Paths of analysis*

PG5

Synthia

October 10, 2022

1 Analysis parameters

Analysis type: Automatic Retrosynthesis

Rules: none selected

Filters: Exclude Diastereoselecitve reactions, Tunnels, FGI, FGI with protections

Max. paths returned: 50

Max. iterations: 2000

Commercial:

1. Max. molecular weight - 1000 g/mol
2. Max. price - 1500 $/g

Published:

1. Max. molecular weight - 1000 g/mol
2. Popularity - 5

My Stockroom:

1. Max. molecular weight - 1000 g/mol

Reaction scoring formula: TUNNEL_COEF*FGI_COEF*STEP*20+1000000*(CONFLICT+NON_SELECTIVITY+FILTERS+PROTECT)

Chemical scoring formula: SMALLER^ 3,SMALLER^ 1.5

Min. search width: 400

Max. reactions per product: 60

*The results stated herein were generated using the proprietary platform owned and maintained by Grzybowski Scientific Inventions, Inc., a subsidiary of Merck KGaA, Darmstadt Germany. The results are provided on an as is basis, and shall be used solely in connection with the rights afforded in the license agreement and for no other purpose.

Strategies: none selected

FGI Coeff: 0

Tunnels Coeff: 0

JSON Parameters: {}

2 Paths

5 paths found. *Paths are sorted by score. Reactions are sorted in appearance order for each path.*

2.1 Path 1

Score: `90.31`

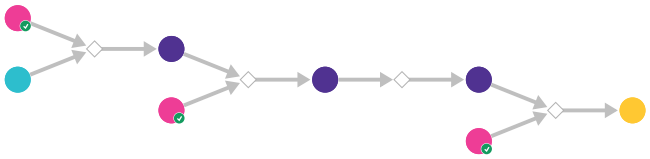
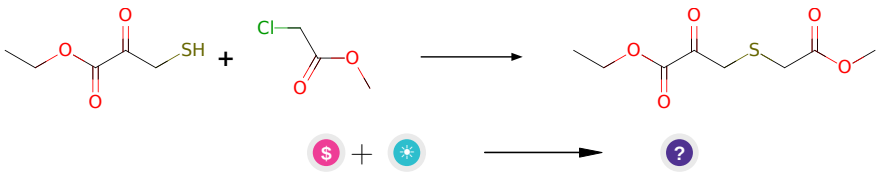


Figure 1: Outline of path 1

2.1.1 Alkylation of thiols with secondary halides



Substrates:

1. Methyl chloroacetate - *available at Sigma-Aldrich*
2. mercapto-pyruvic acid ethyl ester

Products:

1. CCOC(=O)C(=O)CSCC(=O)OC

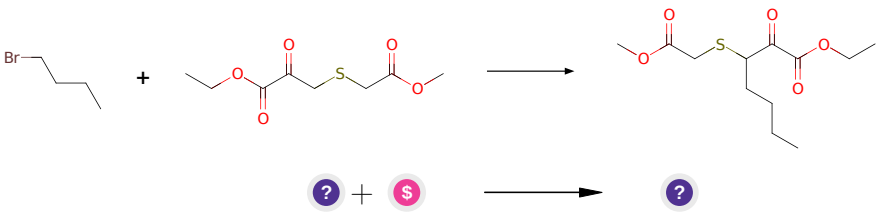
Typical conditions: NaH.MeOH.H2O

Protections: none

Reference: *10.1016/j.tet.2013.07.097* and *10.1016/j.tet.2014.08.020* and *10.1016/j.ejmech.2015.06.055*

Retrosynthesis ID: 25227

2.1.2 Alkylation of ketones



Substrates:

1. CCOC(=O)C(=O)CSCC(=O)OC
2. Butyl bromide - *available at Sigma-Aldrich*

Products:

1. CCCCC(SCC(=O)OC)C(=O)C(=O)OCC

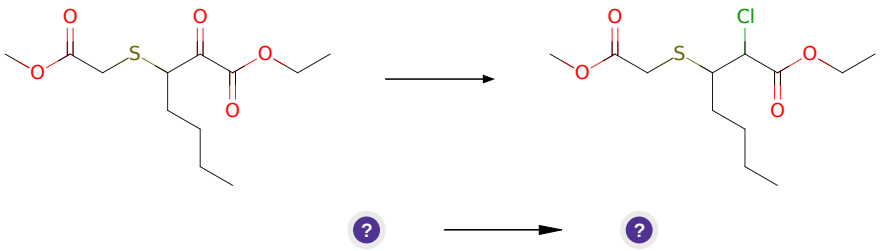
Typical conditions: LDA or other base.THF.-78C

Protections: none

Reference: DOI: *10.1021/jo1019738* OR DOI: *10.1021/jm00114a016*

Retrosynthesis ID: 1866

2.1.3 Synthesis of alkyl chlorides from ketones



Substrates:

1. CCCCC(SCC(=O)OC)C(=O)C(=O)OCC

Products:

1. CCCCC(SCC(=O)OC)C(Cl)C(=O)OCC

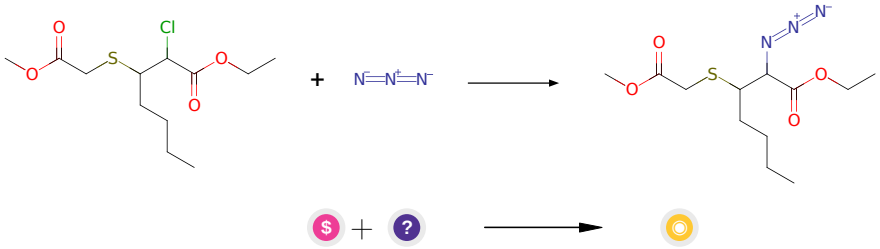
Typical conditions: InO3.chloroform.SiMe2Cl

Protections: none

Reference: DOI: *10.1021/ja0283246*

Retrosynthesis ID: 11620

2.1.4 Nucleophilic substitution with azides



Substrates:

1. Potassium azide - *available at Sigma-Aldrich*
2. CCCCC(SCC(=O)OC)C(Cl)C(=O)OCC

Products:

1. CCCCC(SCC(=O)OC)C(N=[N+]=[N-])C(=O)OCC

Typical conditions: DMF.heat

Protections: none

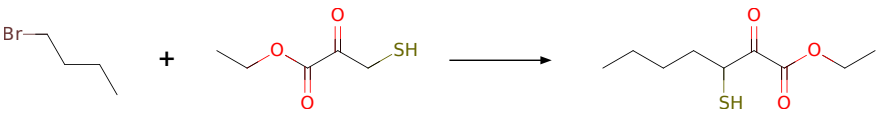
Reference: *10.1016/j.tet.2013.11.027* and *10.1021/jo015632y* and *10.3987/COM-06-S(K)18*

Retrosynthesis ID: 31011248

2.2 Path 2

Score: 90.31

2.2.1 Alkylation of ketones



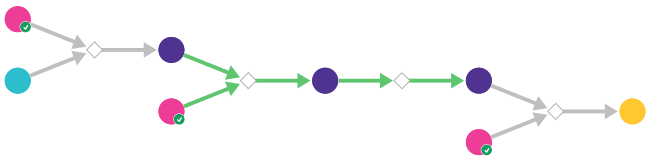
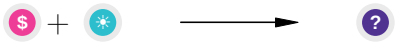


Figure 2: Outline of path 2



Substrates:

1. Butyl bromide - *available at Sigma-Aldrich*
2. mercapto-pyruvic acid ethyl ester

Products:

1. CCCCC(S)C(=O)C(=O)OCC

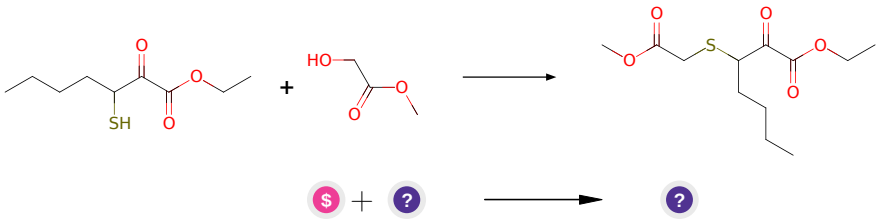
Typical conditions: LDA or other base.THF.-78C

Protections: none

Reference: DOI: *10.1021/jo1019738* OR DOI: *10.1021/jm00114a016*

Retrosynthesis ID: 1866

2.2.2 Synthesis of sulfides via Mitsunobu reaction



Substrates:

1. Methyl glycolate - *available at Sigma-Aldrich*
2. CCCCC(S)C(=O)C(=O)OCC

Products:

1. CCCCC(SCC(=O)OC)C(=O)C(=O)OCC

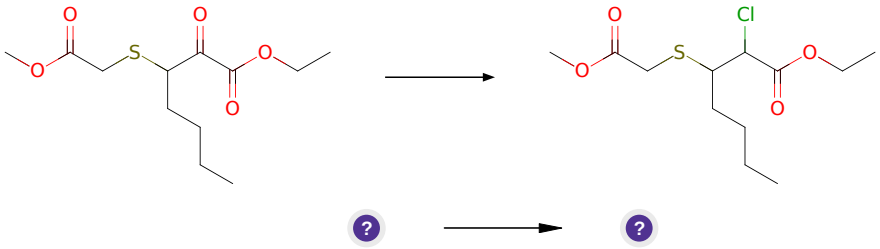
Typical conditions: PPh3.DEAD.ThF

Protections: none

Reference: *10.1016/j.tet.2010.11.017* AND *10.1055/s-2004-837213* AND *10.1021/jm061202u*

Retrosynthesis ID: 14772

2.2.3 Synthesis of alkyl chlorides from ketones



Substrates:

1. CCCCC(SCC(=O)OC)C(=O)C(=O)OCC

Products:

1. CCCCC(SCC(=O)OC)C(Cl)C(=O)OCC

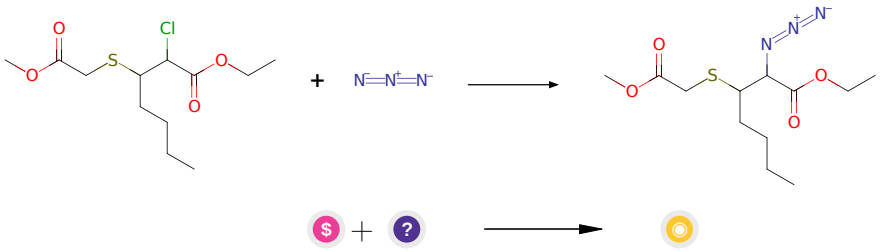
Typical conditions: InO3.chloroform.SiMe2Cl

Protections: none

Reference: DOI: *10.1021/ja0283246*

Retrosynthesis ID: 11620

2.2.4 Nucleophilic substitution with azides



Substrates:

1. Potassium azide - *available at Sigma-Aldrich*
2. CCCCC(SCC(=O)OC)C(Cl)C(=O)OCC

Products:

1. CCCCC(SCC(=O)OC)C(N=[N+]=[N-])C(=O)OCC

Typical conditions: DMF.heat

Protections: none

Reference: *10.1016/j.tet.2013.11.027* and *10.1021/jo015632y* and *10.3987/COM-06-S(K)18*

Retrosynthesis ID: 31011248

2.3 Path 3

Score: `90.31`

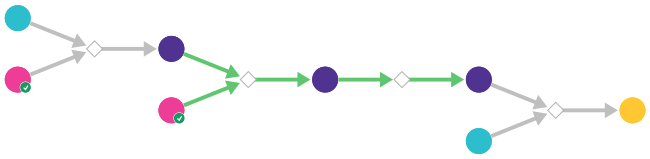
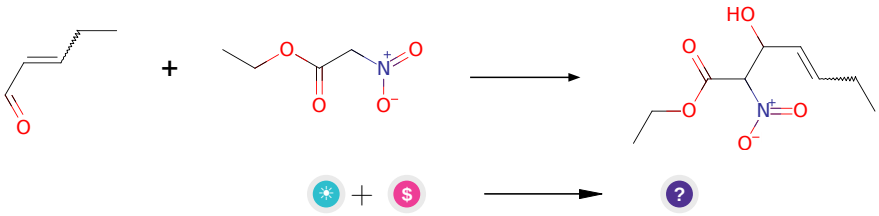


Figure 3: Outline of path 3

2.3.1 Aldol-like condesation with nitro-compound



Substrates:

1. pent-2-enal
2. Ethyl nitroacetate - *available at Sigma-Aldrich*

Products:

1. CCC=CC(O)C(C(=O)OCC)[N+](=O)[O-]

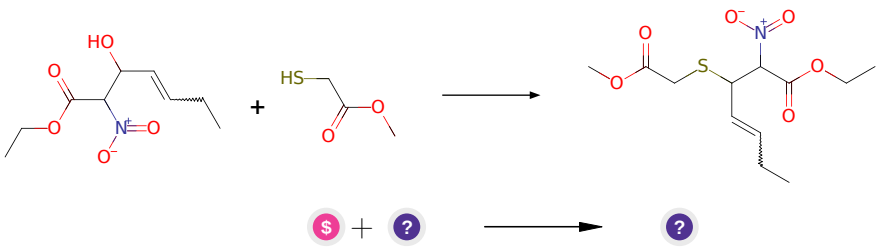
Typical conditions: KOH

Protections: none

Reference: *10.1246/cl.1999.1105* and *10.1016/S0040-4039(03)00274-0* and *10.1021/ja905885z* and *10.1016/j.tetlet.2016.03.041*

Retrosynthesis ID: 27222

2.3.2 Synthesis of sulfides via Mitsunobu reaction



Substrates:

1. Methyl thioglycolate - *available at Sigma-Aldrich*
2. CCC=CC(O)C(C(=O)OCC)[N+](=O)[O-]

Products:

1. CCC=CC(SCC(=O)OC)C(C(=O)OCC)[N+](=O)[O-]

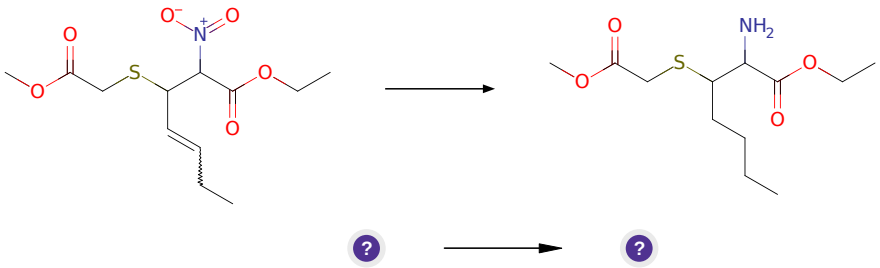
Typical conditions: PPh3.DEAD.ThF

Protections: none

Reference: *10.1016/j.bmc.2010.06.100* AND *10.1021/ja037394p* (SI)

Retrosynthesis ID: 14773

2.3.3 Tandem alkene/nitro reduction



Substrates:

1. CCC=CC(SCC(=O)OC)C(C(=O)OCC)[N+](=O)[O-]

Products:

1. CCCCC(SCC(=O)OC)C(N)C(=O)OCC

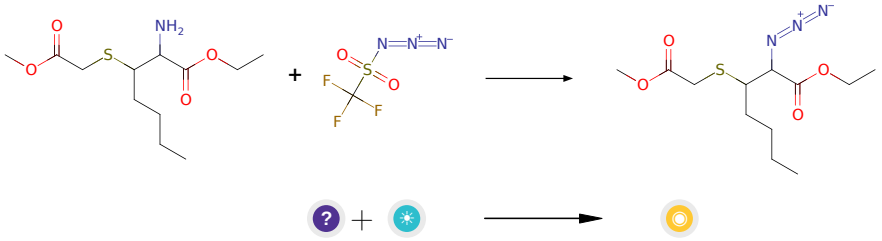
Typical conditions: H2.Pd/C

Protections: none

Reference: *10.1016/j.bmc.2009.05.066* and *10.1016/j.cclet.2015.05.003* and *10.1016/j.bmc.2012.12.025*

Retrosynthesis ID: 31350

2.3.4 Synthesis of alkyl azides from alkyl amines and TfN3



Substrates:

1. CCCCC(SCC(=O)OC)C(N)C(=O)OCC
2. trifluoromethanesulfonyl azide

Products:

1. CCCCC(SCC(=O)OC)C(N=[N+]=[N-])C(=O)OCC

Typical conditions: H2O.K2CO3.CH2Cl2.CuSO4.MeOH

Protections: none

Reference: DOI: *10.1016/0040-4039(96)01307-X*

Retrosynthesis ID: 9920002

2.4 Path 4

Score: `90.31`

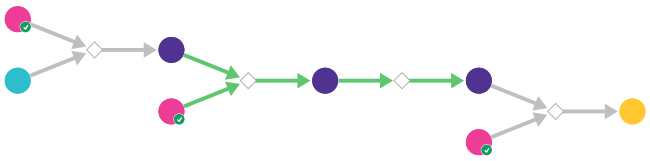
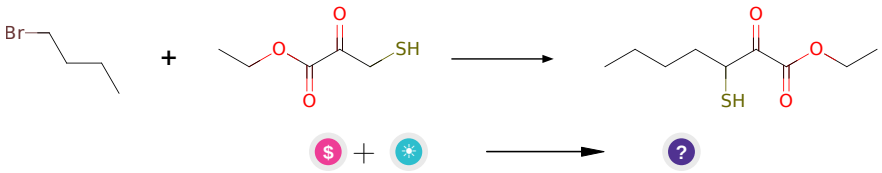


Figure 4: Outline of path 4

2.4.1 Alkylation of ketones



Substrates:

1. Butyl bromide - *available at Sigma-Aldrich*
2. mercapto-pyruvic acid ethyl ester

Products:

1. CCCCC(S)C(=O)C(=O)OCC

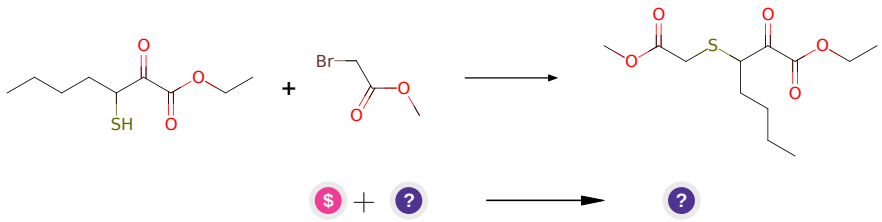
Typical conditions: LDA or other base.THF.-78C

Protections: none

Reference: DOI: *10.1021/jo1019738* OR DOI: *10.1021/jm00114a016*

Retrosynthesis ID: 1866

2.4.2 Reaction of alpha-bromo carbonyl compounds with thiols



Substrates:

1. Methyl bromoacetate - *available at Sigma-Aldrich*
2. CCCCC(S)C(=O)C(=O)OCC

Products:

1. CCCCC(SCC(=O)OC)C(=O)C(=O)OCC

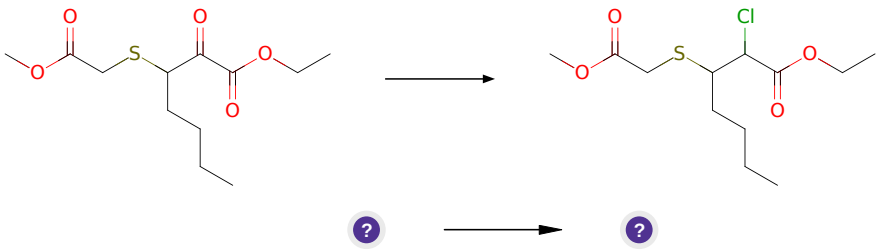
Typical conditions: NEt3.DCM

Protections: none

Reference: *10.1007/BF02251635* AND *10.1080/10426509029940*

Retrosynthesis ID: 14802

2.4.3 Synthesis of alkyl chlorides from ketones



Substrates:

1. CCCCC(SCC(=O)OC)C(=O)C(=O)OCC

Products:

1. CCCCC(SCC(=O)OC)C(Cl)C(=O)OCC

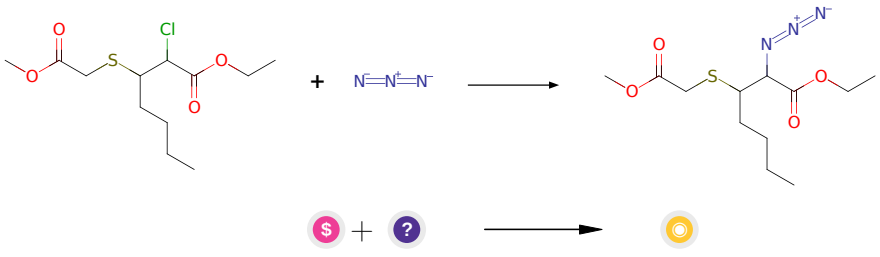
Typical conditions: InO3.chloroform.SiMe2Cl

Protections: none

Reference: DOI: *10.1021/ja0283246*

Retrosynthesis ID: 11620

2.4.4 Nucleophilic substitution with azides



Substrates:

1. Potassium azide - *available at Sigma-Aldrich*
2. CCCCC(SCC(=O)OC)C(Cl)C(=O)OCC

Products:

1. CCCCC(SCC(=O)OC)C(N=[N+]=[N-])C(=O)OCC

Typical conditions: DMF.heat

Protections: none

Reference: *10.1016/j.tet.2013.11.027* and *10.1021/jo015632y* and *10.3987/COM-06-S(K)18*

Retrosynthesis ID: 31011248

2.5 Path 5

Score: 90.31

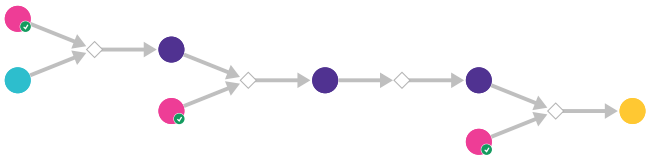
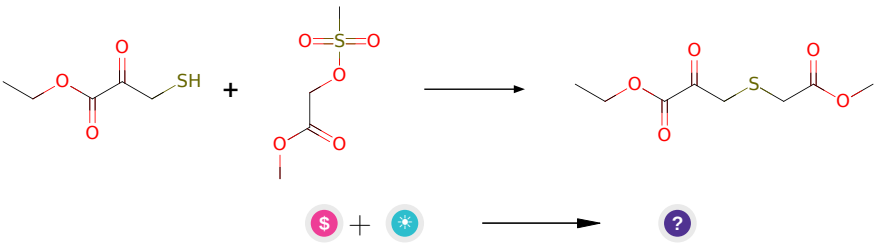


Figure 5: Outline of path 5

2.5.1 Substitution of primary mesyl group with thiol



Substrates:

1. methyl 2-(methanesulfonyloxy)acetate - *available at Sigma-Aldrich*
2. mercapto-pyruvic acid ethyl ester

Products:

1. CCOC(=O)C(=O)CSCC(=O)OC

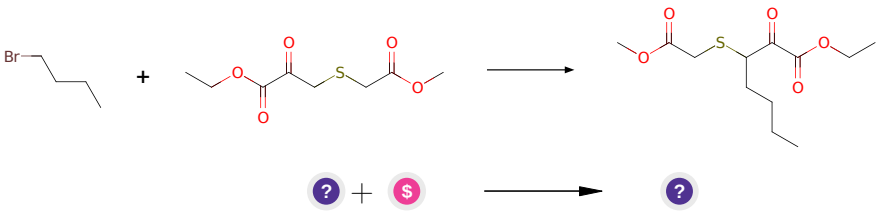
Typical conditions: MeCN.Cs2CO3

Protections: none

Reference: *10.1016/j.bmc.2007.12.005* and *10.1021/jm050269z*

Retrosynthesis ID: 27849

2.5.2 Alkylation of ketones



Substrates:

1. CCOC(=O)C(=O)CSCC(=O)OC
2. Butyl bromide - *available at Sigma-Aldrich*

Products:

1. CCCCC(SCC(=O)OC)C(=O)C(=O)OCC

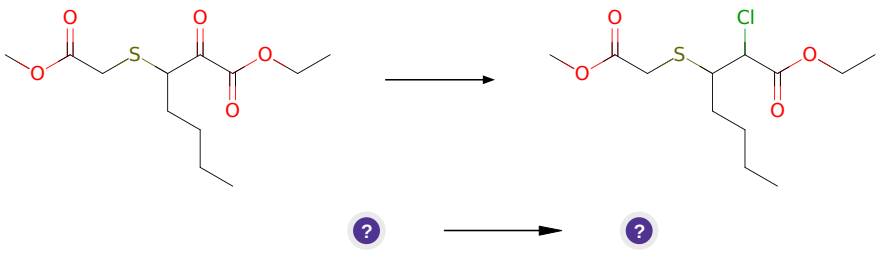
Typical conditions: LDA or other base.THF.-78C

Protections: none

Reference: DOI: *10.1021/jo1019738* OR DOI: *10.1021/jm00114a016*

Retrosynthesis ID: 1866

2.5.3 Synthesis of alkyl chlorides from ketones



Substrates:

1. CCCCC(SCC(=O)OC)C(=O)C(=O)OCC

Products:

1. CCCCC(SCC(=O)OC)C(Cl)C(=O)OCC

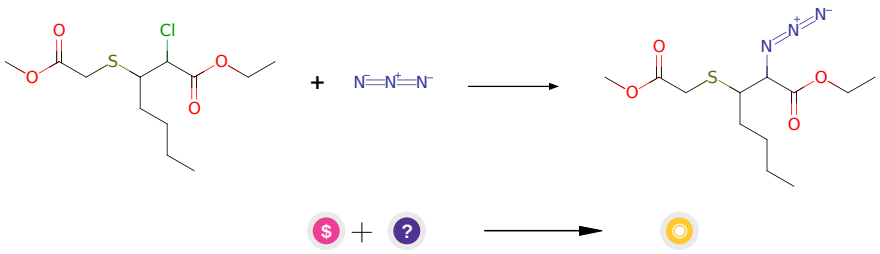
Typical conditions: InO3.chloroform.SiMe2Cl

Protections: none

Reference: DOI: *10.1021/ja0283246*

Retrosynthesis ID: 11620

2.5.4 Nucleophilic substitution with azides



Substrates:

1. Potassium azide - *available at Sigma-Aldrich*
2. CCCCC(SCC(=O)OC)C(Cl)C(=O)OCC

Products:

1. CCCCC(SCC(=O)OC)C(N=[N+]=[N-])C(=O)OCC

Typical conditions: DMF.heat

Protections: none

Reference: *10.1016/j.tet.2013.11.027* and *10.1021/jo015632y* and *10.3987/COM-06-S(K)18*

Retrosynthesis ID: 31011248