Q1.

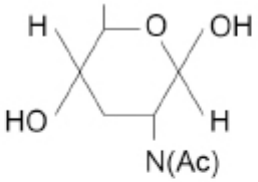
Write an essay on the mechanisms and importance of transport within organisms.

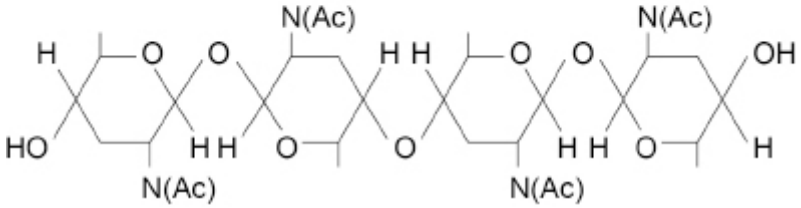
(Total 25 marks)

Q2.

(a) Chitin is a polysaccharide. The chitin monomer is a β-glucose molecule with one OH group replaced by an $NHCOCH_3$ group. $NHCOCH_3$ can be represented by N(Ac).

The figure below shows the monomer that forms chitin and the chitin polymer.





Chitin has a similar structure to cellulose.

Use the figure above to describe **three** ways the structure of chitin is similar to the structure of cellulose.

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2 _____

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3 _____

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(3)

(b) Chitin keeps the tracheae open in the tracheal system of gas exchange in an insect. Gas exchange does **not** occur in the tracheae.

Explain the importance of **one** adaptation of the gas exchange surface in the tracheal system of an insect.

(2)

(c) Lignin is a polymer found in the walls of xylem vessels in plants. Lignin keeps the xylem vessel open as a continuous tube.

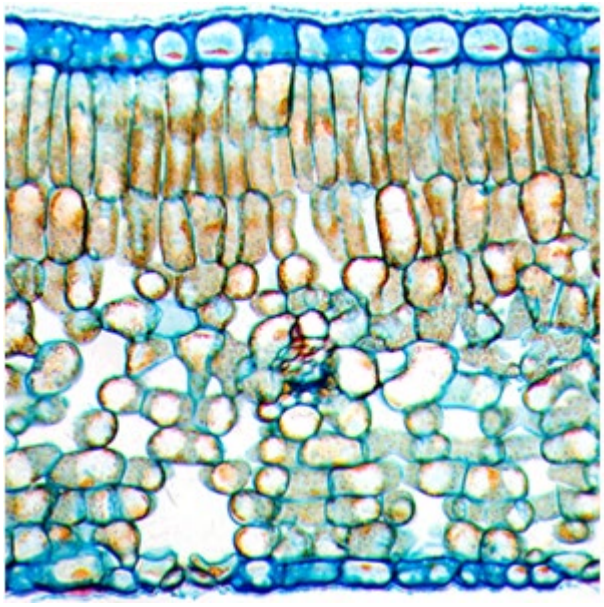
Explain the importance of the xylem being kept open as a continuous tube.

(3)

(Total 8 marks)

Q3.

The figure below is a photograph of a vertical section through a leaf observed using an optical microscope.



(a) In the box below:

- produce a scientific drawing of the arrangement of tissues shown in the figure above
- label **one** of the tissues in your drawing

Do **not** draw individual cells.

(3)

A scientist investigated factors that affect the shelf life of cut flowers.
A cut flower is the part of the stem with the flower bud attached after it has been cut from a plant.

The shelf life is the number of days the cut flowers are in good enough condition to be sold.

He:

- took 12 cut flowers from a rose plant
- determined the mean number of stomata per mm^2 on the leaves
- determined the transpiration rate for each cutting
- stored the cut flowers on a shelf in a brightly lit room
- determined the shelf life of the cut flowers.

The table below shows his results.

Month cut flowers were obtained	**Mean number of stomata / mm^{-2} (± 2 SD)**	**Mean transpiration rate / cm^3 day^{-1} (± 2 SD)**	**Mean shelf life / days (± 2 SD)**
December	23 (± 2)	22 (± 3)	5 (± 1)
April	20 (± 3)	15 (± 2)	16 (± 2)

A value of ± 2 SD (standard deviations) from the mean includes over 95% of the data.

(b) Using information in the table, what can you conclude about the effect of different factors on the mean shelf life of cut flowers?

Explain your conclusions.

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(4)

(c) Other than a change in temperature, give **one** change the scientist could make to the environmental conditions to increase the cut flowers' shelf life.

Explain your answer.

(3)

(Total 10 marks)

Q4.

(a) Describe the transport of carbohydrate in plants.

(5)

(b) Compare and contrast the structure of starch and the structure of cellulose.

(6)

(c) Describe the complete digestion of starch by a mammal.

(4)

(Total 15 marks)