**Plant Data Analysis and Essay Markscheme (CLASS SET)**

**1.** (a) height 0.54 m: 60–79 cm / 0.60–0.79 m (from the plant)
and height 10.8 m: 0–2.9 m
(from the plant); 1
Units needed for both parts of the answer.

(b) the greater the height from which the seed fell,
the further it travelled from the parent plant 1

(c) *at the greater height:*seed can catch the wind to travel further / updrafts /
more wind at greater height;
farther to the ground and does not travel straight down /
more time to be blown before hitting the ground;

 *at lower height*:
seed can fall straight down;
seed can hit downdraft and fall faster; 2 max
Any point must explain the difference in distance
travelled from the two heights.

(d) *Agrostis stolonifera* 1

(e) *Poa trivialis* 1

(f) *Poa* produces seed earliest in the summer / June;
*Holcus* produces most seed in July;
*Agrostis* and *Festuca* produce seed in (late July to) August;
*Holcus* and *Poa* have a peak time of seed fall /
short period of seed fall;
*Agrostis* and *Festuca* may continue to increase in
seed production to September; 3 max
Accept any of these points made conversely as an alternative.

(g) *Award* ***[1]*** *each for any two of the following*.
to avoid predation /
disperse at times when other species are dispersing their seeds;
to avoid competition;
late in the year to allow seeds to germinate over winter /
better germination conditions;
better dispersal conditions / more wind / animals for dispersal;
photoperiod – required day length for flowering;
more energy stored at the end of the summer for seed production;
more light / warmth / better conditions for seedling photosynthesis /
growth; 2 max

(h) *Award* ***[1]*** *each for any two of the following*.
tropical fruits have higher lipid content than temperate fruits;
temperate fruits (80%) have greater carbohydrate
content than tropical fruits (55%);
protein levels are similar in both groups of fruits /
slightly higher in temperate fruits
than tropical fruits;
(must make it clear that the difference is slight) 2 max

(i) mistletoe;
high proportion of lipid and carbohydrate
(lipid has approximately twice the energy content
of protein and carbohydrate); 2

(j) *Award* ***[1]*** *for advantage and* ***[1]*** *for disadvantage*.

 *animal dispersal advantage*:
travel further / digestion cracks seed coat for better germination /
deposited in feces with organic matter /
better in areas with little wind;

 *animal dispersal disadvantage*:
predation / seeds eaten / deposited in poor environment /
buried too deep / buried too shallow (if deposited with feces) /
animal might become extinct / scarce; 2 max

[17]

**2.** name of dicotyledonous plant;
*Do not accept tree, pondweed, any monocots, conifers, ferns.*

 *Award* ***[1]*** *for each of the following structures clearly
drawn and correctly labelled, up to* ***[4 max].***root / roots; *(Shown forming a branching network joined to the stem.)*stem / stems;
leaf / leaves;
axillary bud drawn in leaf axil;
terminal bud drawn at tip of stem;
flower / inflorescence / named part of flower;

[5]

**3.** *Award* ***[1]*** *for each of the following structures, shown in the correct relative position
and labelled. Individual cells are not needed but do not penalize if they are shown*.
upper epidermis;
palisade layer / mesophyll;
spongy layer / mesophyll;
lower epidermis;
xylem (in a major or minor vein);
phloem (in a major or minor vein);
collenchyma (in the midrib);
guard cells; (*do not accept stoma / stomata only*)

[6]

**4.** living tissue;
composed of companion cells / sieve tube members;
companion cells involved in ATP production;
sucrose / amino acids / assimilate /
products of photosynthesis transported;
bi-directional transport;
source / leaves to sink / fruits / roots /
storage organs / named storage organ;
pressure flow hypothesis /
movement of water into phloem causes transport;

[5]

**5.** *To receive full marks responses must address all three parts.*

 *light:* ***[2 max]***

 causes stomatal opening in morning, increasing transpiration;
increasing light increases transpiration;
because stomatal opening increases;
no light causes stomatal closure, reducing transpiration;

 *wind:* ***[3 max]***

 removes water / vapour from around leaf;
increases water vapour / humidity gradient so increases transpiration;
increases transpiration / lack of wind can reduce transpiration;
no increase in transpiration if humidity is 100%;

 *humidity :* ***[3 max]***

 high humidity reduces water vapour gradient so lowers transpiration;
high humidity lowers transpiration rate;
lowering humidity can increase transpiration rate (**to a point**);
at very low humidity stomata may shut down;

[8]

**6.** roots have a large / increased surface area (in relation to their volume);
root hairs increase the surface area;
water is absorbed by osmosis;
solute concentration inside the root is higher than in the soil / outside;
due to active transport of ion into the root;
apoplastic and symplastic transport across root;
apoplastic route is through the cell walls (and intercellular spaces);
symplastic route is through the cytoplasm (and plasmodesmata);
carried up stem by xylem (vessel elements / tracheids);
water has to pass through cytoplasm of endodermis /
Casparian strip blocks water;
water movement in xylem due to pulling force /
transpiration pull from leaves;
cohesion between water molecules;

 Adhesion between water molecules and xylem cell walls prevent falling due to gravity and transmit tension.

[8]

**7.** absorption of water;
gibberellic acid produced in embryo;
stimulates production of amylase;
catalyses the breakdown of starch to maltose;
maltose diffuses to embryo;
used for energy production and growth; 5 max
*(Plus up to* ***[2]*** *for quality)*

[5]

**8.** *Award* ***[1]*** *for each of the following structures clearly drawn and labelled correctly.*

 petals;
sepal;
stigma;
style;
ovary;
stamen / anther and filament;
receptacle / nectary;

[6]

**9.** some flowering plants are short-day plants;
others are long-day plants;
important variable is length of darkness / photoperiod;
some plants grown in greenhouses with controlled light conditions;
short-day plants kept in the dark during daylight hours;
long-day plants artificially lit during the night;
using an appropriate wavelength / far-red light / 730 nm;
possible to expose only for brief periods to keep costs down
but long enough to interrupt the dark period;
involves interaction of phytochromes with metabolic reactions;
controlled by the plant’s biological clock;

[6]

**10.** flowering in LDP controlled by the plant's biological clock;
uses phytochrome to measure dark period /
Pr converted to Pfr during daylight;
LDP needs a day length longer than a critical period /
night length shorter than a critical period;
Pfr remains at the end of short nights;
Pfr stimulates flowering;
flowering hormone / florigen released;
phytochrome system / biological clock located in leaf;
example of LDP;

[4]