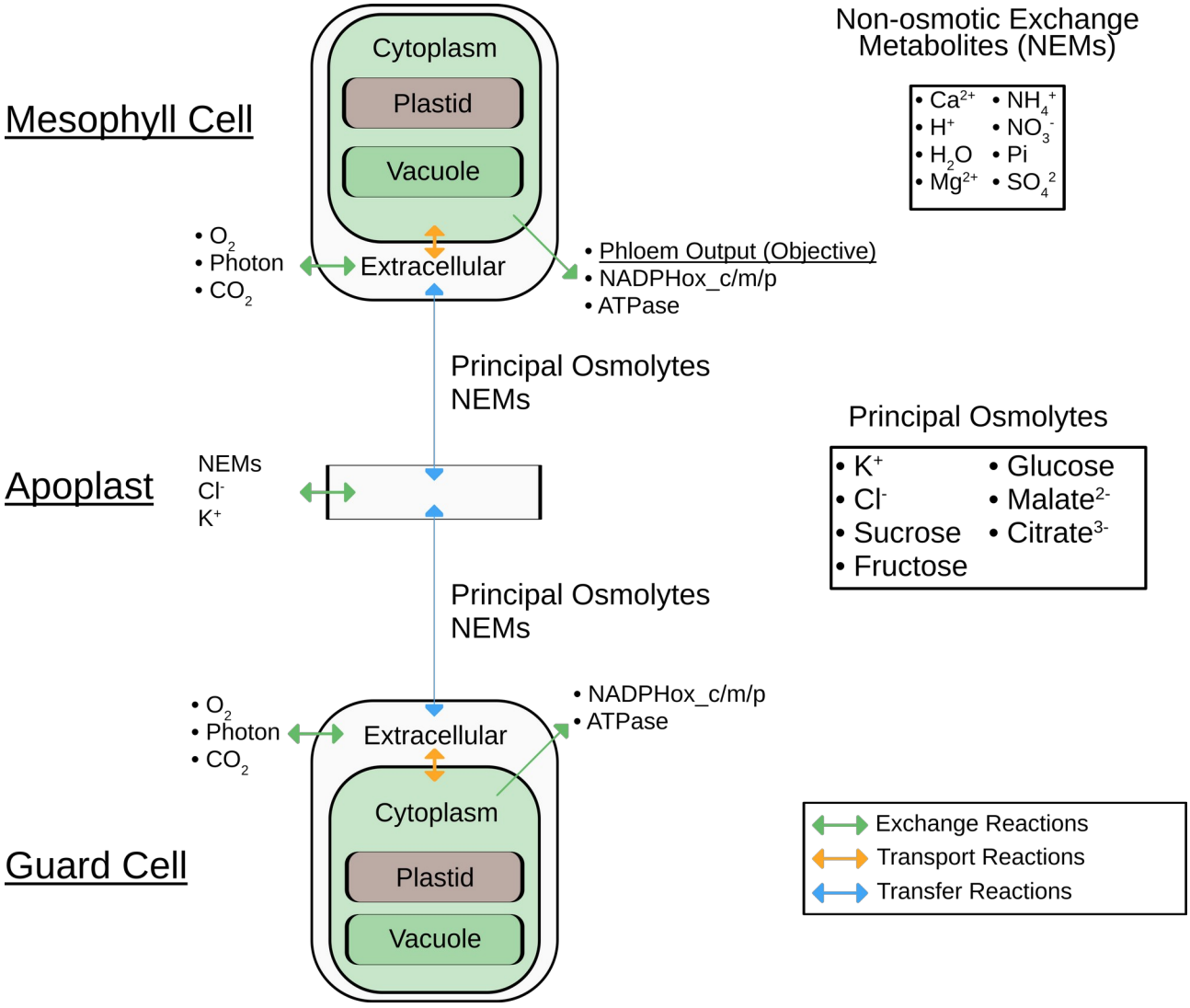
Supplemental Table 1. List of linker reactions.

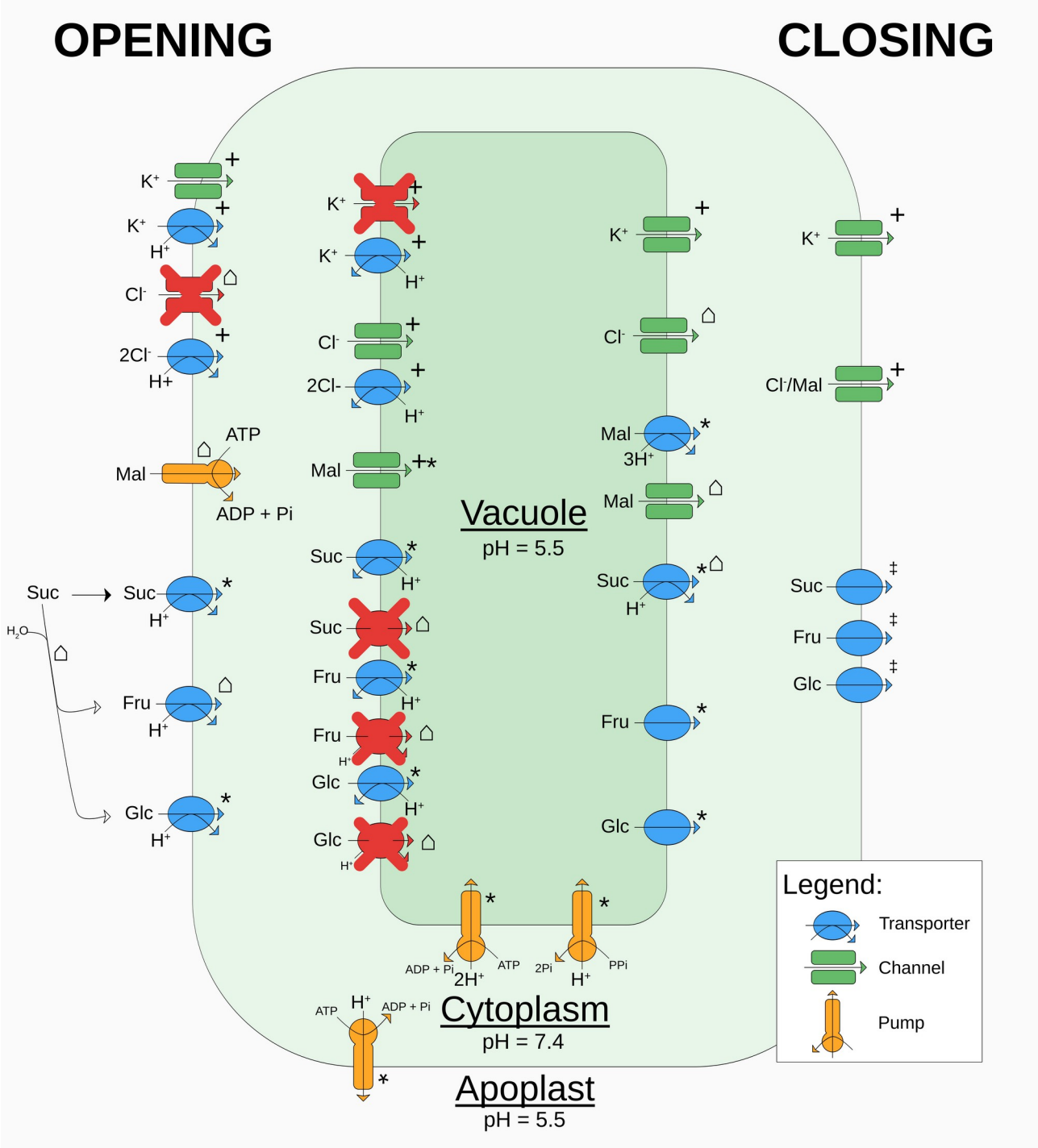
Osmotic coefficient refers to whether or not the linker reaction contributes to osmolarity. a, Apoplast; gc, Guard cell; me, Mesophyll cell; p, Plastid; v, Vacuole; c, Cytosol.

Osmotic Coefficient	Cell	Compartment	Metabolites
0	a	NA	Cl, Fructose, Glucose, K, Malate, Nitrate, Sucrose, aMalate
	gc	p	Starch
	me	p	Starch
		v	4_amino_butyrate, Arg, Asn, Citrate, Cys, Gln, Glt, Gly, His, Ile, Leu, Lys, L_alpha_alanine, L_aspartate, Malate, Met, Phe, Pro, Ser, Sucrose, Thr, Trp, Tyr, Val, aCitrate, aMalate, bHis
1	gc	c	Citrate, Cl, Fructose, Glucose, K, Malate, Nitrate, Sucrose
		v	4_amino_butyrate, Arg, Asn, Citrate, Cys, Cl, Fructose, Glucose, Gln, Glt, Gly, His, Ile, K, Leu, Lys, L_alpha_alanine, L_aspartate, Malate, Met, Nitrate, Phe, Pro, Ser, Sucrose, Thr, Trp, Tyr, Val, aCitrate, aMalate, bHis

Supplemental Figure 1. Transfer metabolites and ions



Supplemental Figure 2. Transporters and channels in guard cell model



Supplemental Table 2. Parameter bounds for parameter scan

Parameter	Lower	Upper	Units	Source Lower	Source Upper
*P*abs	0.81	0.99	Dimensionless	90% of (Zhu et al., 2010)	110% of (Zhu et al., 2010)
Tl	1.7 x 10-4	2.4 x 10-4	m	(Wuyts et al., 2010)	(Ramonell et al., 2001)
Al	1	1	m2	Fixed	Fixed

*V*gc	4.75 x 10-13	4.1 x 10-12	dm3	(Jezek and Blatt, 2017)	(Hills et al., 2012)
*FqF*m	0.79	0.9	Dimensionless	(Lawson et al., 2003)	(Lawson et al., 2003)
*R*ch	0.035	0.183	Dimensionless	(Fujiwara et al., 2019)	(Fujiwara et al., 2019)
Lair	0.185	0.37	Dimensionless	(Ramonell et al., 2001)	(Earles et al., 2018)
*L*epidermis	0.1	0.24	Dimensionless	(Willmer and Fricker, 1996)	(Ramonell et al., 2001)
*Vac*frac	0.751	0.9	Dimensionless	(Wang et al., 2017)	(Andrés et al., 2014)
T	283.15	298.15	K	10C	25C
R	0.08205	0.08205	dm3·atm·K⁻1·mol⁻1	Tiesinga et al. (2019)	Tiesinga et al. (2019)
*N*gcs	1.72 x 108	11.6 x 108	m-2	(Willmer and Fricker, 1996)	(Papanatsiou et al., 2016)
n	1.5	2.5	atm	Wang et al. (2012)	(Wang et al., 2017)
m	0.8	1	atm·µm-1	(Wang et al., 2017)	Wang et al. (2012)
r	5 x 10-14	8 x 10-14	dm3·µm-1	(Wang et al., 2017)	Wang et al. (2012)
s	1 x 10-13	3 x 10-13	dm3	Wang et al. (2012)	(Wang et al., 2017)
*C*apo	0.0230	37.3	mol·dm-3	(Wang et al., 2017)	(Roelfsema and Hedrich, 2002)
*A*closed	1	4	µm	(Jezek and Blatt, 2017)	(Wang et al., 2017)
*A*open	2.75	12	µm	(Horrer et al., 2016)	(Wang et al., 2017)
ATPase	0	17	fmol·GC-1·h-1	0	(Flütsch et al., 2020b)