Plant Nutrition

Mark Scheme 5

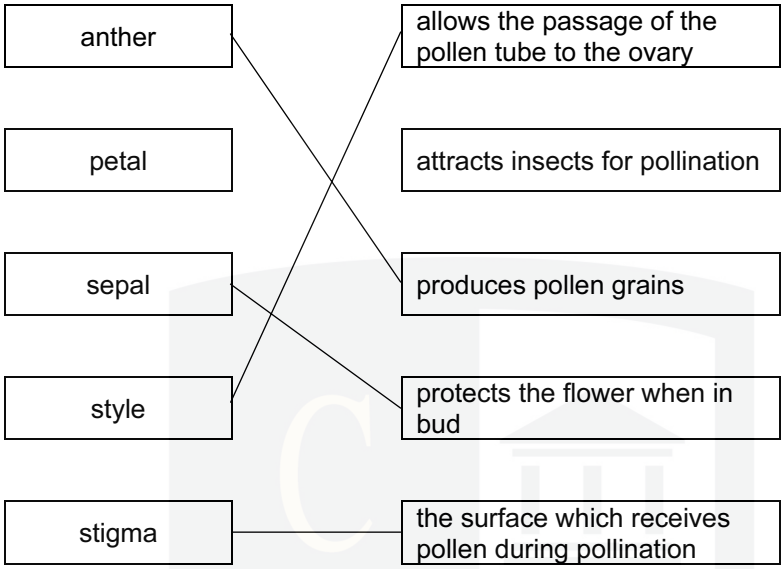
Level	IGCSE
Subject	Biology
Exam Board	CIE
Topic	Plant Nutrition
Paper Type	(Extended) Theory Paper
Booklet	Mark Scheme 5

Time Allowed: **72 minutes**

Score: **/60**

Percentage: **/100**

1 **(a** *reject lines to or from the same box, e.g. anther and petal to produce pollen grains*
A *if lines do not touch box but meaning is clear*



[4]

(b) *assume answer is about stigma of wind-pollinated flower unless told otherwise, accept* ***ora****, 2 max for differences, 1 or 2 for significance*

wind-pollinated stigma,	*insect-pollinated stigma*
feathery / hairy **;** **R** branched *ignore not sticky*	not, feathery / hairy **;** *ignore sticky*
large(r) **;** **A** large surface area	small(er) **;** **A** small surface area
outside flower / AW **;** **A** pendulous / exposed *ignore long and short*	inside flower / AW **;** [2 max]

explanation
to catch pollen / AW (in the wind) **;** **A** for pollen to attach (to stigma)
or make pollination more likely / easier
increase chance of pollination **;**

'more likely to catch pollen' = 2 marks [max 3]

(c) **1** little / less / AW / no, <u>variation</u> **;** **R** cloning
2 ref to becoming homozygous **;** *ignore ref to gene*
3 e.g. of consequence 'good' or 'bad' **;**
e.g. less chance of adapting to changing conditions / less ability to evolve
may become extinct / adapted variety spreads / AW **;**
4 greater chance of pollination / ensures pollination occurs **;**
A reproduction / fertilisation
5 useful if no other plants (of same species) nearby **;**
6 less wastage of pollen **;** **A** gametes
7 not dependent on (named) agent of pollination **;** [max 3]

[Total: 10]

2 **(a)** *bars must be within potato square*

bars plotted accurately at 2.6 and 5.6 **;**
shading correct according to key **;** [2]

(b) **(i)** (sugar) beet **;** [1]
(ii) wheat **;** [1]

(c) *award three different main points as given below*
or award two marks for the main points and max one for any detail of one point

use of named appropriate machinery **;** e.g. tractor / combine harvester
detail e.g. more efficient, sowing / harvesting / watering **;**
(artificial) fertilisers **;**
detail e.g. prevent mineral deficiencies / provide more nutrients **;**
pesticides / insecticides / fungicides / AW **;**
detail e.g. control, pests / diseases, feed / destroy / damage, crops **;**
A reduce losses to, pests / diseases
herbicides **;**
detail e.g. control / kill, weeds / competitors **;**
use of, hormones / named hormone(s) **;**
detail e.g. reduce vegetative growth / promote fruiting / AW **;**
irrigation **;** **R** 'put on (more) water'
detail e.g. prevent water becoming limiting factor / not relying on rain / AW **;**
glasshouses / greenhouses **;**
detail e.g. control, light intensity / carbon dioxide concentration / temperature

monoculture **;**
detail e.g. easier to harvest **;**

genetic engineering / gene transfer / GM **;** *ignore* genetic technology
artificial selection / selective breeding **;**
detail e.g. improve, growth / aspect of yield / quality / disease resistance / pest resistance **;** [max 3]

(d) *idea that* water content of plants varies **;** [1]

(e) *idea that* energy is lost, along a food chain / between maize and cows **;** [1]

energy loss by animals to max 2
food not eaten **;**
food not, digested / absorbed **;** **A** egested
(chemical energy) excreted **;**
heat loss **;**
movement **;**
respiration **;** [max 2]

2 **(f)** **(** $6O_2$ **;** **R** $6O^2$ / 6O2 [1]

(ii) large surface area / broad / wide **;** **R** flat
chloroplasts / chlorophyll **;**
leaf mosaic / leaves arranged to avoid shading **;**
leaves, grow at right angles to light / move to follow the sun **;**
cuticle / epidermis, thin / transparent **;**
leaf is thin **;**
palisade cells tightly packed **;**
movement of chloroplasts towards light source **;**
AVP **;** [max 2]

(iii) root hair(s) **;**
down water potential gradient / from high to low water potential / soil has higher water potential / root has lower water potential **;**
osmosis / across partially permeable membrane **;**
A semi-permeable / selectively permeable **R** 'and active uptake'
[3]

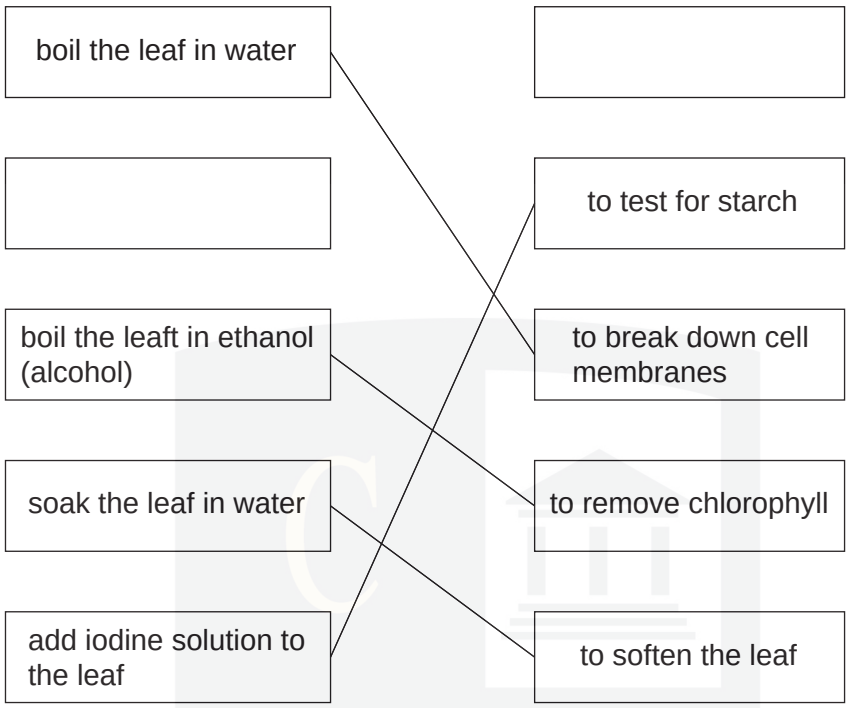
(iv) (carbon dioxide) diffuses (from air) / ref to down diffusion gradient **;**
through stoma(ta) **;**

air spaces, between (mesophyll) cells / in leaf **;**
dissolves in water, on / in, cell wall **;**
(diffuses) through, cell wall / membrane **;**

carbon dioxide from, respiration / mitochondria **;** [max 2]

[Total: 19]

3 **(a) (i)**



[4]

(ii) chlorophyll masks the colour change (shown with iodine) / AW ; [1]

(b) light ;
water ; **A** moisture
suitable temperature ; **R** heat
chlorophyll ; [max 2]

(c) to show that the factor under test is responsible for the change observed / AW ;
e.g. to show carbon dioxide is need
to show plants can photosynthesis under the glass cover
A so there is only one variable [1]

(d) to be sure that starch is produced during the experiment ; [1]

(e) *correct result for starch test and reason needed for each mark*
reject crossed ticks

stage	leaf from plant	starch test (✓ or ×)	reason
2	**A and B**	×	plants have had no light for photosynthesis / destarched / AW ;
4	**A**	×	plant has had no carbon dioxide for photosynthesis ;
	B	✓	plant has had, carbon dioxide / all conditions, for photosynthesis ;

[3]

3 **(f)** no photosynthesis ;
plant respires ; **R** 'plant begins to respire' / 'instead it respires'
carbon dioxide produced ; **A** correct equation for aerobic respiration
carbon dioxide, released / diffuses, from plant ; [max 3]

[Total: 15]

4 **(a)** order needs to be correct for one mark ; TICK TO LEFT OF TABLE
All numbers correct for **two** marks ; ; * NUMBER TO MATCH TISSUE
Three correct for **one** mark

	tissue	number of chloroplasts	
	upper epidermal cells	none	+
	palisade mesophyll	many	+
✓	spongy mesophyll	some / many	✓
	guard cells	some	✓

3

(b) ONE MARK FOR SYMBOLS CORRECT **R** energy
ONE MARK FOR CORRECT BALANCING

$6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2$ **2**

(ii)
i. internal factor / external factor / environmental variable / named factor (CO_2 / H_2O / light / temp) ;
ii. which restricts the effects of others AW / limits rate of reaction ;
A converse answer **R** photosynthesis / growth
iii. it is the one in short(est) supply ; **max. 2**

(iii) carbon dioxide / CO_2 ; **1**

(c) **(i)**
i. ref. to long / tubular / formed as a vessel AW / lumen present / hollow ;
ii. ref. to absence of end walls ;
iii. ref. to dead cells / lack of cell contents / named part(s) (cytoplasm / nucleus) ;
iv. ref. to lignified walls ;
v. ref. to tracheids ; **max 3**

(ii) MAX. 3 IN EITHER SECTION
(xylem)
i. ref. to transport / carry ; AWARD ONCE
ii. ref. to water ;
iii. ref. to mineral salts / named salts / ions ; **R** nutrients unqual.
iv. from roots to leaves :
v. provides structural support AW ;
vi. ref. to transpiration ;

(phloem)
vii. ref. to transport ; (IF NOT ALREADY GIVEN)
viii. ref. to amino acids ;
ix. ref. to sugars / sucrose / organic materials ; **R** glucose, food, nutrients
x. from leaves to storage area or place of use AW ; **R** up the plant
xi. ref. to translocation ; **max 4**

(d) ref. to reduce (less / no) + water loss / wilting / transpiration ; **1**

total max. 16