

Unit 2

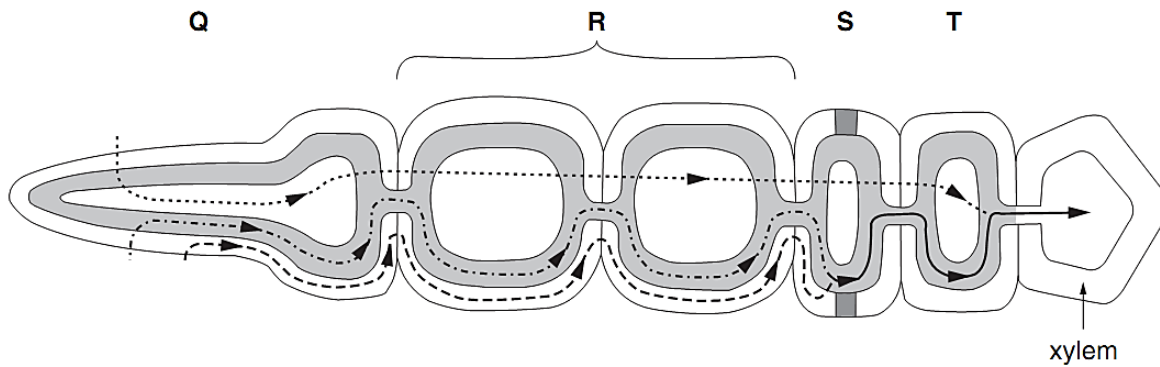
The Variety of Living Organisms

Plant Biology

Practice Exam Questions

1

Fig. 5.1 shows the possible pathways taken by water across the root of a plant.



Key:

-▶ pathway 1
- · - · - ·▶ pathway 2
- - - -▶ pathway 3
- ▶ common pathways

Fig. 5.1

(a) (i) Name the process by which water enters cell **Q** from the soil.

..... [1]

(ii) Pathway 1 is known as the vacuolar pathway, as the water passes into and through the cell vacuoles.

Name pathway 2 and pathway 3.

pathway 2

pathway 3 [2]

(iii) State which letter, **Q**, **R**, **S** or **T**, on Fig. 5.1, represents the endodermis.

..... [1]

Fig. 6.1 is a plan diagram of a transverse section of a leaf from *Nerium oleander*, a plant adapted to survive in dry areas.

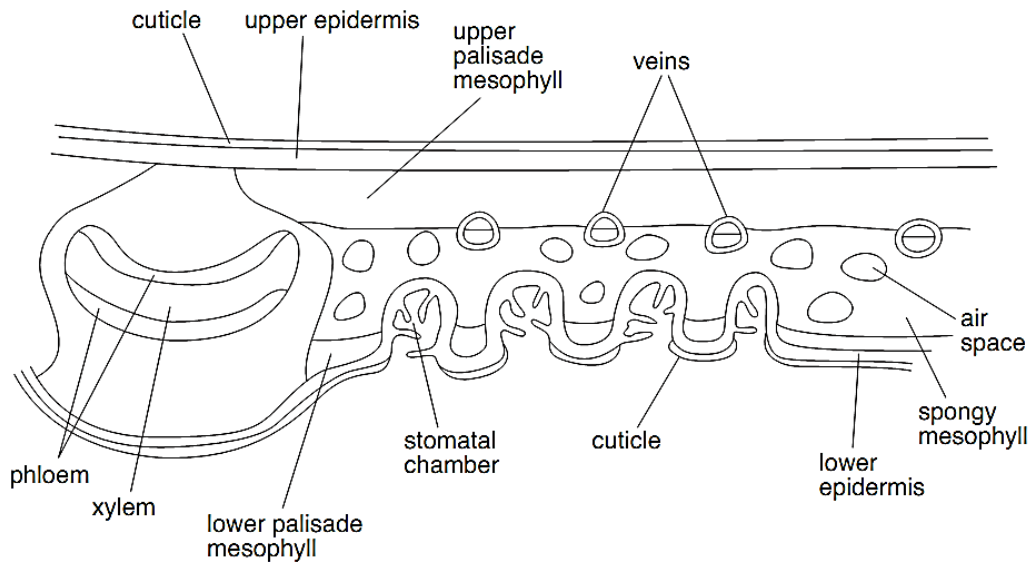


Fig. 6.1

Fig. 6.2 shows the lower epidermis that lines the stomatal chambers in greater detail.

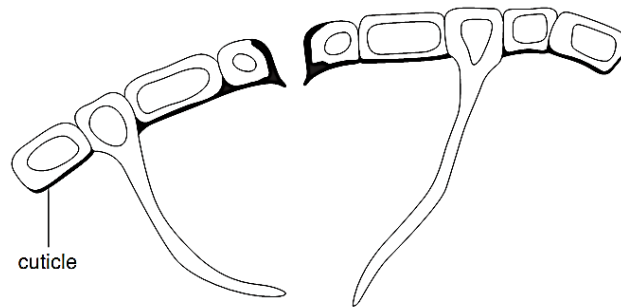


Fig. 6.2

Explain how the following features shown in Fig. 6.1 and Fig. 6.2 help the plant to survive in dry areas.

cuticle

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.....

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.....

stomatal chambers

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..... [4]

[Total: 4]

Fig. 4.1 shows some xerophytic plants.

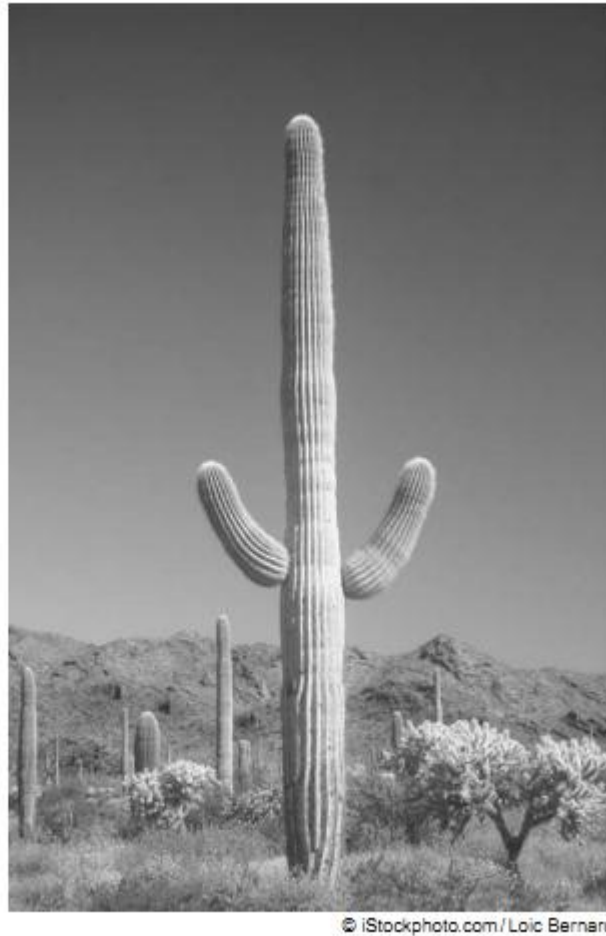


Fig. 4.1

Complete the following paragraph on xerophytic plants, using the most appropriate word or words.

Xerophytes are plants living in desert habitats where the conditions are very Their leaves show a variety of modifications to transpiration. Many have a thick cuticle. Their leaves may be covered with hairs which trap In some, the leaves are in the form of needles which reduces their surface area. Their are often sunken into pits in the surface of the leaf or stem.

[5]

[Total: 5]

- 4 Mistletoe is a plant that is a partial parasite. It has no roots in the ground, but grows by attaching itself to the branches of a tree.

Fig. 4.1 shows mistletoe attached to the branch of a tree. The enlargements show details, in transverse section, of part of the leaf structure of mistletoe (C) and of the region where it attaches to the tree branch (D).

Mistletoe carries out photosynthesis and transpiration like non-parasitic plants.

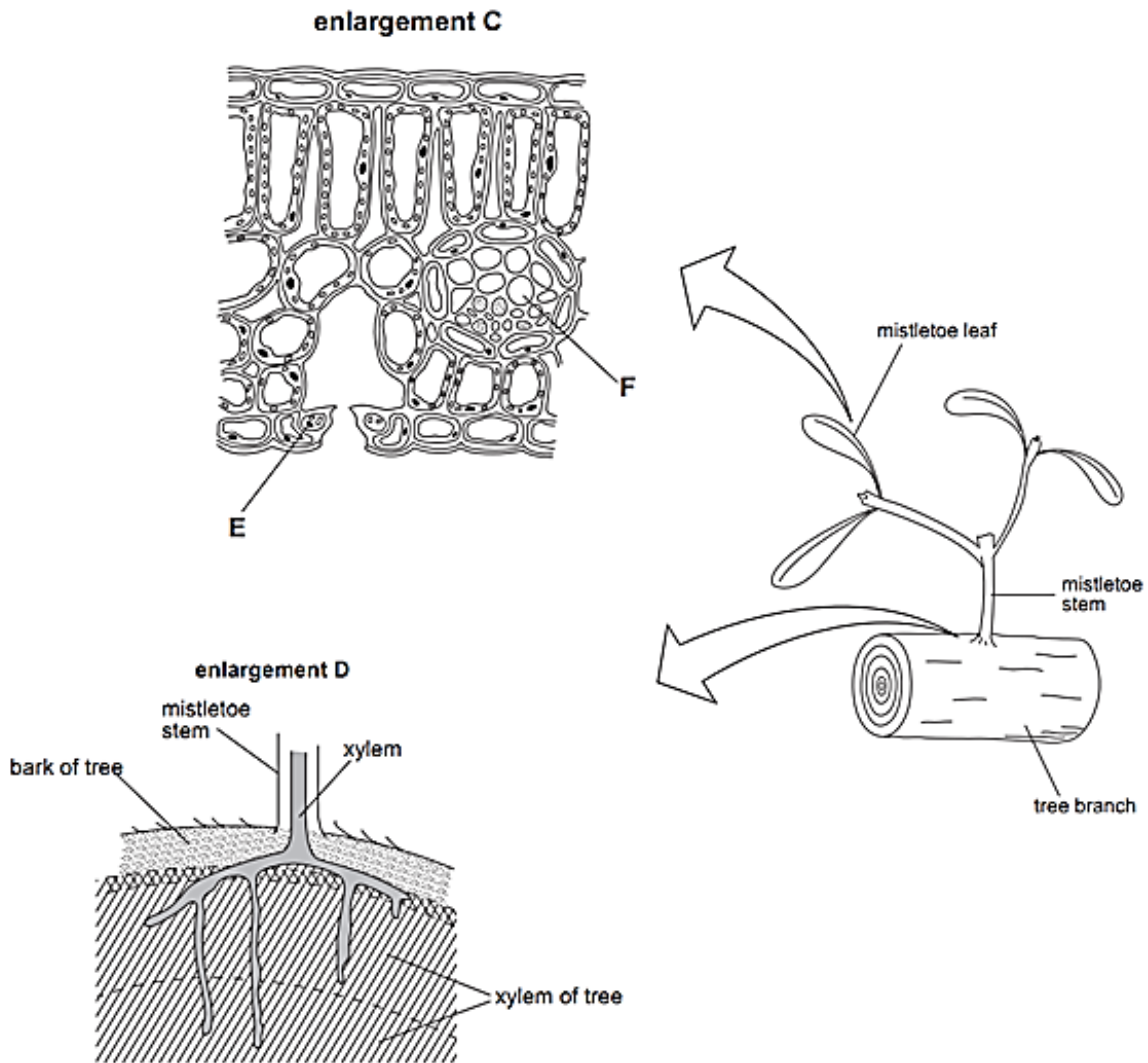


Fig. 4.1

(a) Name cells **E** and **F** shown in enlargement **C**.

E

F[2]

(b) Many text books state that transpiration is an inevitable consequence of gas exchange in plants.

Explain why transpiration is considered to be an inevitable consequence of gas exchange.

.....
.....
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.....[3]

(c) Mistletoe has no roots in the ground.

Using the information in Fig. 4.1 to help you, outline the mechanism by which water reaches the cells in the leaf of mistletoe.

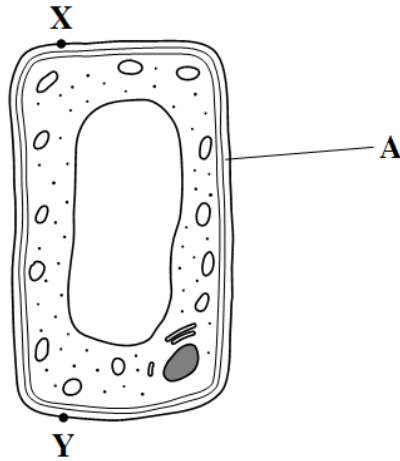
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.....[4]

[Total: 9]

(a) Name the process in which cells become adapted for different functions.

.....
 (1 mark)

(b) Palisade cells are found in leaves. The diagram shows a palisade cell.



(b) (i) Name structure A.

.....
 (1 mark)

(b) (ii) The real length of this cell between X and Y is 20 micrometres (μm). By how many times has it been magnified? Show your working.

Answer
 (2 marks)

(b) (iii) Explain **one** way in which this cell is adapted for photosynthesis.

.....

 (1 mark)

6

- (a) Give **one** feature of starch and explain how this feature enables it to act as a storage substance.

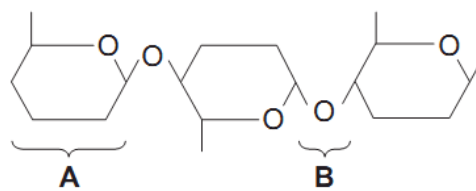
Feature

Explanation

.....

(2 marks)

- (b) The diagram shows part of a cellulose molecule.



- (b) (i) Name part **A**.

.....
 (1 mark)

- (b) (ii) Name bond **B**.

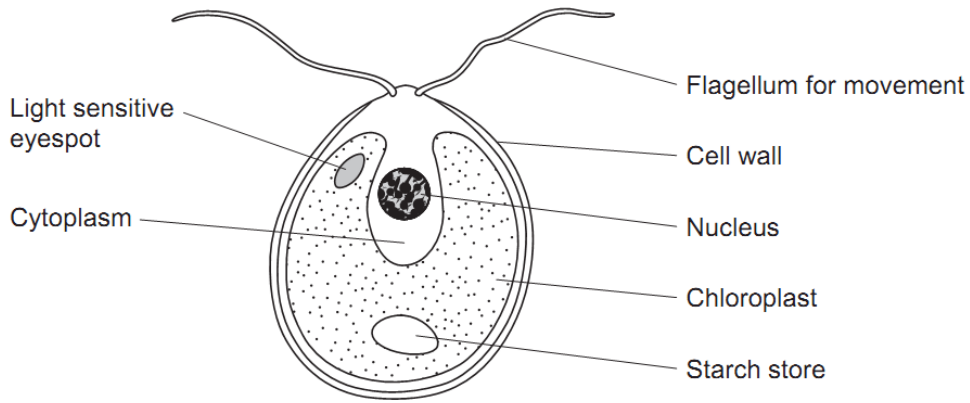
.....
 (1 mark)

- (c) The structure of cellulose is related to its role in plant cell walls. Explain how.

.....

(3 marks)

The diagram shows an organism called *Chlamydomonas*.



(a) Name **two** structures shown in the diagram that are present in plant cells but are **not** present in animal cells.

- 1
- 2 (2 marks)

(b) *Chlamydomonas* lives in fresh water ponds. Use your knowledge of osmosis to suggest an advantage of using starch as a carbohydrate store.

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-
-
-
-
- (2 marks)

(c) *Chlamydomonas* has adaptations that help it to maintain a high rate of photosynthesis. Use information in the diagram to explain what these adaptations are.

-
-
-
-
-
- (3 marks)

8

(a) What is a tissue?

.....
.....

(1 mark)

(b) A student cut a thin section of tissue from a potato and examined it with an optical microscope.

(b) (i) Starch was present in the cells of this tissue. Describe how the student could find out where in the cells the starch was present.

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.....

(2 marks)

(b) (ii) The student cut a thin section of the tissue. Explain why it was important that the section was thin.

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(2 marks)

(c) The cell walls of potato cells contain cellulose. Cellulose and starch are both carbohydrates. Describe **two** ways in which molecules of cellulose are similar to molecules of starch.

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.....

(2 marks)

Total 7 marks

Plant Biology

Answers and Markscheme

Question 1

(a)	(i)	osmosis ;	1	
	(ii)	2 = symplast (pathway) ; 3 = apoplast (pathway) ;	2	ACCEPT symplastic ACCEPT apoplastic
	(iii)	S ;	1	
(b)		<p><i>This is a QWC question</i></p> <p>1 water moves into xylem down water potential gradient ;</p> <p>2 root pressure / high (hydrostatic) pressure at bottom of xylem ;</p> <p>3 water vapour loss / transpiration / evaporation, at leaves / top of plant ;</p> <p>4 (creating) low (hydrostatic) pressure at top of xylem ;</p> <p>5 water, under tension / pulled up (in a continuous column) ;</p> <p>6 cohesion between water molecules / described ;</p> <p>7 adhesion of water molecules to xylem / described ;</p> <p>8 capillary action / described ;</p> <p>9 water moves up (xylem / stem) by mass flow ;</p> <p>10 from high(er) (hydrostatic) pressure to low(er) (hydrostatic) pressure / down (hydrostatic) pressure gradient ;</p>	max 4	<p>ACCEPT ψ for water potential ACCEPT water moves from high ψ to low ψ</p> <p>IGNORE drawn for pulled up</p> <p>ACCEPT ref to xylem being very narrow so water rises</p>
		QWC (three terms used in correct context and spelt correctly) ;	1	Any three terms from the following : water potential, hydrostatic pressure, transpiration / evaporation, cohesion / cohesive, adhesion / adhesive, tension, root pressure, capillary action / capillarity, mass flow

Question 2

	<i>cuticle</i>		
1	wax / waxy / waterproof / impermeable ;		1. DO NOT ACCEPT thick / a barrier
2	reduces / limits / helps prevent , water loss / transpiration / evaporation / AW ;		2. DO NOT ACCEPT stops or anything that suggests all water loss ceases unless qualified e.g. 'prevents water loss so less transpiration'
3	reflective / AW ;		
4	(so) reduces heating up ; 2 max		4. needs to be linked to 3
	<i>stomatal chambers</i>		
5	saturated air builds up / hairs trap water vapour / AW ;		5. DO NOT CREDIT water / H ₂ O unqualified. Look for water vapour / moist air / humidity / AW ACCEPT moisture
6	reduction of wind effect / AW ;		6. ACCEPT moist air / AW , not easily blown away / AW
7	reduced, water potential / diffusion, gradient ;		7. DO NOT CREDIT refs to concentration gradients
8	(so) less, diffusion / transpiration / water loss ;		8. Needs to be qualified e.g. 'chambers are sunken' OR in terms of 5, 6 ,7
9	refs to stomata /chamber on <u>lower</u> surface correctly qualified ; 2max		9. Qualification needs to relate the position on the lower surface to being more protected / less wind effect / cooler / AW IGNORE ref to cuticle in stomatal chamber
	Total	4	

Question 3

dry / AW ; **R** hot / harsh
 reduce / AW ; **R** stop / prevent / AW
 waxy / wax / waterproof ;
 water vapour / humid air / moist air / AW ; **R** water, molecules, droplets,
 particles etc
 stomata / guard cells ; **A** stoma

[Total: 5]

Question 4

Question	Expected Answers	Additional Guidance	Marks
4 (a)	E guard cell(s) ; F xylem vessel (element) ;	F ACCEPT xylem / tracheid. DO NOT CREDIT xylem tissue	2
(b)	1. carbon dioxide absorption / oxygen release ; 2. (carbon dioxide) needed / (oxygen) produced in photosynthesis ; 3. ref. to (open) stomata ; 4. large surface area in the mesophyll ; 5. ref. to low carbon dioxide concentration in atmosphere (so need large surface area) ; 6. (mesophyll) surfaces are moist ; 7. ref. to water potential / Ψ / diffusion, gradient for water vapour (out of leaf) ;	Many candidates give superb answers on transpiration here, be careful you are not awarding for part c answers here. 1. REJECT just carbon dioxide / oxygen exchange 2. IGNORE refs to respiration 3. DO NOT CREDIT ref to guard cells on their own 4. DO NOT CREDIT surface area of leaves (look for internal area)	3 max
(c)	1. transpiration / evaporation ; 2. sets up a water potential / Ψ , gradient (anywhere) ; 3. (results in) the water in the (leaf) xylem being put under tension / AW ; 4. cohesion of water molecules / hydrogen bonding between water molecules ; 5. mistletoe / parasite, xylem linked to tree xylem / AW ; 6. so water pulled / drawn, up xylem / from tree / AW ; 7. mistletoe xylem increases surface area ;	1. a free standing mark – showing evaporation / transpiration is involved, DO NOT CREDIT ref to transpiration stream 2. DO NOT CREDIT water potential / Ψ , gradient in roots – location, stem or leaf needs to be implied 3. ACCEPT ref to lower <u>hydrostatic</u> pressure at the top or higher at bottom. DO NOT CREDIT unqualified pressure gradient 4. DO NOT CREDIT water travels by 'cohesion tension theory' 5. Ref. to xylem is needed for mark. Needs idea of physical contact between parasite xylem and tree xylem. E.g. mistletoe roots into tree xylem = 0 marks. 6. DO NOT CREDIT sucks / travels	4 max
[Total: 9]			

Question 5

Part	Marking Guidance	Mark	Comments
(a)	Differentiation/specialisation	1	
(b)(i)	(cellulose) <u>Cell wall</u> ;	1	
(b)(ii)	Two marks for correct answer 2350– 2500;; One mark for a measured length divided by real length;	2	Accept measured and real lengths in different units for one mark.
(b)(iii)	<u>Chloroplasts</u> absorb <u>light</u> ; Large vacuole pushes <u>chloroplasts</u> to edge (of cell); Thin/permeable (cell) wall to absorb carbon dioxide;	1 max	Q Do not accept chlorophyll as alternative to chloroplasts

Question 6

(a)		Helical /spiral/coiled;	1	2 max Feature = one mark Explanation = one mark
		Compact / description e.g. 'tightly packed';	1	
		Insoluble;	1	
		Prevents osmosis/uptake of water / does not affect water potential / (starch) does not leave cell;	1	
		Large molecule / long chain; Does not leave cell;	1	
			1	Allow idea of compact/helical/spiral/coiled due to bonding for two marks.
(b)	(i)	β /beta Glucose;	1	Q Reject alpha glucose
(b)	(ii)	Glycosidic;	1	
(c)		Long/straight/unbranched chains (of glucose);	1	3 max Q Ignore reference to alpha glucose
		(Joined by) hydrogen bonds;	1	
		Form (micro)fibrils/(macro)fibrils;	1	
		Provide rigidity/strength/support;	1	
				Allow suitable descriptions for last point e.g. 'prevents bursting';

Question 7

(a)	Cell wall; Starch (store); Chloroplast;	2 max	Accept: phone
(b)	Insoluble; Reduces/'stops' water entry/osmosis / does not affect water potential / is osmotically inactive;	2	Accept: description for first point e.g. 'does not dissolve'.
(c)	Light sensitive eyespot / eyespot detects light; Flagellum enables movement towards light; Chloroplast/chlorophyll absorbs light/ for photosynthesis;	3	Do not penalise references to 'many chloroplasts'.

Question 8

Part	Sub Part	Marking Guidance	Mark	Comments
(a)		(Group of) similar/identical cells/cells with a common origin;	1	Q Ignore references to function
(b)	(i)	Add iodine/stain specific for starch to the slide/cells/tissue/ /add iodine/stain specific for starch and examine under microscope; Blue-black/blue/black/purple;	2	Reject sample
(b)	(ii)	Need a single layer of cells/only a few cells thick/not too many layers; Light must be able to pass through; Detail obscured by cells underneath;	2 max	
(c)		Both are polymers/made of monomers; Joined by condensation/molecules can be broken down by hydrolysis; Both have 1-4 links; Contain C(arbon), H(ydrogen) and O(xygen)/both made up of glucose; Both insoluble; Both contain glycosidic bonds;	2 max	Accept other valid answers. Ignore ref to unbranched.