9.2 Transport in angiospermophytes – *summary of mark schemes*

9.2.1	Outline how the root system provides a large surface area for mineral ion and water uptake by means of branching and root hairs. Mark Scheme A. roots have a large / increased surface area (in relation to their volume); B. branching / lateral roots (increases the surface area); C. root hairs increase the surface area; D. cortex cell walls (increase the surface area); E. water is absorbed by osmosis; F. solute concentration inside the root is higher than in the soil / outside; G. due to active transport of ions into the root; H. apoplastic and symplastic transport across the root; I. apoplastic route is through the cell walls (and intercellular spaces); J. symplastic route is through the cytoplasm (and plasmodesmata); K. (most) water travels through the apoplastic pathway / through cell walls; L. By diffusion / down concentration gradient; M. water has to pass through cytoplasm of endodermis / Casparian strip blocks walls; N. enters xylem within vascular cylinder / stele; O. water movement in xylem due to pulling force / transpiration pull; P. cohesion between water molecules; Q. correct reference to root pressure;
9.2.6	Explain how water is carried by the transpiration stream, including the structure of xylem vessels, transpiration pull, cohesion, adhesion and evaporation. Mark Scheme A. transported in xylem (vessels); B. passive / no energy used by plants; C. evaporation / transpiration causes low pressure / suction / pull; D. transpiration stream / continuous column of water from roots to leaves; E. water molecules are cohesive (so transmit the pull) / hydrogen bonding; F. root pressure can move water up the plant; G. apoplastic pathway is through cell walls;
9.2.9	Explain how the abiotic factors light, temperature, wind and humidity, affect the rate of transpiration in a typical terrestrial plant. Mark Scheme temperature A. faster diffusion / more kinetic energy (of water molecules); B. faster evaporation (due to more latent heat available); light: C. causes stomatal opening; D. increasing light increases transpiration; E. because stomatal opening increases; F. no light causes stomatal closure, reducing transpiration; G. wider opening with brighter light hence more transpiration; wind: H. removes water / vapour from around leaf; I. increases water vapour / humidity gradient so increases transpiration; J. increases transpiration / lack of wind can reduce transpiration; K. no increase in transpiration if humidity is 100%; humidity: L. high humidity reduces water vapour gradient so lowers transpiration; M. high humidity lowers transpiration rate; N. lowering humidity can increase transpiration rate (to a point); O. at very low humidity stomata may shut down;

9.2.11	Outline the role of phloem in active translocation of sugars (sucrose) and amino acids from source (photosynthetic tissue and storage organs) to sink (fruits, seeds, roots). Mark Scheme A. living tissue; B. composed of companion cells / sieve tube members; C. companion cells involved in ATP production; D. sucrose / amino acids / assimilate / products of photosynthesis transported; E. bi-directional transport; F. source / leaves to sink / fruits / roots / storage organs / named storage organ; G. pressure flow hypothesis / movement of water into phloem causes transport;