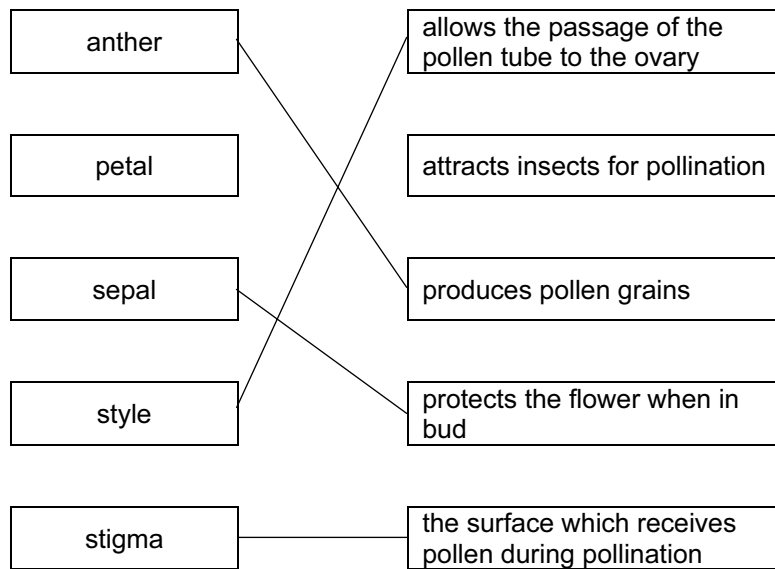


- 1 (a) *reject lines to or from the same box, e.g. anther and petal to produce pollen grains*  
**A** if lines do not touch box but meaning is clear



[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  
 outside flower / AW ;

small(er) ; **A** small surface area  
 inside flower / AW ;

**A** pendulous / exposed  
*ignore long and short*

[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]

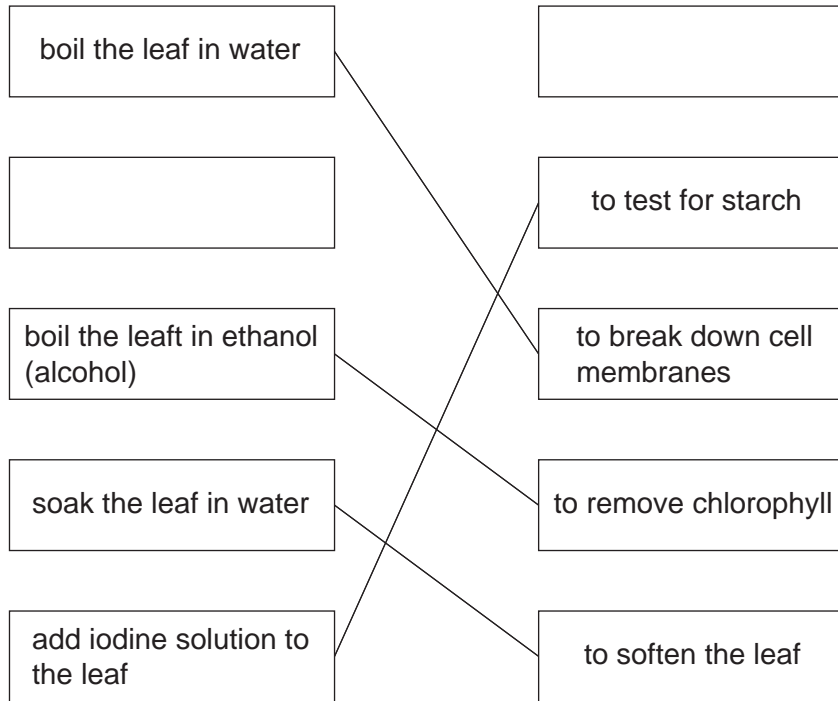
(iii) root hair(s) ;  
down water potential gradient / from high to low water potential / soil has  
higher water potential / root has lower water potential ;  
osmosis / across partially permeable membrane ;  
A semi-permeable / selectively permeable R 'and active uptake'  
[3]

(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	<b>A and B</b>	×	plants have had no light for photosynthesis / destarched / AW ;
4	<b>A</b>	×	plant has had no carbon dioxide for <u>photosynthesis</u> ;
	<b>B</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]

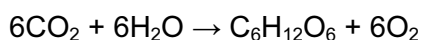
**[Total: 15]**

- 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)

- internal factor / external factor / environmental variable / named factor (CO<sub>2</sub> / H<sub>2</sub>O / light / temp) ;
- which restricts the effects of others AW / limits rate of reaction ;  
**A** converse answer **R** photosynthesis / growth
- it is the one in short(est) supply ;

max. 2

(iii) carbon dioxide / CO<sub>2</sub> ;

1

(c) (i)

- ref. to long / tubular / formed as a vessel AW / lumen present / hollow ;
- ref. to absence of end walls ;
- ref. to dead cells / lack of cell contents / named part(s) (cytoplasm / nucleus) ;
- ref. to lignified walls ;
- ref. to tracheids ;

max 3

(ii) MAX. 3 IN EITHER SECTION  
 (xylem)

- ref. to transport / carry ; AWARD ONCE
- ref. to water ;
- ref. to mineral salts / named salts / ions ; **R** nutrients unequal.
- from roots to leaves ;
- provides structural support AW ;
- ref. to transpiration ;

(phloem)

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

max 4

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

1

total max. 16