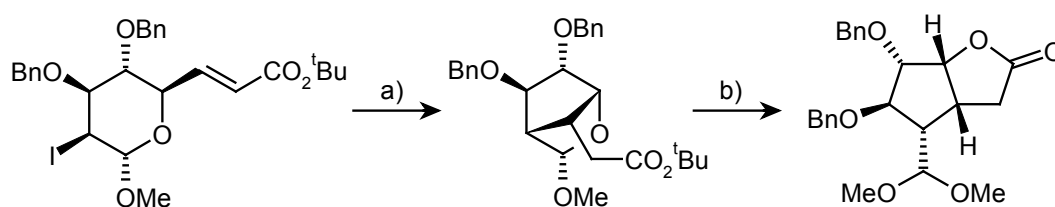
**Bibliography:** Ireland, R.B.; Wilcox, C.S. *J. Org. Chem.* **1980**, *45*, 197.

**Exercise 5.**

**i**

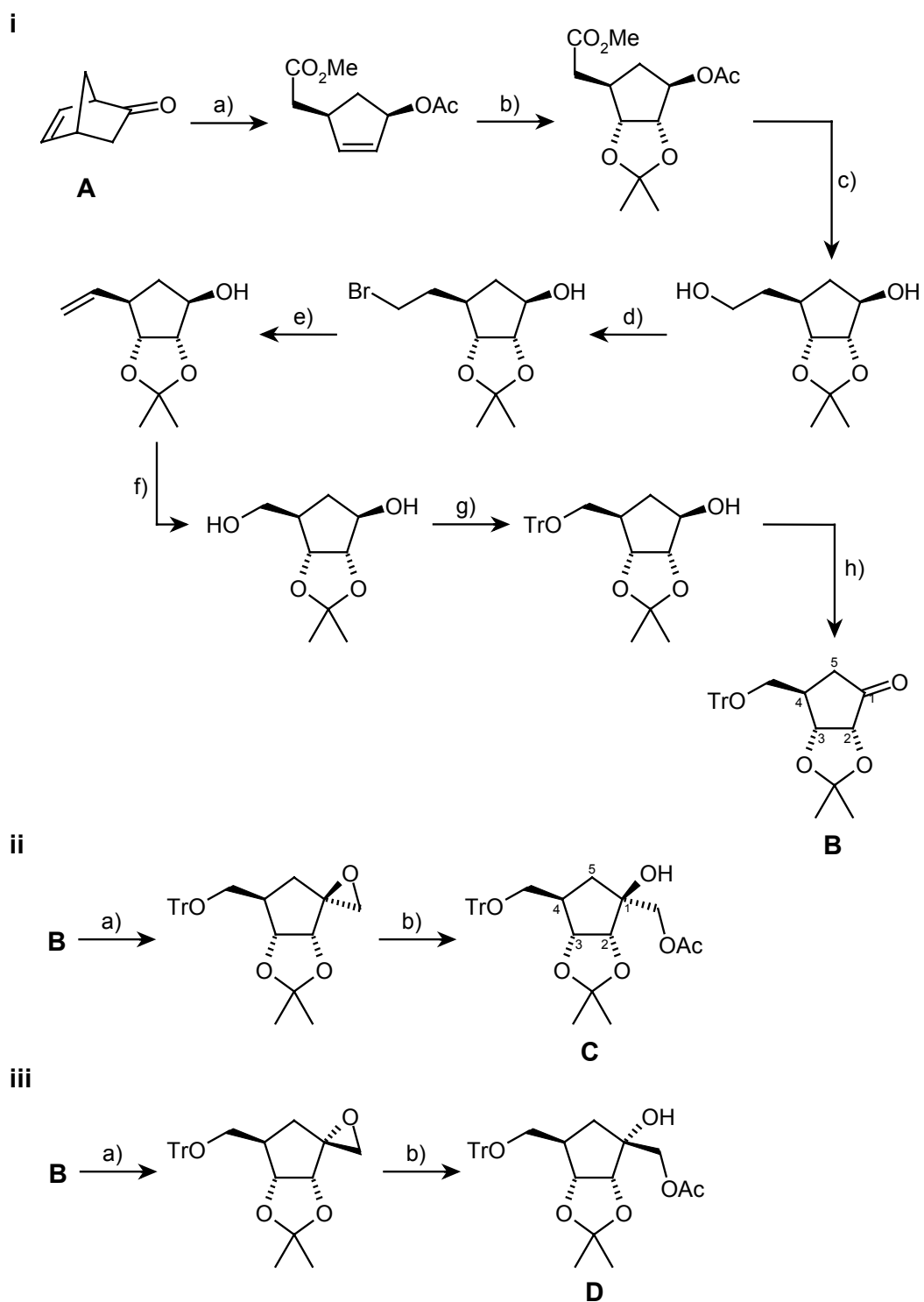


**ii**



**Bibliography:** Vite, G.D.; Alonso, R.; Fraser-Reid, B. *J. Org. Chem.* **1989**, 2268.

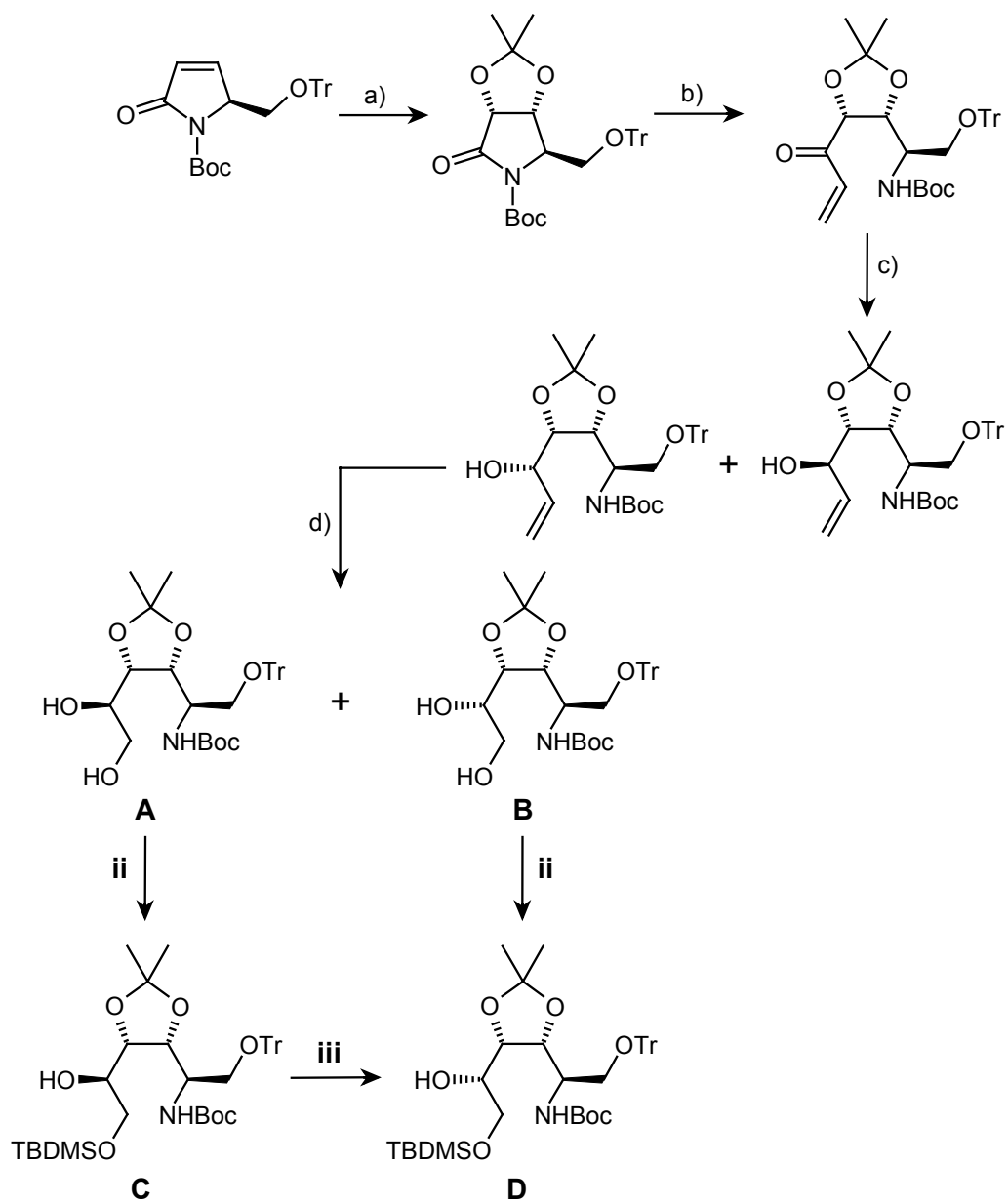
## Exercise 6.



**Bibliography:** Marschner, C.; Penn, G.; Griengl, H. *Tetrahedron* **1993**, *49*, 5067.

## Exercise 7.

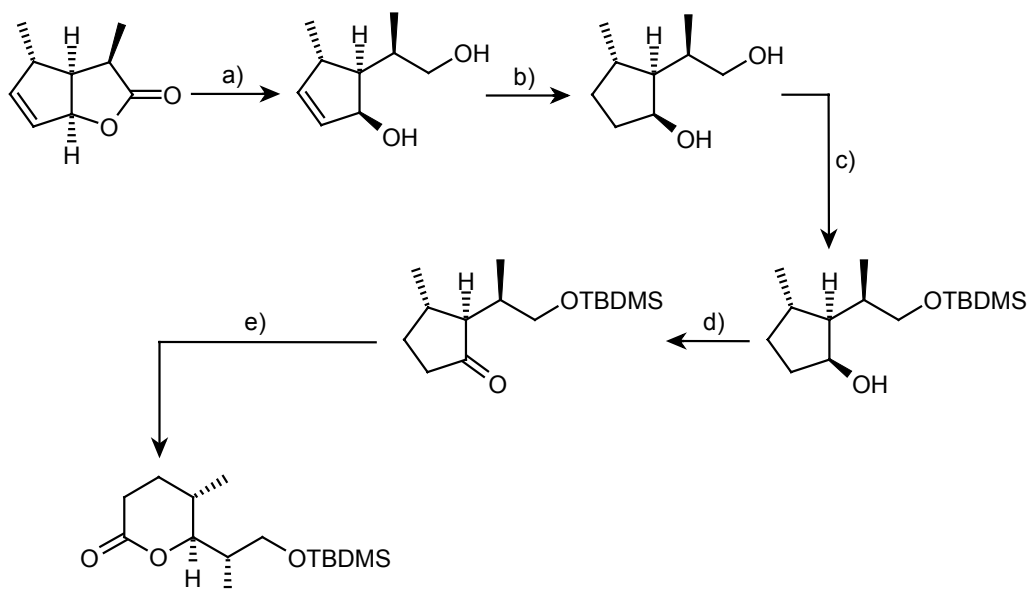
i



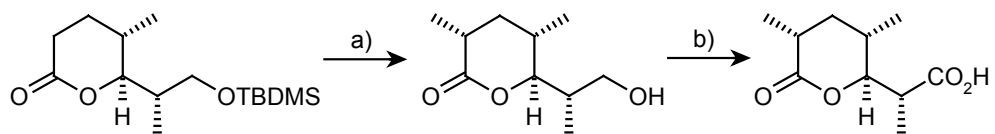


**Exercise 8.**

**i**



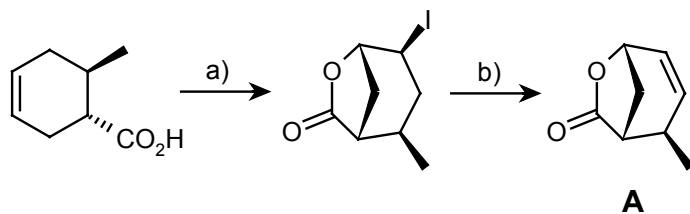
**ii**



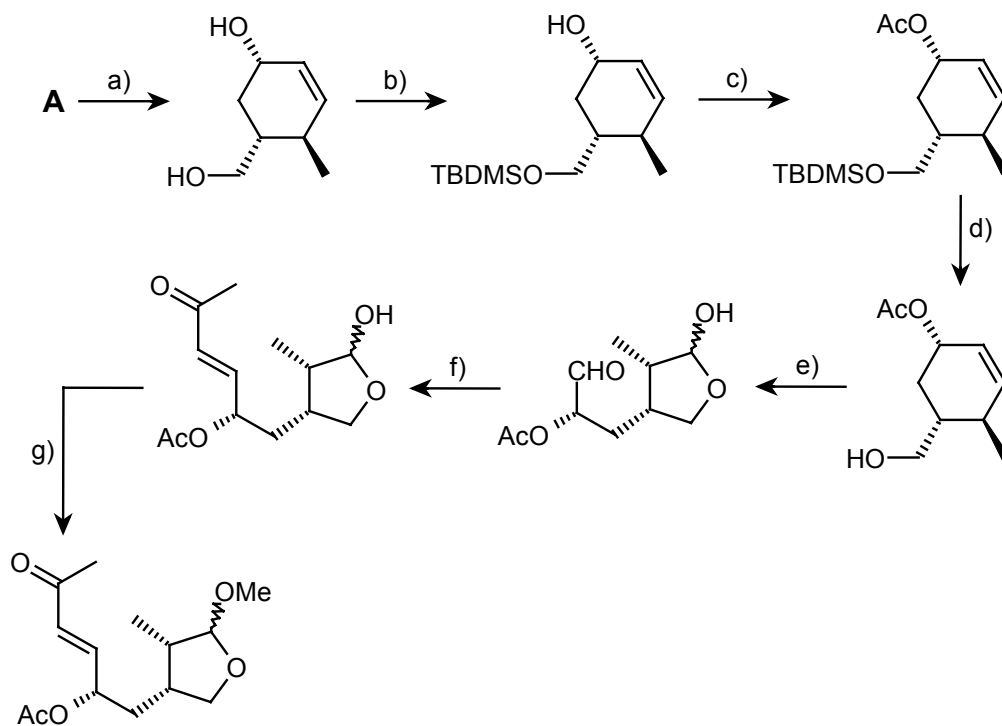
**Bibliography:** Grieco, P.A.; Ohfuné, Y.; Yokoyama, Y.; Owens, W. *J. Am. Chem. Soc.* **1979**, *101*, 4749.

## Exercise 9.

i



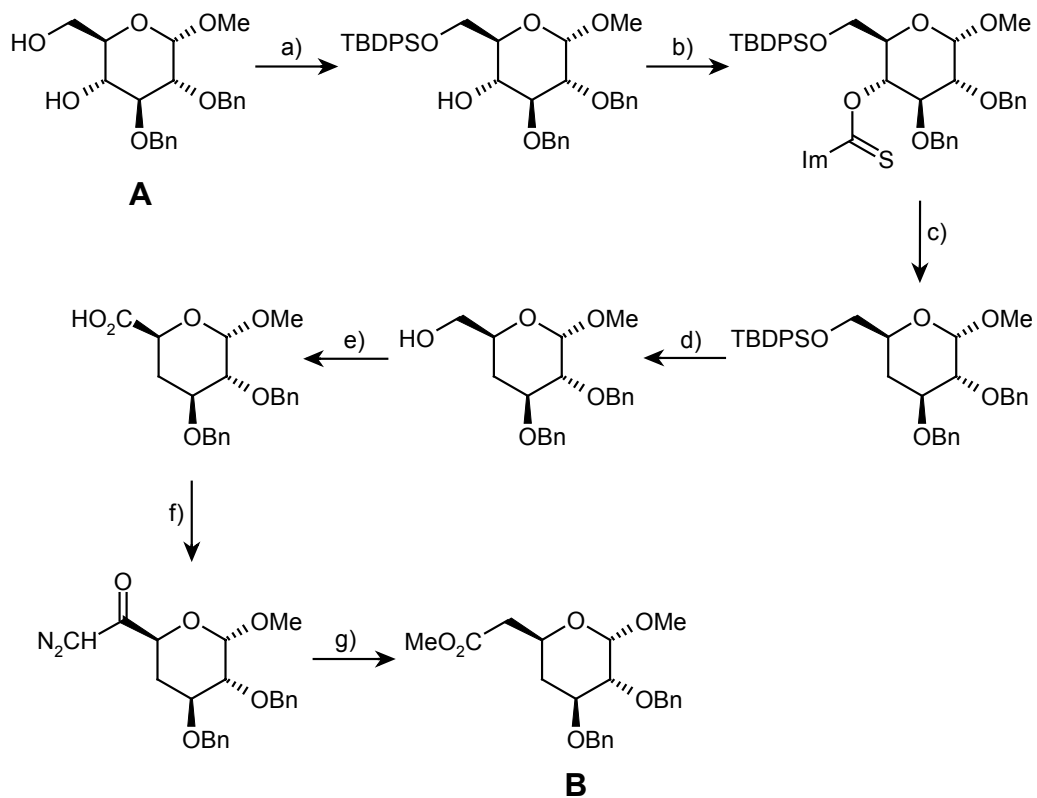
ii



**Bibliography:** Toyota, M.; Nishikawa, Y.; Motoki, K.; Yoshida, N.; Fukumoto, K. *Tetrahedron* **1993**, *48*, 11189.

**Exercise 10.**

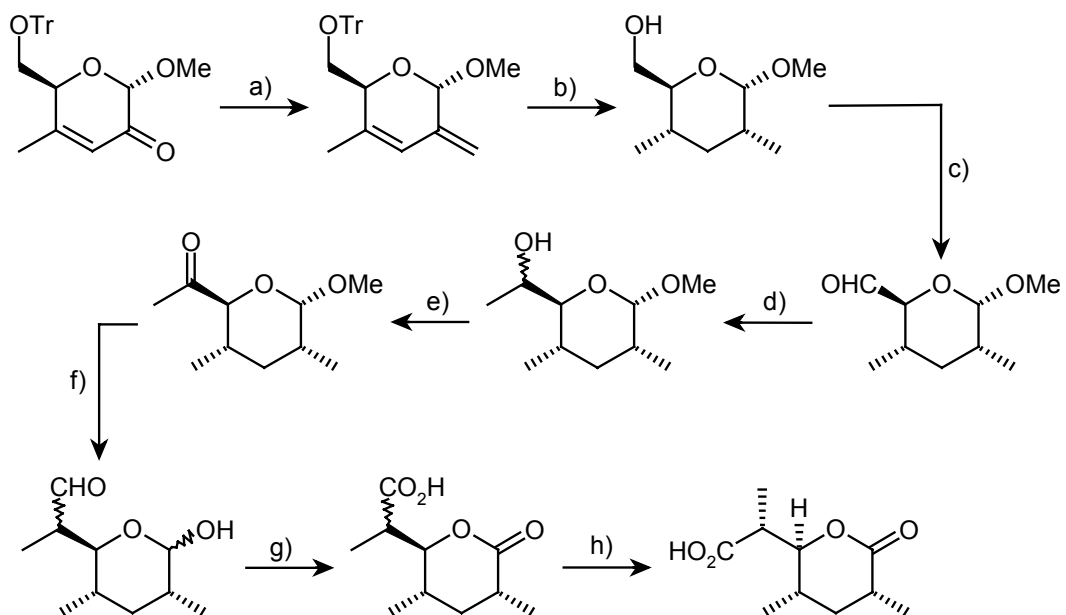
i



**Bibliography:** Kende, A.S.; Mendoza, J.S.; Fujii, Y. *Tetrahedron* **1993**, *36*, 8015.

## Exercise 11.

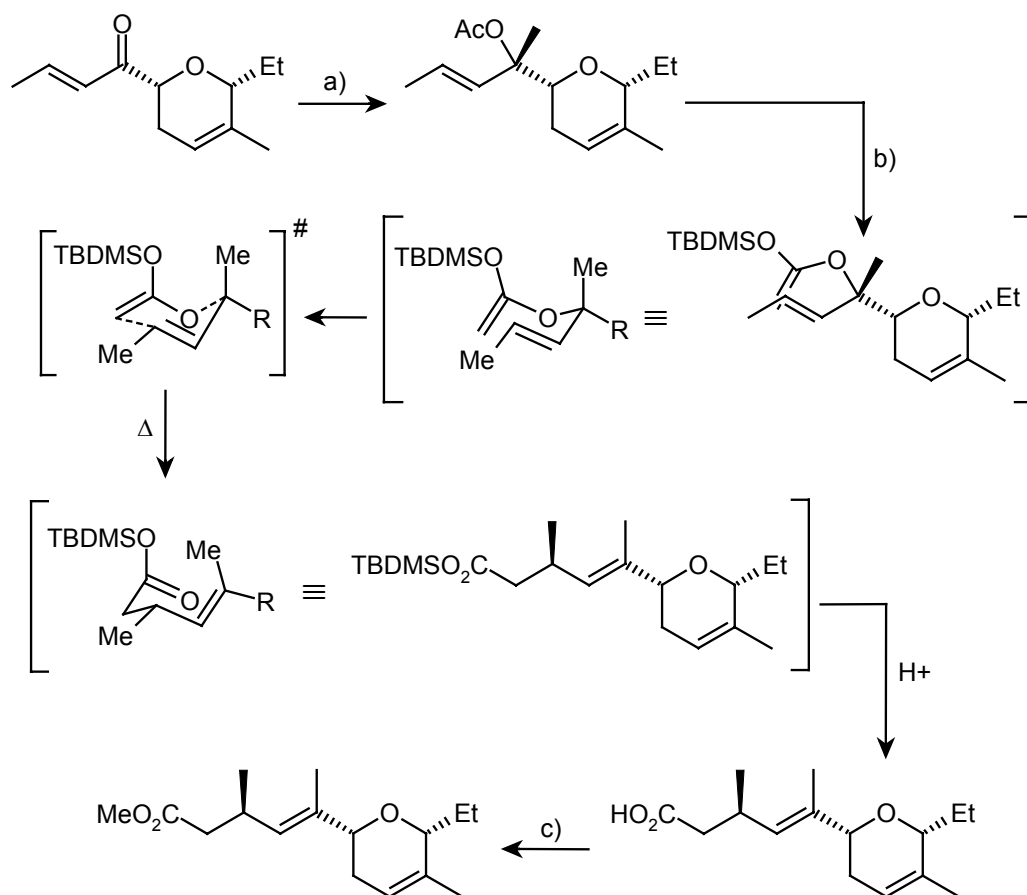
i



**Bibliography:** Jarosz, S.; Fraser-Reid, B. *Tetrahedron Lett.* **1981**, *22*, 2533.

## Exercise 12.

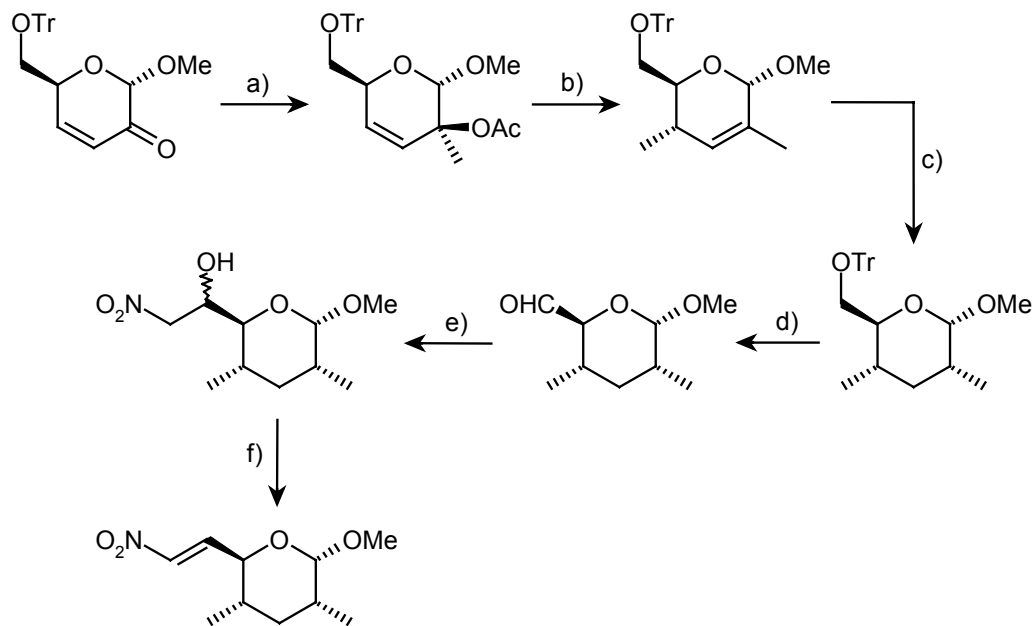
i



**Bibliography:** Kende, A.S.; Mendoza, J.S.; Fujii, Y. *Tetrahedron* **1993**, 36, 8015.

## Exercise 13.

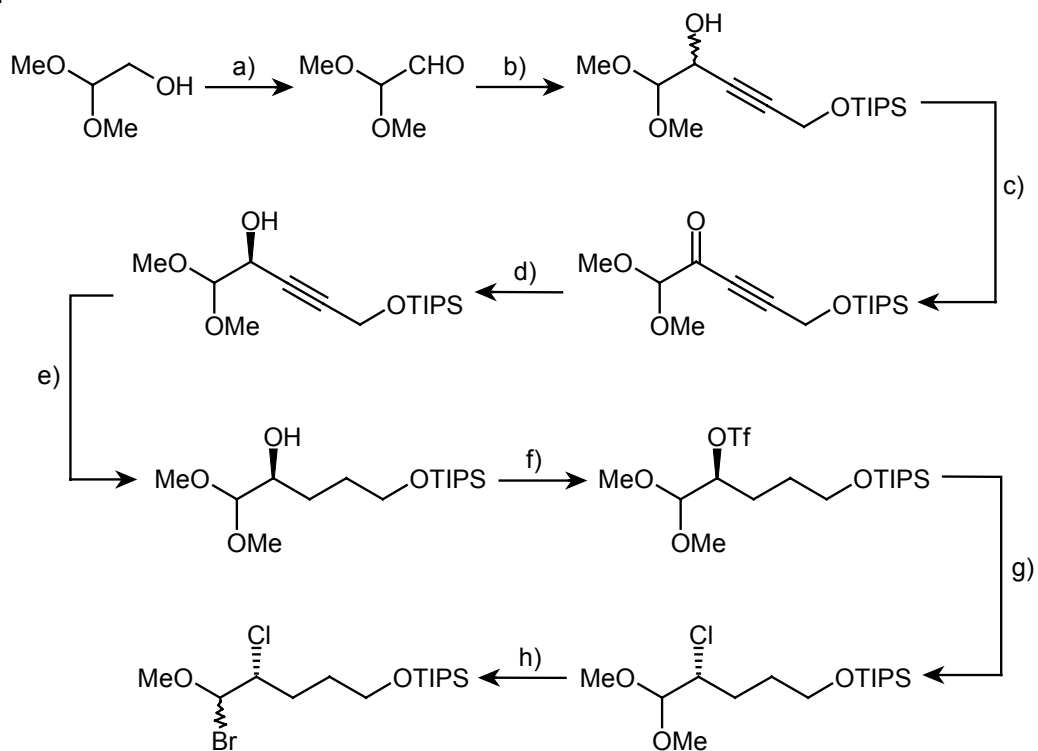
i



**Bibliography:** Kawachi, N.; Hashimoto, H. *Bull. Chem. Soc. Jpn.* **1987**, *60*, 1441.

## Exercise 14.

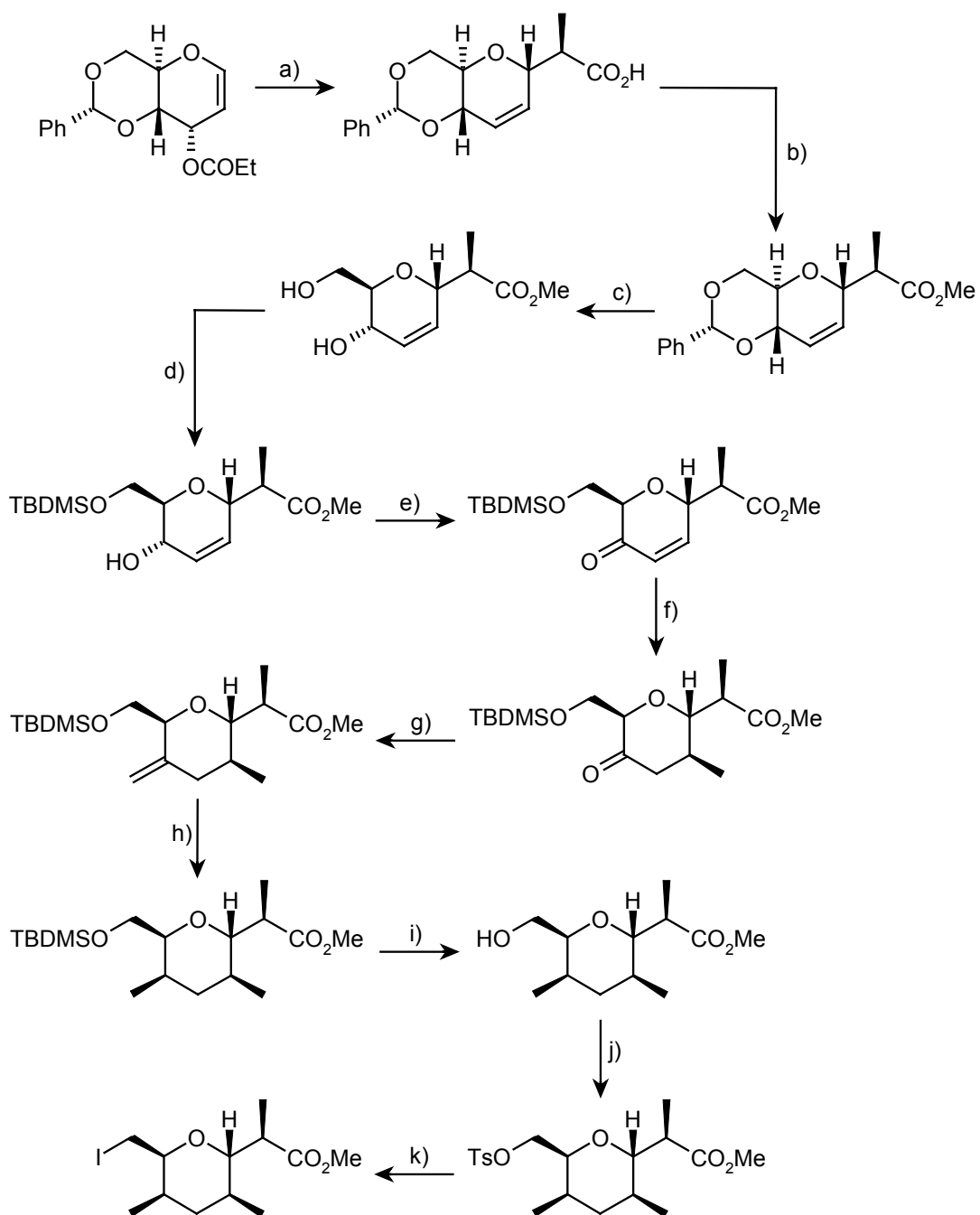
i



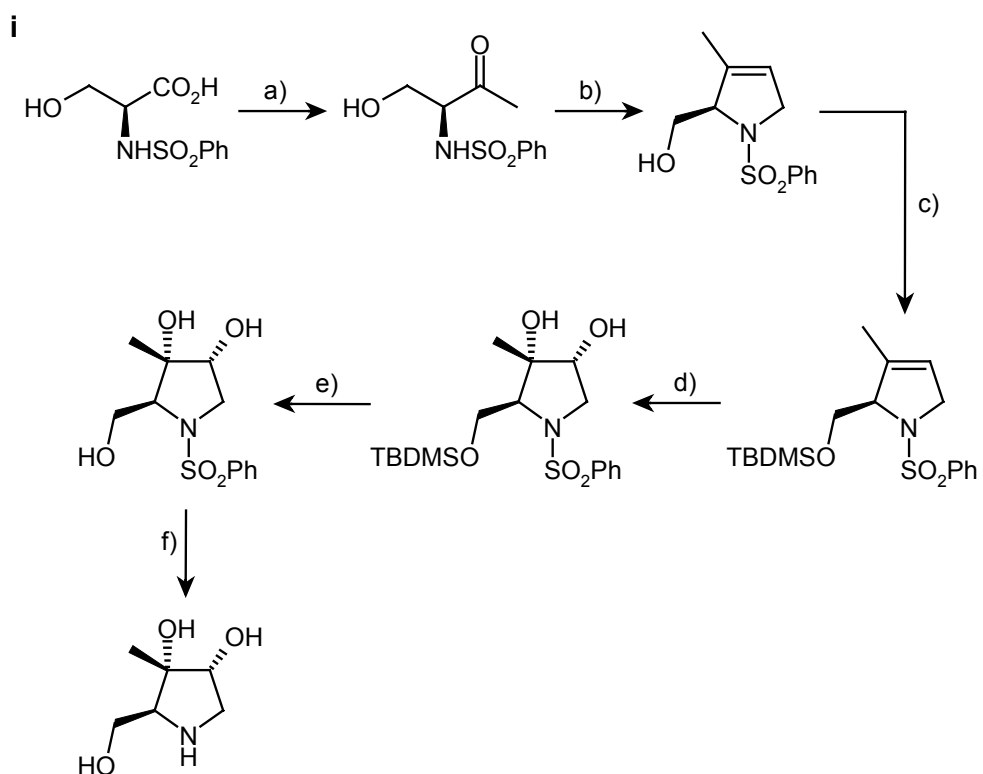
**Bibliography:** Berger, D.; Overman, L.E.; Renhowe, P.A. *J. Am. Chem. Soc.* **1993**, *115*, 9305.

## Exercise 15.

i



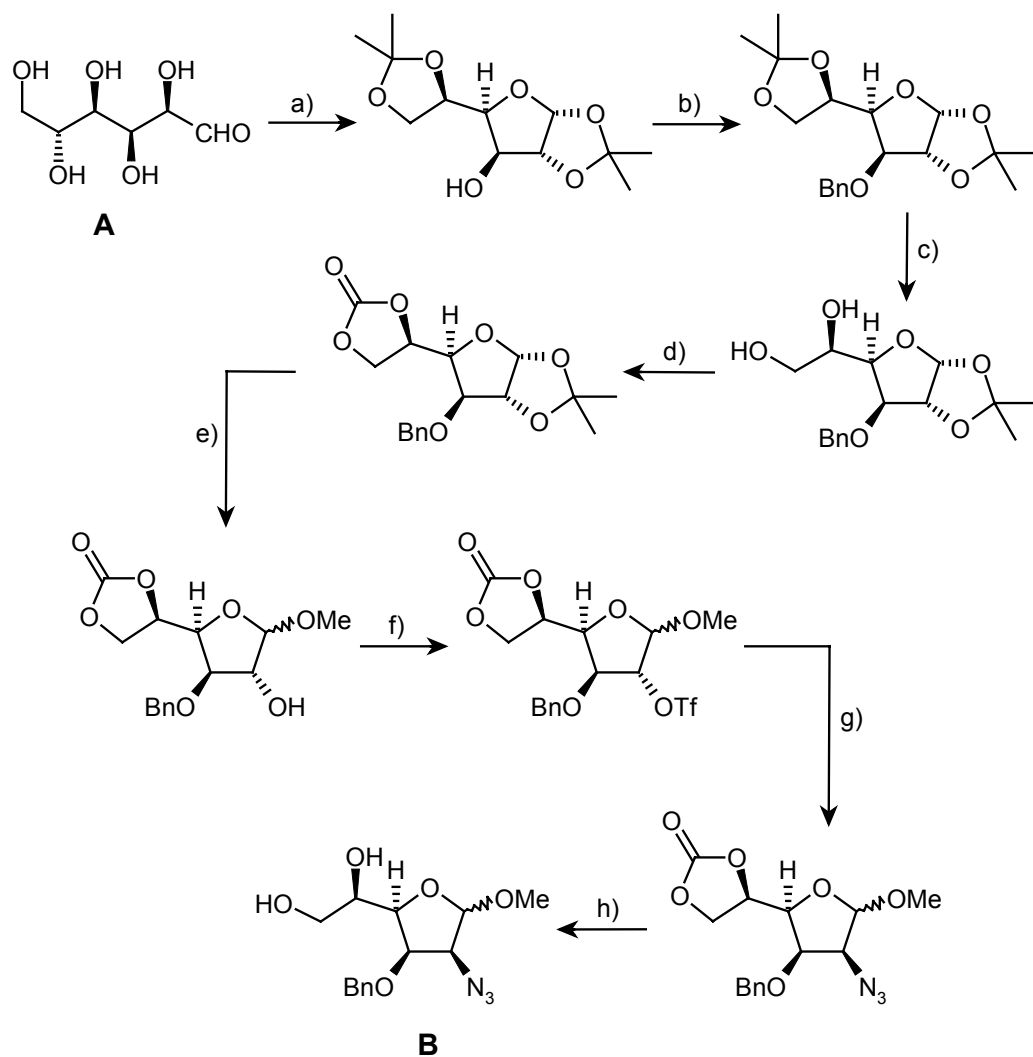
**Bibliography:** Ireland, R.E.; Daub, J.P. *J. Org. Chem.* **1981**, *46*, 479.

**Exercise 16.**

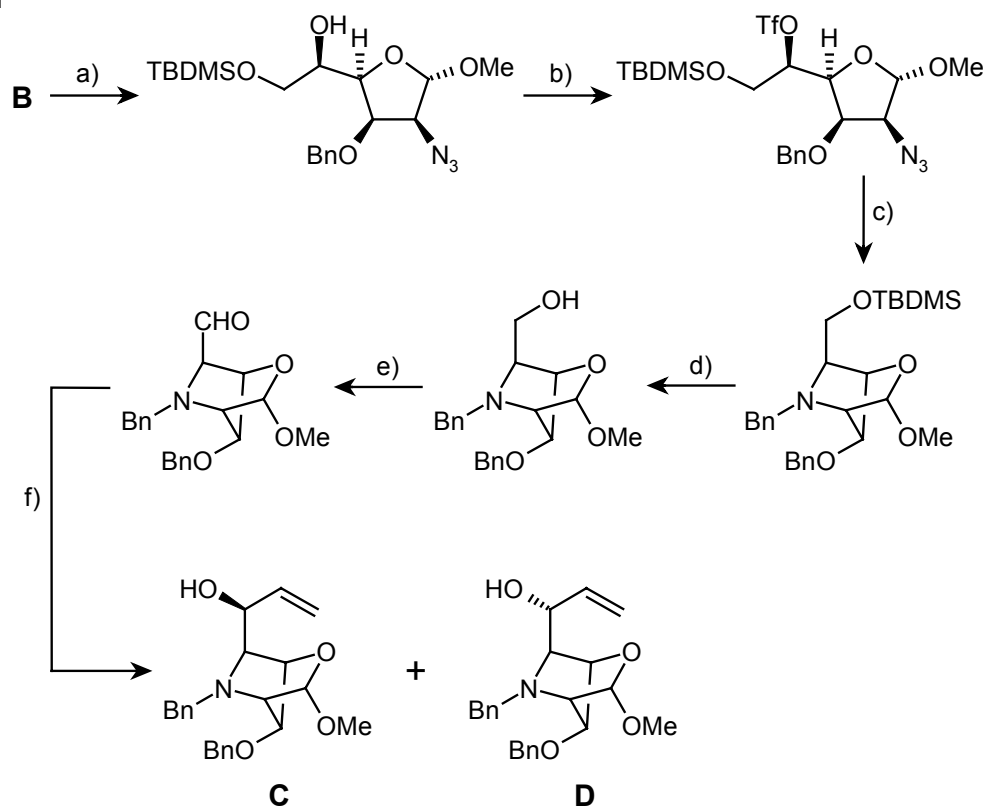
**Bibliography:** Burley, I.; Hewson, A.T. *Tetrahedron Lett.* **1994**, 35, 7099.

## Exercise 17.

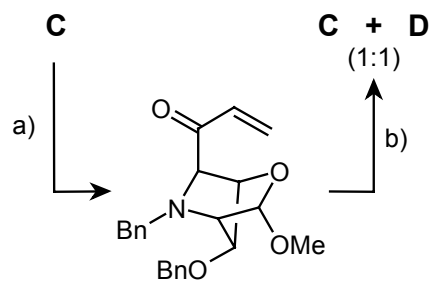
i



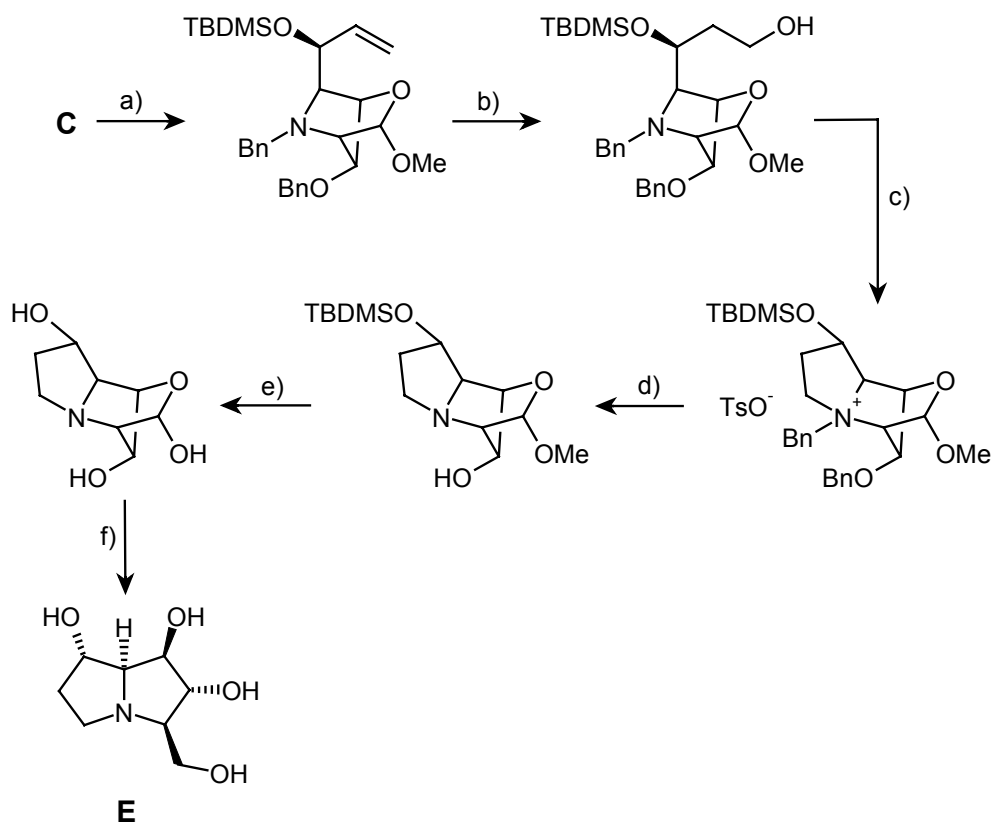
ii



iii



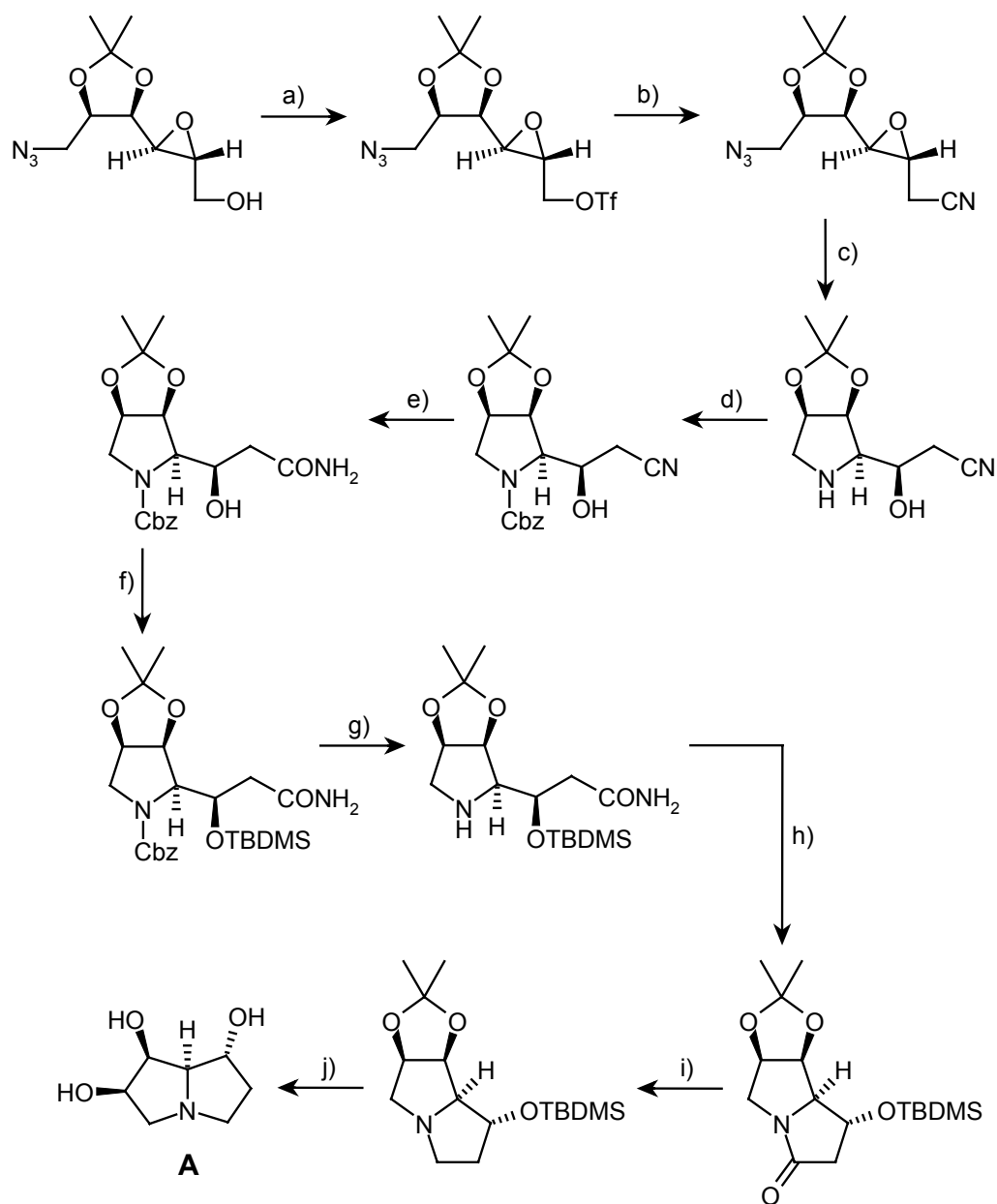
iv



**Bibliography:** a) Fleet, G.W.J.; Smith, P.W. *Tetrahedron* **1987**, *43*, 971. b) Fleet, G.W.J.; Haraldsson, M.; Nash, R.J.; Fellows, L.E. *Tetrahedron Lett.* **1988**, *29*, 5441.

## Exercise 18.

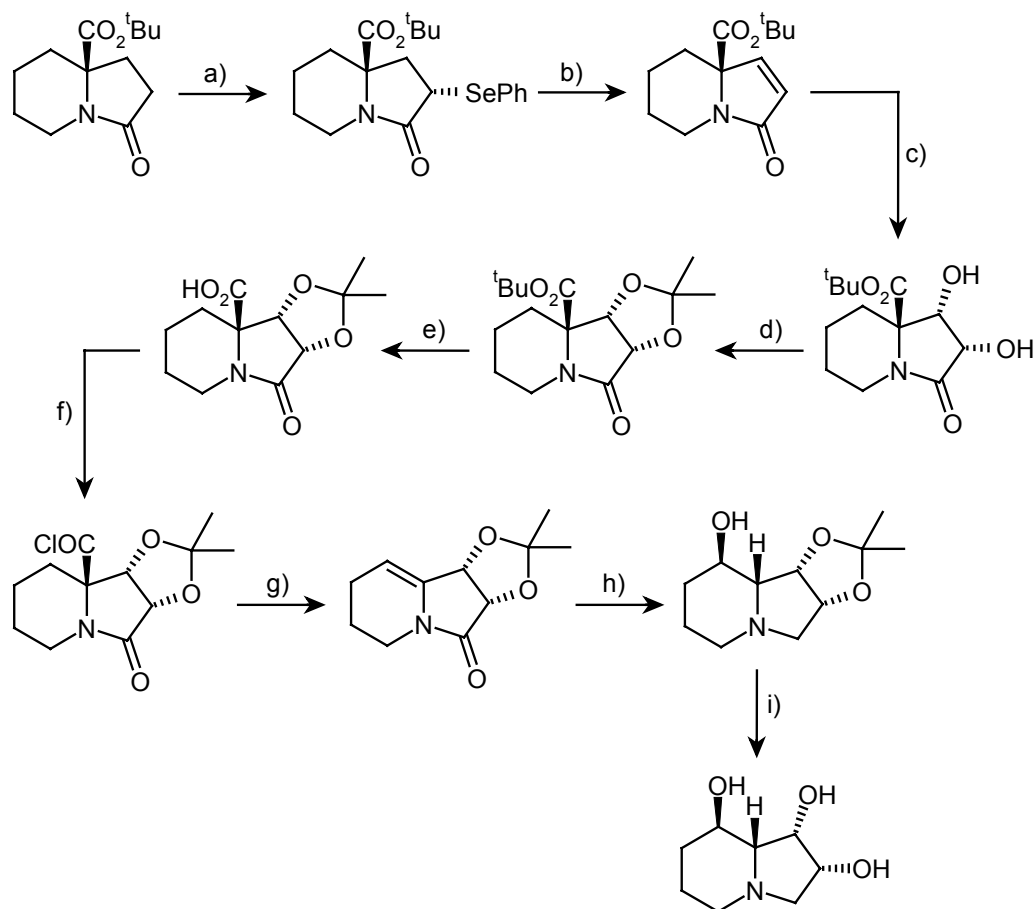
i



**Bibliography:** Carpenter, N.M.; Fleet, G.W.J.; Cenci di Bello, I.; Winchester, B.; Fellows, L.E.; Nash, R.J. *Tetrahedron Lett.* **1989**, 30, 7261.

## Exercise 19.

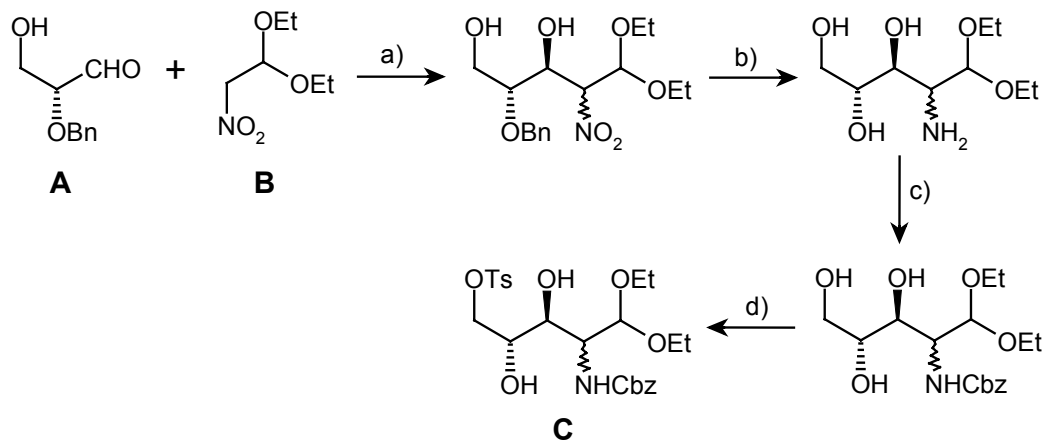
i



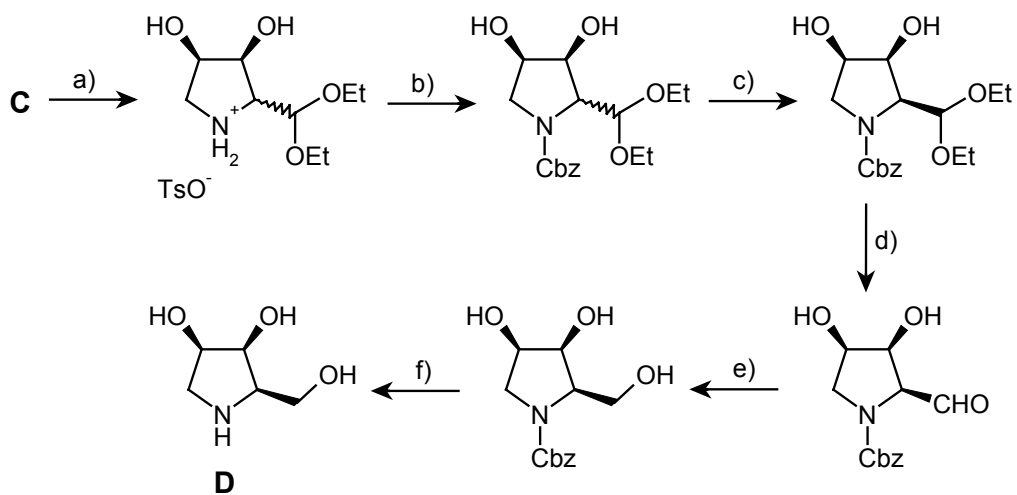
**Bibliography:** Martín-López, M.J.; Bermejo-González, F. *Tetrahedron Lett.* **1994**, 35, 8843; Martín-López, M.J.; Bermejo-González, F. *Tetrahedron Lett.* **1994**, 35, 4235.

## Exercise 20.

i



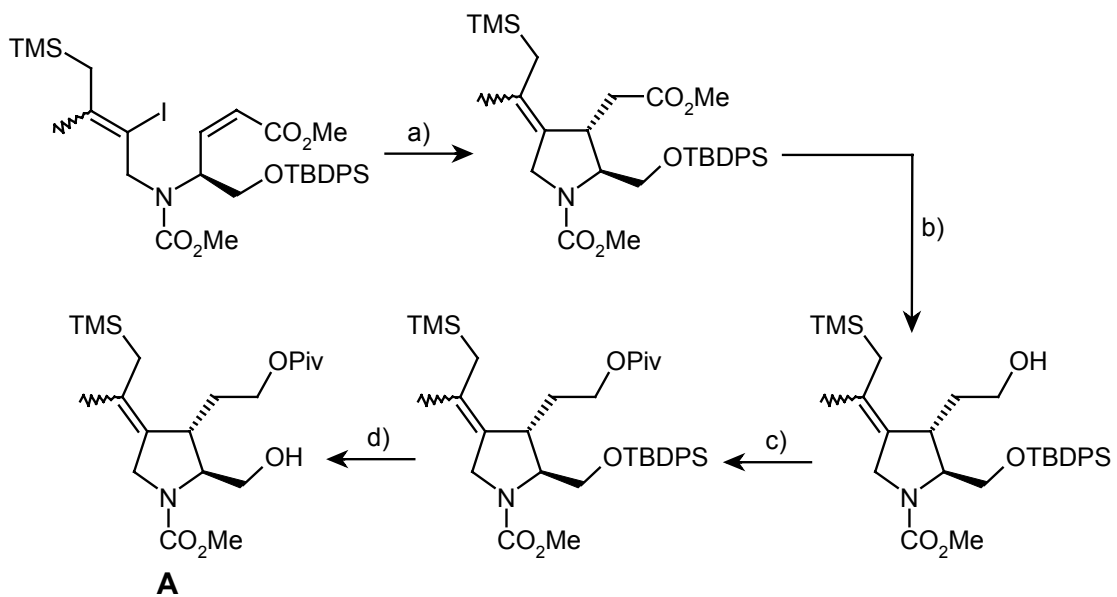
ii



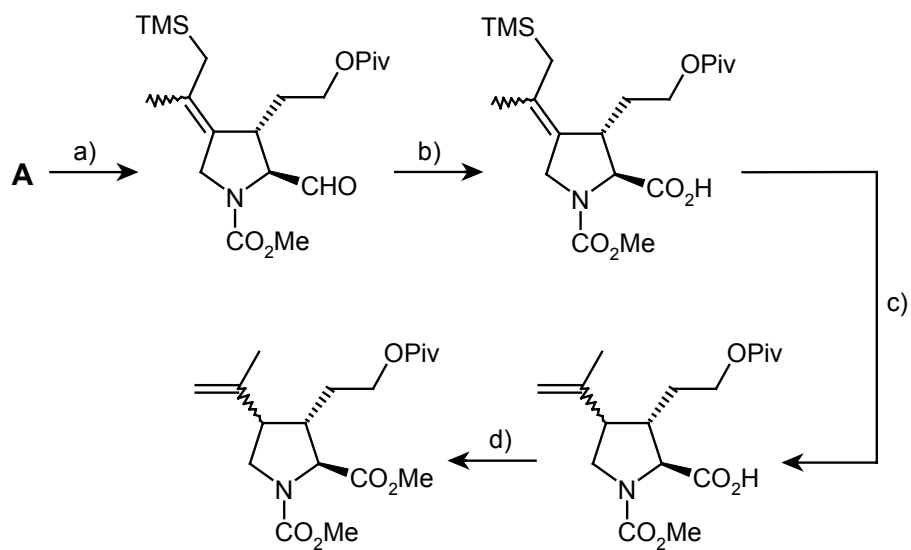
**Bibliography:** a) Wehner, V.; Jäger, V. *Angew. Chem., Int. Ed. Engl.* **1990**, *29*, 1169. b) Jäger, V.; Hümer, W. *Angew. Chem., Int. Ed. Engl.* **1990**, *29*, 1182. c) Müller, R.; Leibold, T.; Pätzelt, M.; Jäger, V. *Angew. Chem., Int. Ed. Engl.* **1994**, *33*, 1295.

## Exercise 21.

i



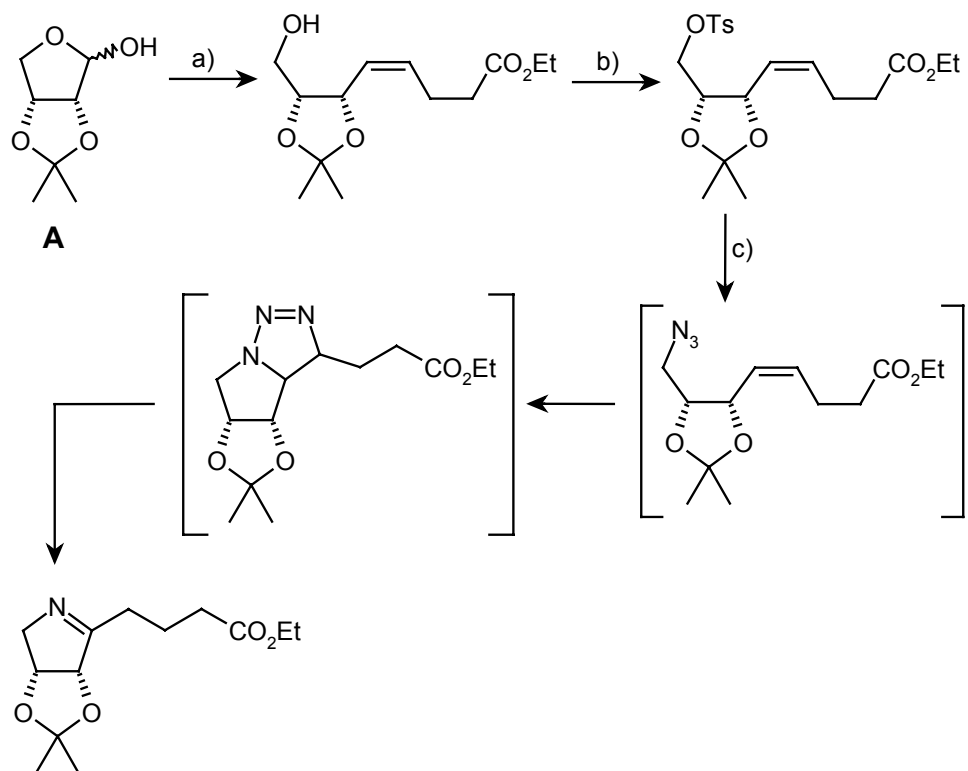
ii



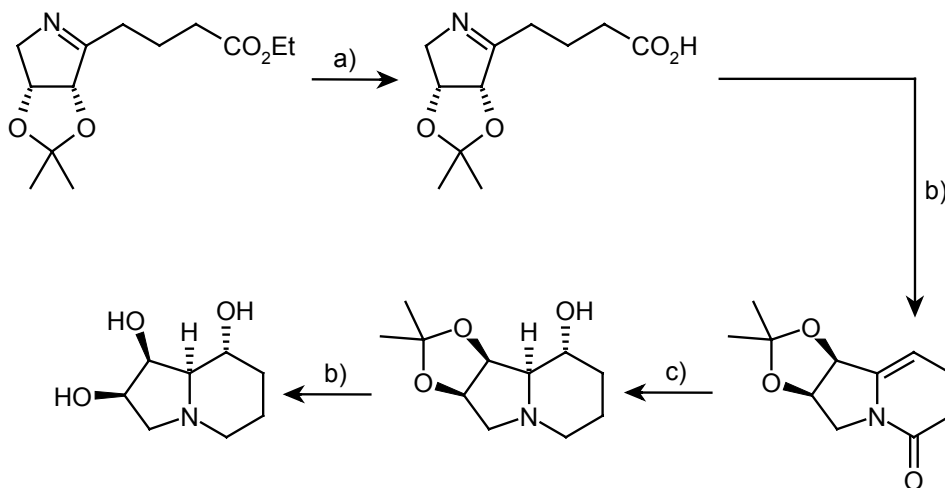
**Bibliography:** Takano, S.; Inomata, K.; Ogasawara, K.J. *J. Chem. Soc. Chem. Commun.* **1992**, 169.

## Exercise 22.

i



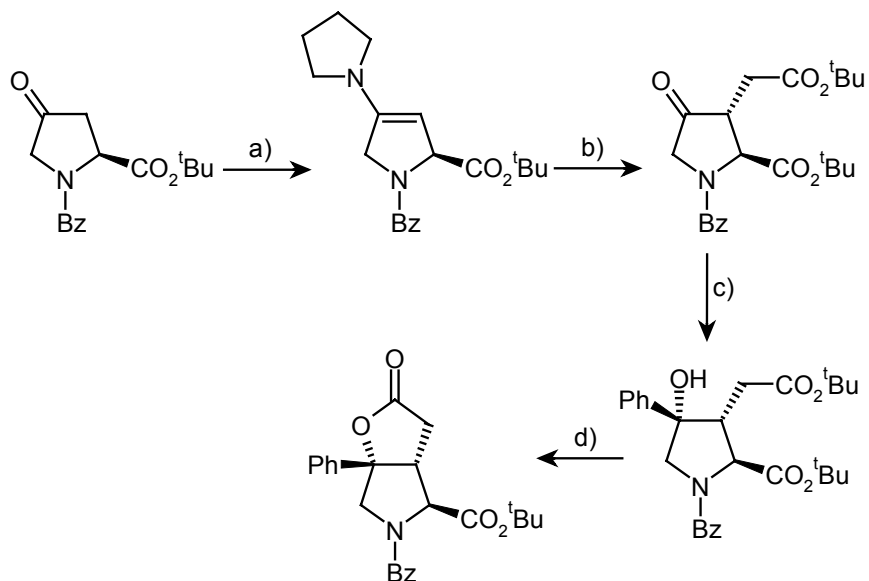
ii



**Bibliography:** Bennett III, R.B.; Choi, J.-R.; Montgomery, W.D.; Cha, J.K.; *J. Am. Chem. Soc.* **1989**, *111*, 2580.

**Exercise 23.**

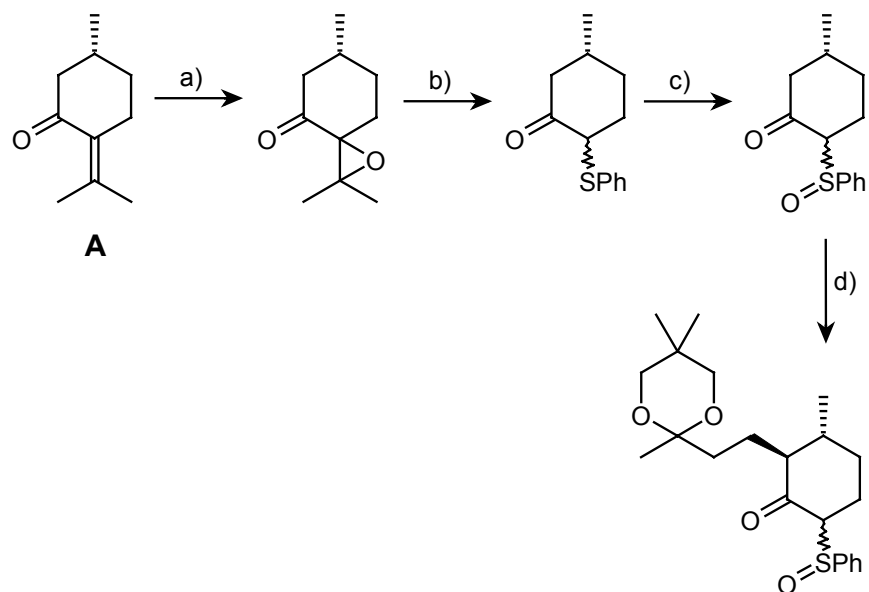
i



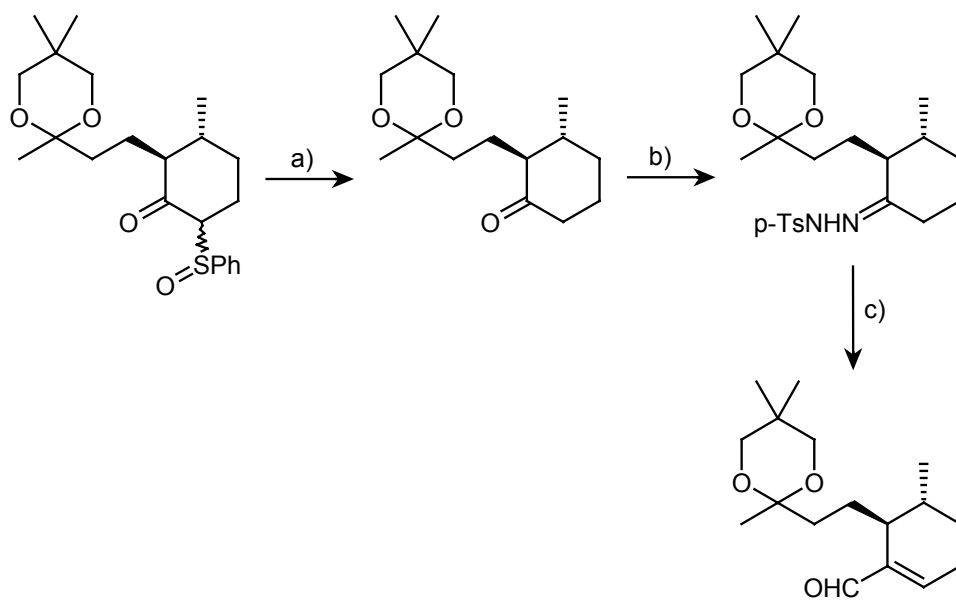
**Bibliography:** Baldwin, J.E.; Rudolph, M. *Tetrahedron Lett.* **1994**, 35, 6163.

## Exercise 24.

i

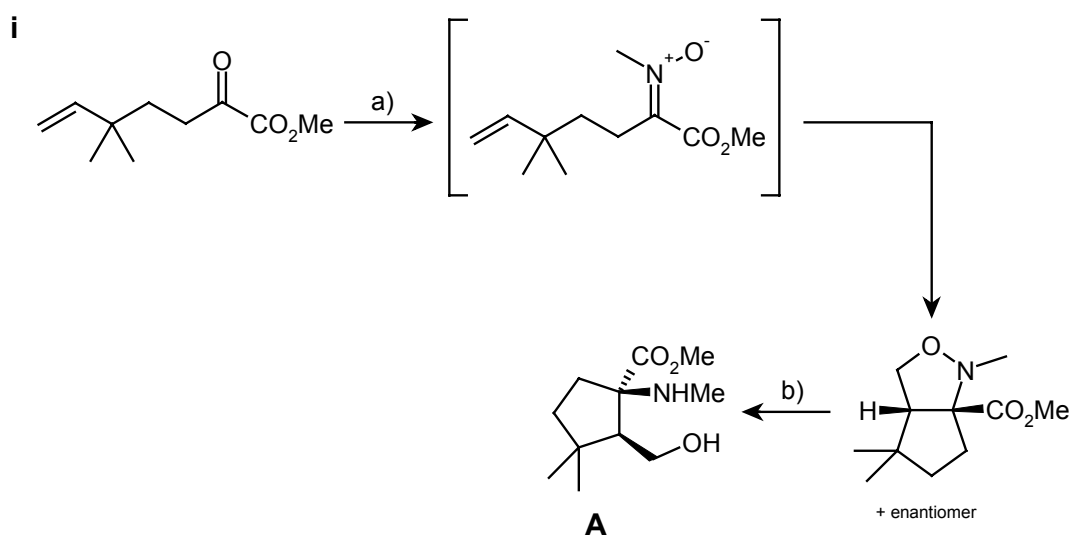


ii



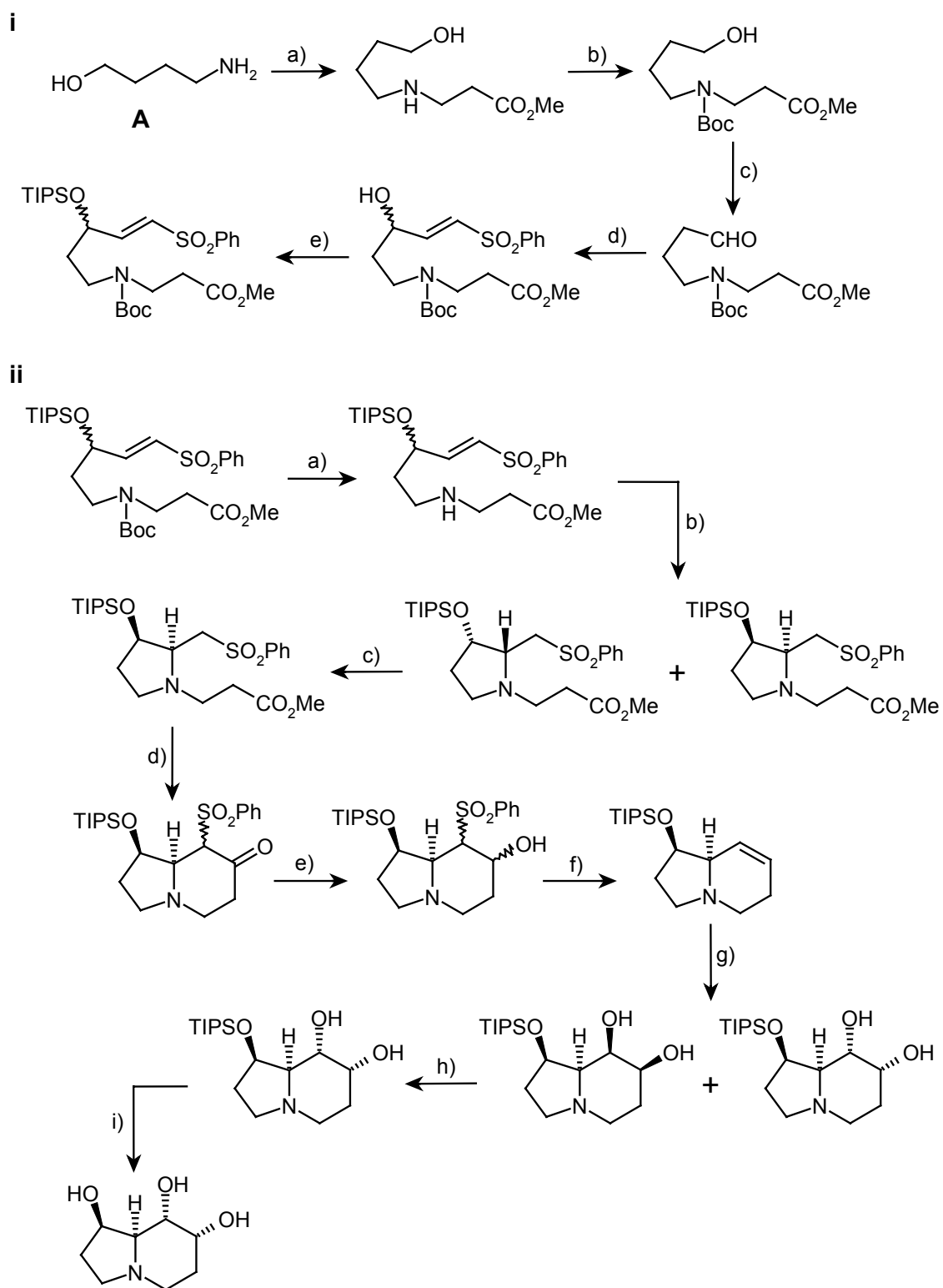
**Bibliography:** Avery, M.A.; Chong, W.K.M.; Jennings-White, C. *J. Am. Chem. Soc.* **1992**, *114*, 974.

## Exercise 25.



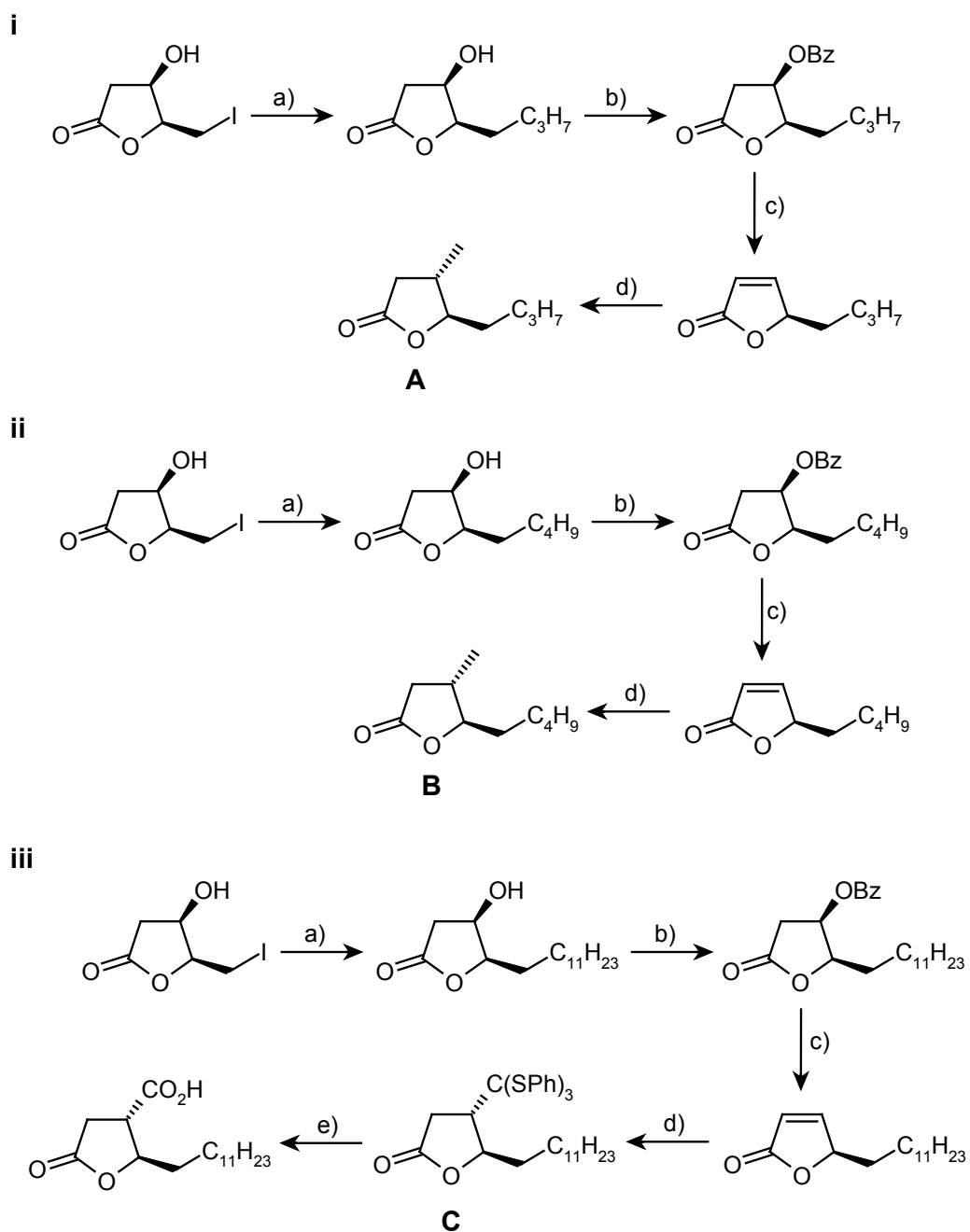
**Bibliography:** Toy, A.; Thompson, W.J. *Tetrahedron Lett.* **1984**, 33, 3533.

## Exercise 26.



**Bibliography:** Carretero, J.C.; Gómez-Arrayás, R. *J. Org. Chem.* **1995**, *60*, 6000.

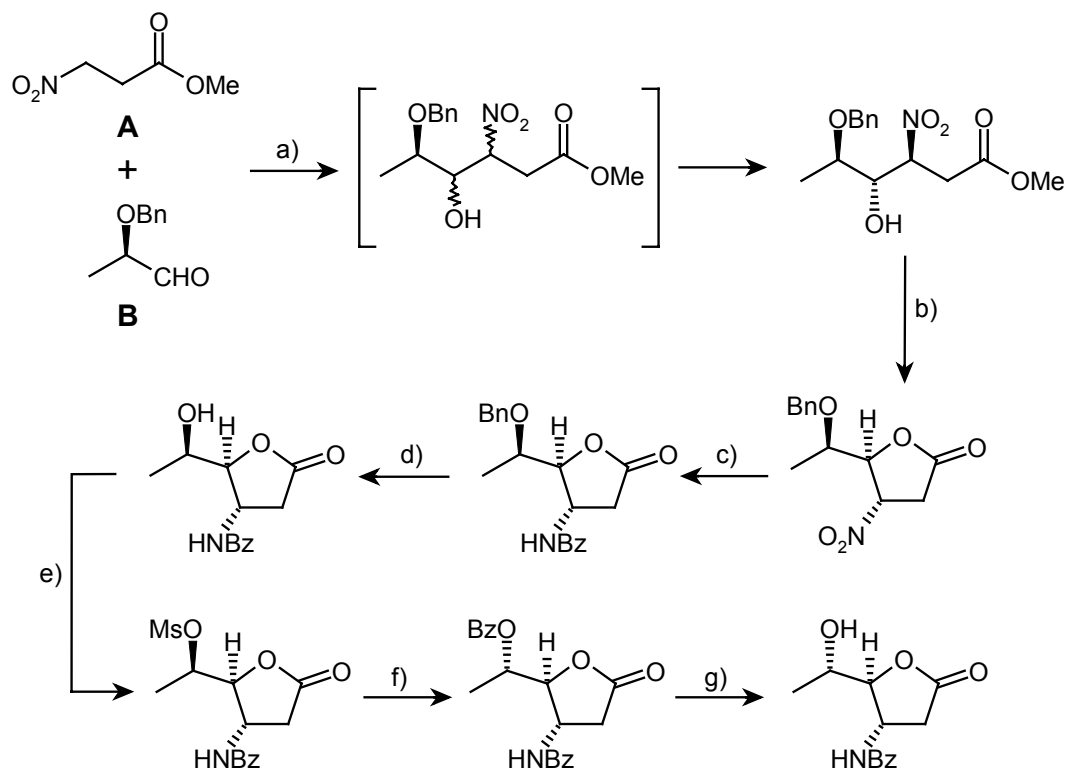
## Exercise 27.



**Bibliography:** Takahata, H.; Uchida, Y.; Momose, T. *J. Org. Chem.* **1995**, *60*, 5628.

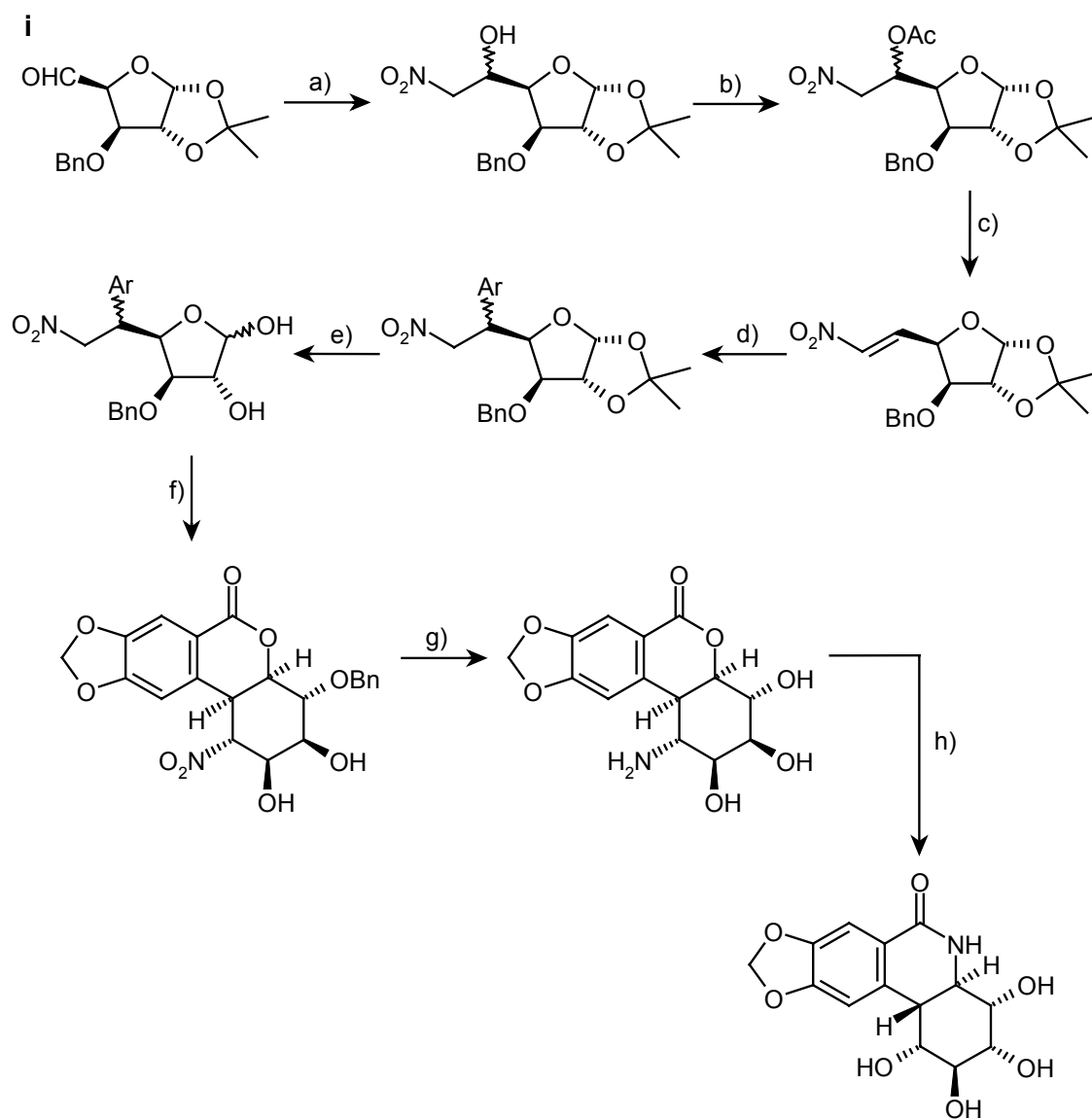
## Exercise 28.

i



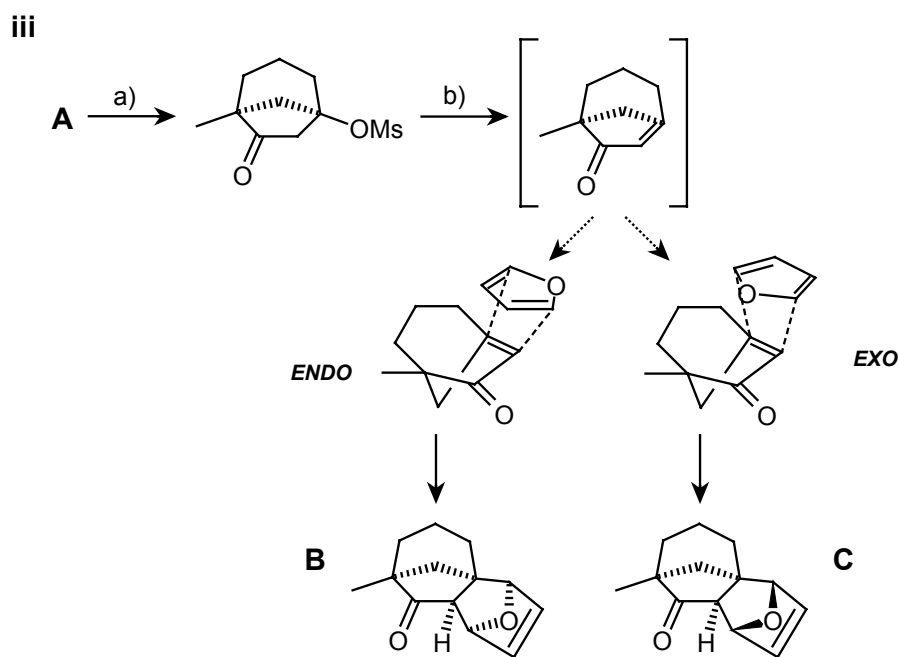
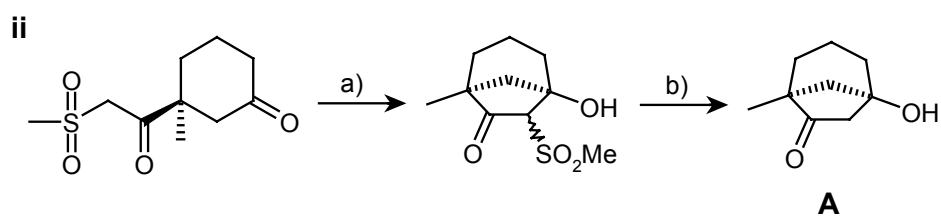
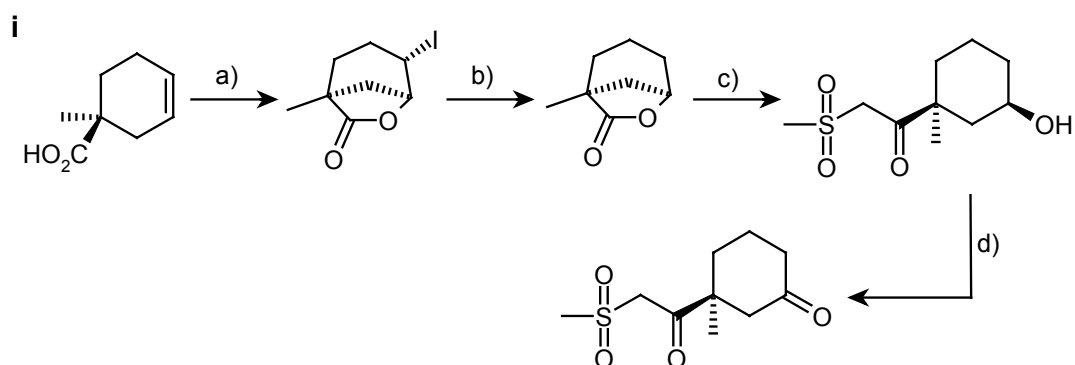
**Bibliography:** Hanessian, S.; Kloss, J.; *Tetrahedron Lett.* **1985**, 26, 1261.

## Exercise 29.



**Bibliography:** Paulsen, H.; Stubbe, M. *Tetrahedron Lett.* **1982**, 23, 3171.

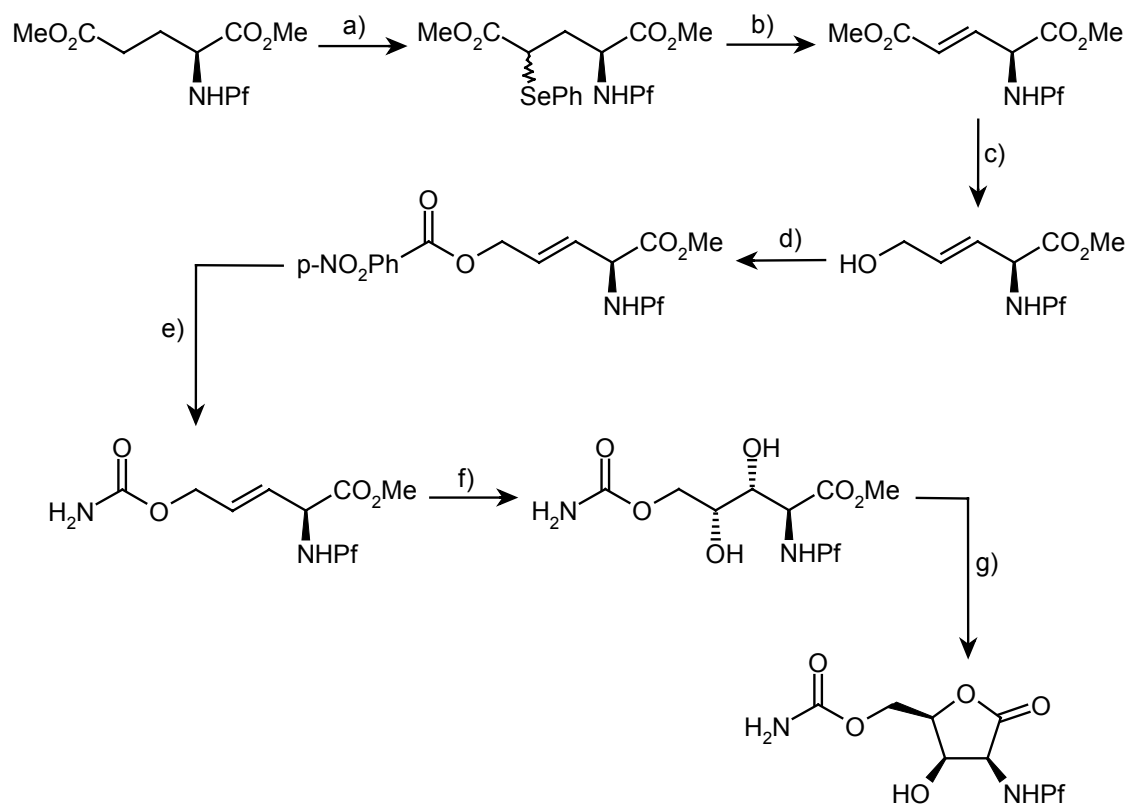
## Exercise 30.



**Bibliography:** House, H.O.; Haack, J.L.; McDaniel, W.C.; Vanderveer, D. *J. Org. Chem.* **1983**, *48*, 1643.

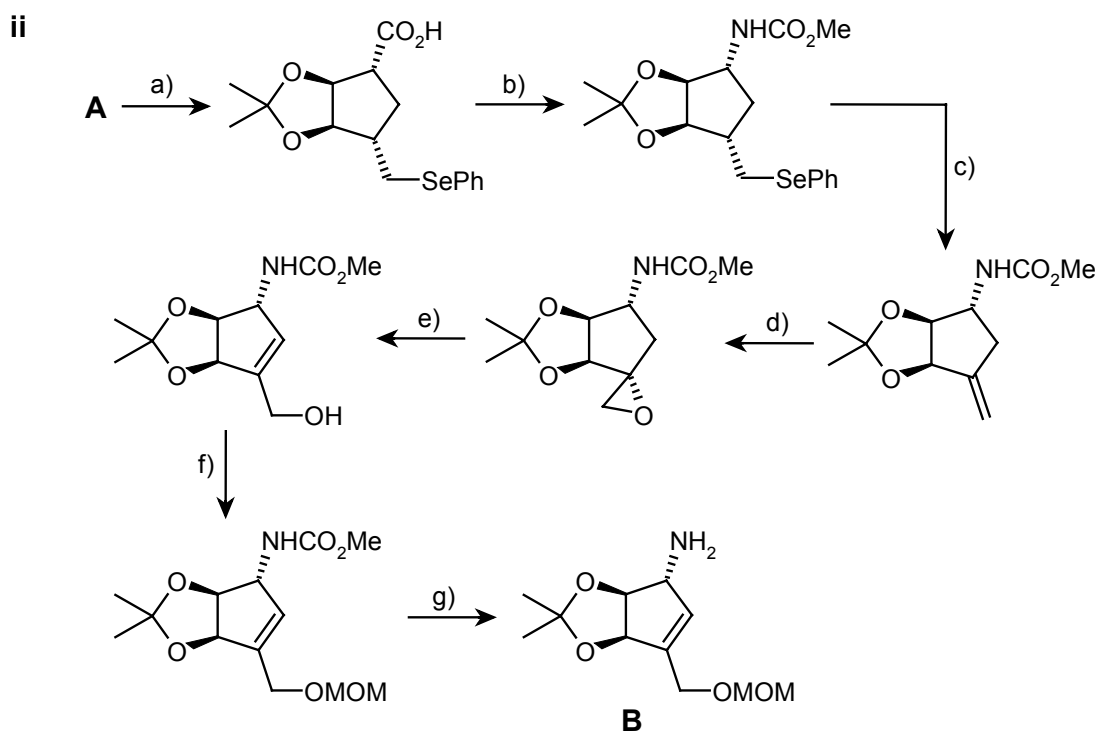
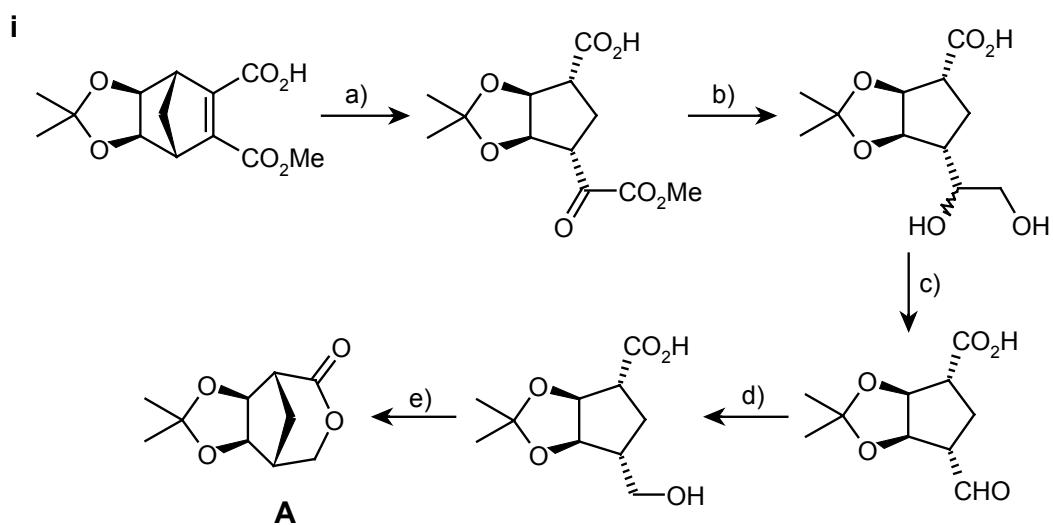
## Exercise 31.

i

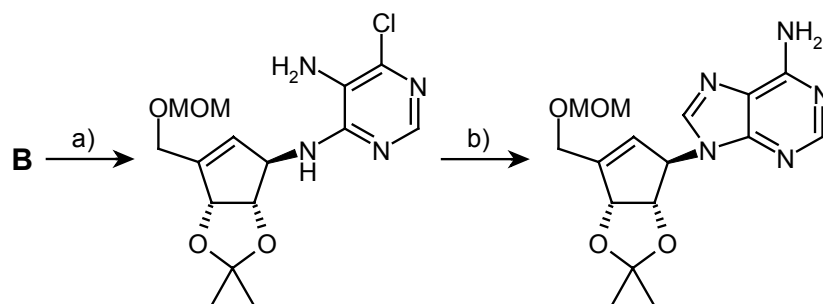


**Bibliography:** Paz, M.M.; Sardina, F.J. *J. Org. Chem.* **1993**, *58*, 6090.

## Exercise 32.

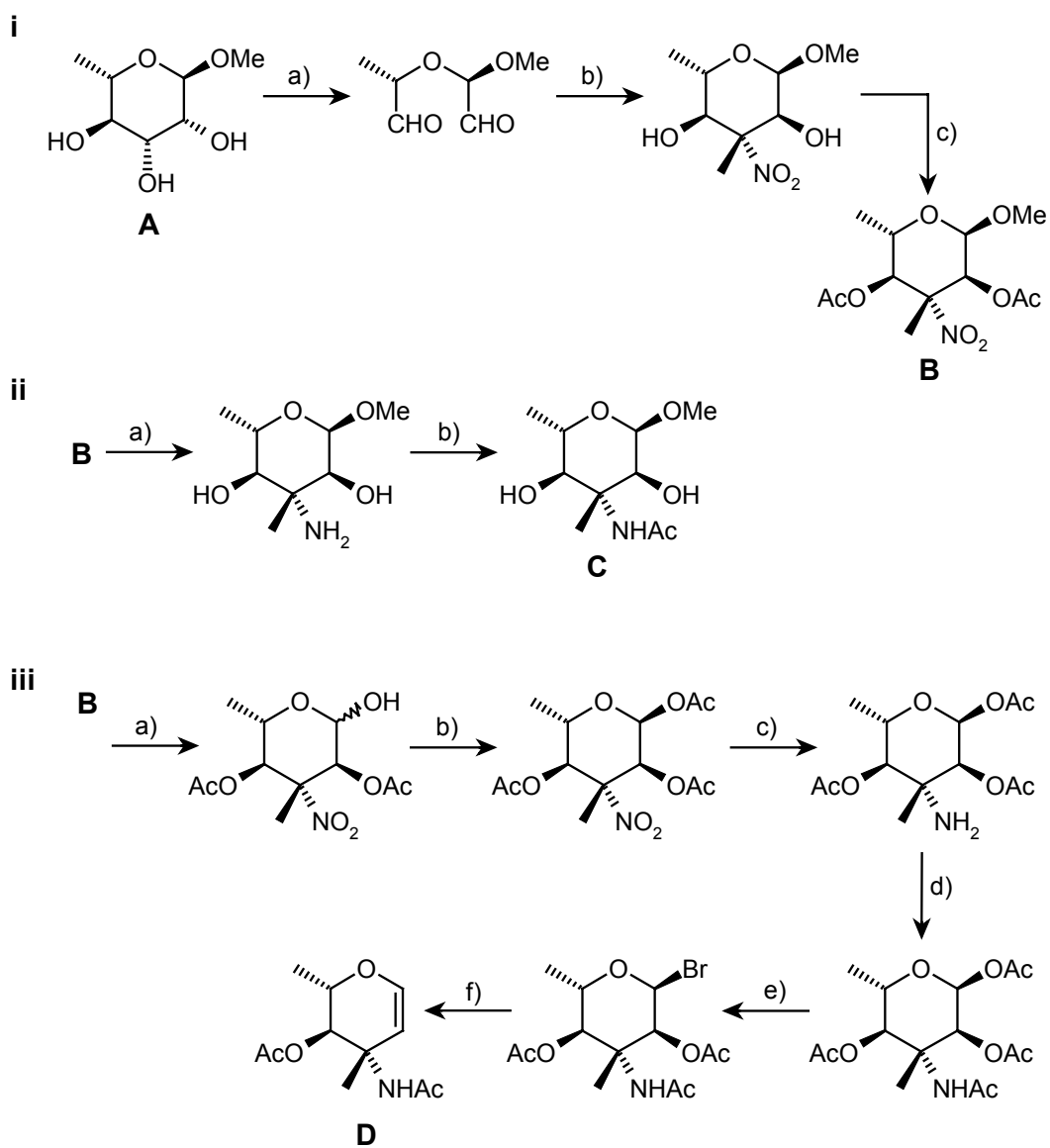


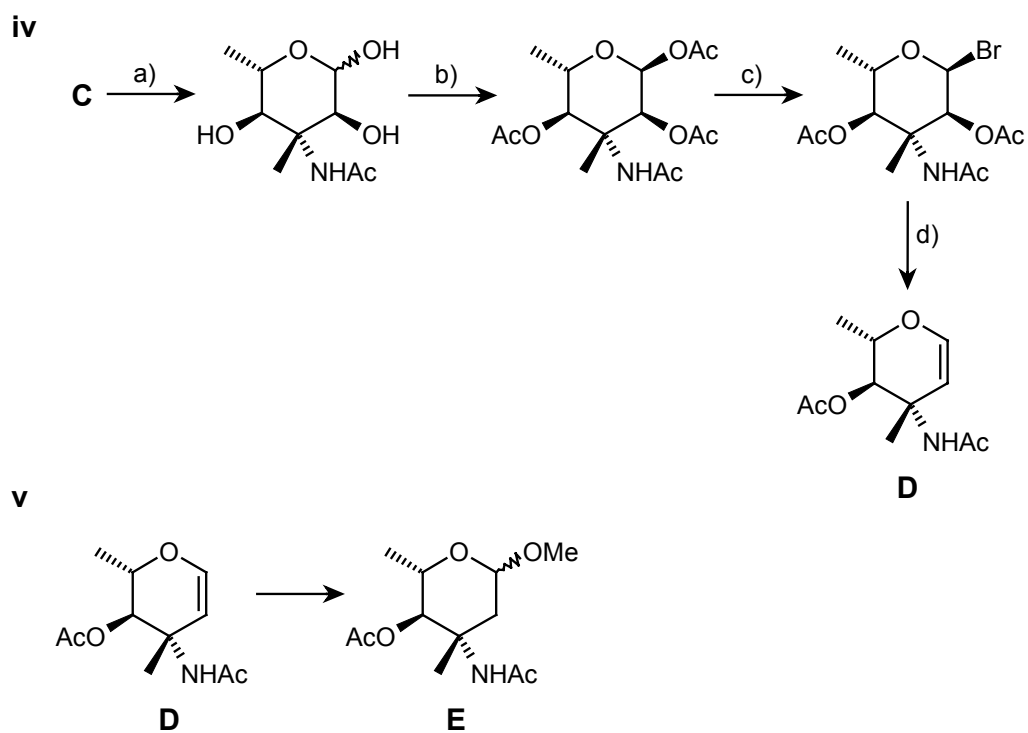
iii



**Bibliography:** Arita, M.; Adachi, K.; Ito, Y.; Sawai, H.; Ohno, M. *J. Am. Chem. Soc.* **1983**, *105*, 4049-4055.

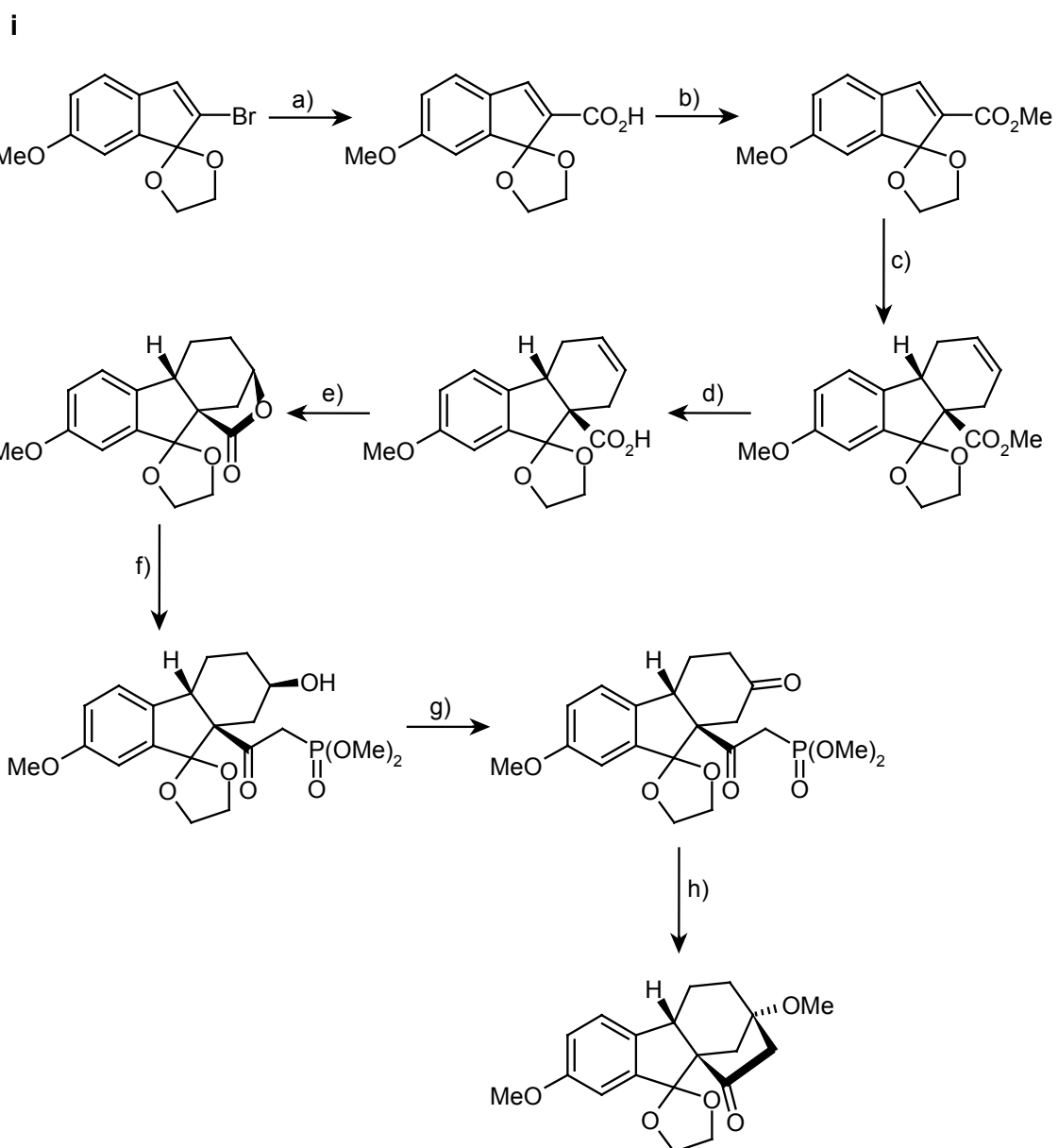
## Exercise 33.





**Bibliography:** a) Brimacombe, J.S.; Doner, L.W. *J. Chem. Soc. Perkin Trans. I*, **1974**, 62; b) Brimacombe, J.S.; Mengech, A.S. *J. Chem. Soc. Perkin Trans. I*, **1980**, 2054.

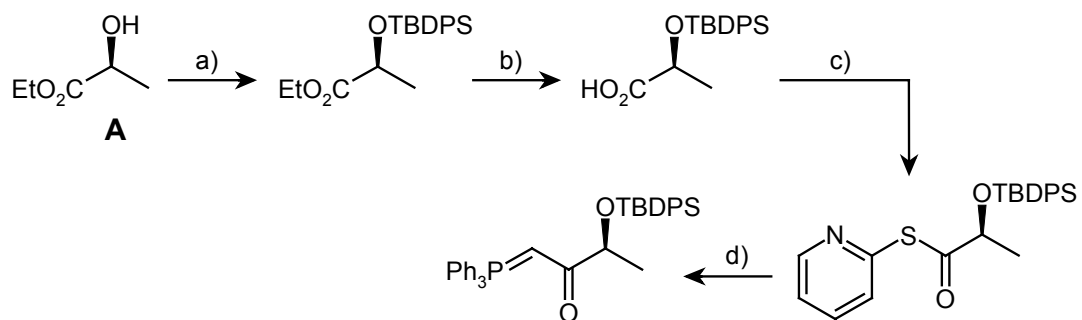
## Exercise 34.



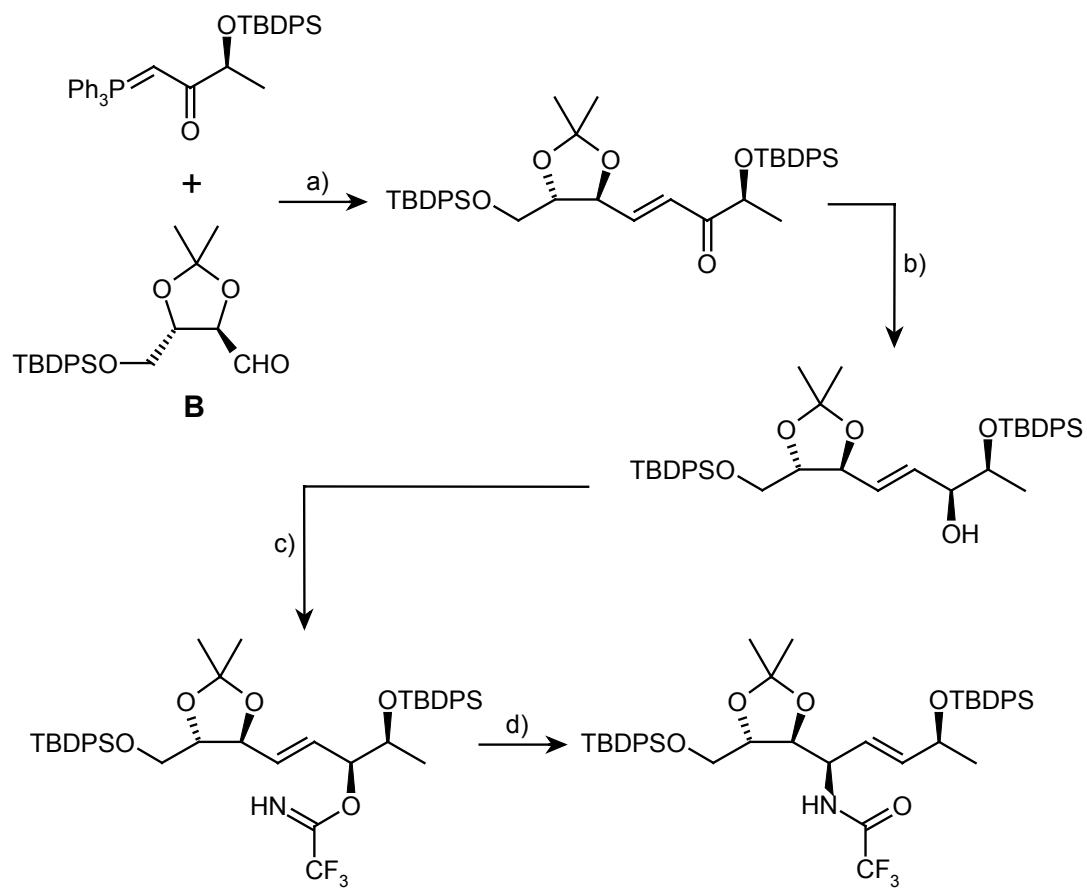
**Bibliography:** House, H.O.; Haack, J.L.; McDaniel, W.C.; Vanderveer, D. *J. Org. Chem.* **1983**, *48*, 1643-1654.

**Exercise 35.**

**i**



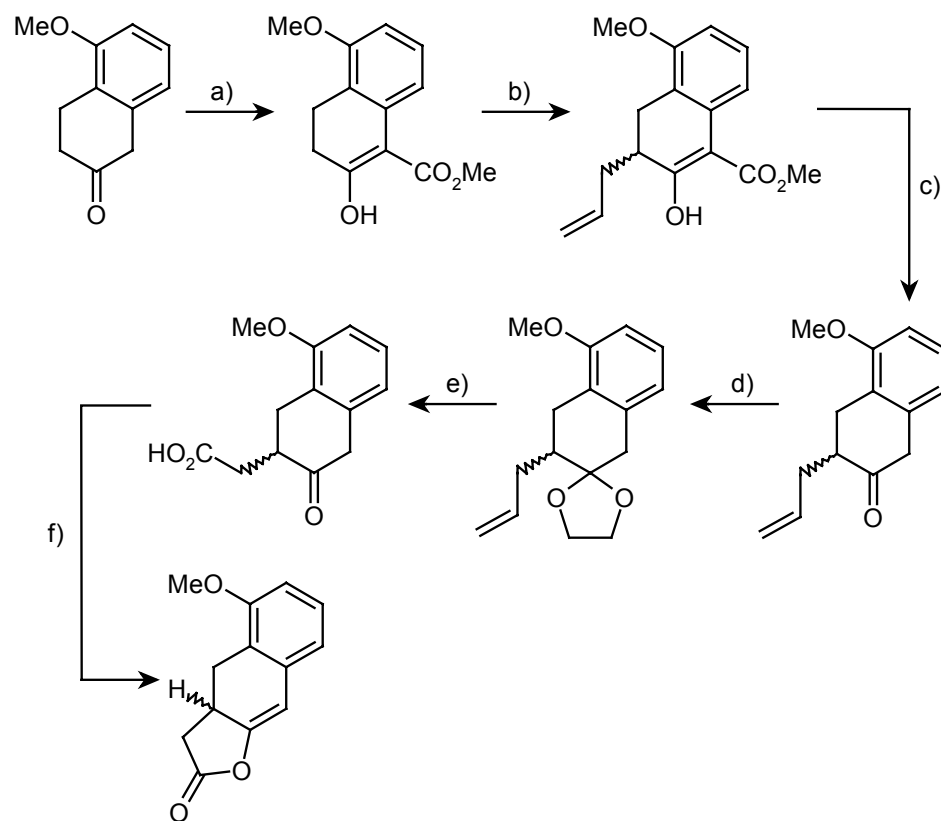
**ii**



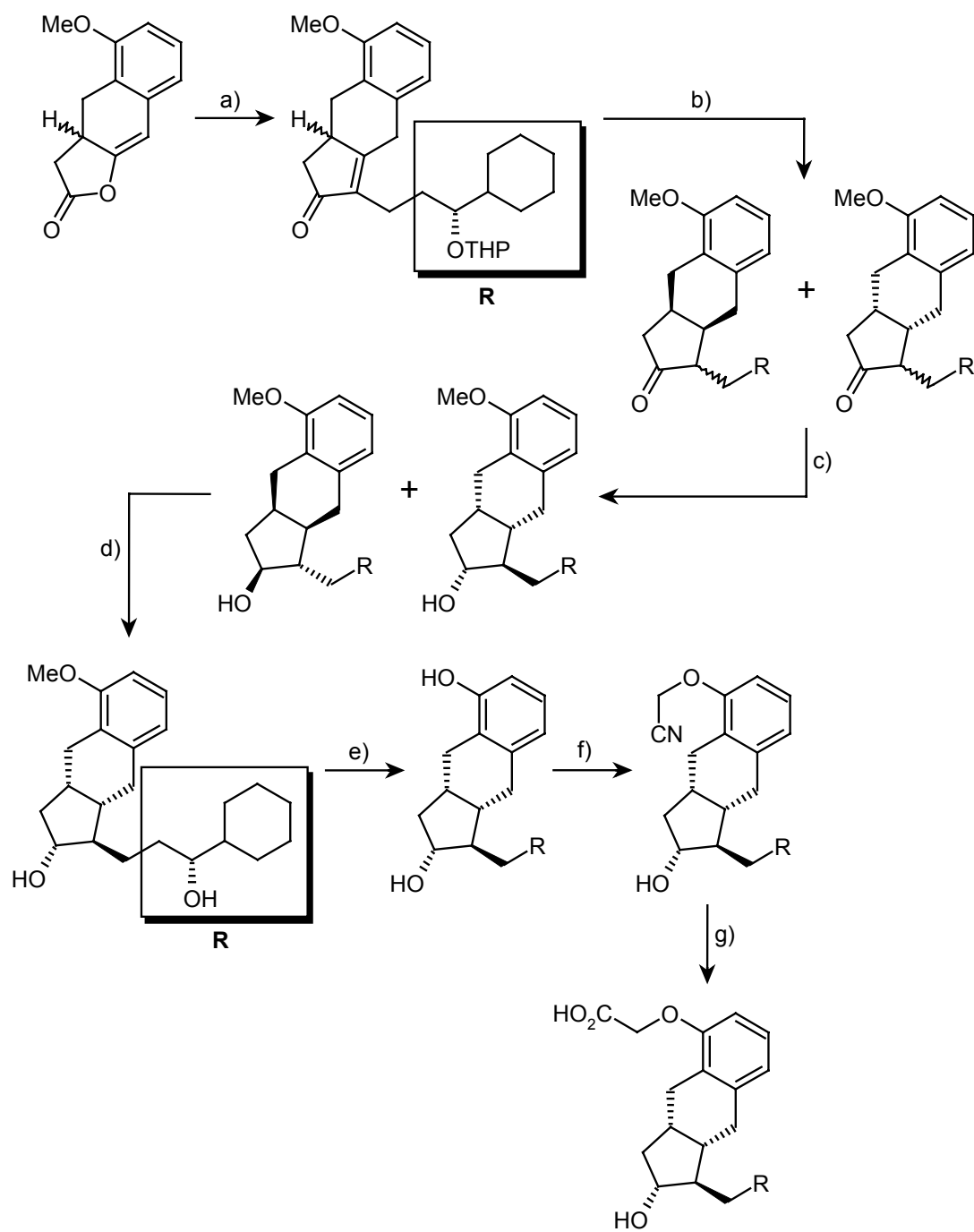
**Bibliography:** Savage, I.; Thomas, E.J. *J. Chem. Soc. Chem. Commun.* **1989**, 717.

## Exercise 36.

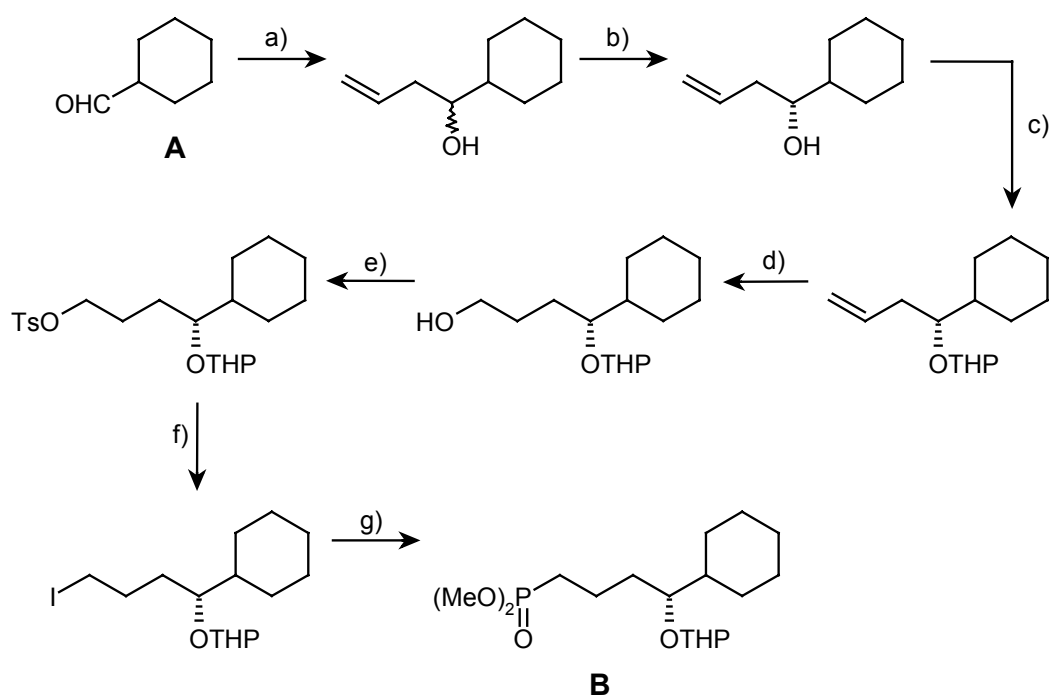
i



ii



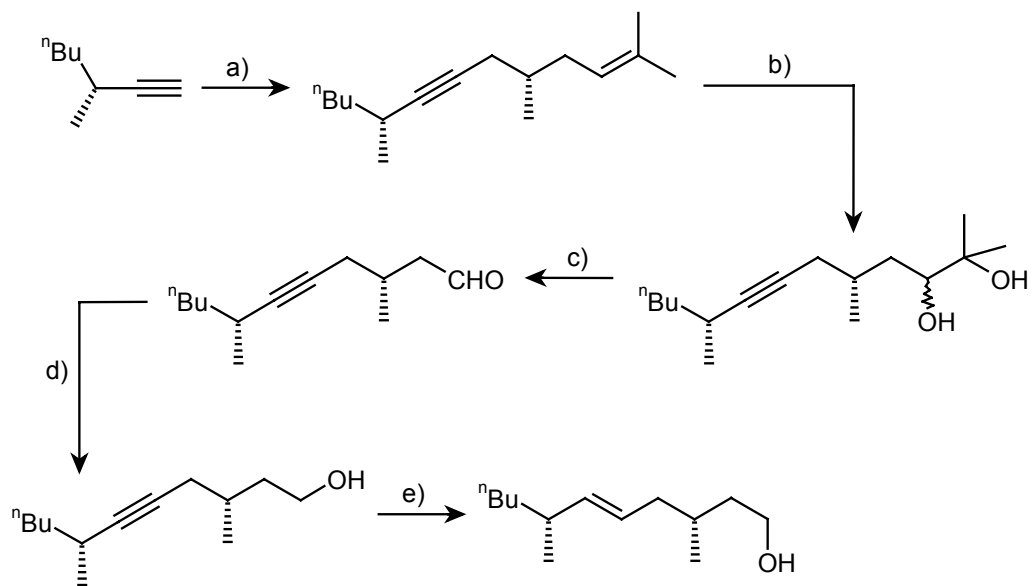
iii



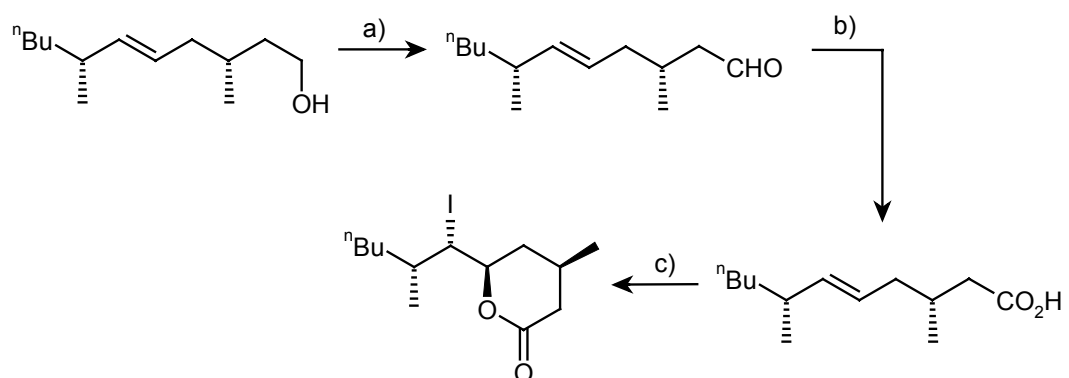
**Bibliography:** Aristoff, P.A.; Johnson, P.D.; Harrison, A.W. *J. Am. Chem. Soc.* **1985**, *107*, 7971.

## Exercise 37.

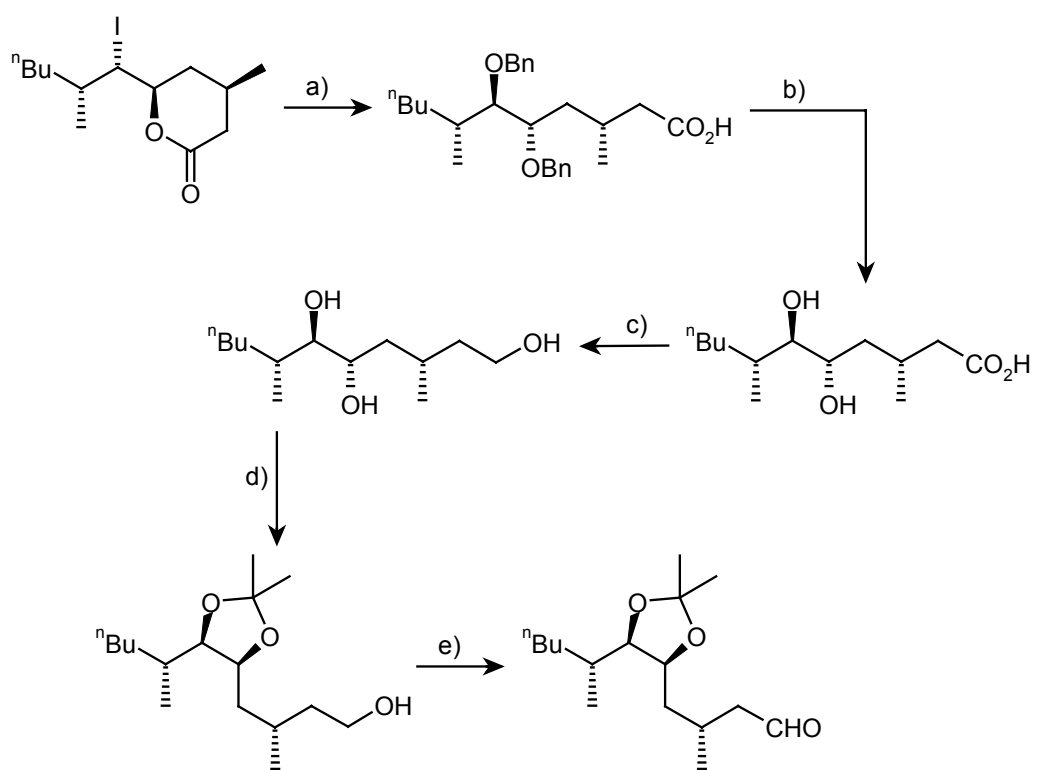
i



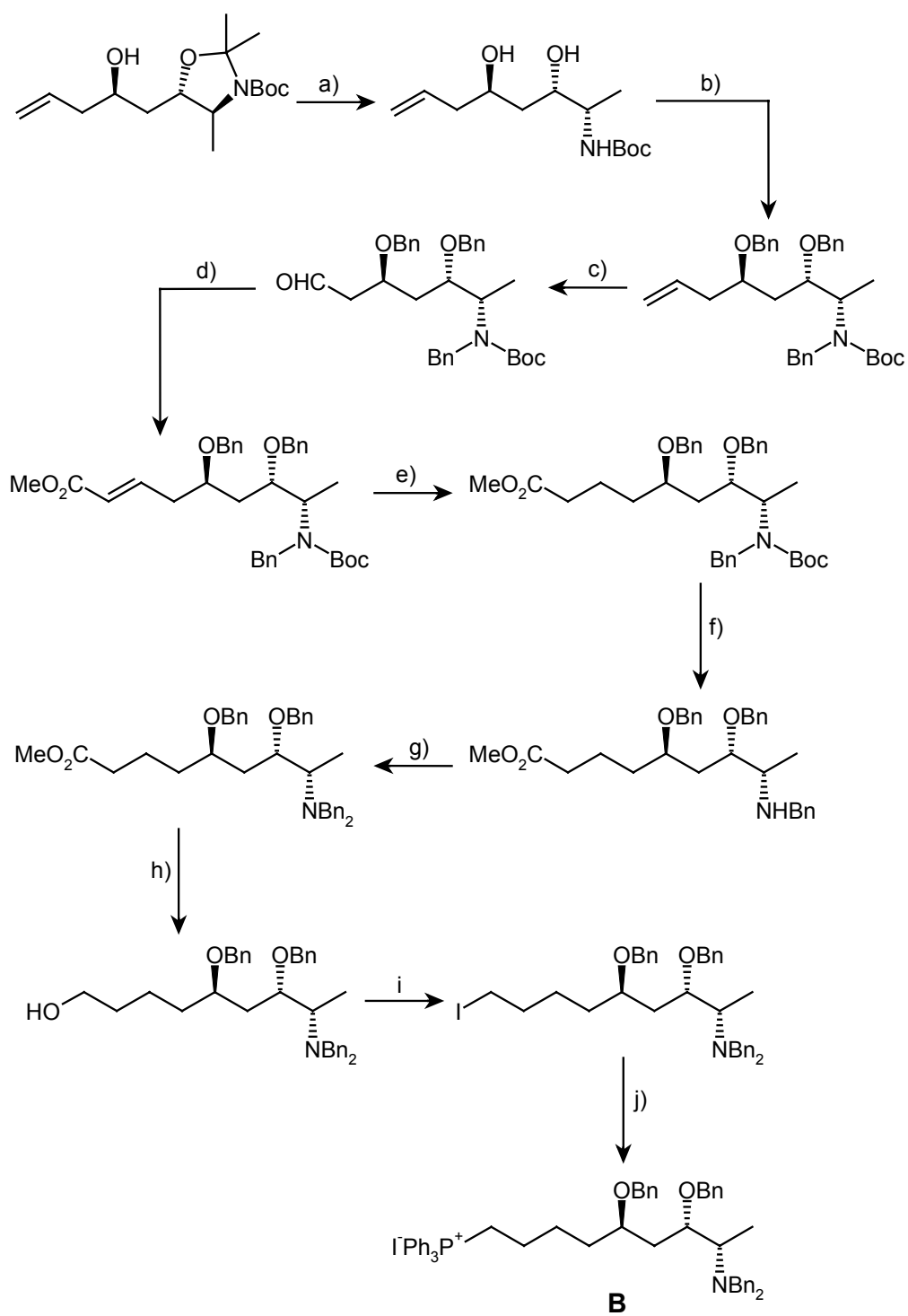
ii

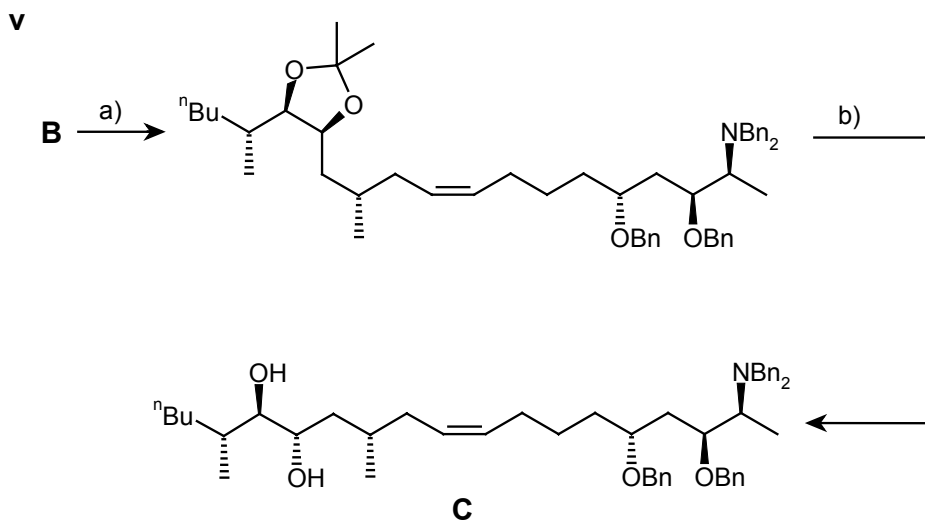


iii



iv

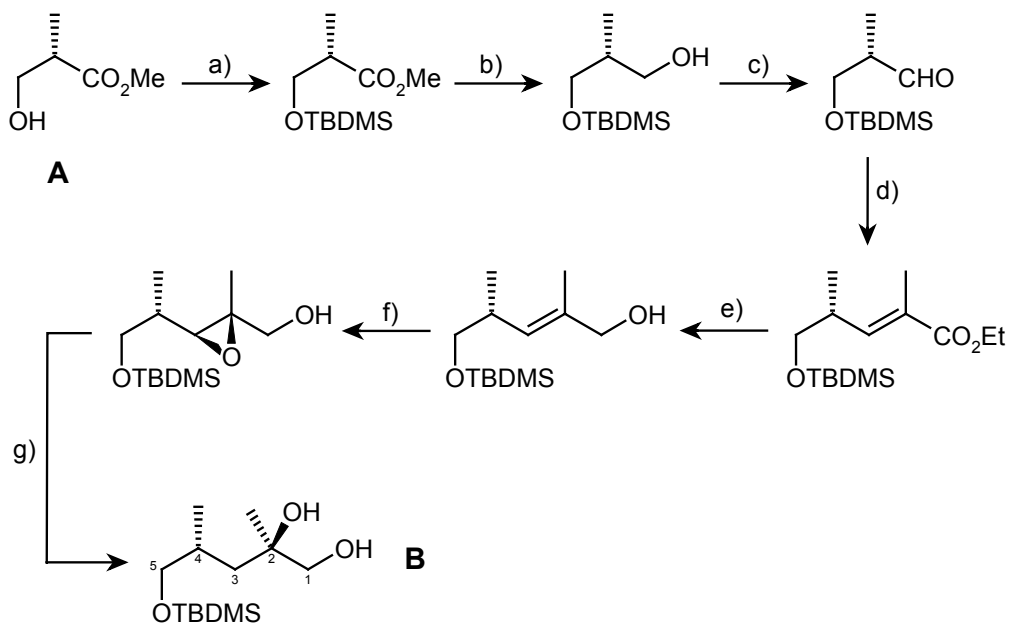




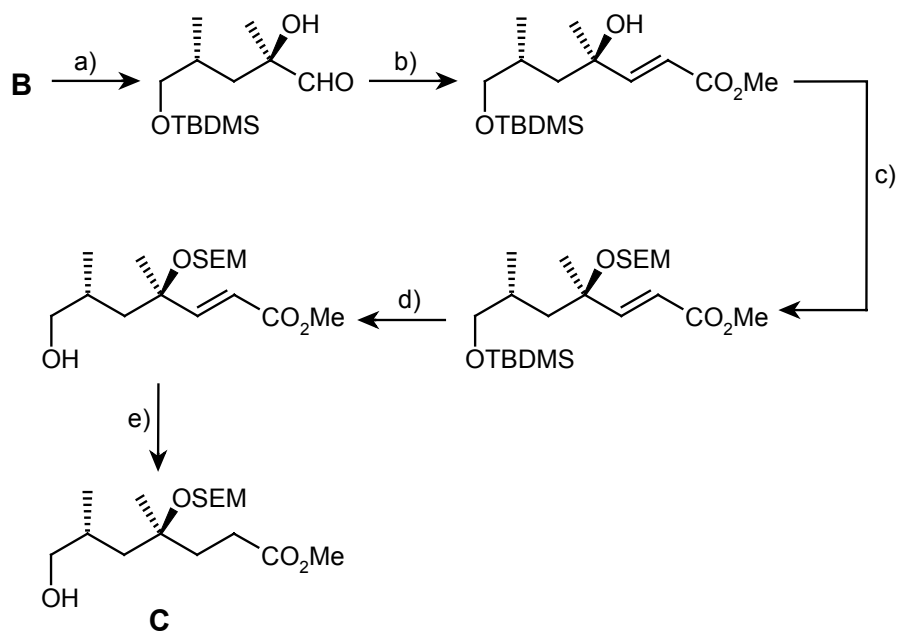
**Bibliography:** Shi, Y.; Peng, Lee F.; Kishi, Yoshito, *J. Org. Chem.* **1997**, *62*, 5666.

## Exercise 38.

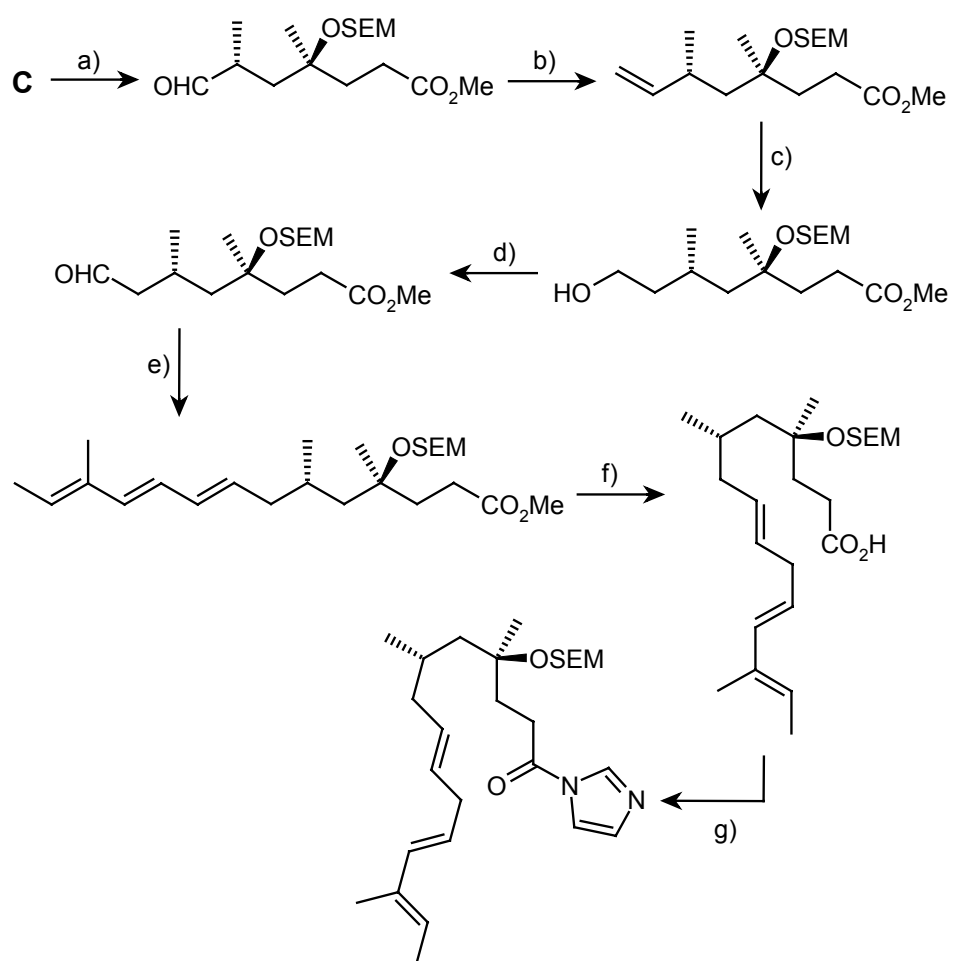
i



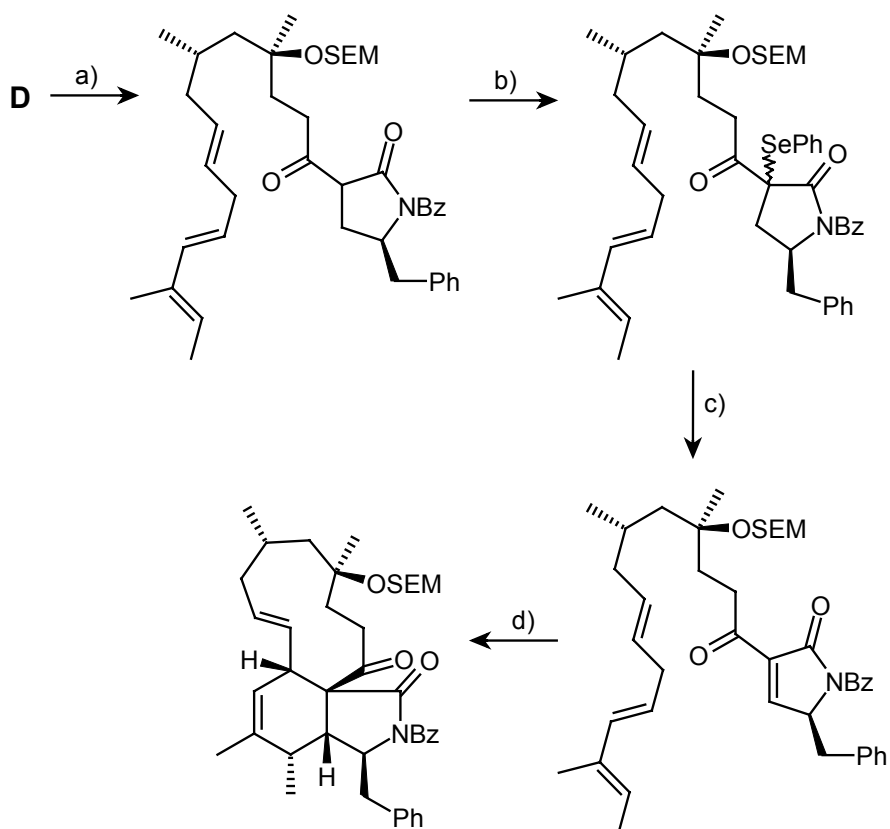
ii



iii



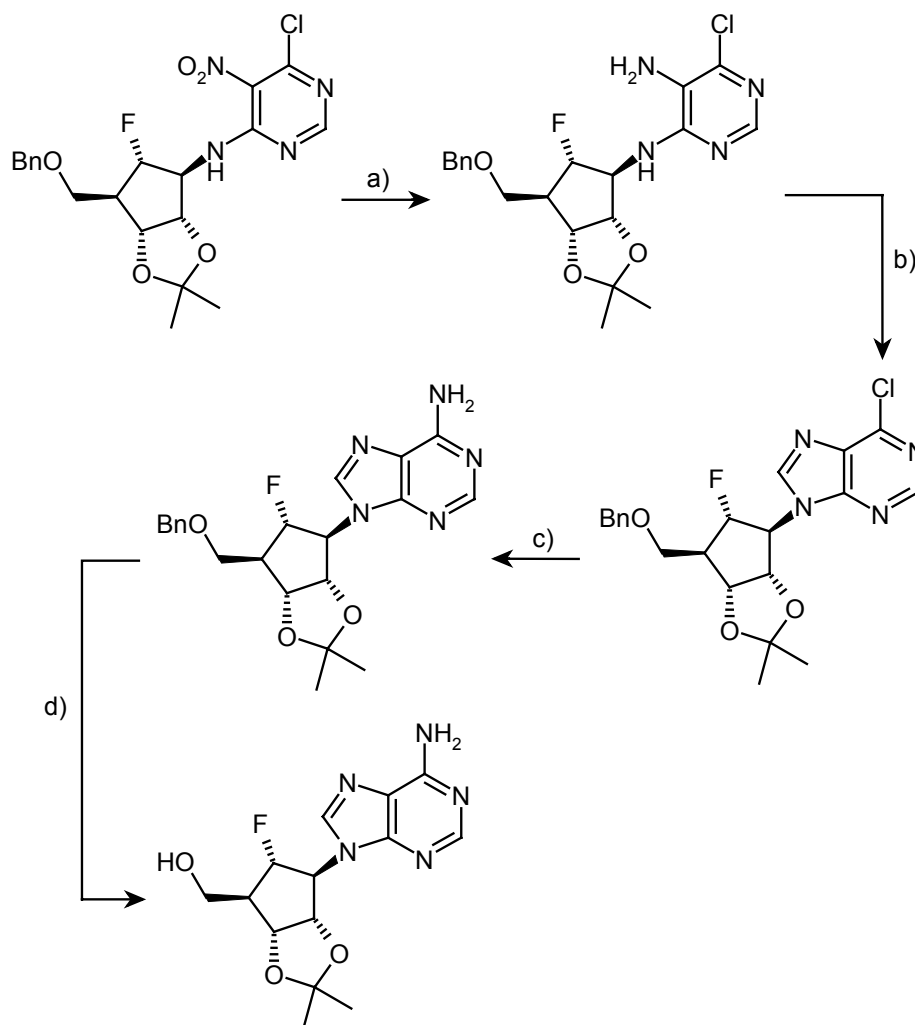
iv



**Bibliography:** Thomas, Eric J.; Whitehead, John W.F. *J. Chem. Soc. Perkin Trans. I*, **1989**, 507.

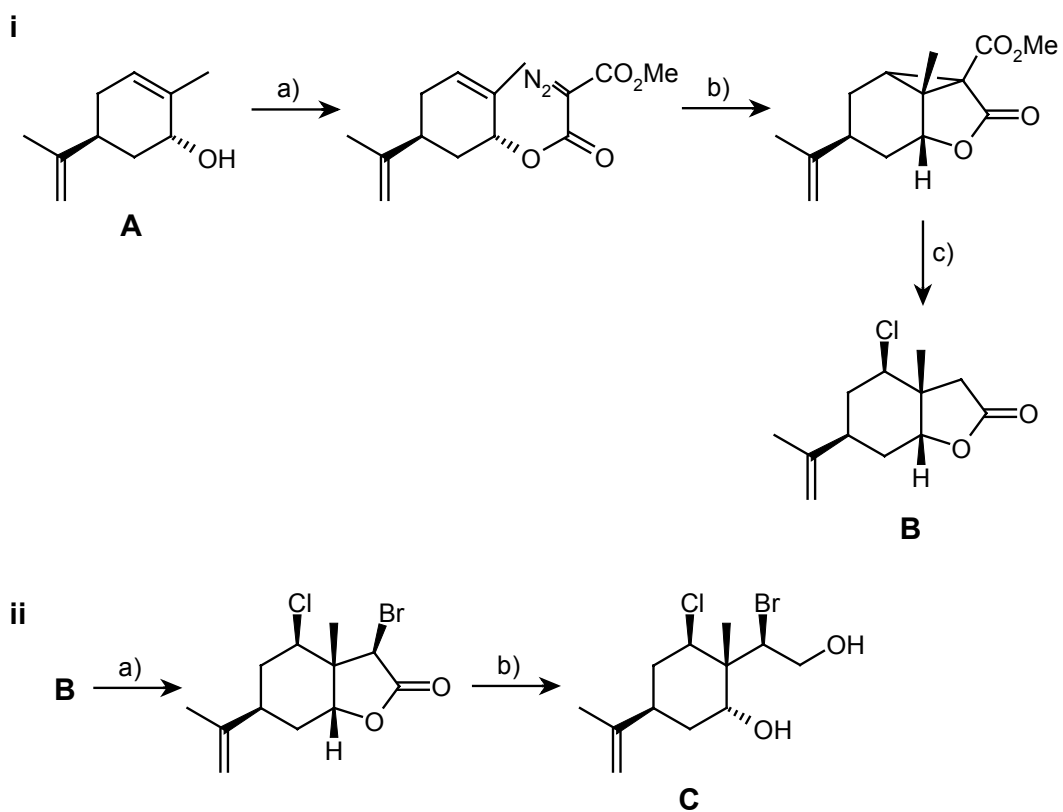
## Exercise 39.

iii



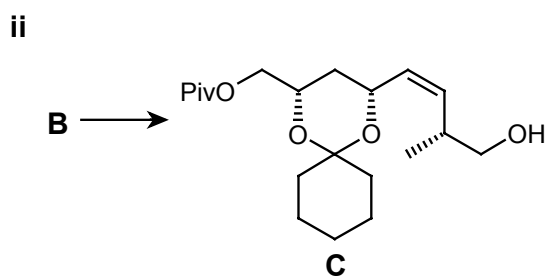
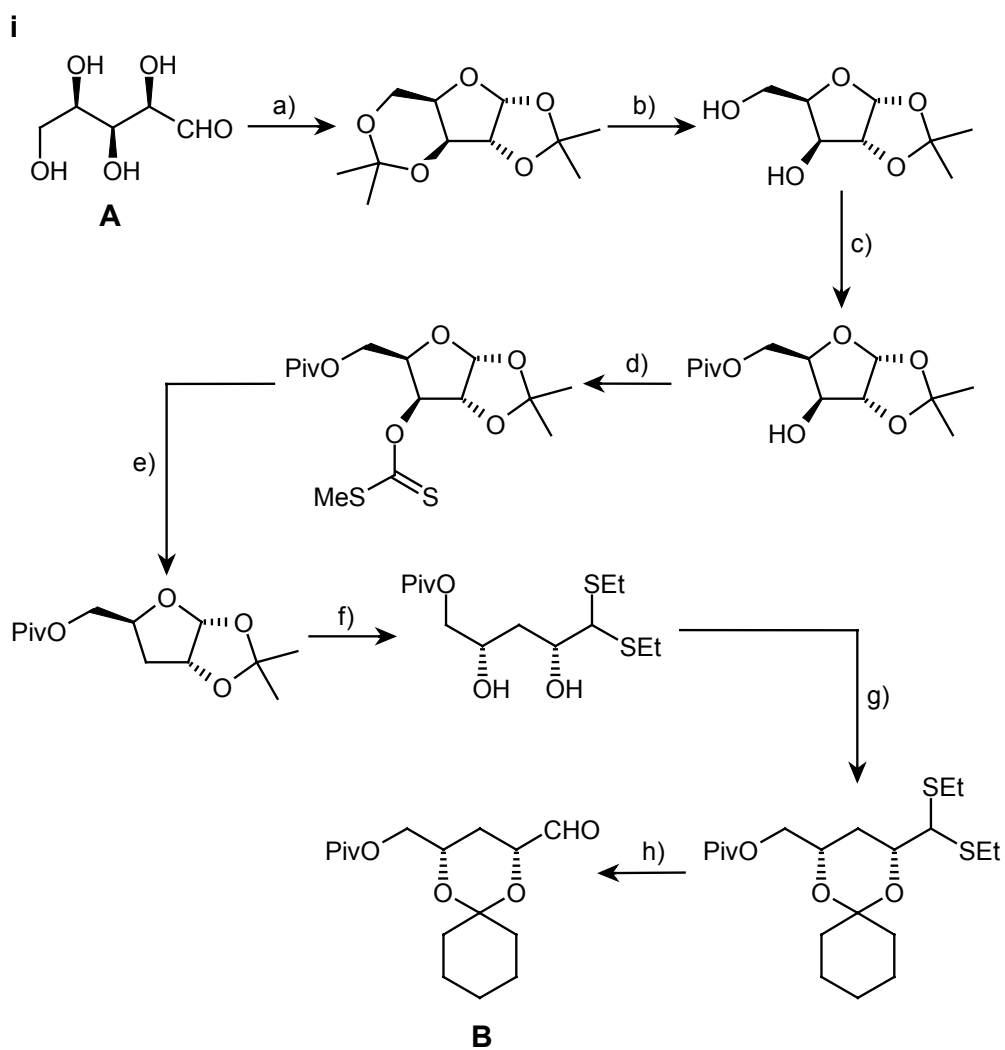
**Bibliography:** Cotterill, I.C.; Cox, P.B.; Drake, A.F.; Le Grand, D.M.; Hutchinson, E.J.; Latouche R.; Pettman, R.B.; Pryce, R.J.; Roberts, S.M.; Ryback, G.; Sik, V.; Williams, J.O. *J. Chem. Soc. Perkin Trans. I*, **1991**, 3071.

## Exercise 40.



**Bibliography:** Fukuyama, Tohru; Chen, Xiaoqi, *J. Am. Chem. Soc.* **1994**, *116*, 3125.

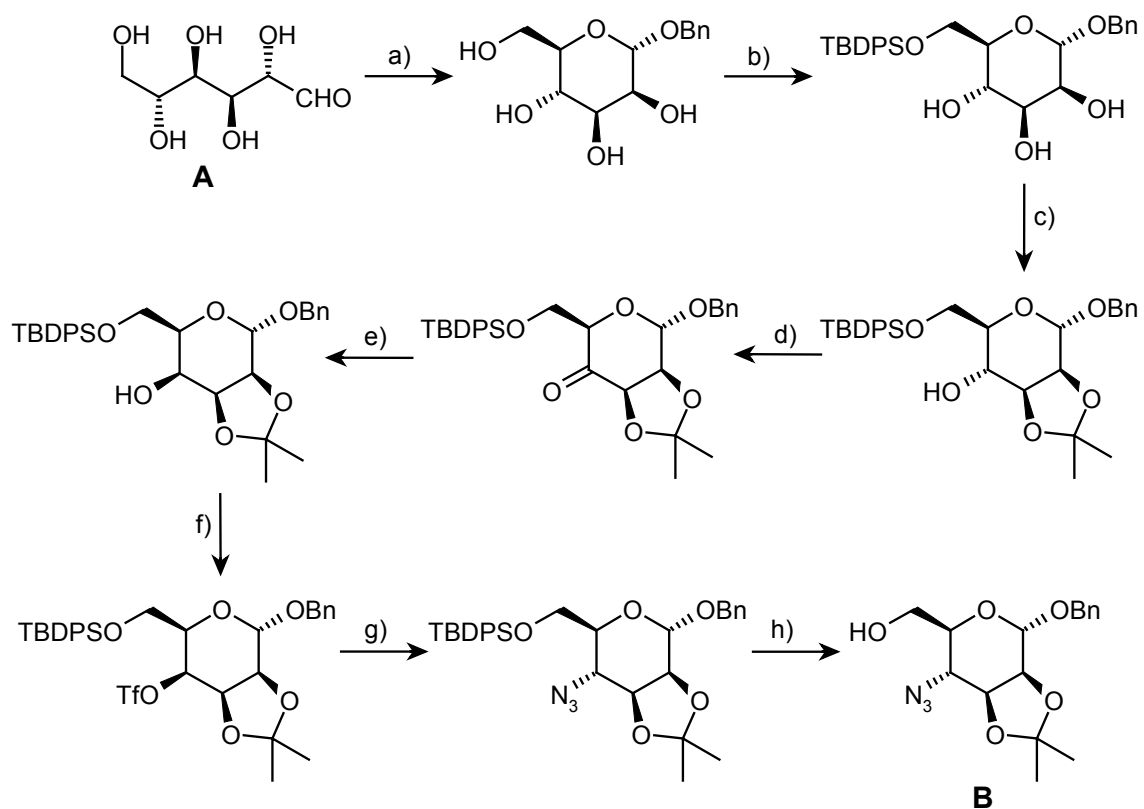
## Exercise 41.



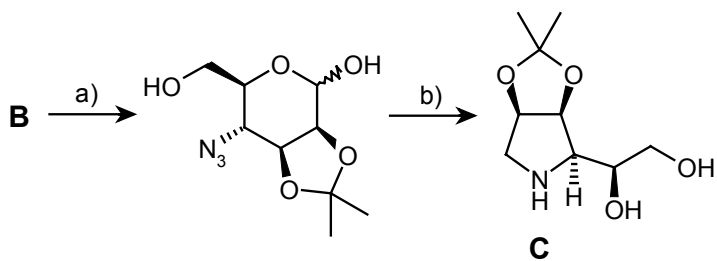
**Bibliography:** White, James D.; Jeffrey, Scott C. *J. Org. Chem.* **1996**, *61*, 2600.

## Exercise 42.

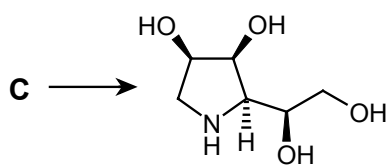
i



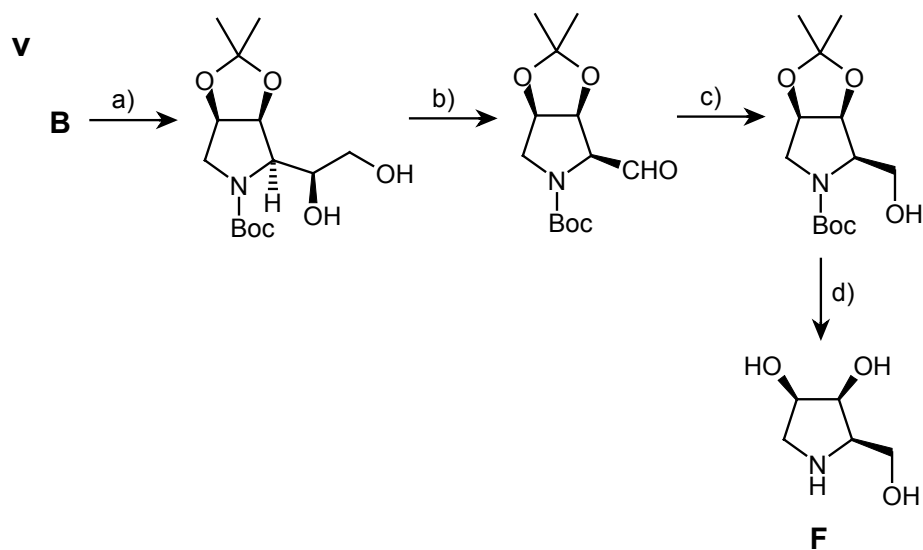
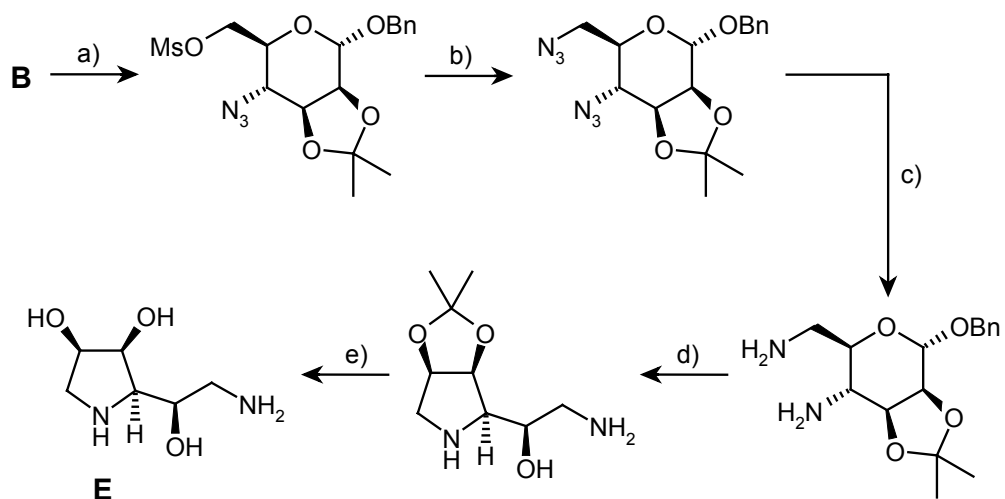
ii



iii

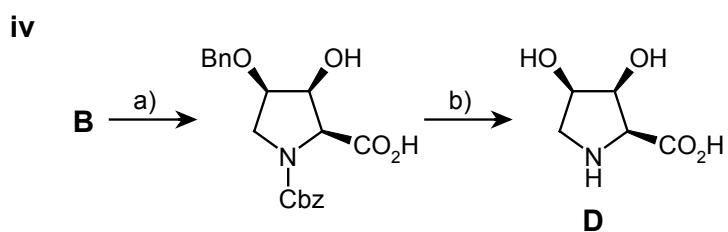
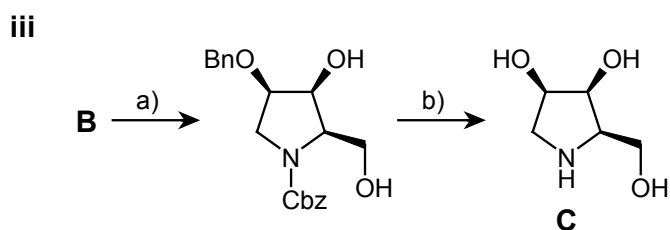
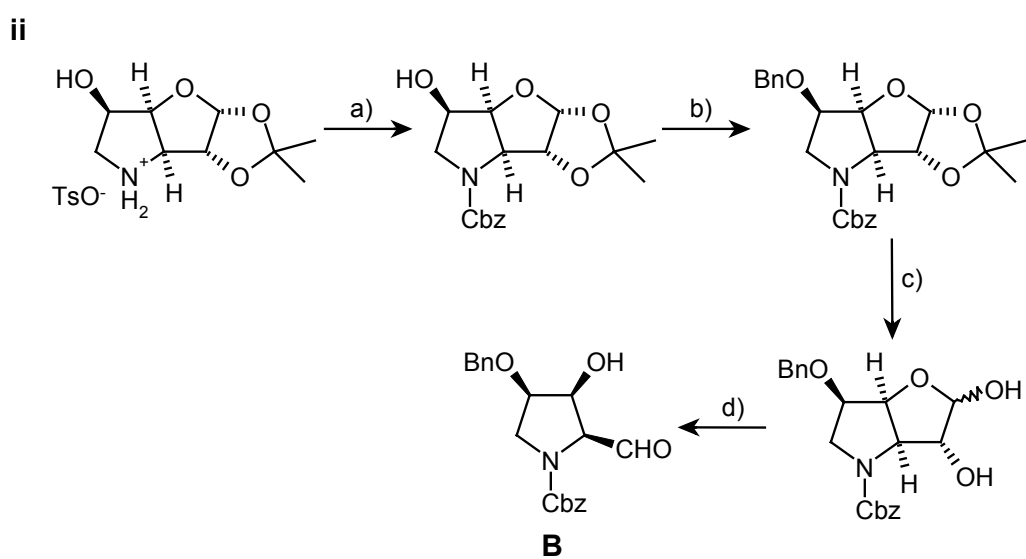
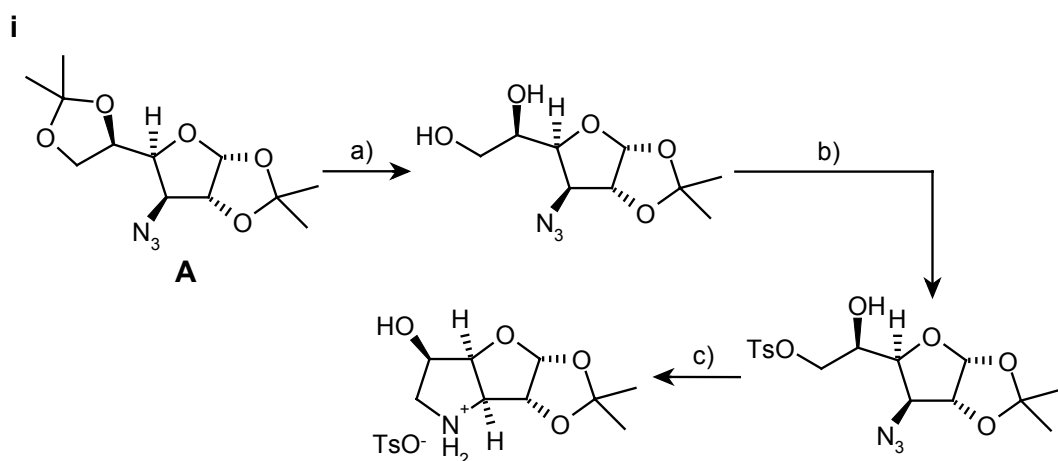


iv

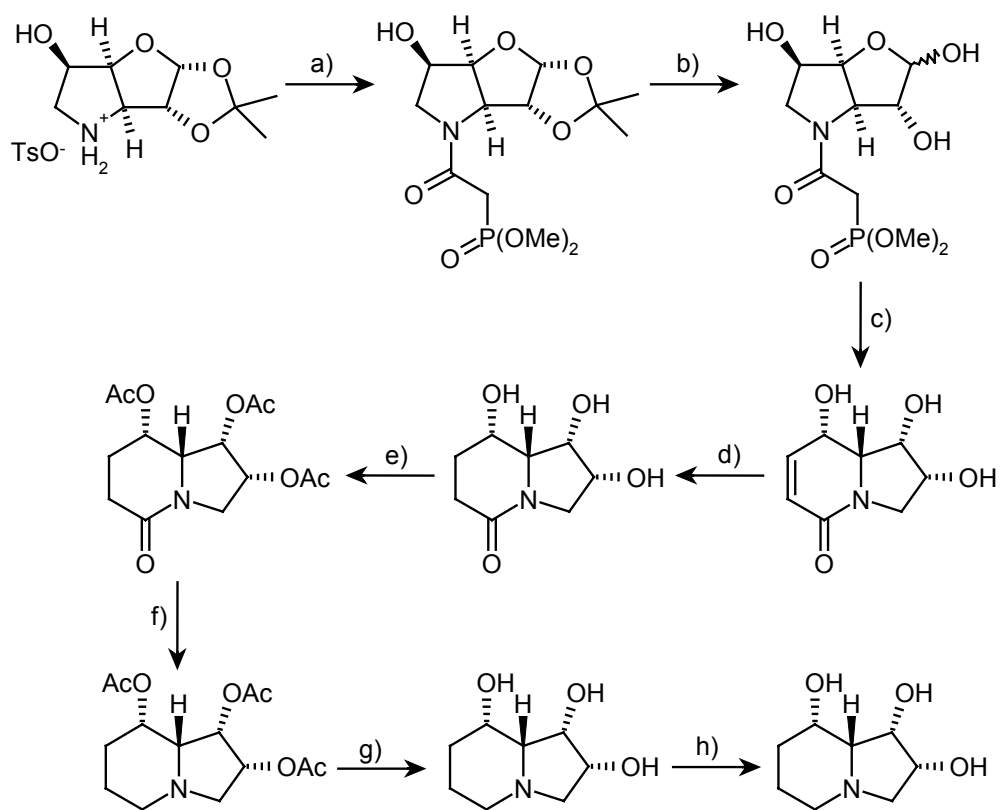


**Bibliography:** Fleet, G.W.J.; Nicholas, S.J.; Smith, P.W.; Evans, S.V.; Fellows, L.E.; Nash, R.J. *Tetrahedron Lett.* **1985**, *26*, 3127; Bashyal, B.P.; Fleet, G.W.J.; Gough, M.J.; Smith, P.W. *Tetrahedron* **1987**, *25*, 1853; Bashyal, B.P.; Fleet, G.W.J.; Gough, M.J.; Smith, P.W. *Tetrahedron* **1987**, *43*, 3083; Farr, R.A.; Holland, A.K.; Huber, E.W.; Peet, N.P.; Weintraub, P.M. *Tetrahedron* **1994**, *50*, 1033.

## Exercise 43.



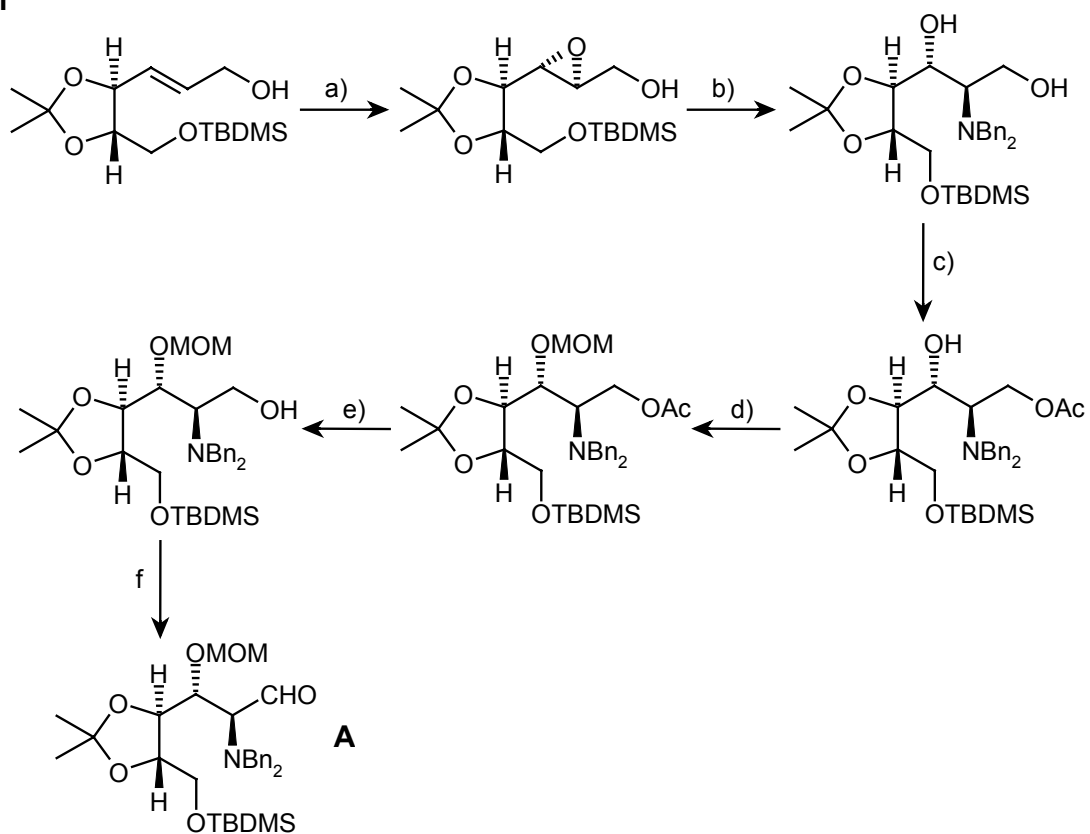
v



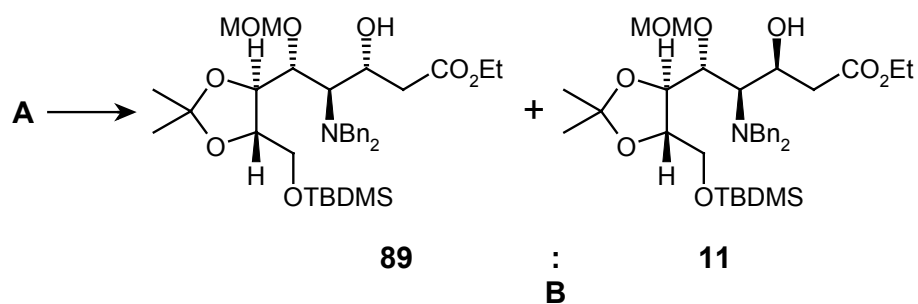
**Bibliography:** Austin, G.N.; Baird, P.D.; Fleet, G.W.J.; Peach, J.M.; Smith, P.W.; Watkin, D.J. *Tetrahedron* **1987**, *43*, 3095.

## Exercise 44.

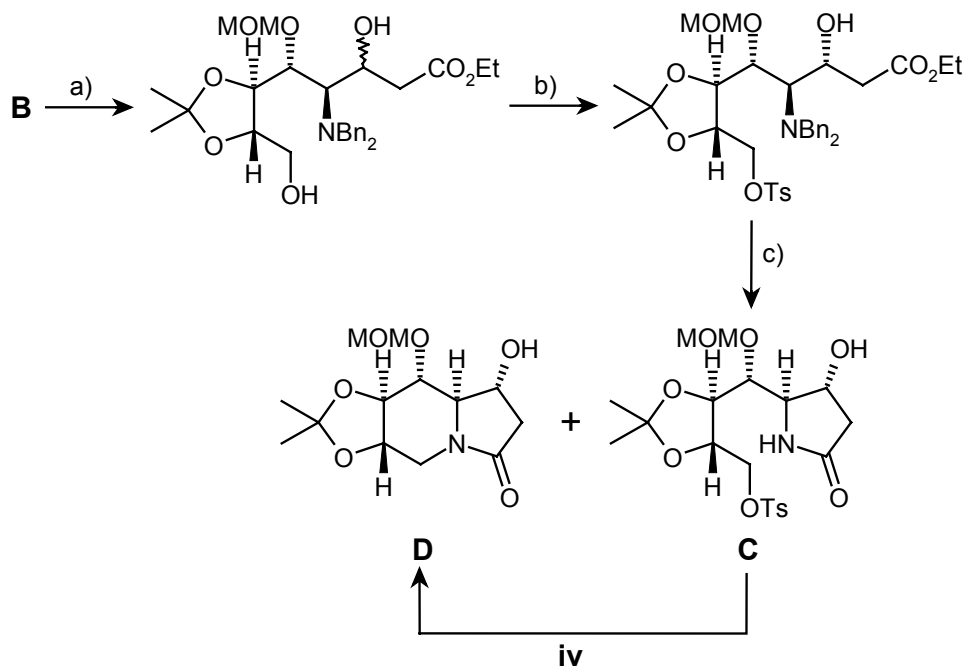
i



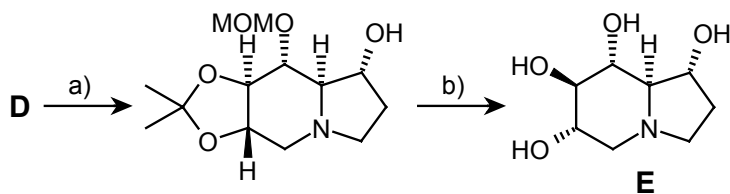
ii



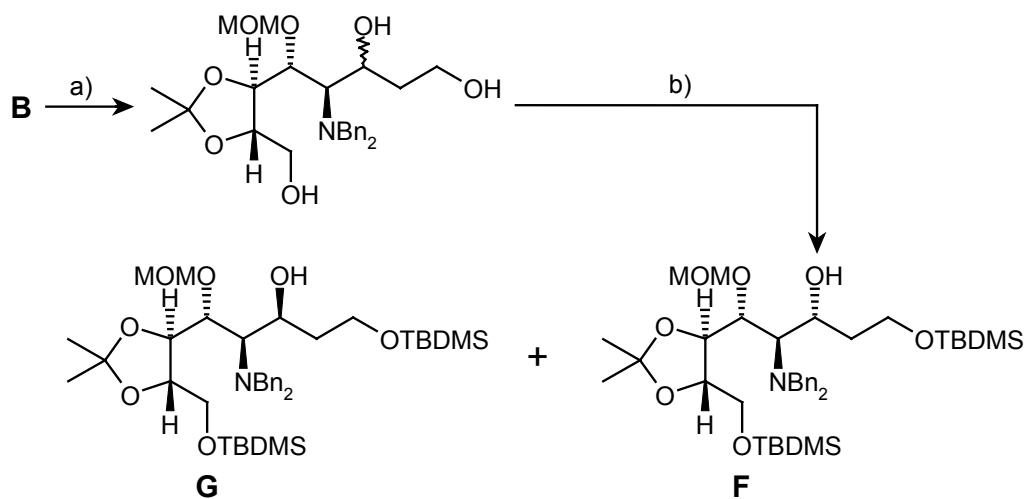
iii



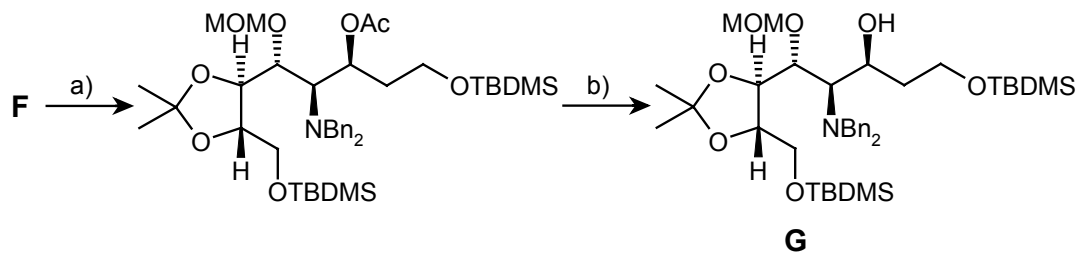
v



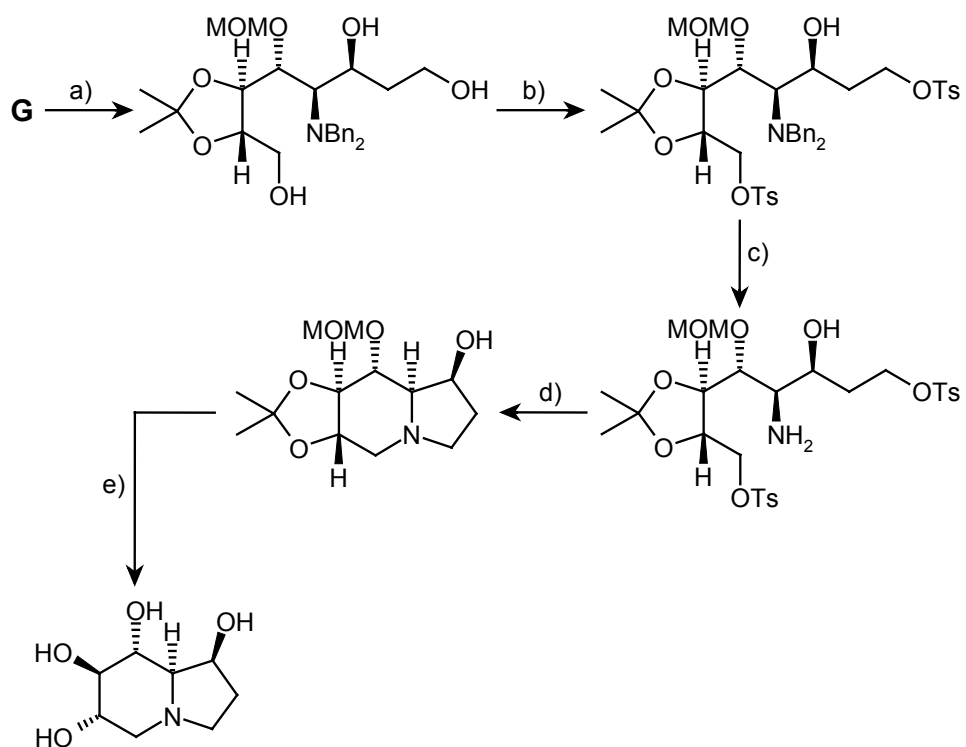
vi



vii



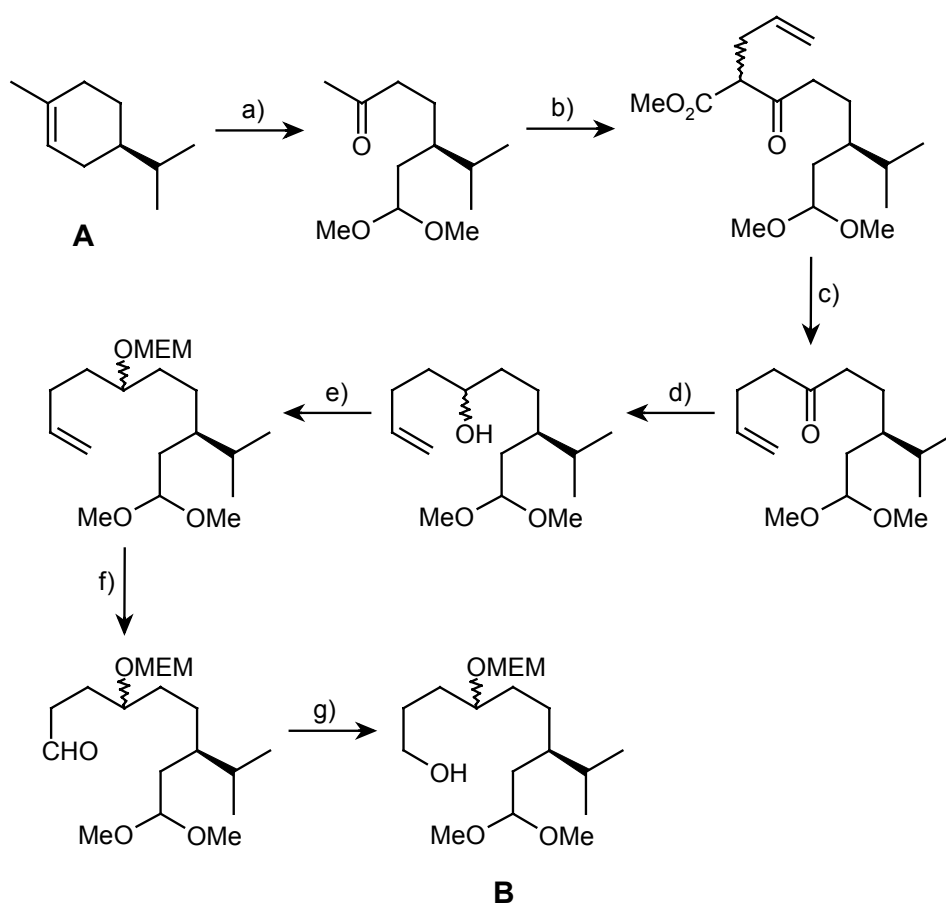
viii



**Bibliography:** Ina, Hiroji; Kibayashi, Chihiro, *J. Org. Chem.* **1993**, *58*, 52.

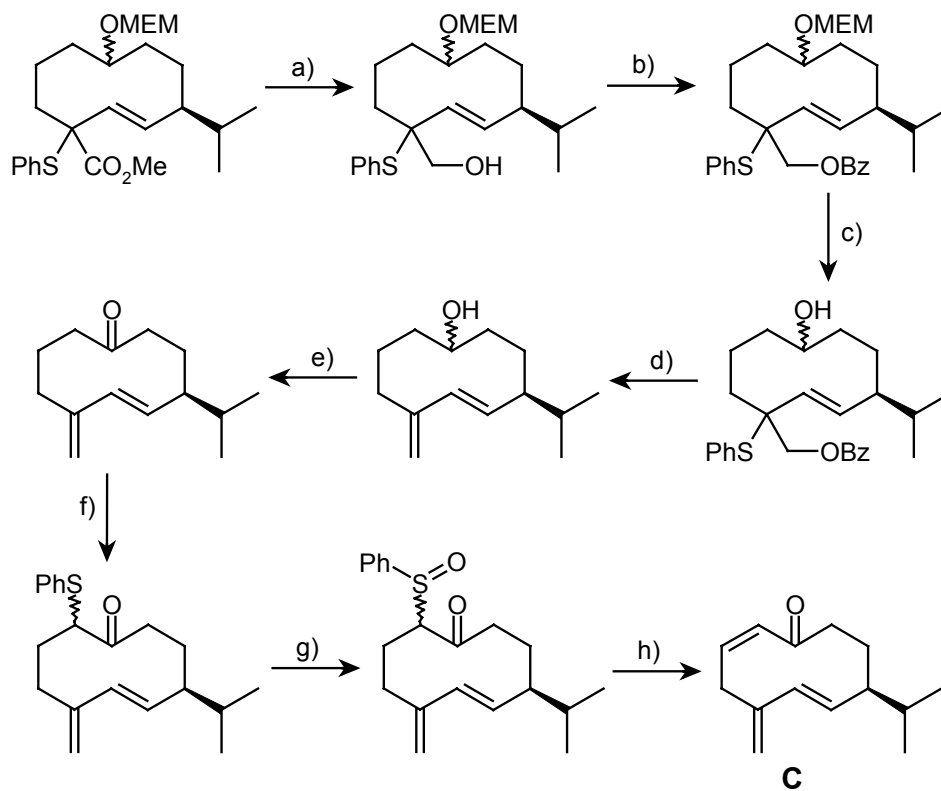
## Exercise 45.

i

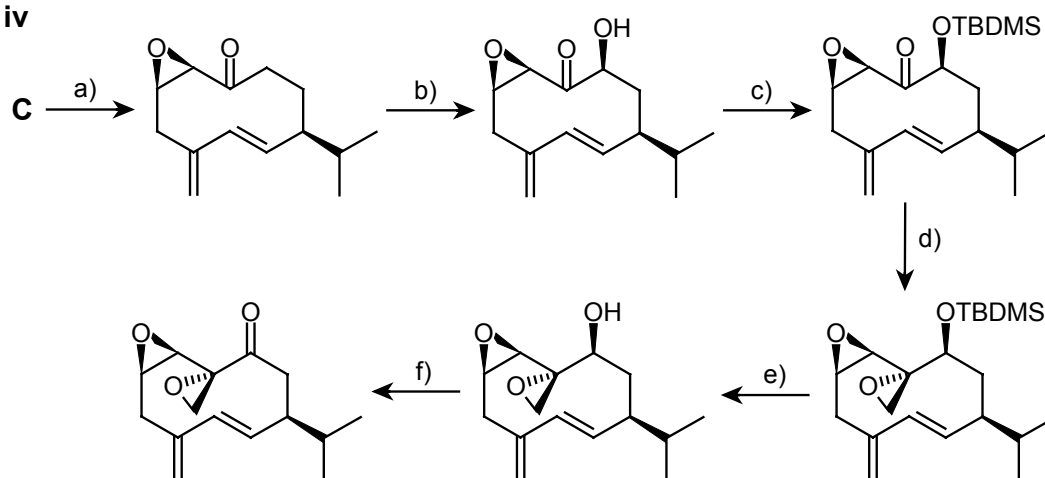




iii

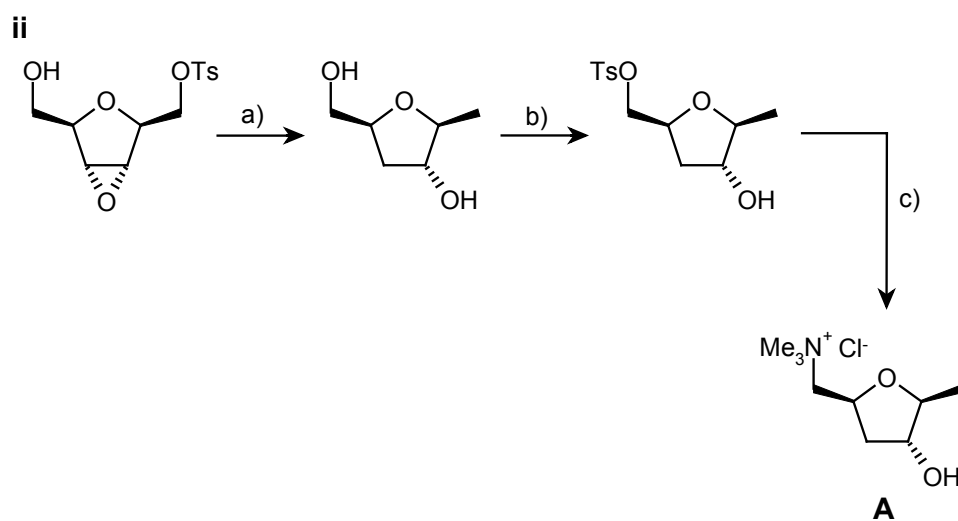
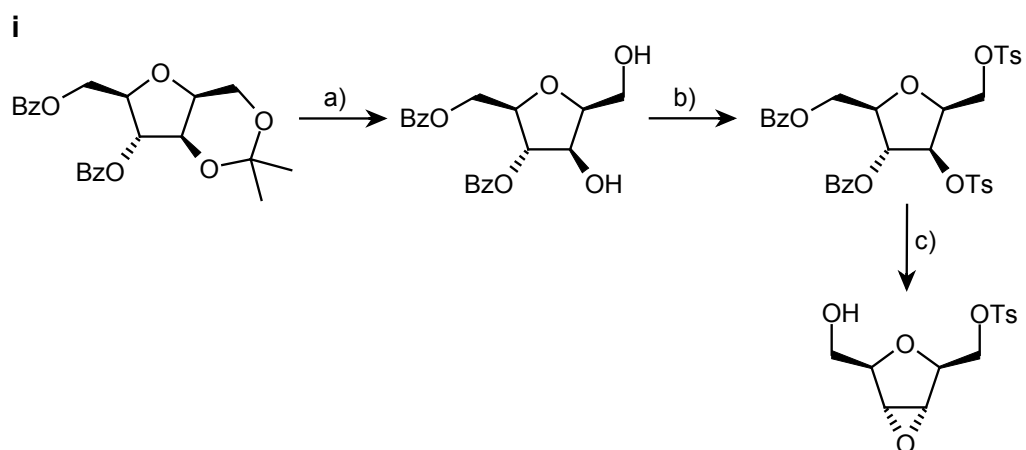


iv



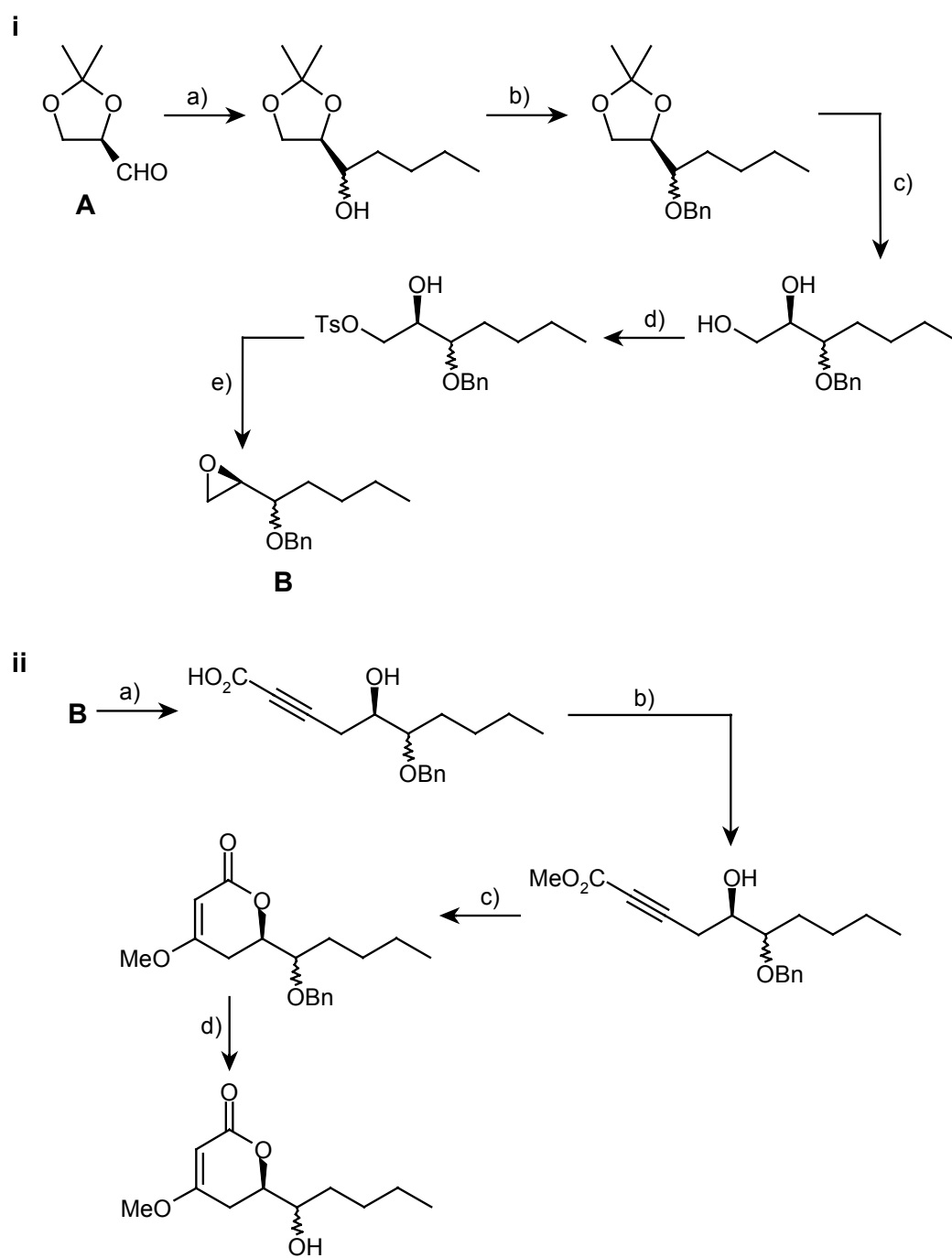
**Bibliography:** Kitahara, T.; Masataka, M.; Mori, K. *Tetrahedron* **1987**, *43*, 2689.

## Exercise 46.



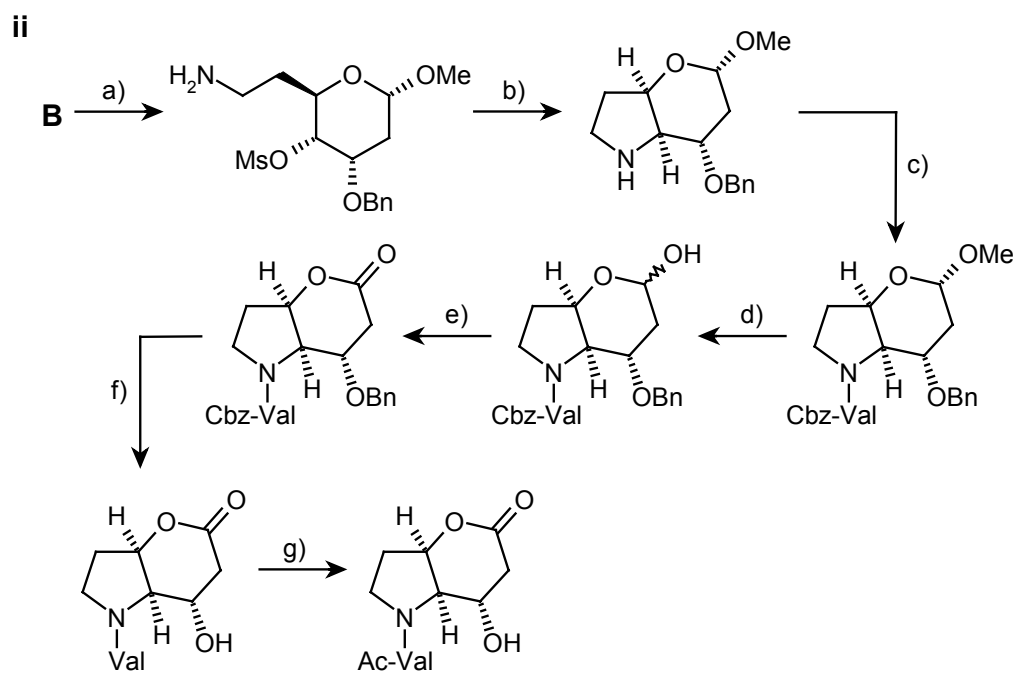
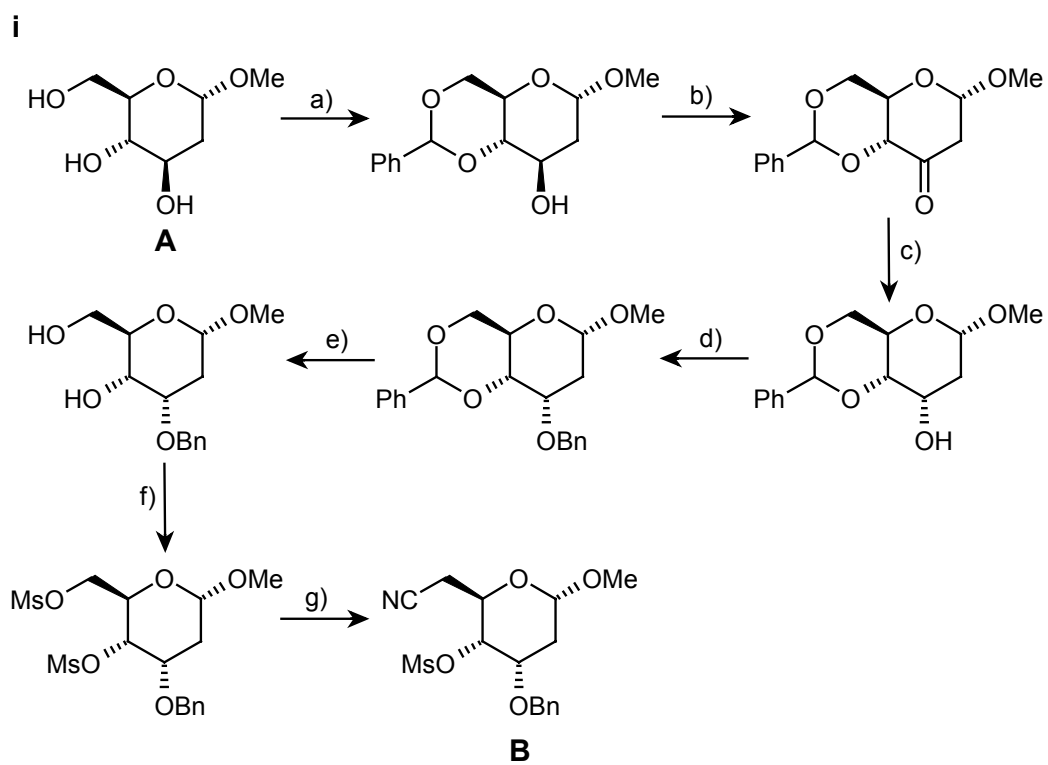
**Bibliography:** Mubarak, A.M.; Brown, D.M. *Tetrahedron Lett*, **1980**, *21*, 2453.

## Exercise 47.



**Bibliography:** Mori, K.; Oda, M. y Matsui, M. *Tetrahedron Lett.* **1976**, *17*, 3173.

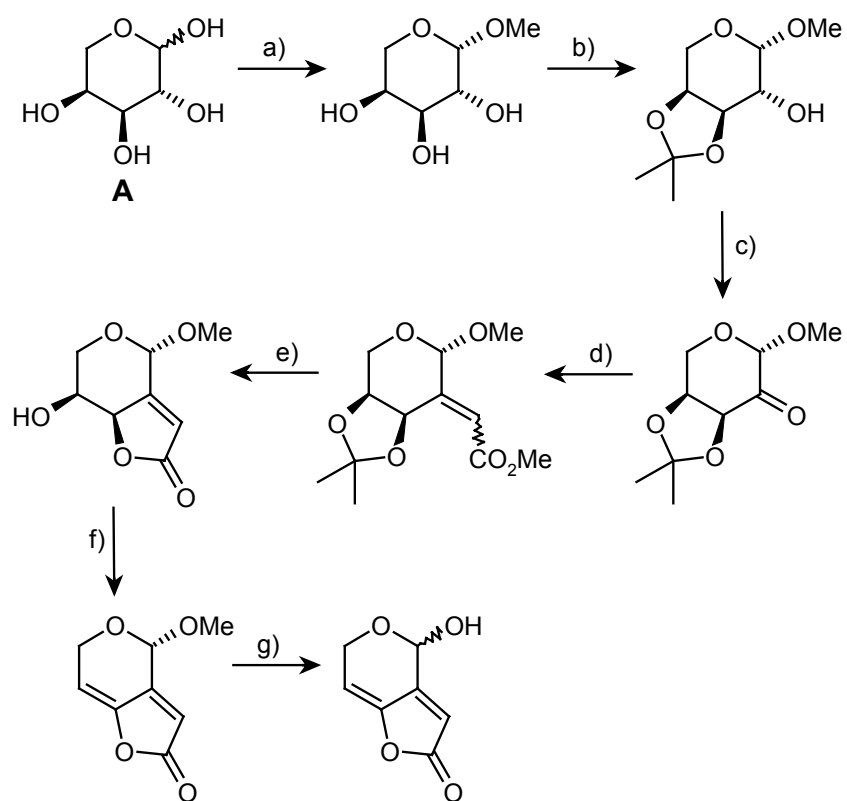
## Exercise 48.



**Bibliography:** Kakinuma, K.; Ōtake, N.; Yonehara, H. *Tetrahedron Lett*, **1980**, 21, 167.

## Exercise 49.

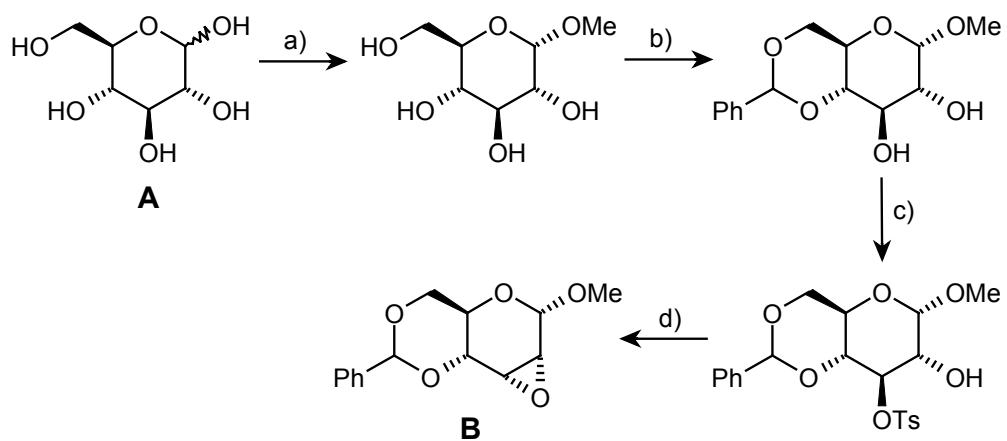
i



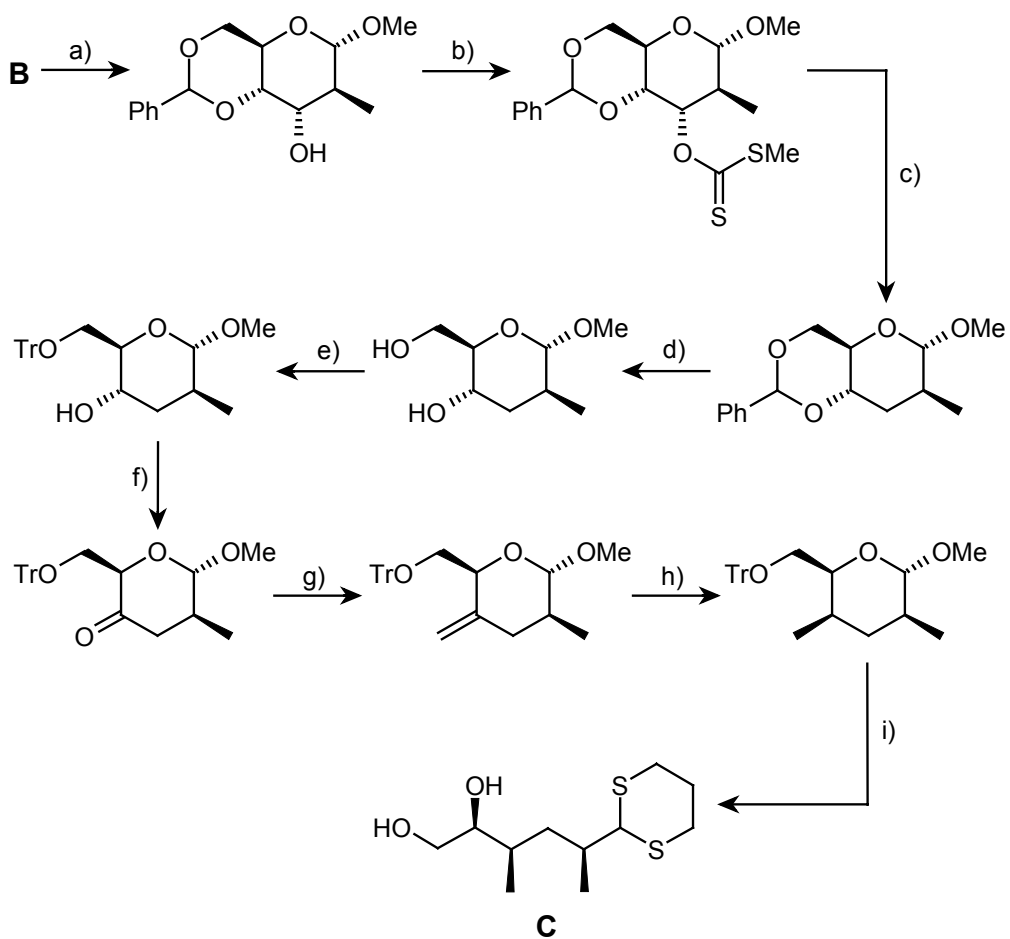
**Bibliography:** Seijas, J.A.; Vázquez Tato, M.P.; Estévez, R.J.; Castedo, L.; Riguera, R. *Heterocycles*, **1989**, 29, 181.

## Exercise 50.

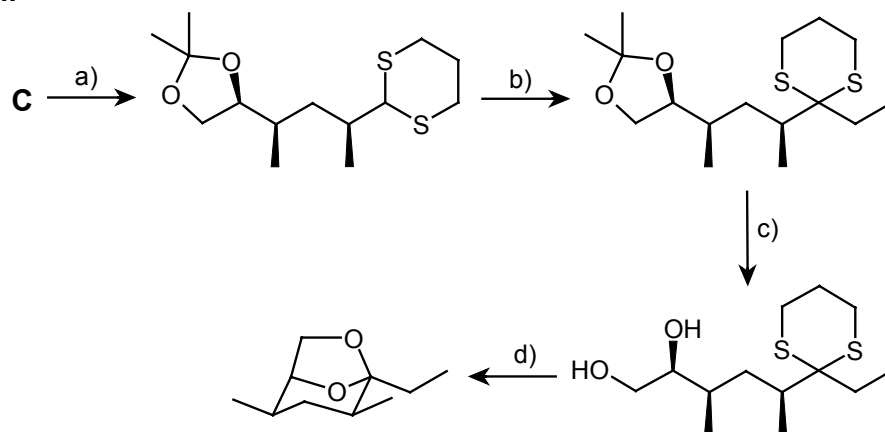
i



ii



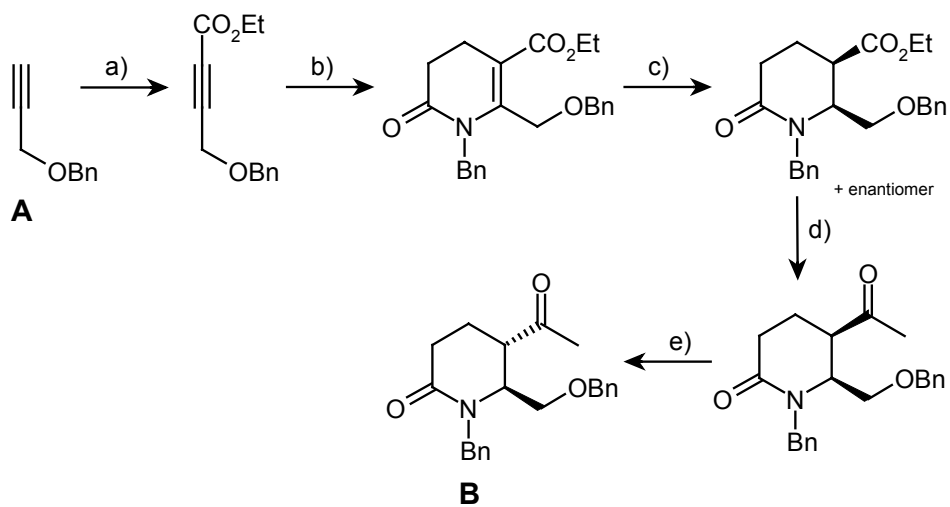
iii



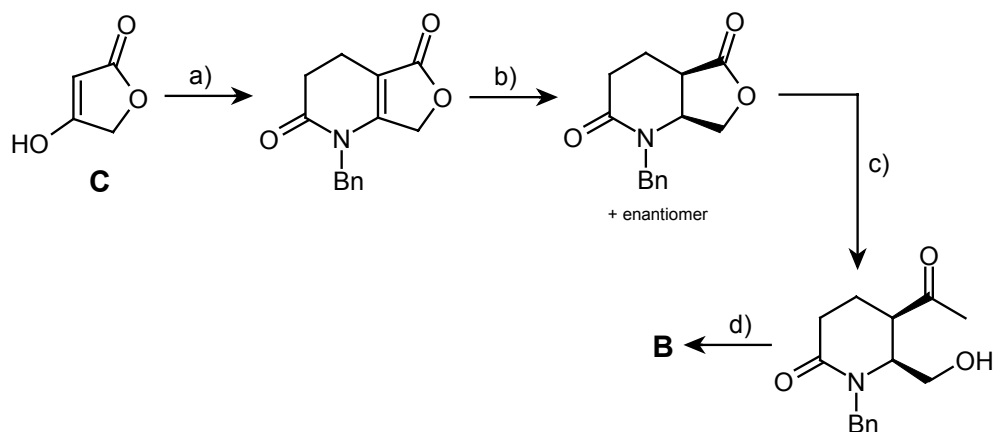
**Bibliography:** Sum, P.-E.; Weiler, L. *Can. J. Chem.* **1978**, *56*, 2700.

## Exercise 51.

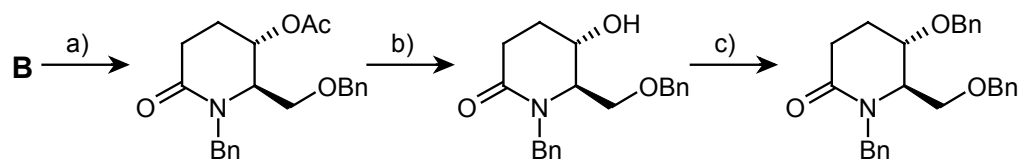
i



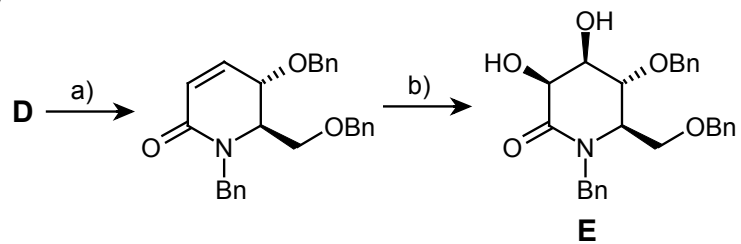
ii



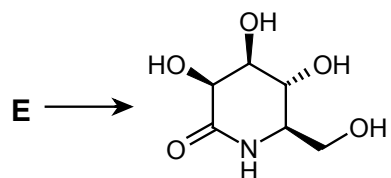
iii



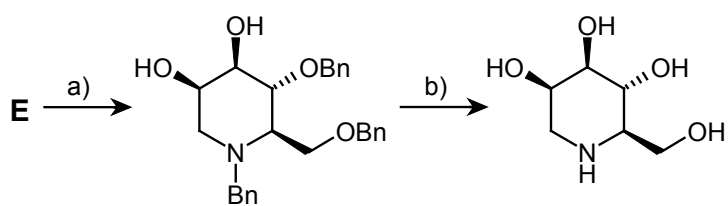
iv



v



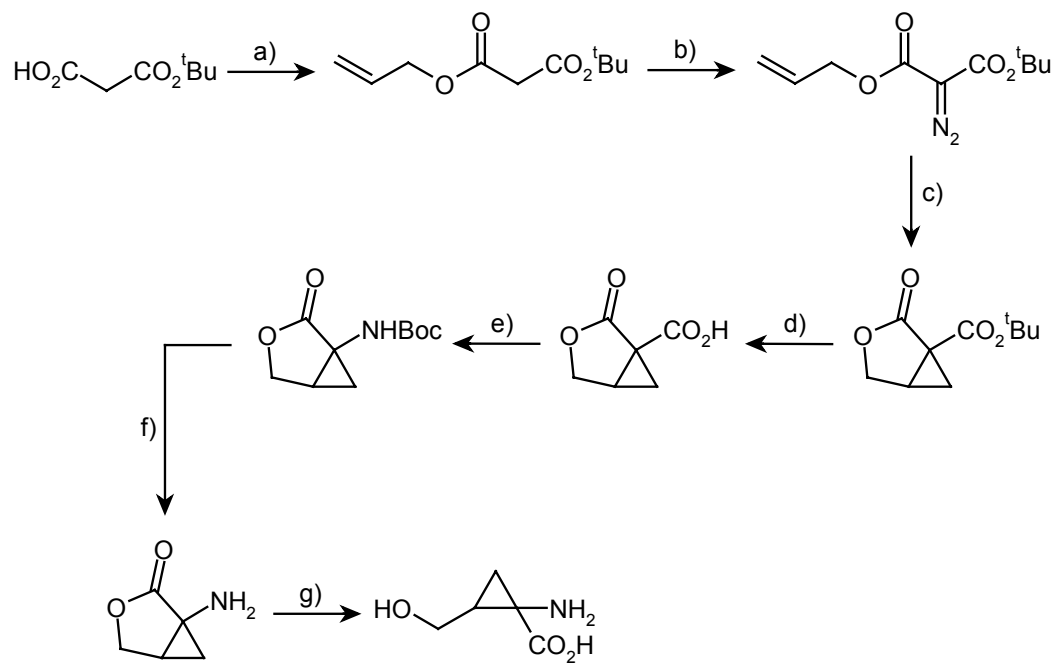
vi



**Bibliography:** Cook, G.R.; Beholz, L.G.; Stille, J.R. *J. Org. Chem.* **1994**, *59*, 3575.

## Exercise 52.

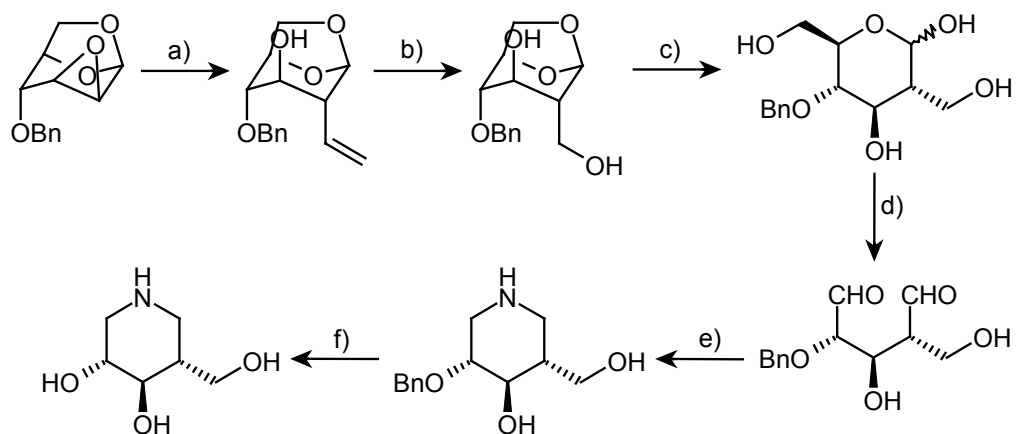
i



**Bibliography:** Koskinen, A.M.P.; Muñoz, L. *J. Org. Chem.* **1993**, *58*, 879.

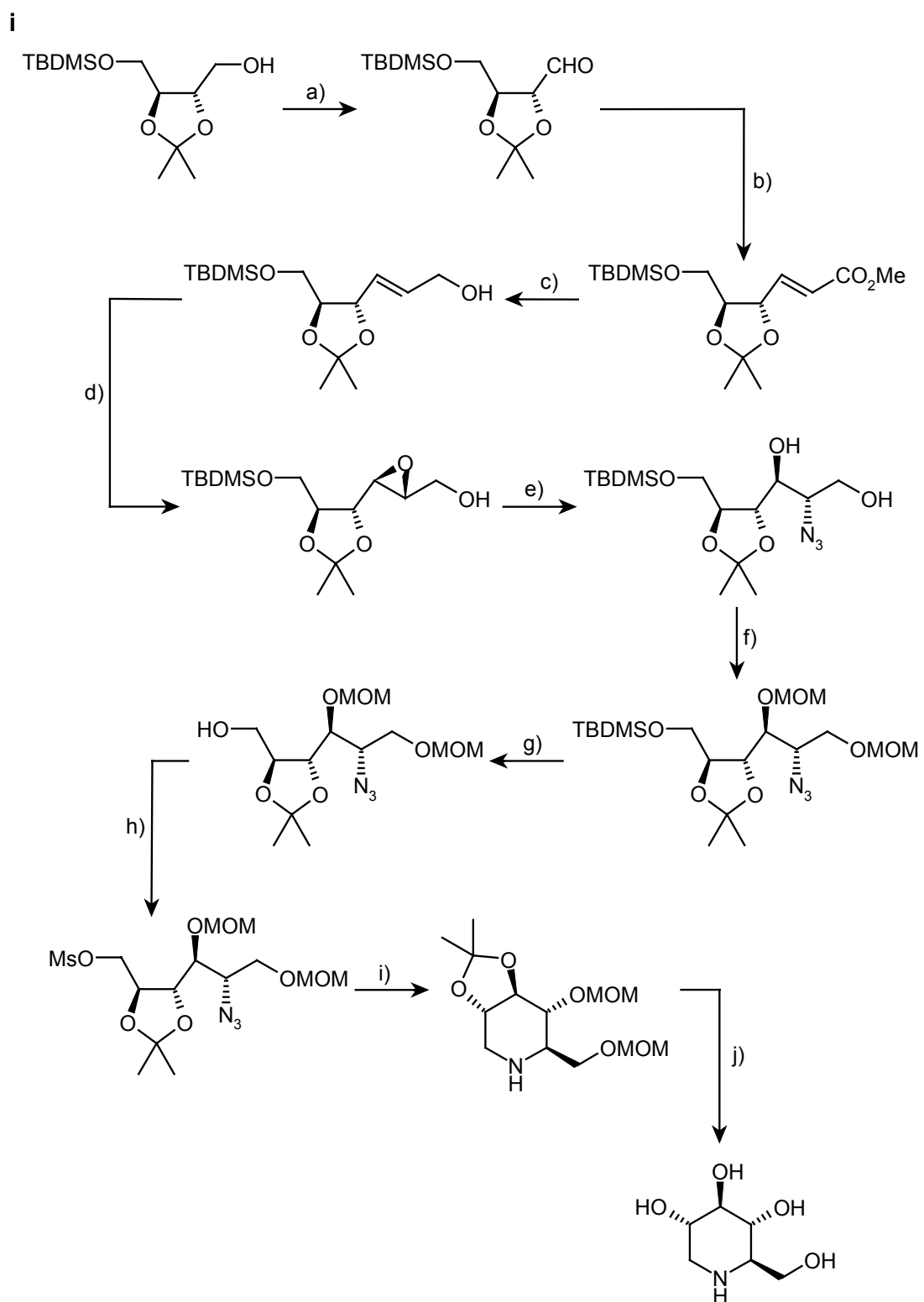
**Exercise 53.**

i



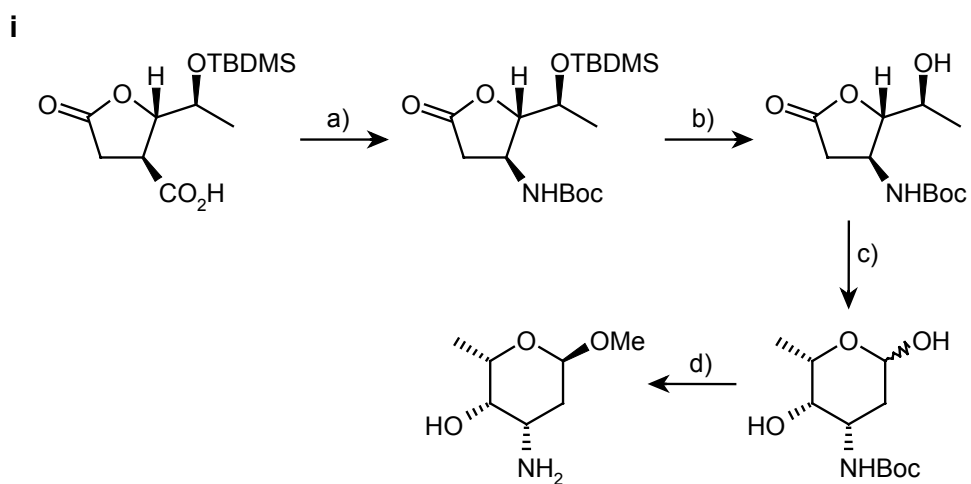
**Bibliography:** Jespersen, T.M.; Bols, M.; Sierks, M.R.; Skrydstrup, T. *Tetrahedron* **1994**, *50*, 13449.

## Exercise 54.



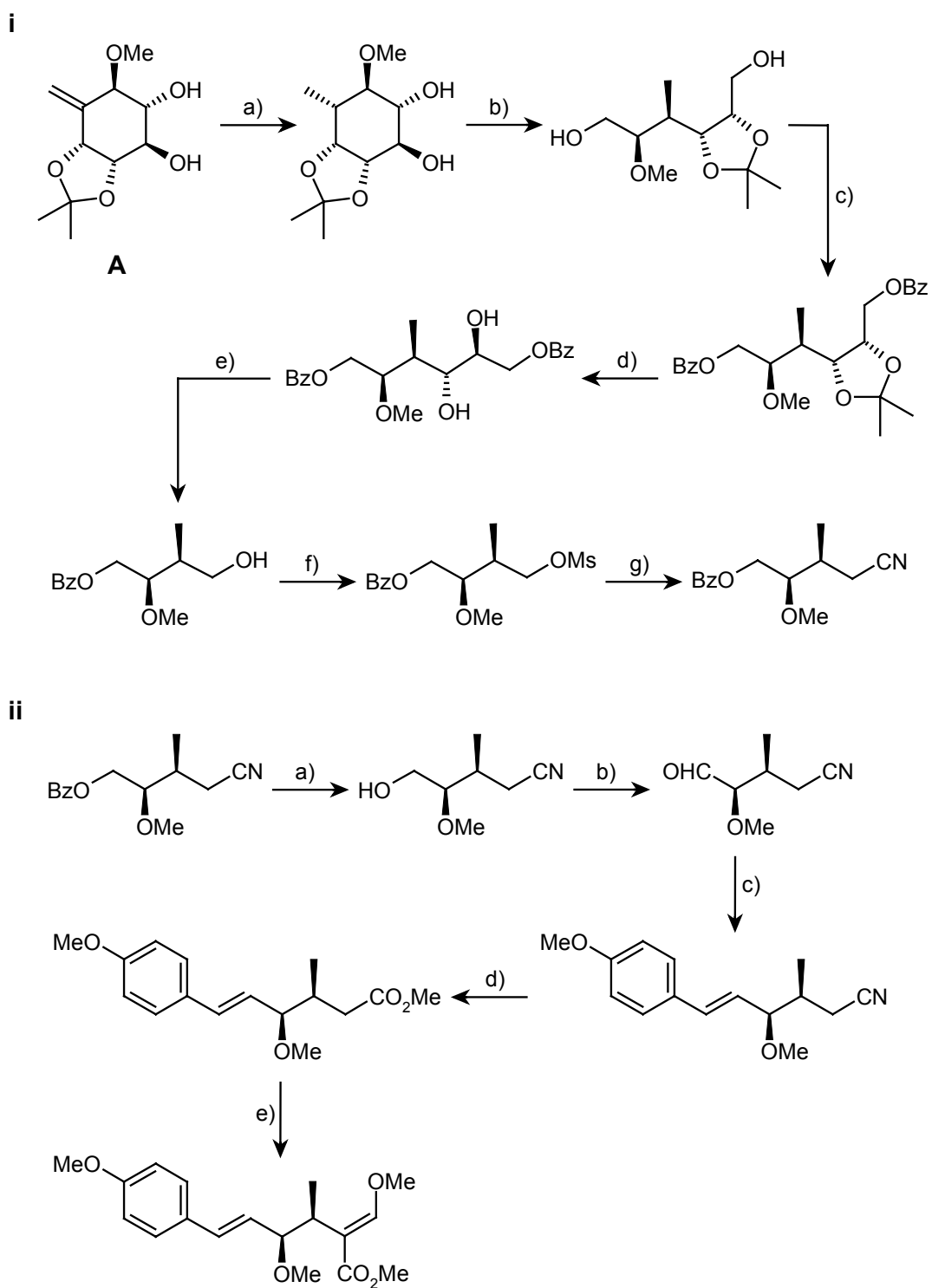
**Bibliography:** Iida, H.; Yamazaki, N.; Kibayashi, C. *J. Org. Chem.* **1987**, *52*, 3337.



**Exercise 56.**

**Bibliography:** Sibi, M.P.; Lu, J.; Edwards, J. *J. Org. Chem.* **1997**, *62*, 5864.

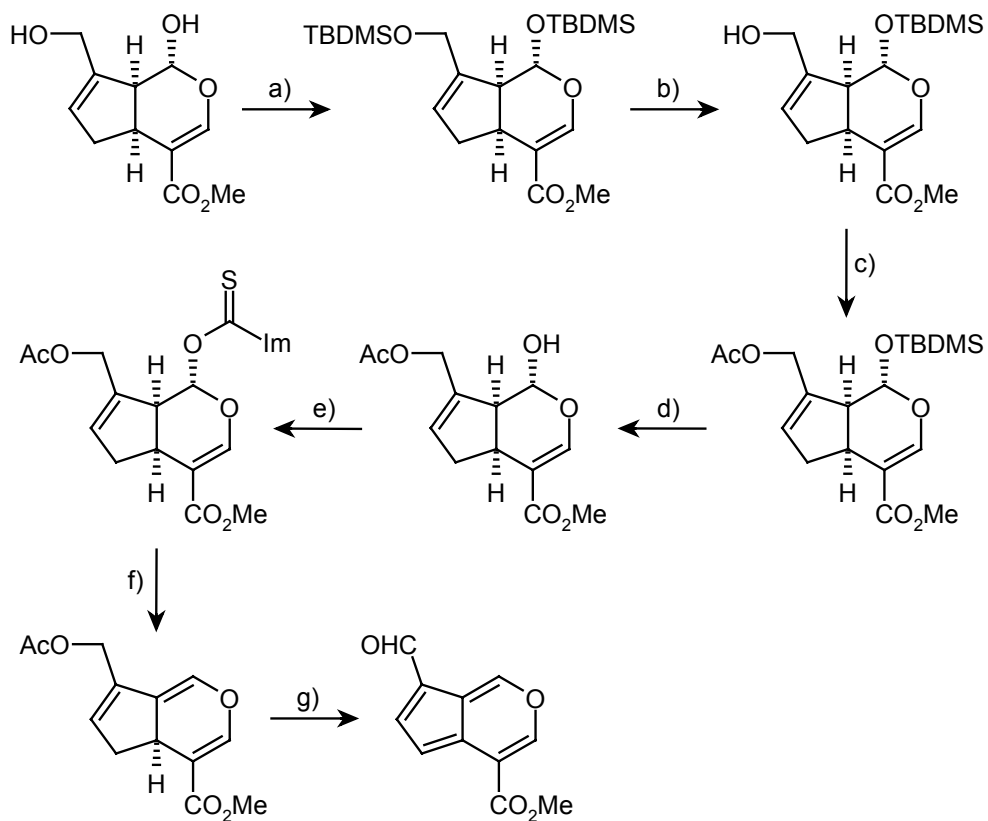
## Exercise 57.



**Bibliography:** Chida, N.; Yamada, K.; Ogawa, S. *Chem. Lett.* **1992**, 687.

## Exercise 58.

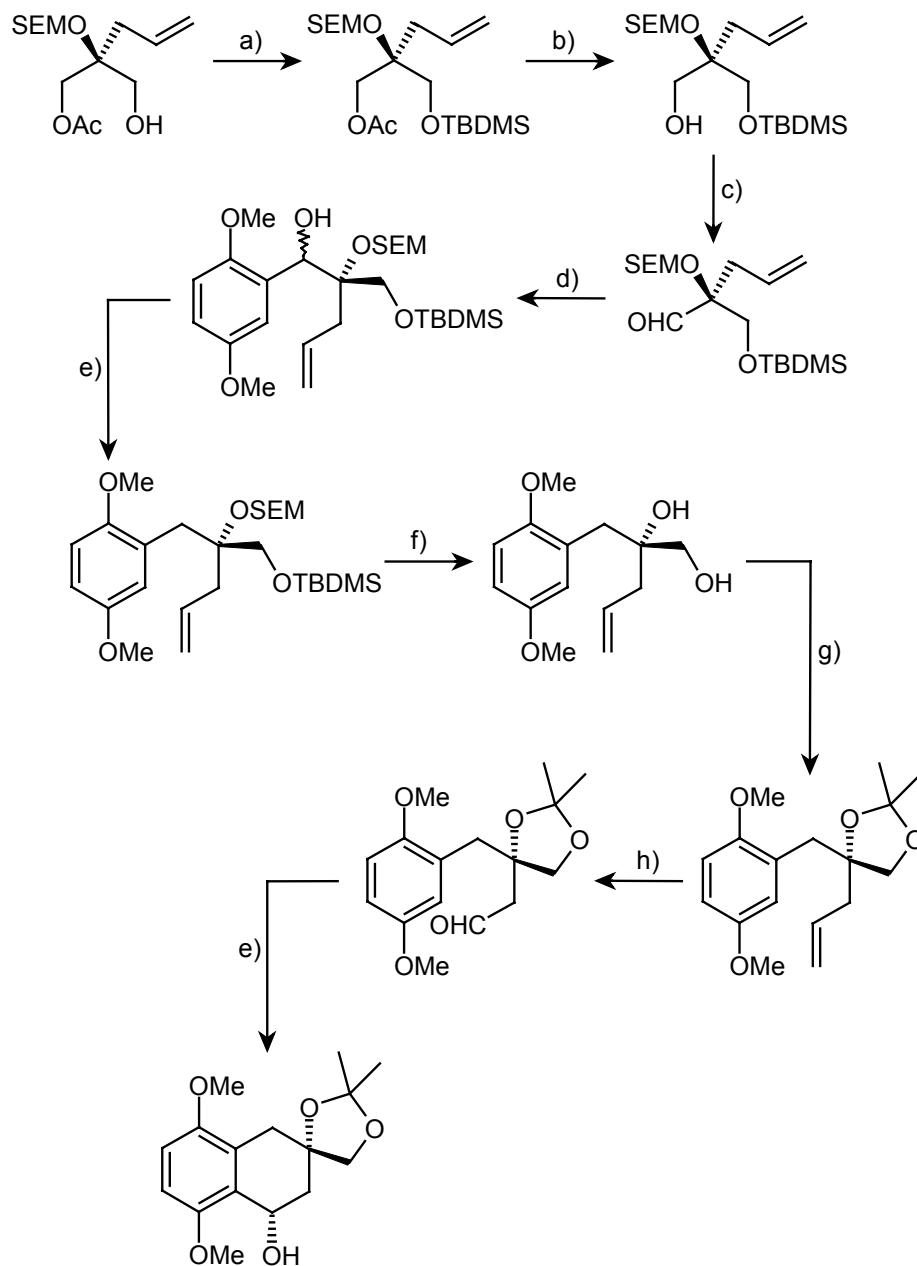
i



**Bibliography:** Ge, Y.; Isoe, S. *Chem. Lett.* **1992**, 139.

## Exercise 59.

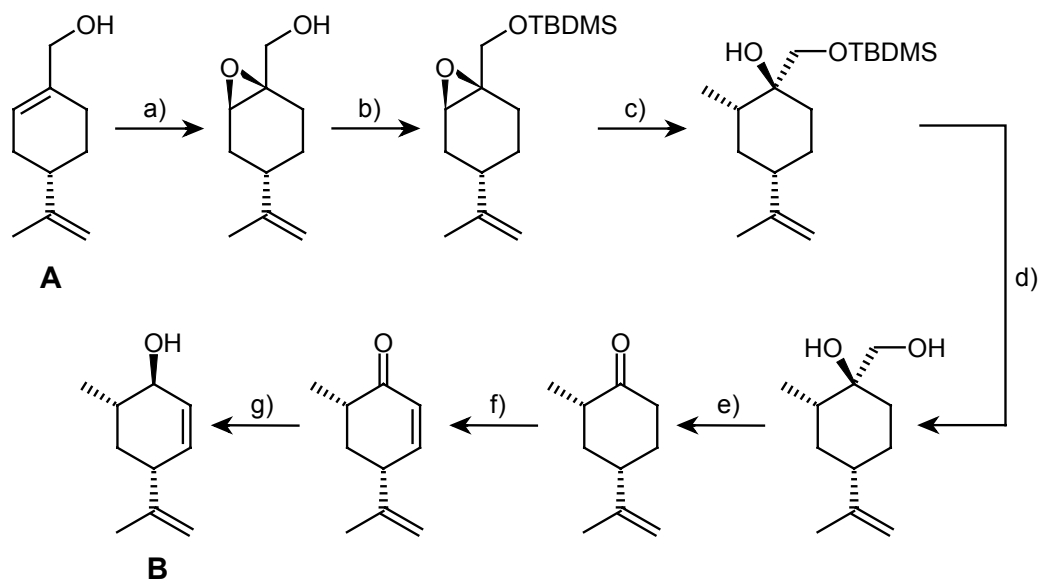
i



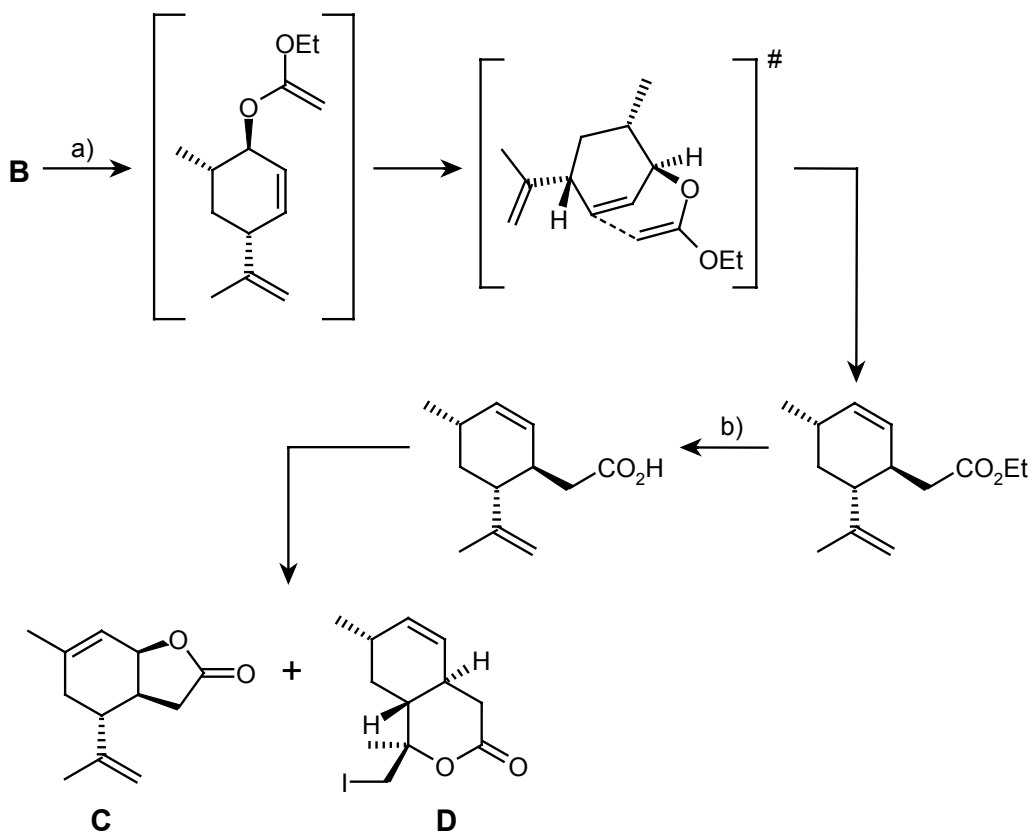
**Bibliography:** Watanabe, N.; Ohta, H. *Chem. Lett.* **1992**, 661.

## Exercise 60.

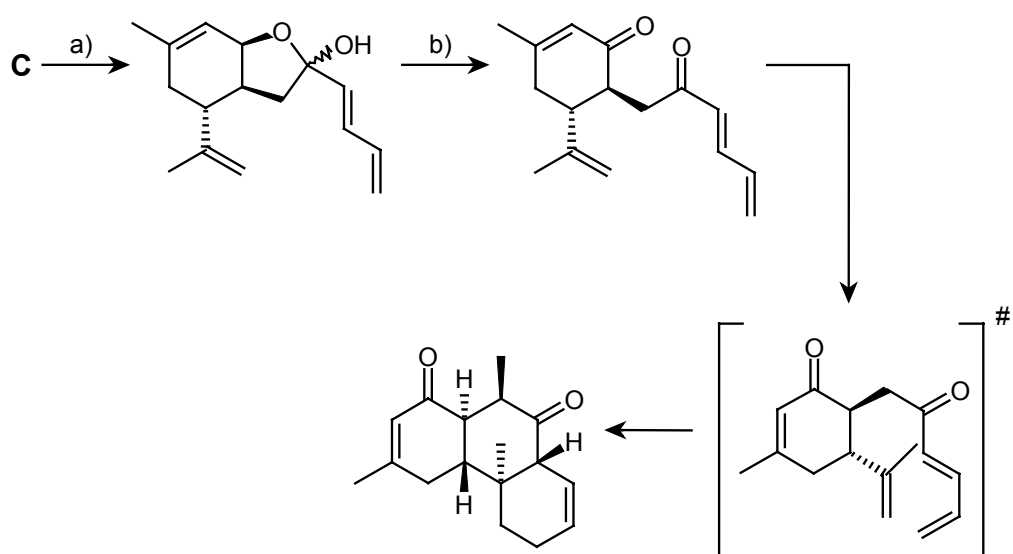
i



ii



iii



**Bibliography:** Tanner, D.; Andersson, P.G.; Tedenborg, L.; Somfai, P. *Tetrahedron* **1994**, *50*, 9135.