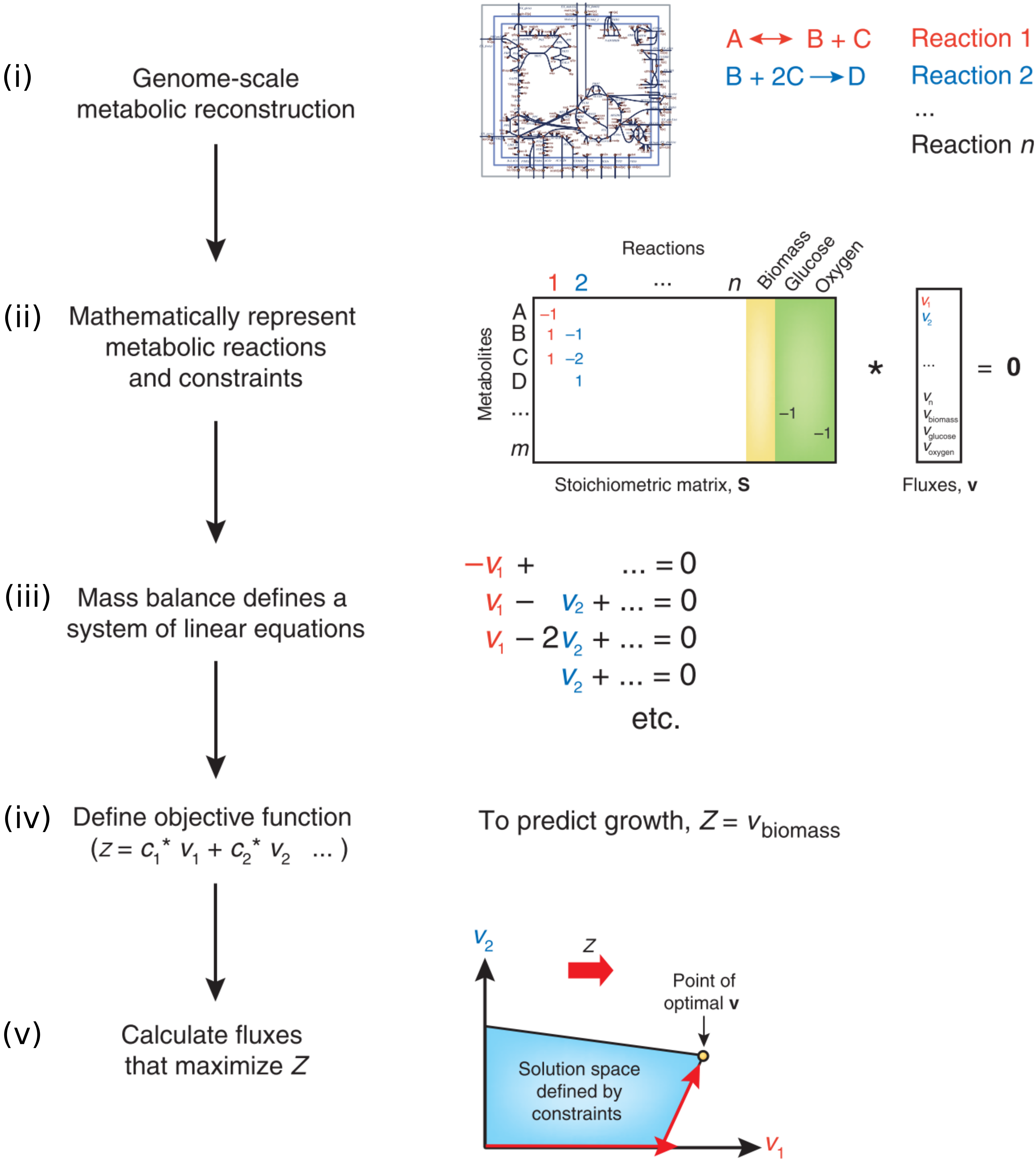

(i) Genome-scale metabolic reconstruction
A ↔ B + C
B + 2C → D
Reaction 1
Reaction 2
...
Reaction n
(ii) Mathematically represent metabolic reactions and constraints
Reactions
1 2 ... n
Biomass
Glucose
Oxygen
Metabolites
A B C D ... m
−1
1 −1
1 −2
1
−1
−1
*
v1
v2
...
vn
vbiomass
vglucose
voxygen
= 0
Stoichiometric matrix, S
Fluxes, v
(iii) Mass balance defines a system of linear equations
−v1 + ... = 0
v1 − v2 + ... = 0
v1 − 2v2 + ... = 0
v2 + ... = 0
etc.
(iv) Define objective function (z = c1* v1 + c2* v2 ...)
To predict growth, Z = vbiomass
(v) Calculate fluxes that maximize Z
v2
Z
Point of optimal v
Solution space defined by constraints
v1