

Plant Nutrition

Mark Scheme 5

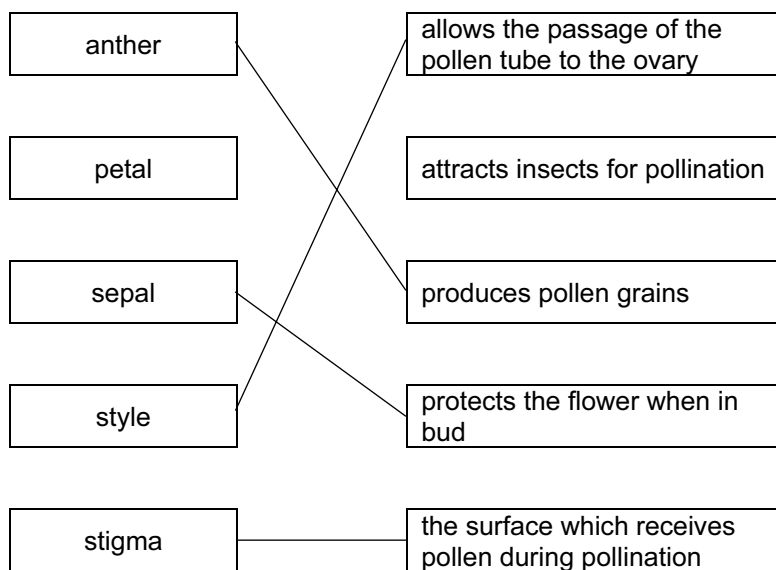
| | |
|-------------------|-------------------------|
| Level | IGCSE |
| Subject | Biology |
| Exam Board | CIE |
| Topic | Plant Nutrition |
| Paper Type | (Extended) Theory Paper |
| Booklet | Mark Scheme 5 |

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
 large(r) ; **A** large surface area
 outside flower / AW ;
A pendulous / exposed
ignore long and short

not, feathery / hairy ;
ignore sticky
 small(er) ; **A** small surface area
 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, variation ; **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) ((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 $6O^2 / 6O_2$ [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]

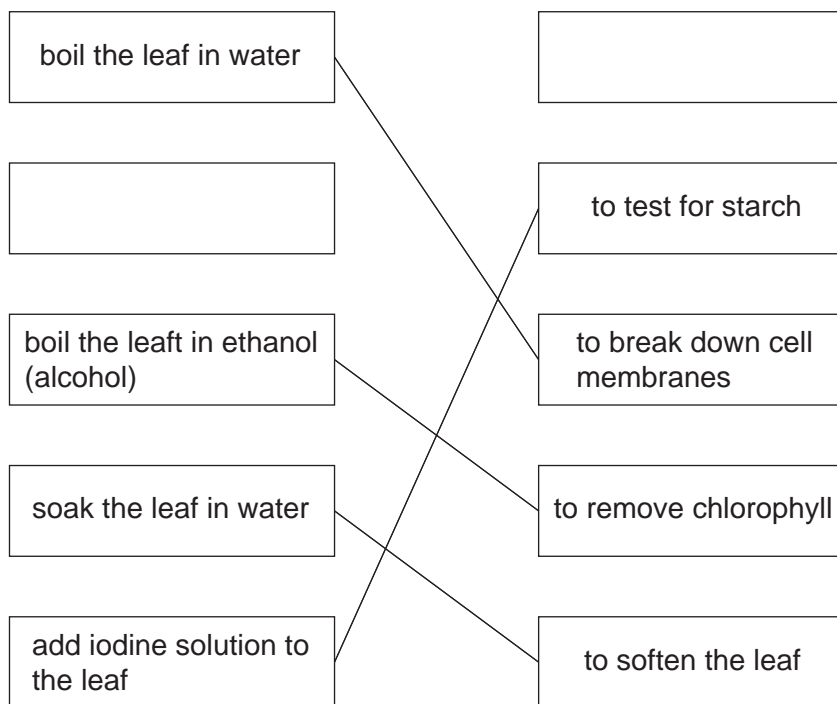
(iv) (carbon dioxide) diffuses (from air) / ref to down diffusion gradient ;
through stoma(ta) ;

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 <u>photosynthesis</u> ; |
| | B | ✓ | plant has had, carbon dioxide / all conditions, for <u>photosynthesis</u> ; |

[3]

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

[max 3]

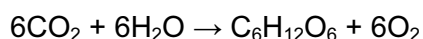
[Total: 15]

- 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



2

(ii)

- i. internal factor / external factor / environmental variable / named factor (CO₂ / H₂O / 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 / CO₂ ;

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 unequal.
- 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