**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]