14. Homeostasis

14.2 Homeostasis in Plants

Paper 4

Marking Scheme

Q1.

(a)	*any **four** from*: **1** protons / H^+ ions, pumped, from guard cells / into guard cell wall ; **2** *ref. to* negative potential (inside cell) **or** Cl^- ions enter (cell) ; **3** (voltage-gated) K^+ channels open **or** K^+ ions enter (guard) cells ; **4** water enters cell, by osmosis / down water potential gradient ; **5** (guard) cells, become turgid / swell / increase in volume ;	**4**

(b)(i)	*any **two** from*: **1** as abscisic acid concentration increases stomatal conductance decreases **or** negative correlation / inverse correlation / inversely proportional ; **2** two sets of *x y* figures to support mp 1 with units (at least once) ; **3** steep decrease in conductance to 100–150 ABA ; **4** no / little, effect on conductance above 250–425 ABA ;	**2**
(b)(ii)	*any **four** from*: **1** ABA causes stomata to close ; **2** ABA binds to receptor on guard cell ; **3** Ca^{2+} ions, enter (guard) cells / act as 2nd messenger ; **4** K^+ ions leave (guard) cells ; **5** water leaves so cells become, flaccid / less turgid ; **6** AVP ;	**4**

Q2.

(a)	*any **three** from:* **1** open in, day / light ; **2** to take in carbon dioxide for, photosynthesis / light-independent stage / Calvin cycle ; **3** close in, night / dark ; **4** to decrease water loss by transpiration ;	**3**
(b)	*any **six** from:* **1** hydrogen ions / protons / H ions / H^+, leave (cell) using, energy / ATP ; **2** low H^+ (in cell) / more negative charge ; **3** K^+ / potassium ion, channel (proteins) open **OR** K^+, move into / enter, cell (by facilitated diffusion) ; **4** Cl^- ions, move into / enter (cell) ; **5** water potential of cell decreases ; **6** water moves in (to cell) by osmosis ; **7** (cells) become turgid / swell / increase in volume / expand ; **8** (guard cell) inner wall thicker / outer wall thinner, so cells, bend / curve ;	**6**
(c)	**1** (environment) light needed, to keep cycle normal / to achieve same peak % of stomata opening ; **2** genes have a role as (regular), rhythm / pattern / cycle, continues, in darkness / without light ;	**2**

Q3.

(c)(i)	*any **two** from:* 1 (as climate changes) increase in CO_2 concentration causes, stomatal aperture to decrease / stomata to be less open ; 2 less water, lost / evaporated / transpired (though stomata) ; 3 compensates for / allows survival in, low water availability / dry conditions ;	**2**

(c)(ii)	*any **four** from:* 1 (abscisic acid / ABA) binds to receptor on, (guard) cell surface membrane ; 2 H^+ stops moving, out of cell / into cell wall ; 3 Ca^{2+} ions enter, cytoplasm / cell **or** Ca^{2+} ions act as second messenger ; 4 K^+ ions leave cell ; 5 water leaves cell, by osmosis / down water potential gradient ; 6 less turgid / flaccid, guard cell(s) close stoma(ta) ;	**4**

Q4.

(a)	<table><tr><th>letter</th><th>feature</th></tr><tr><td>**B**</td><td>location of Calvin cycle</td></tr><tr><td>**D**</td><td>made of cellulose</td></tr></table> ; ;	**2**
(b)	*any **four** from:* **1** H^+ pumped, out of guard cell / into cell wall of guard cell ; **2** inside of cell becomes (relatively) negatively charged ; **3** K^+ enters cell by facilitated diffusion ; **4** water potential of cell decreases ; **5** water enters cell by osmosis ; **6** cell, expands / increases in volume / becomes turgid ; **7** stoma opens due to thick inner wall ;	**4**