Gene control

Question Paper 1

Level	International A Level
Subject	Biology
Exam Board	CIE
Topic	Inherited change
Sub Topic	Gene control
Booklet	Theory
Paper Type	Question Paper 1

Time Allowed : **26 minutes**

Score : **/ 21**

Percentage : **/100**

Grade Boundaries:

A*	A	B	C	D	E	U
>85%	'77.5%	70%	62.5%	57.5%	45%	<45%

1 *Agrobacterium tumefaciens* is a bacterium that can enter plants through wounds and cause a disease known as crown gall disease.

The bacterium attaches to the surface of cells and inserts a small circular DNA molecule, known as a plasmid, into the cell. Some of the genes on the plasmid code for proteins that cause changes in the plant cell and result in the formation of a plant tumour, or gall.

(a) Outline the changes that occur during tumour formation.

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(b) Bacteria that enter the stem through a wound can reach the root of the plant to cause damage.

Suggest how the bacteria are able to reach the root of the plant.

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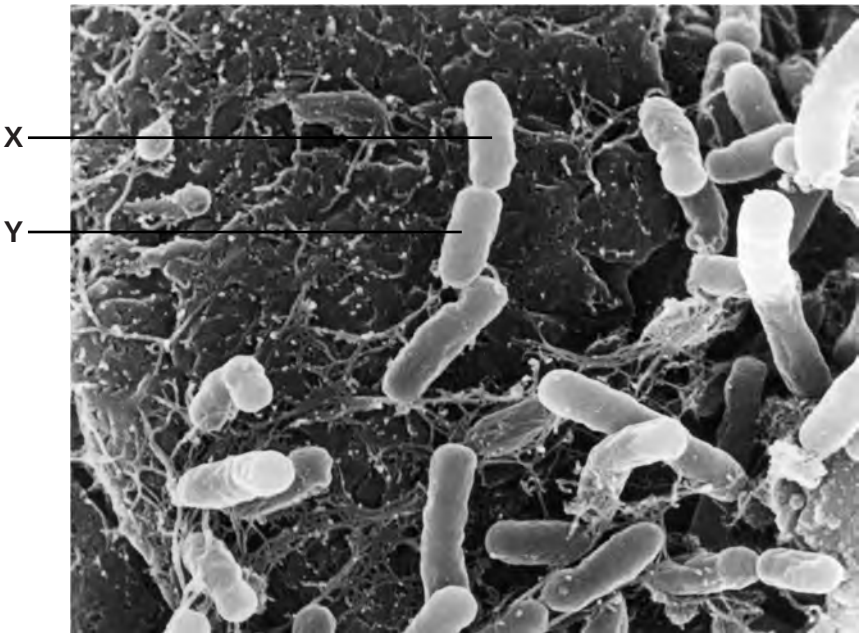
(c) Fig. 6.1 shows *A. tumefaciens* on the surface of cells of a tobacco plant, *Nicotiana plumbaginifolia*.

The cells **X** and **Y** are newly formed cells.



magnification ×11500

Fig. 6.1

Calculate the actual length of cell **X** in micrometres.

Show your working.

answer ..... μm [2]

[Total: 7]

2 When haemoglobin in red blood cells travels through the capillaries of the lungs it binds with oxygen to form oxyhaemoglobin. When oxyhaemoglobin reaches respiring tissues, it dissociates to release oxygen.

(a) Explain what causes oxyhaemoglobin to dissociate readily in actively respiring tissues.

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(b) When people move to high altitudes there is an increased production of red blood cells. Explain why more red blood cells are produced when people move to higher altitudes.

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(c) Some people who move to live at high altitudes can develop chronic mountain sickness. One feature of this condition makes it difficult for the heart to pump blood around the body owing to the increased production of red blood cells.

The *EPAS*1 gene codes for a type of protein called a transcription factor, which helps to regulate the transcription of genes involved in red blood cell production. Some people have a mutated version of this gene that prevents the over-production of red blood cells.

(i) Explain what is meant by *transcription*.

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(ii) Describe how a mutated version of the *EPAS*1 gene can cause a change in the transcription factor protein produced.

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(iii) Some transcription factors may prevent transcription.

Suggest two ways in which they may do this.

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[Total: 14]