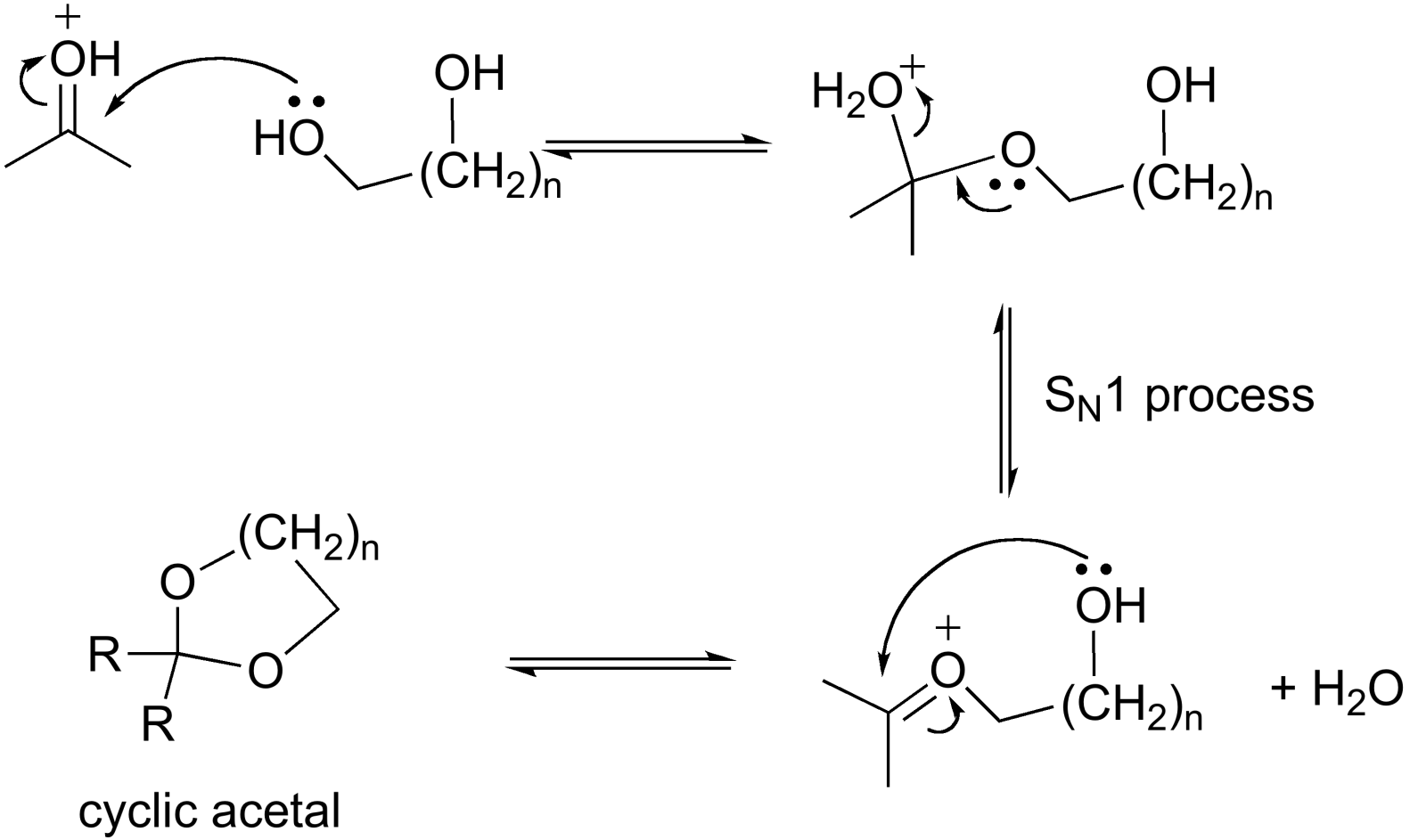
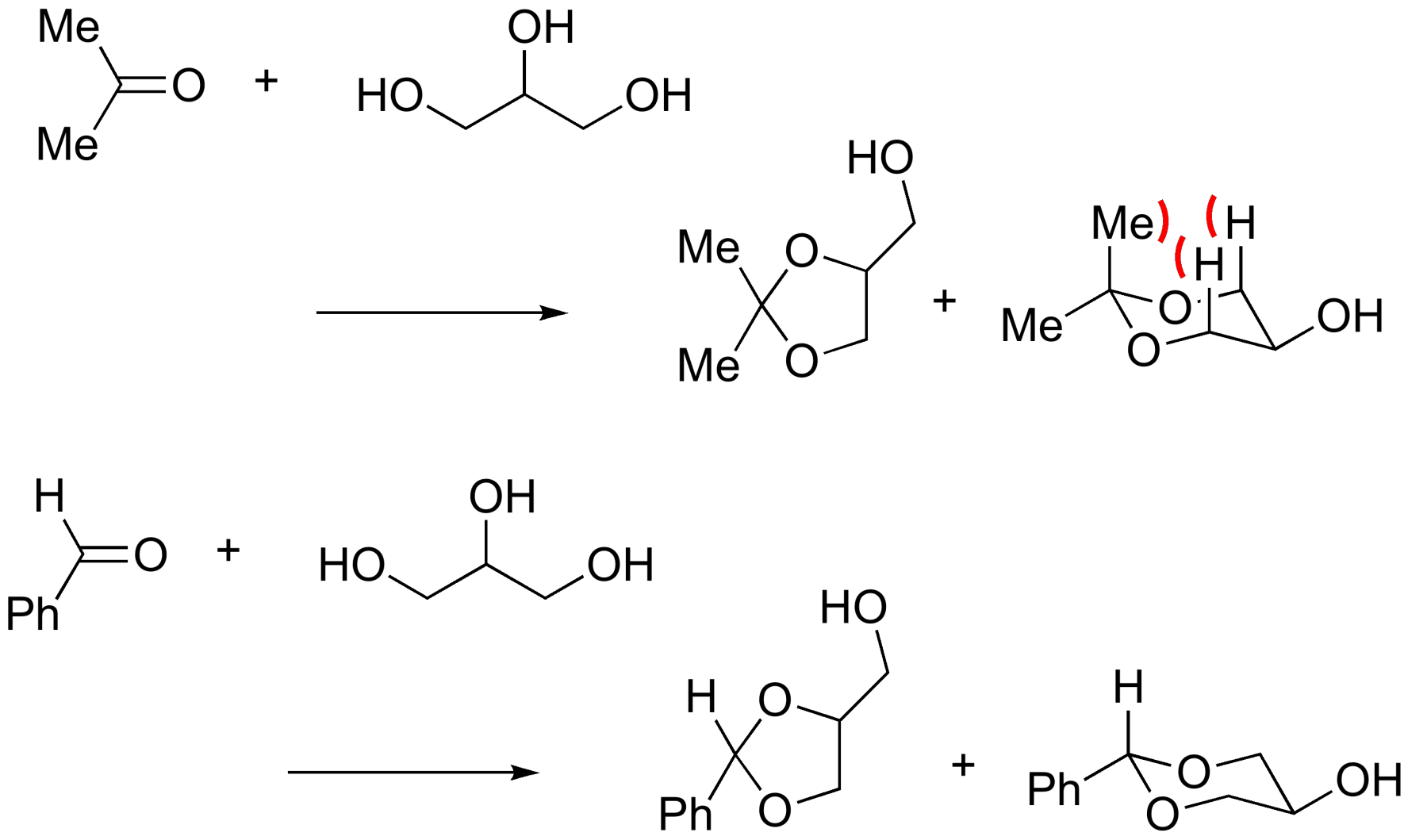
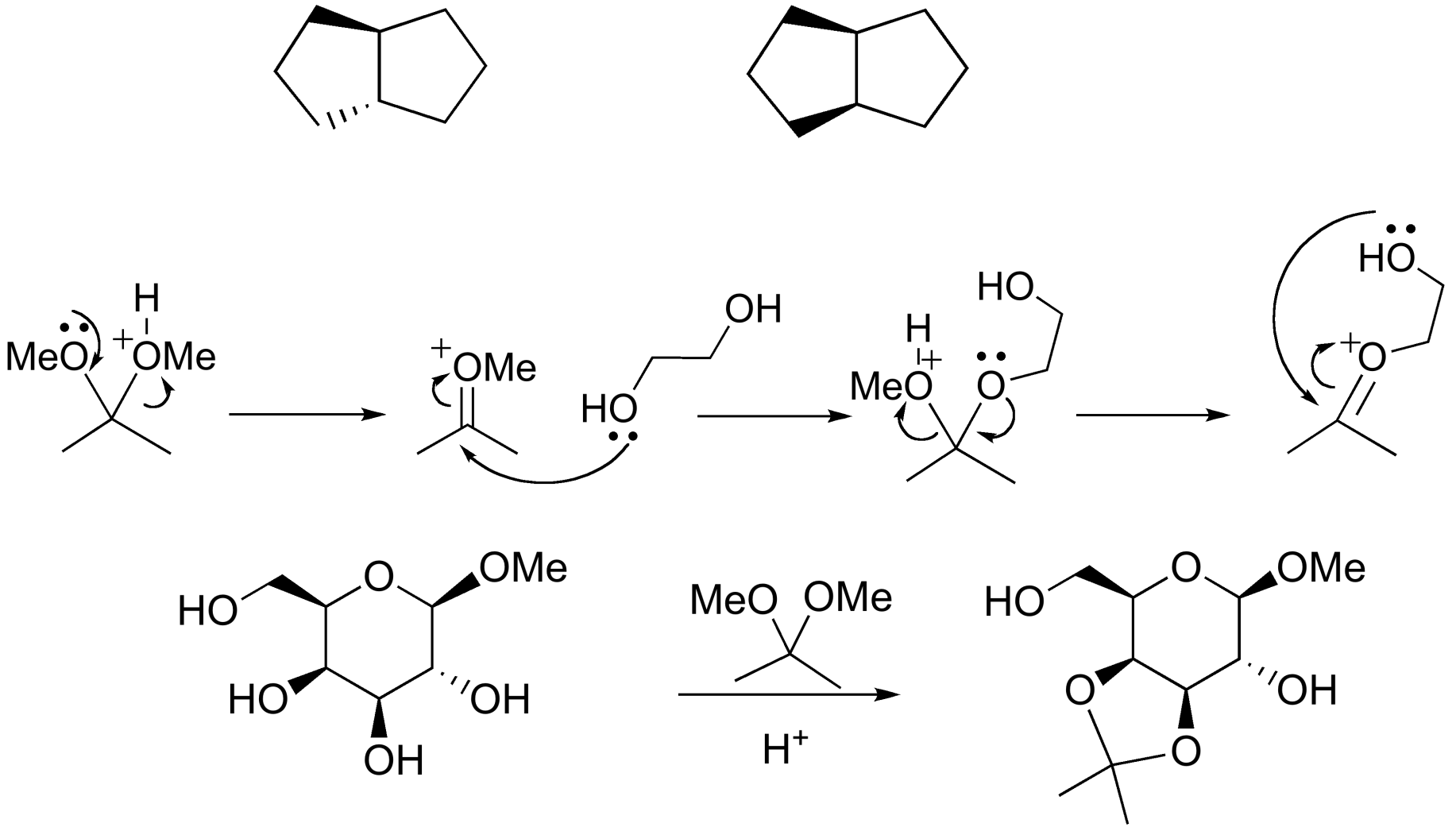
Lecture 7.1 Rxns of hydroxyl groups-2

1. Cyclic acetal formation: 5-ring vs 6-ring

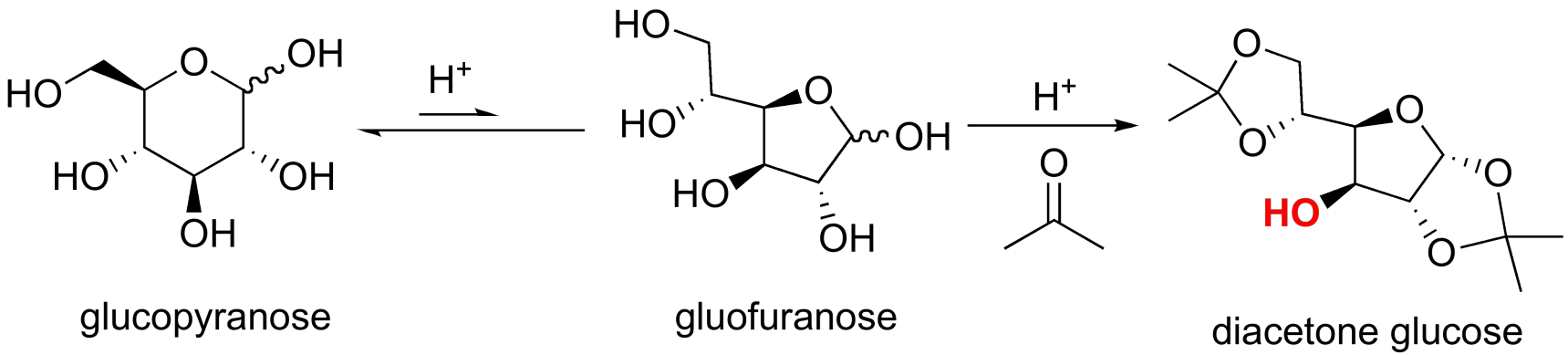



Me
O
Me
+
OH
HO
OH
HO
Me
O
Me
O
+
Me
H
H
O
Me
O
OH
H
Ph
O
+
OH
HO
OH
HO
H
O
Ph
O
+
H
Ph
O
O
OH

2. Acetonide protection of carbohydrate hydroxyl groups



2.1 Rxn of glucose with acetone and acid

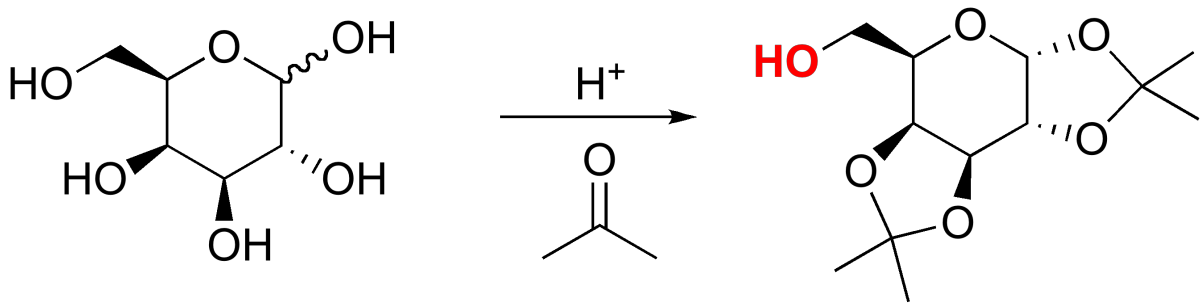


glucopyranose

gluofuranose

diacetone glucose

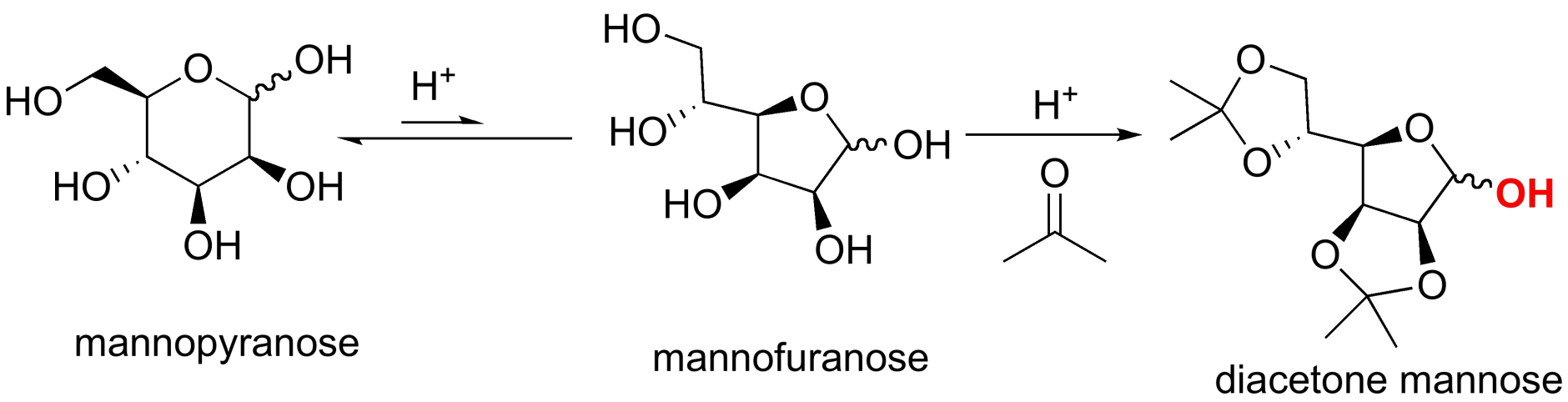
2.2 Rxn of galactose with acetone and acid



galactopyranose

diacetone galactose

2.3 Rxn of mannose with acetone and acid

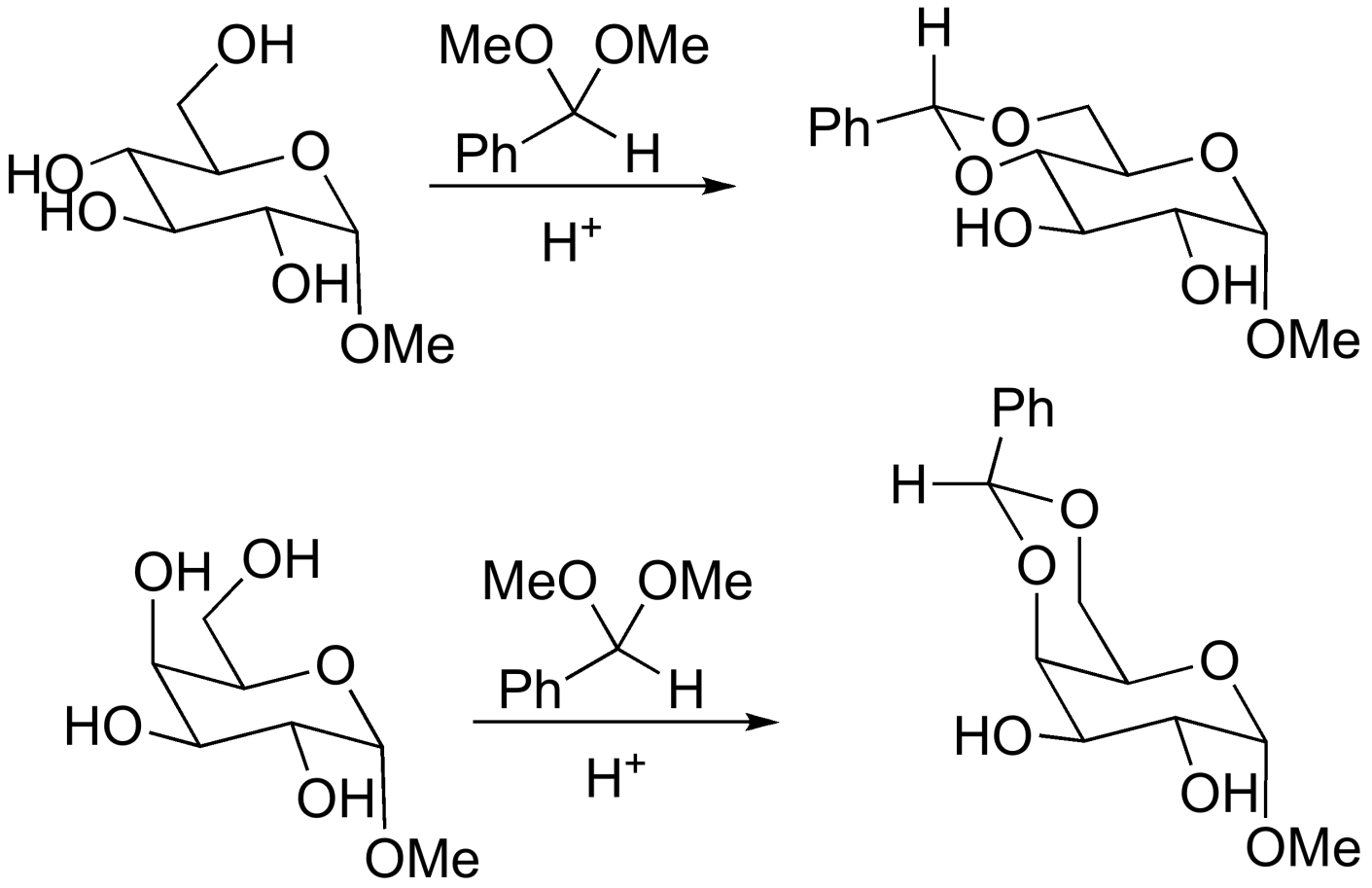


mannopyranose

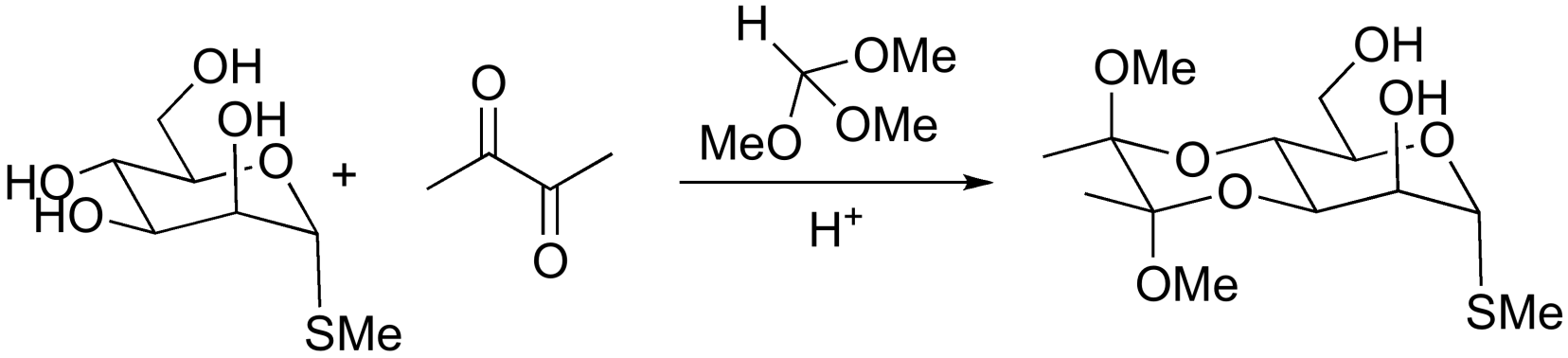
mannofuranose

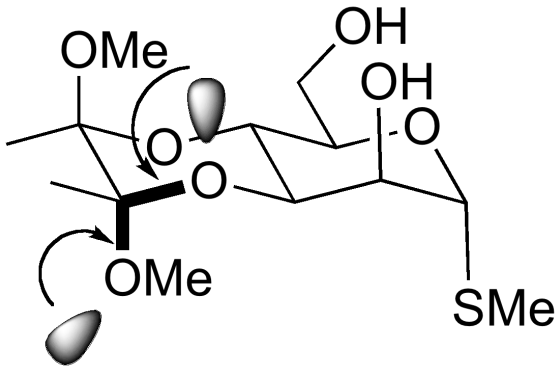
diacetone mannose

3. Benzylidene protection of carbohydrate hydroxyl groups

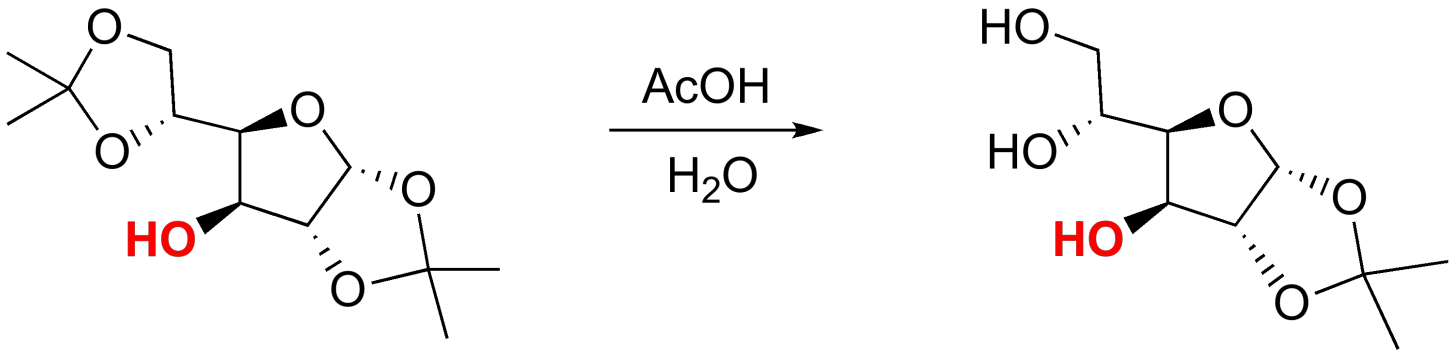


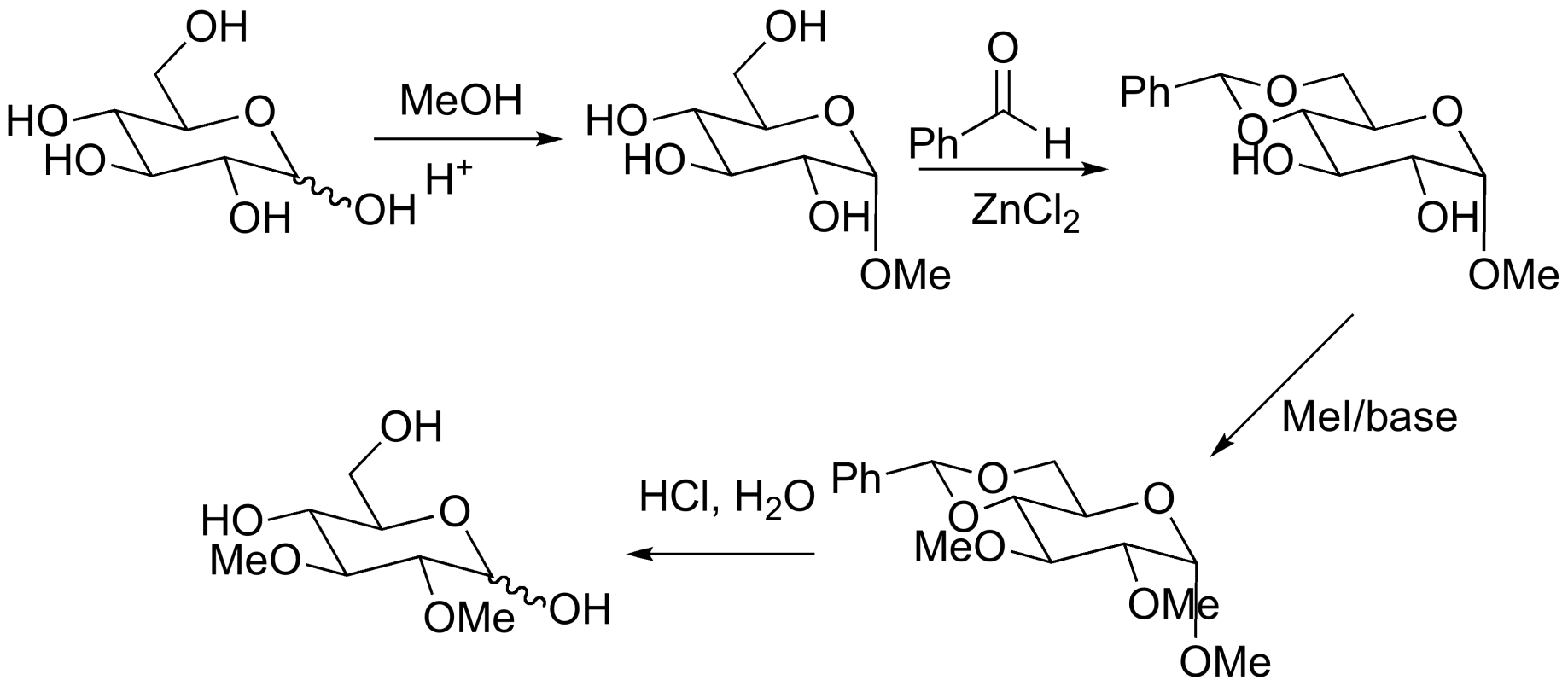
4. Butane diacetal protection of diols

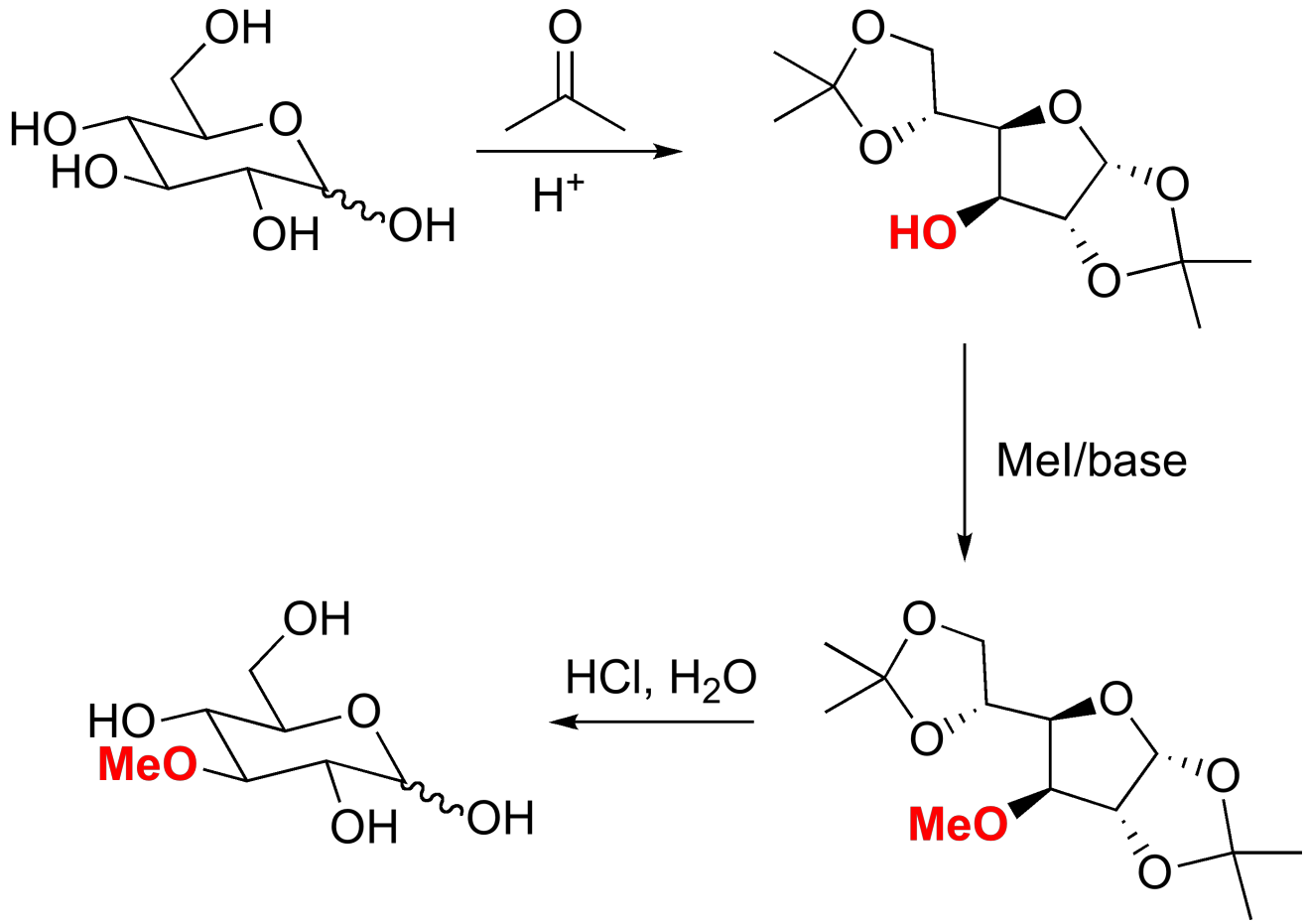




5. Cyclic acetal hydrolysis: deprotection of carbohydrate hydroxyl groups




OH
HO
HO
O
OH
OH
MeOH
H+
OH
HO
HO
O
OH
OMe
O
Ph
H
ZnCl2
Ph
O
O
HO
O
OH
OMe
MeI/base
Ph
O
O
MeO
O
OMe
OMe
HCl, H2O
OH
HO
MeO
O
OMe
OH


OH
HO
HO
O
OH
OH
O
H+
O
O
O
O
O
HO
O
MeI/base
O
O
O
O
O
MeO
O
HCl, H2O
OH
HO
MeO
O
OH
OH

Summary

Explain why the rxn of carbohydrates with acetone and acid selectively produces cyclic 5-ring acetonide , whereas rxn With benzaldehyde and acid produces 6-ring

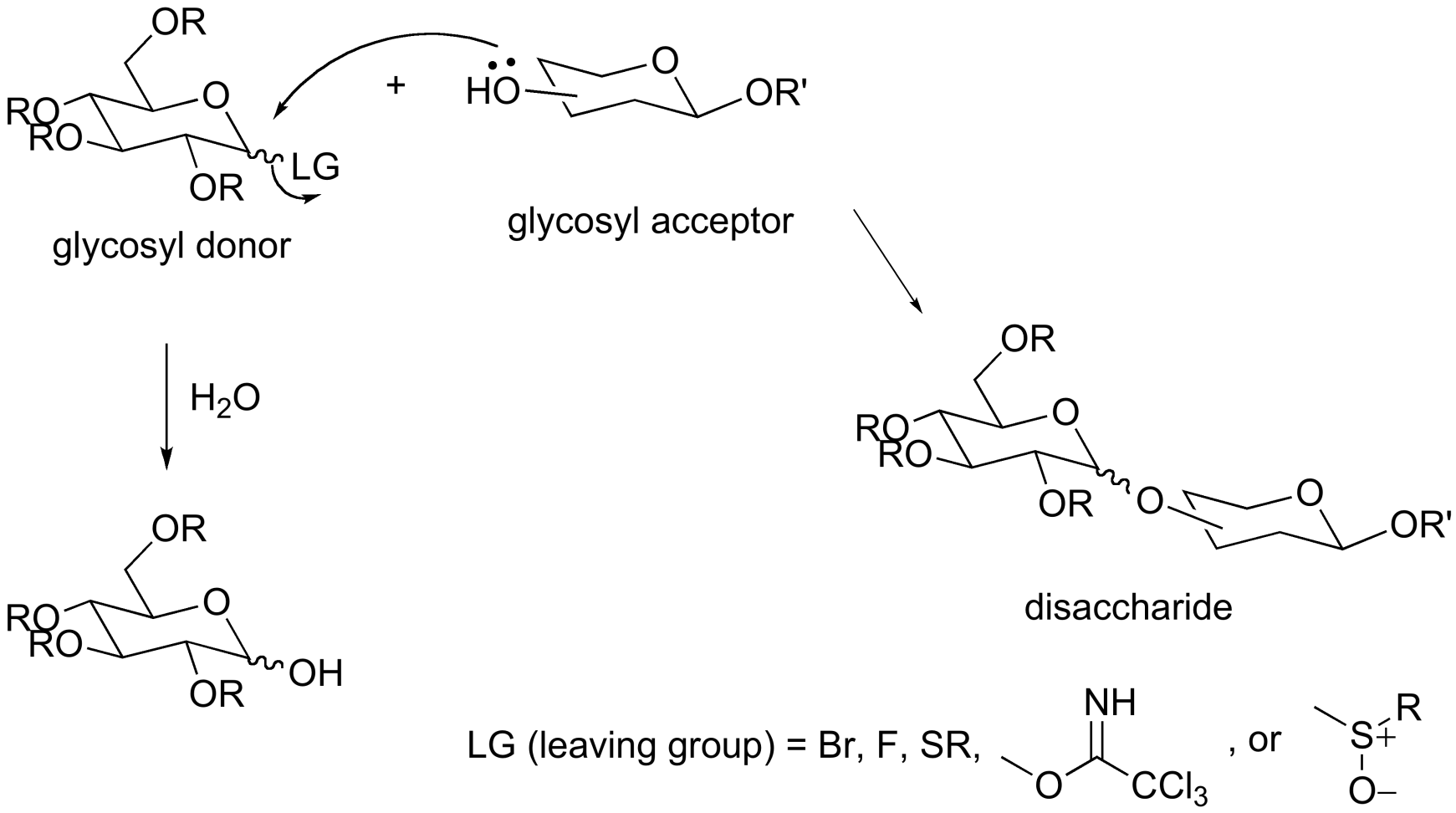
Remember the rxn of glucose, galactose and mannose with acetone and acid

Explain why protection of carbohydrates as butane diacetals results in selective protection of vicinal diequatorial diol groups

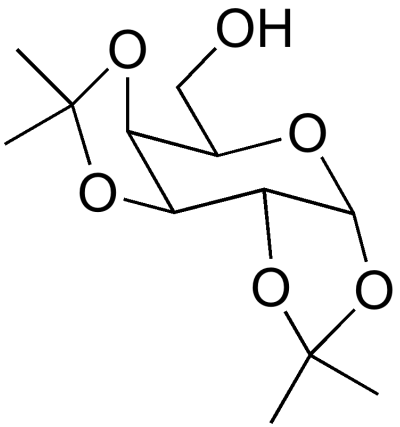
Differentiate between acid stable and acid labile protecting groups and explain rxn sequences involving selective acetal protection, followed at a later stage by acidic hydrolysis

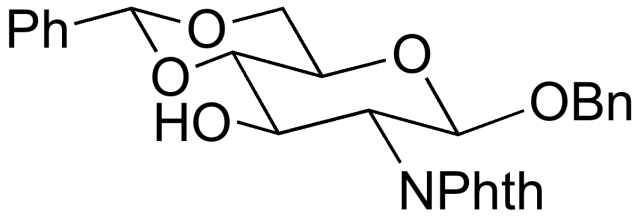
Lecture 7.2 Chemical disaccharide formation

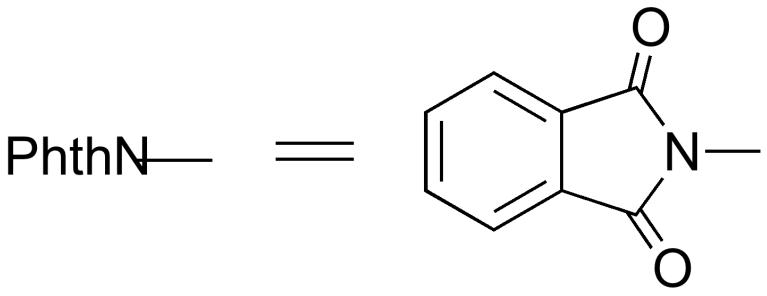
1. Glycosylation rxns



2. Glycosyl acceptors







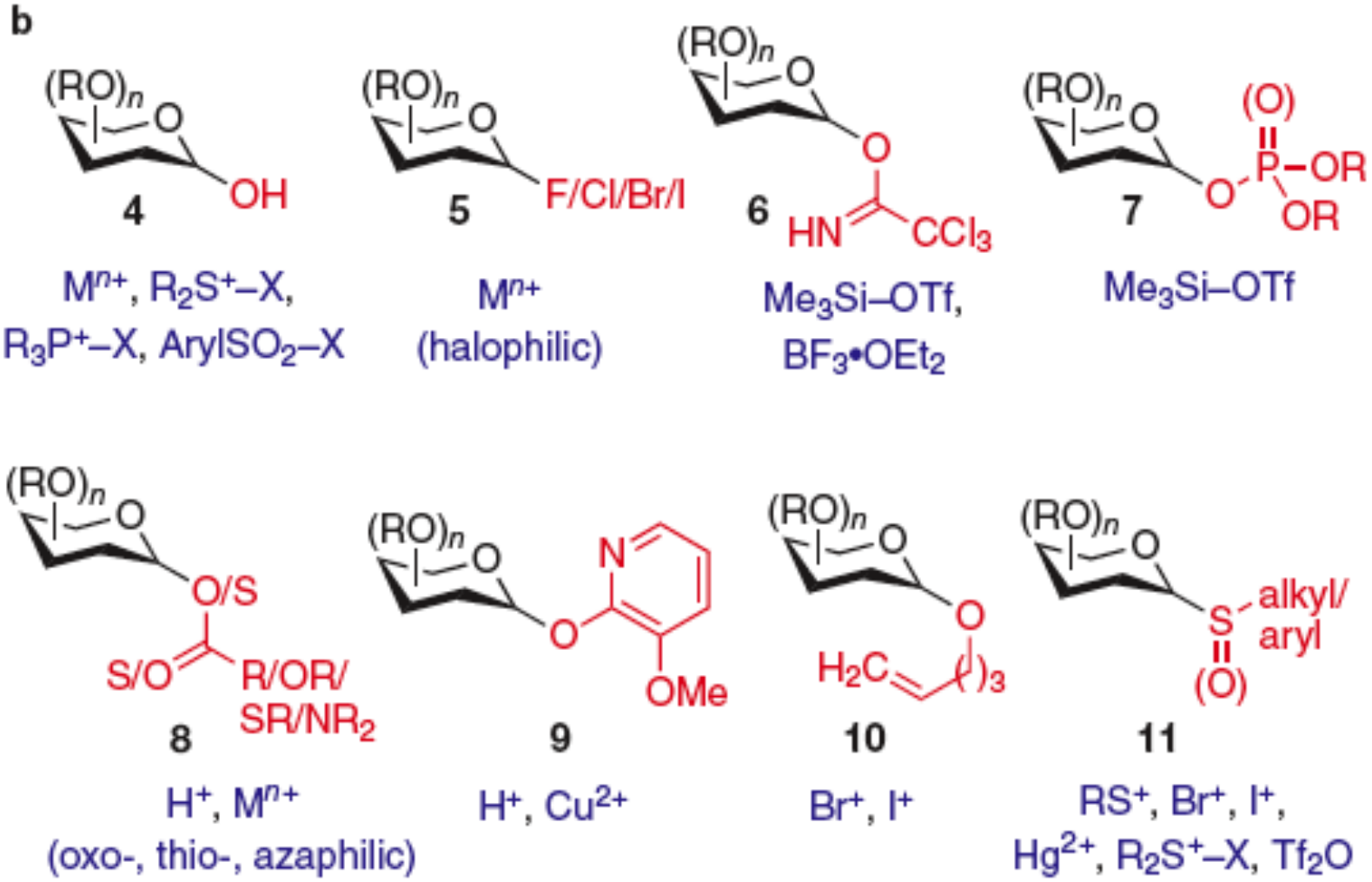
3. Glycosyl donors

Two essential Criteria

The substituent at the anomeric center of the glycosyl acceptor must remain unaffected by the activation conditions

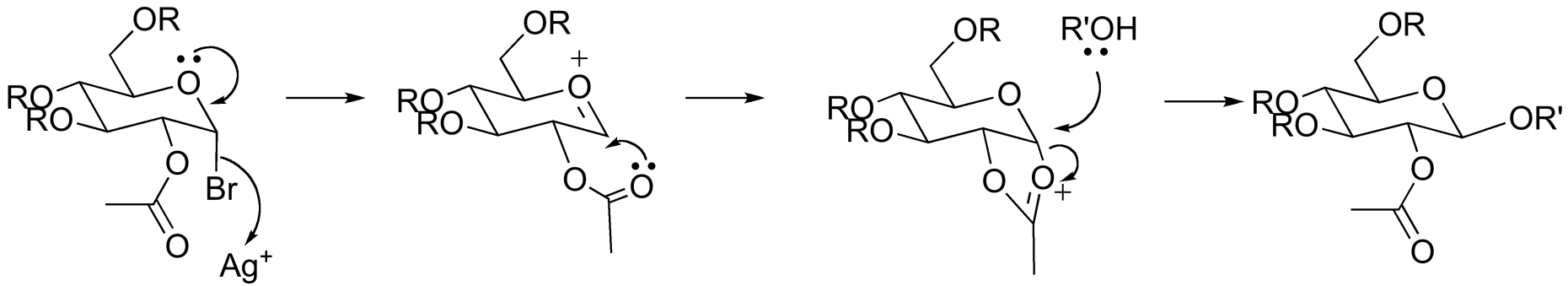
Any other existing glycosidic linkages, either in donor or acceptor, must also be unaffected by the process; otherwise oligosaccharide synthesis, wherein either the glycosyl donor or acceptor (or both) are at least disaccharides, would be impossilbe

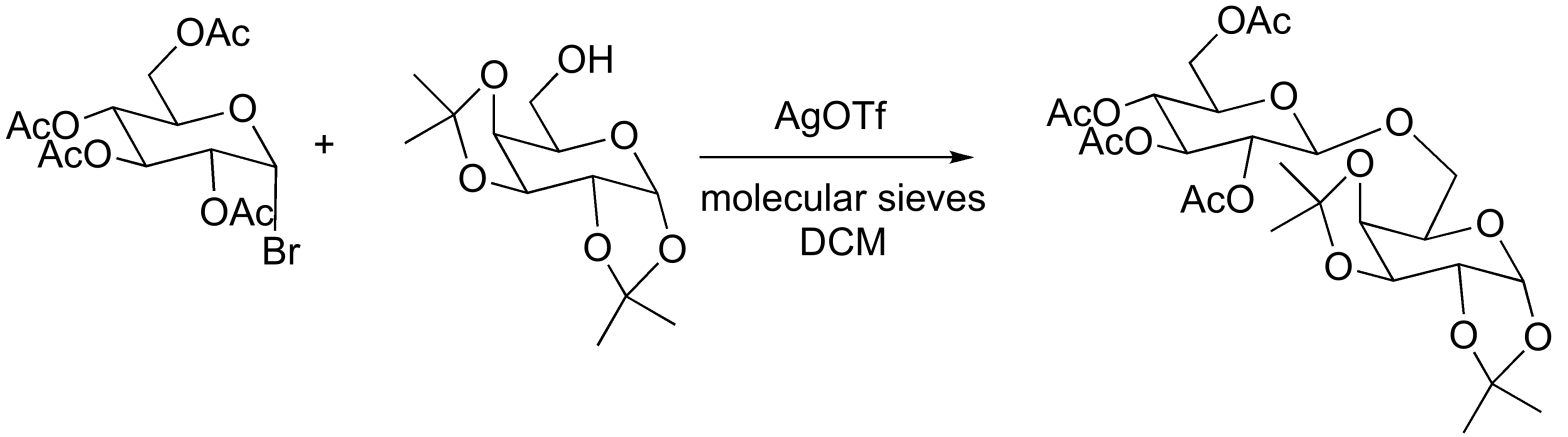
Good leaving group



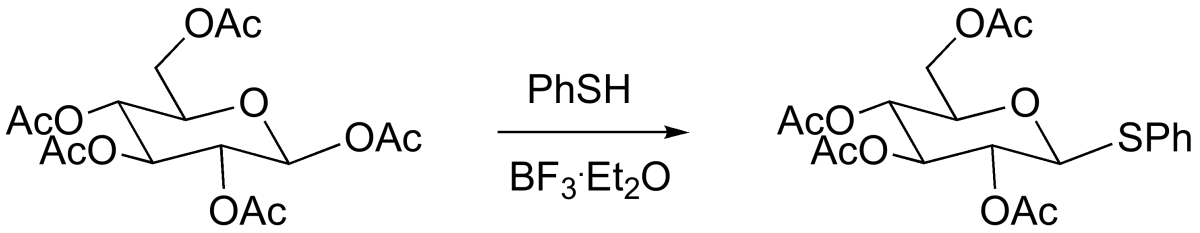
Nature 2007, 446, 1000

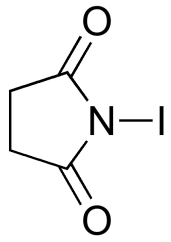
3.1 Glycosyl bromides



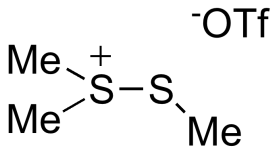


3.2 Thioglycosides

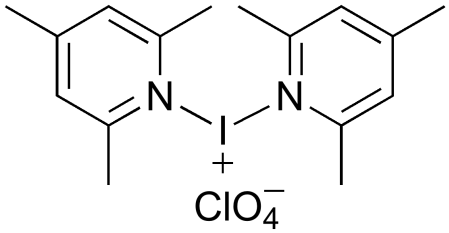




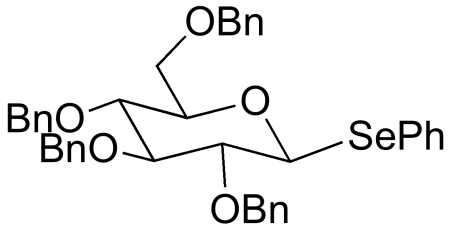
N-iodosuccinimide (NIS)



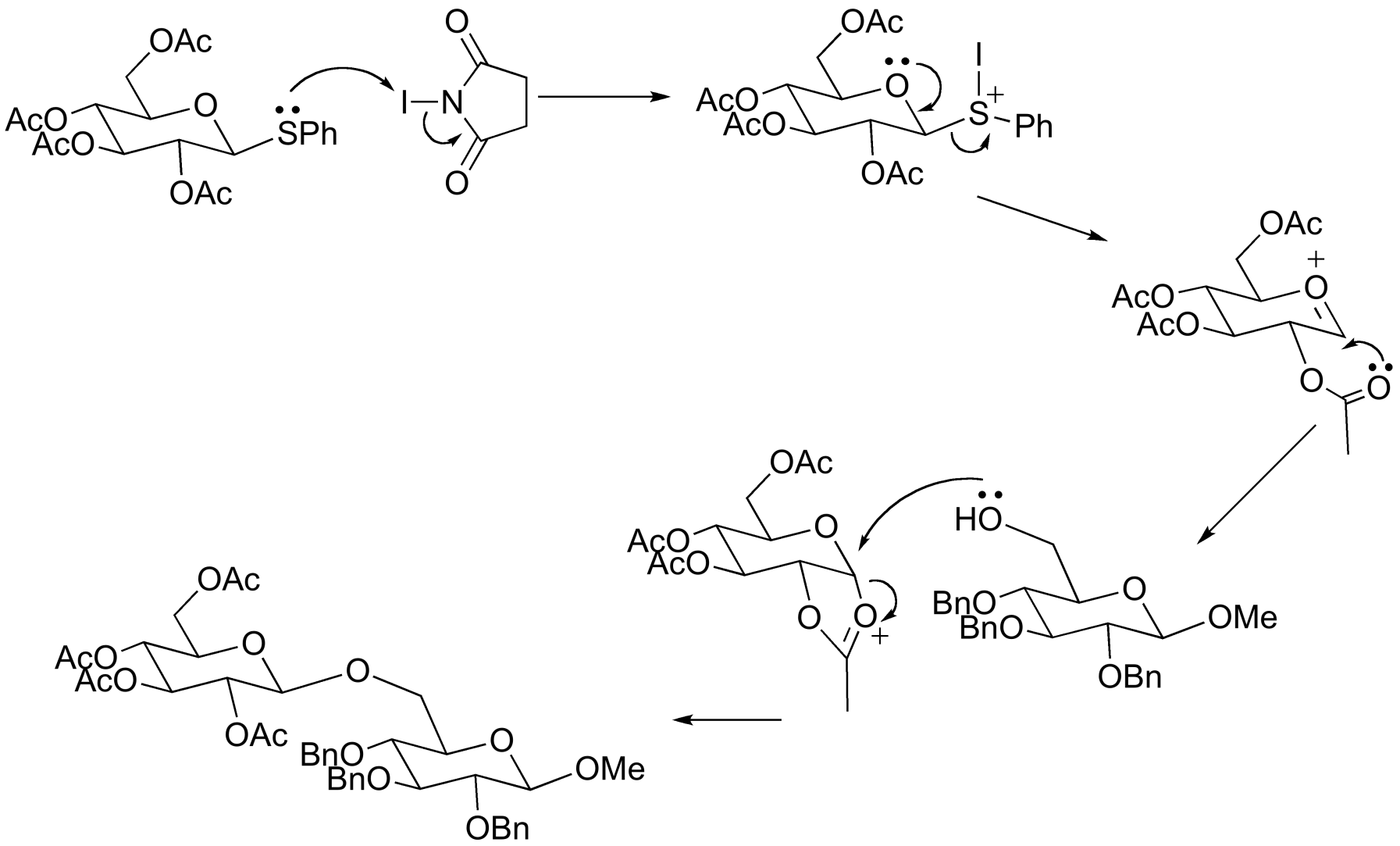
dimethyl(thiomethyl) sulfonium triflate (DMTST)



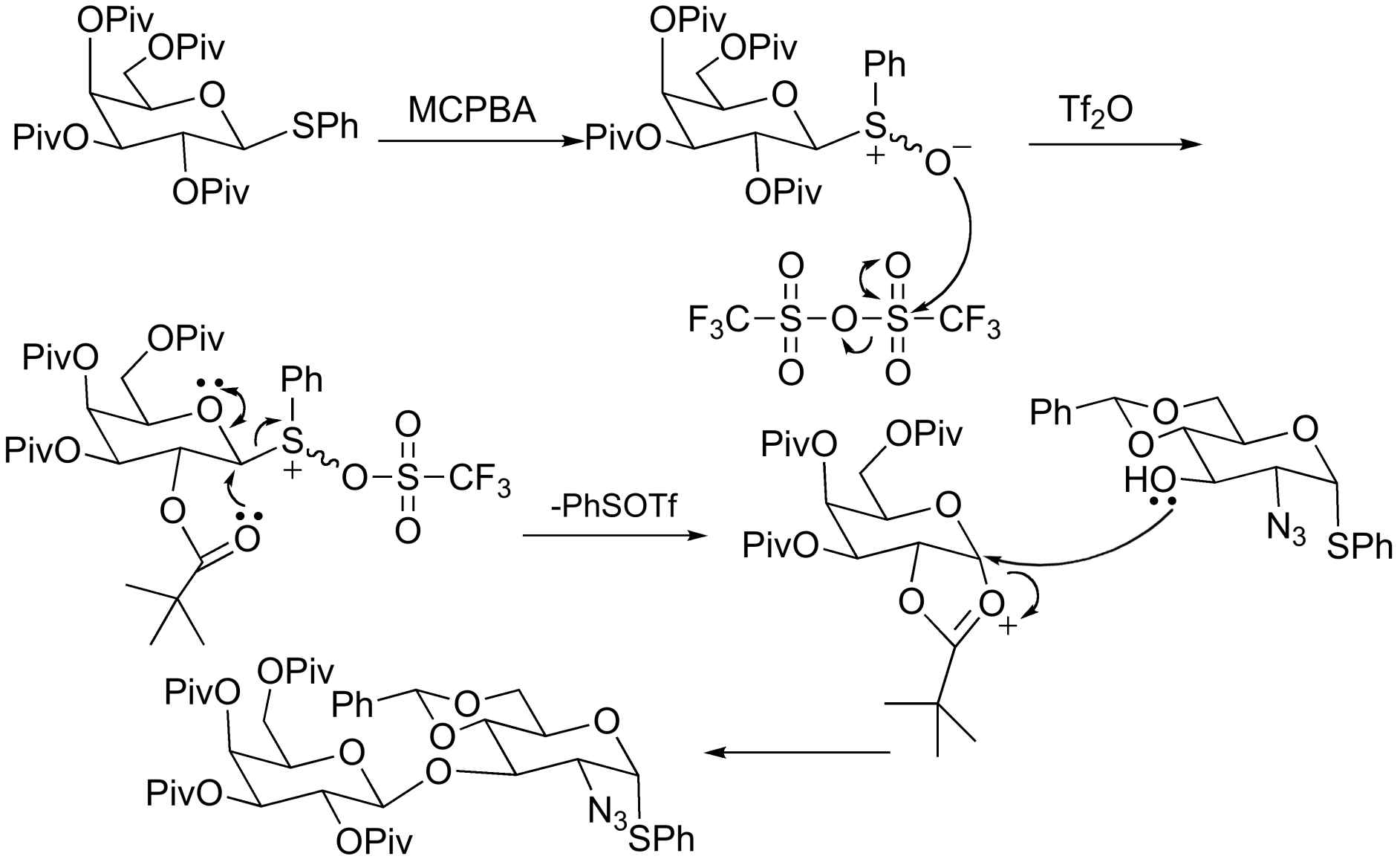
Iodonium dicollidine perchlorate (IDCP)

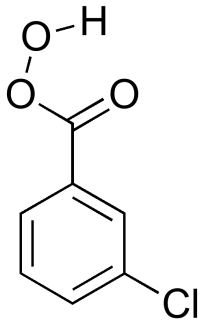


selenoglycoside

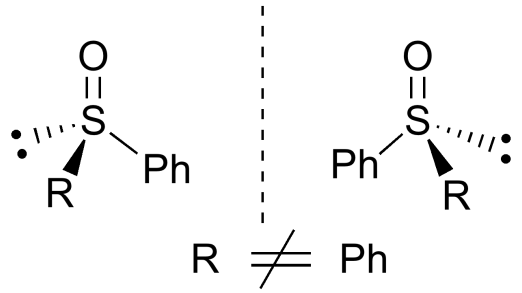

OAc
AcO
AcO
O
SPh
OAc
I
N
O
O
OAc
AcO
AcO
O
I
S
Ph
OAc
OAc
O
AcO
AcO
O
O
OAc
AcO
AcO
O
O
O
HO
BnO
BnO
O
OMe
OBn
OAc
AcO
AcO
O
O
OAc
BnO
BnO
O
OMe
OBn

3.3 Glycosyl sulfoxides

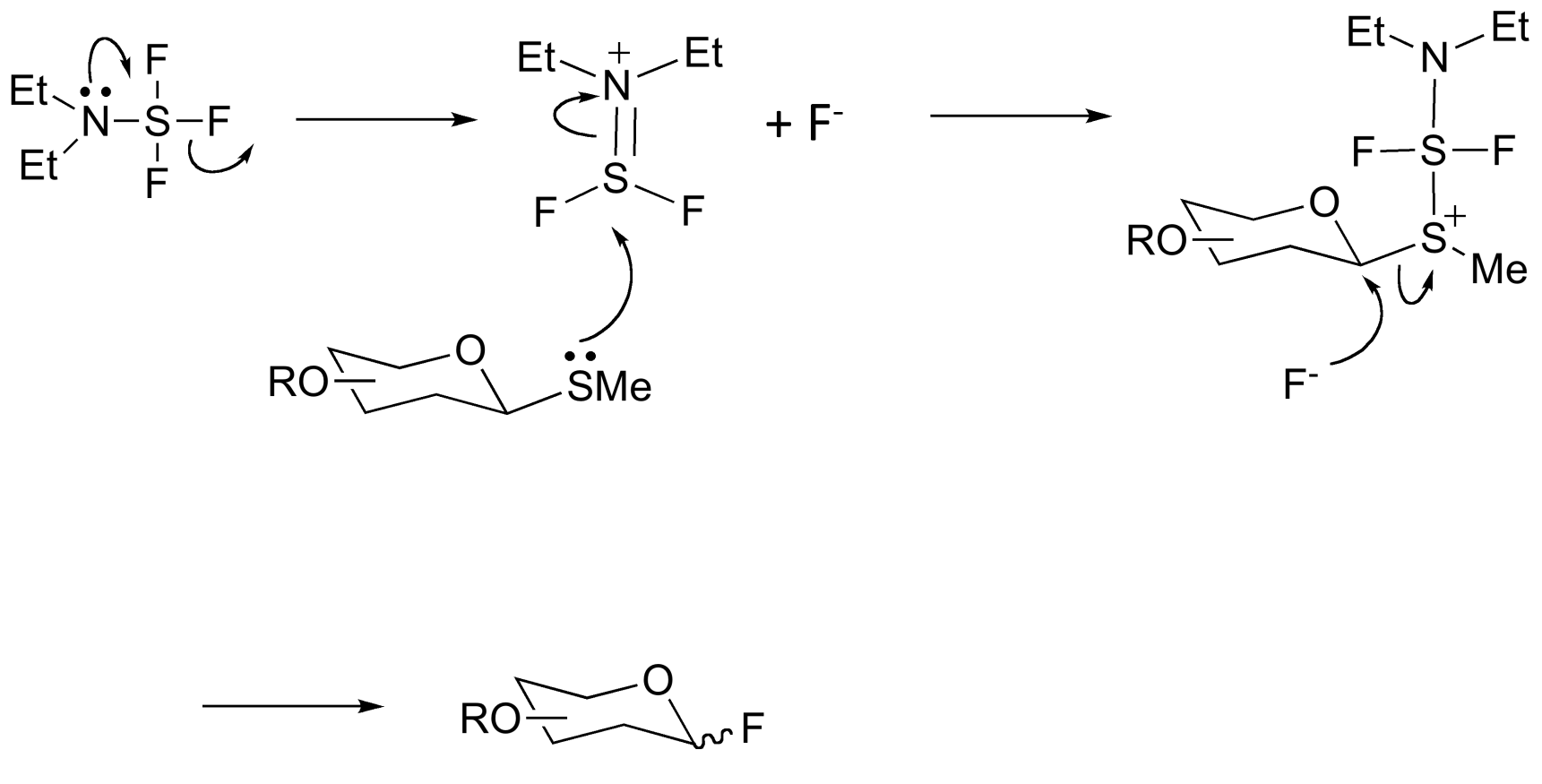


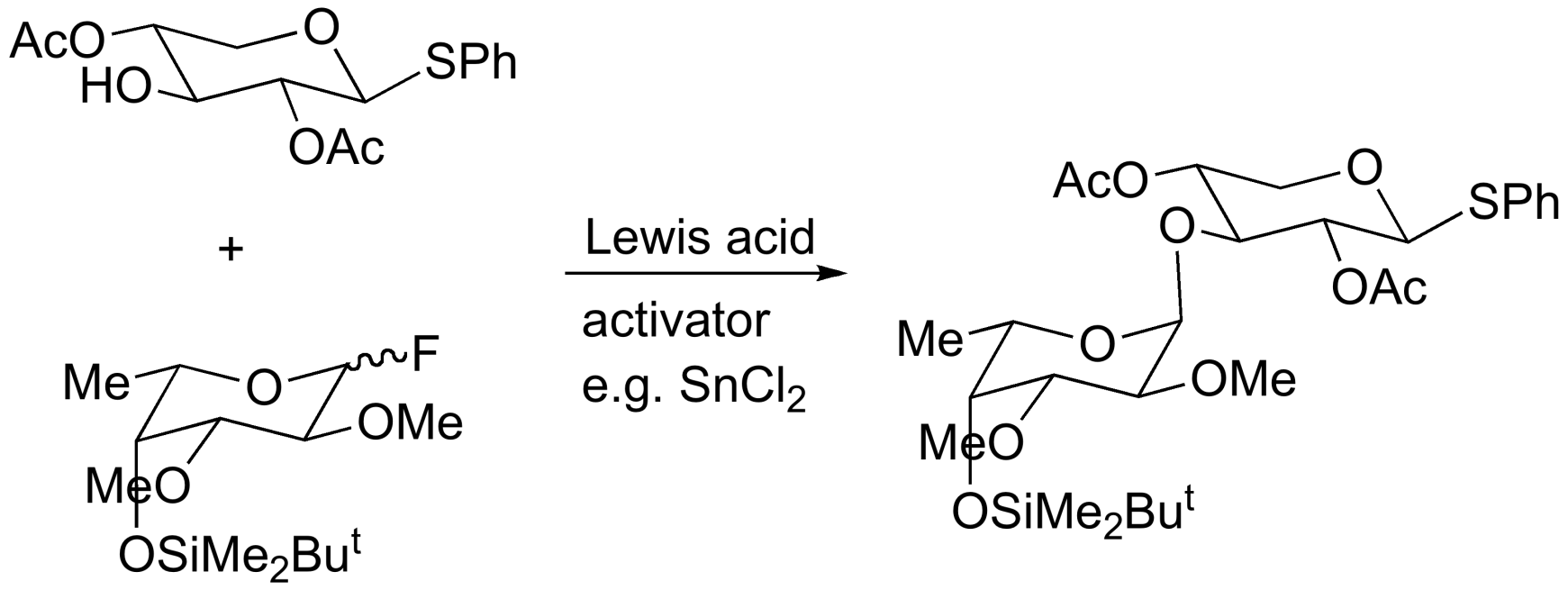


meta-chloroperoxybenzoic acid (MCPBA)

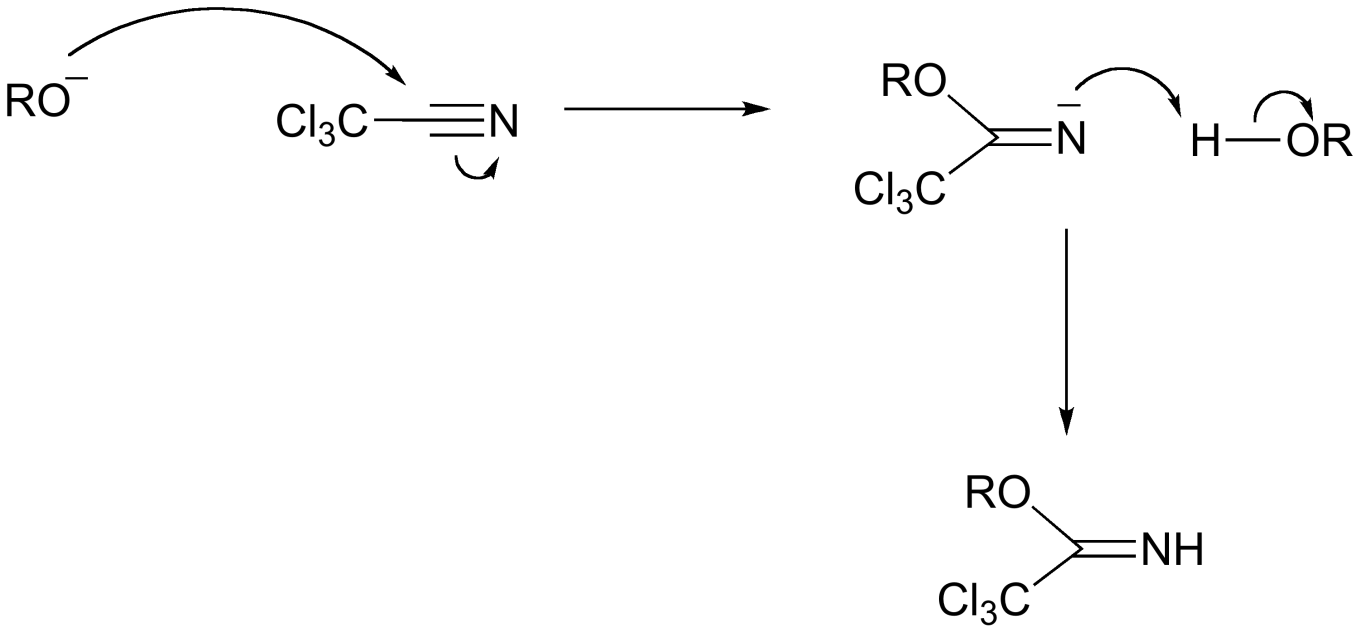


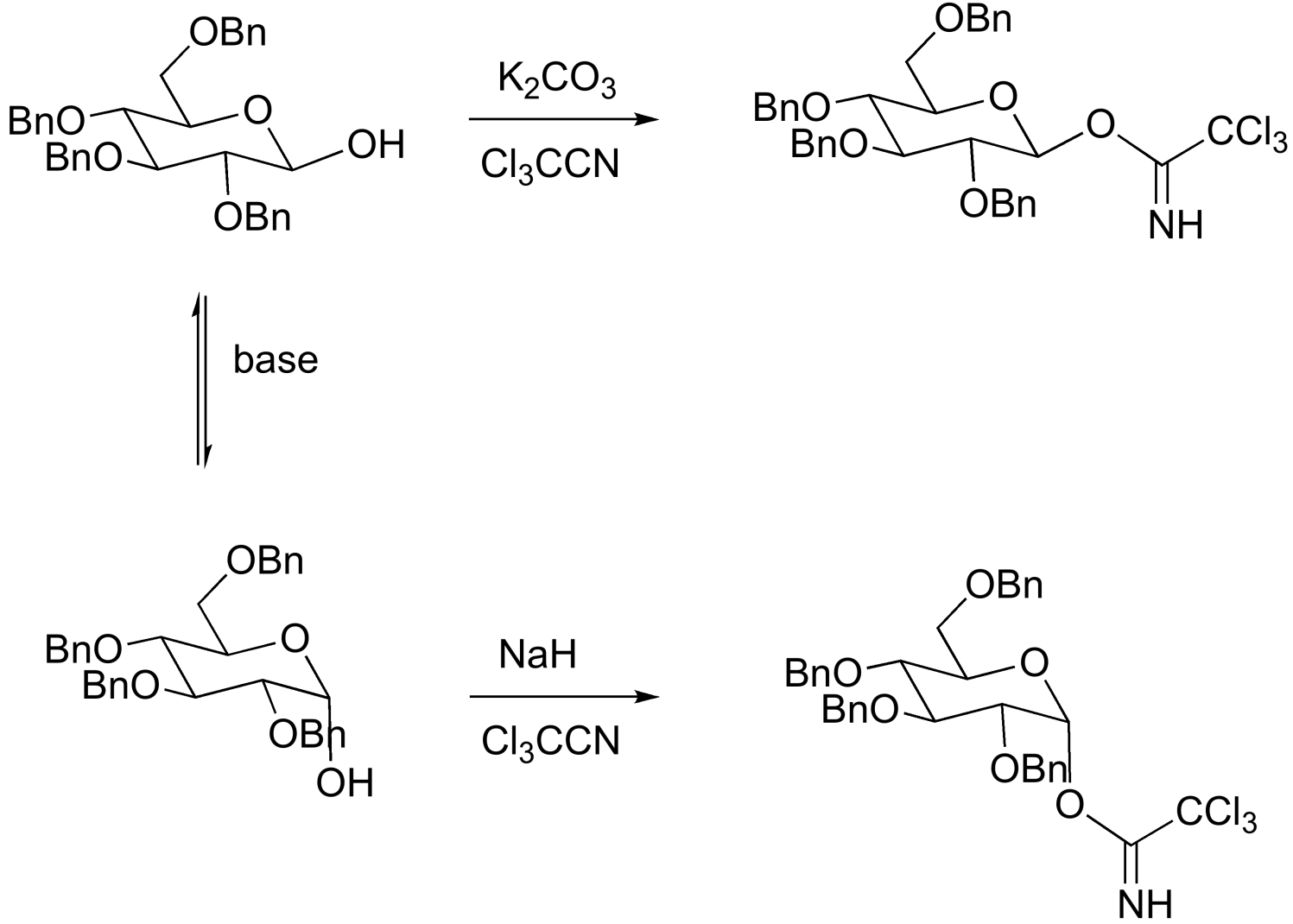
3.4 Glycosyl fluorides




AcO
O
SPh
HO
OAc
+
Me
O
F
OMe
MeO
OSiMe2But
Lewis acid
activator
e.g. SnCl2
AcO
O
SPh
O
OAc
Me
O
OMe
MeO
OSiMe2But

3.5 Trichloroacetimidates




OBn
BnO
BnO
O
OH
OBn
K_2CO_3
Cl_3CCN
OBn
BnO
BnO
O
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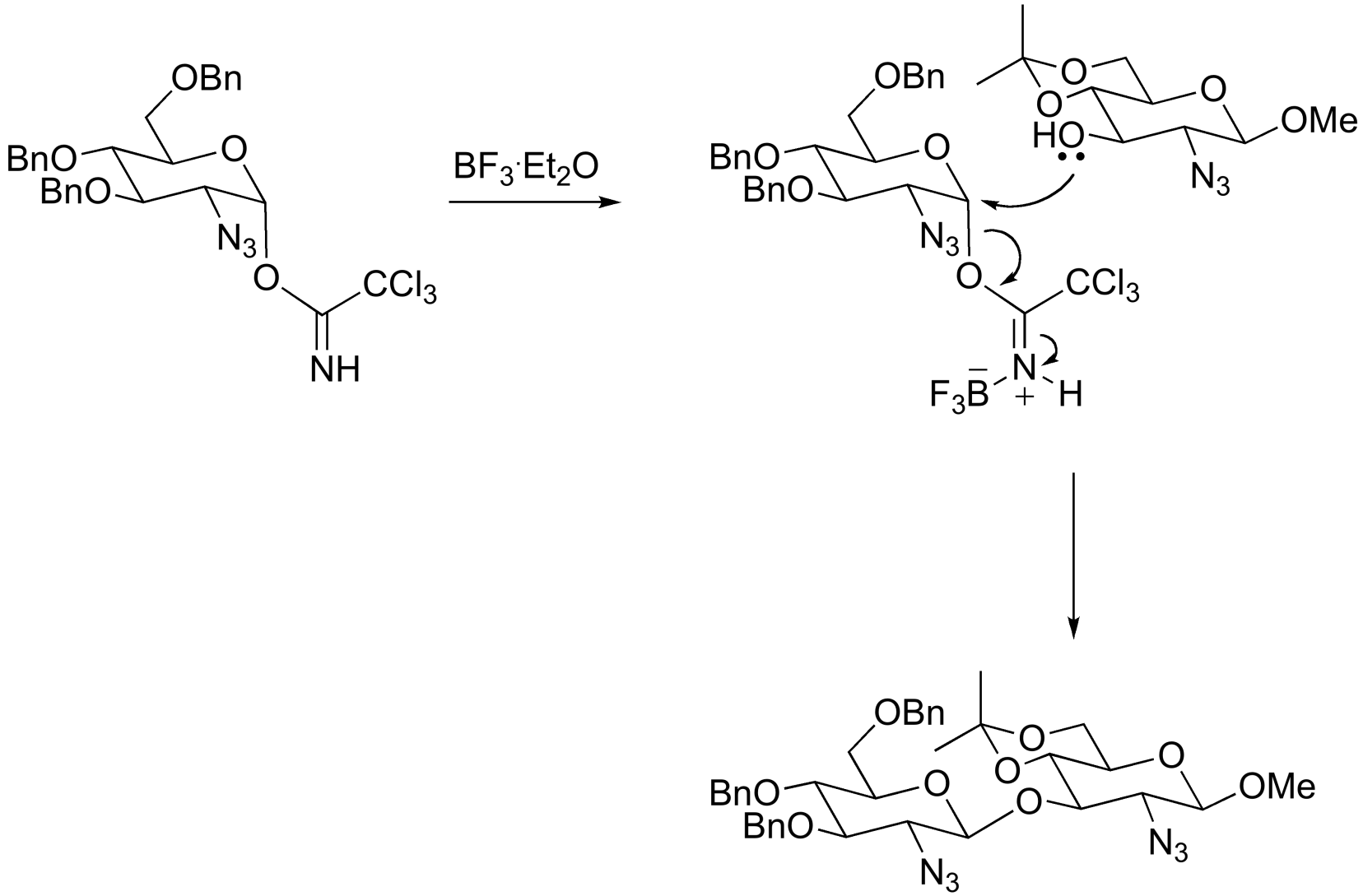
CCl_3
OBn
NH
base
OBn
BnO
BnO
O
OBn
OH
NaH
Cl_3CCN
OBn
BnO
BnO
O
OBn
O
CCl_3
NH


OBn
BnO
BnO
O
N3
O
CCl3
NH
BF3·Et2O
OBn
BnO
BnO
O
N3
O
CCl3
N
F3B
H
O
O
HO
O
OMe
N3
OBn
BnO
BnO
O
N3
O
O
O
O
O
OMe
N3