

Past-paper walk-through

Principles of genetic technology ■ 19.1

eXercise

Questions in this set

- 9700/41 N25 Q8 ■ 9 marks
- 9700/42 N25 Q5 ■ 14 marks
- 9700/44 N25 Q3 ■ 11 marks

Reading the mark scheme

- **B1** a mark that stands on its own – the point is either made or not.
- **M1** a *method* mark: the right approach, even if the number is wrong.
- **A1** an *answer* mark, and it usually needs its M mark first.
- **C1** a working mark on the way to the answer.
- **//** separates answers the examiner accepts equally.
- **ecf** = error carried forward: a later part is marked on your own earlier answer.
- **owtte** = “or words to that effect” – the wording need not match.

Question 8

9700/41 N25 ■ Q8 ■ 9 marks

- 8 LibertyLink® soybean is a genetically modified crop. It was first grown in 1996 and used in food products from 1998. It has been grown in 6 countries and used in food products in 21 countries.

Table 8.1 summarises the modifications made to the soybean plant to produce LibertyLink® soybean.

Table 8.1

name of introduced gene	gene donor organism	gene product	function of gene product
<i>pat</i>	<i>Streptomyces viridochromogenes</i>	phosphinothricin <i>N</i> -acetyltransferase	stops action of glufosinate, a herbicide

- (a) Explain how the modification made to produce LibertyLink® soybean may help to solve the global demand for food.

Question 8

- (b) (i) Name the type of enzyme that could be used to cut out the *pat* gene from *S. viridochromogenes*.

Question 8

- (ii) Name the enzyme that could be used to join the *pat* gene to a plasmid by forming phosphodiester bonds.

Question 8

- (c) Suggest reasons why LibertyLink® soybean is used in food products in 21 countries but only grown in 6 countries.

Question 8

[Total: 9]

Solution 8

(a) Mark scheme

- any four from:
- 1
- (Liberty Link soybean / it, is) not harmed by / not killed by / resistant to, herbicide / glufosinate ;
- 2
- herbicide / glufosinate, kills, weeds / unwanted plants ;
- 3
- reduces / removes / less / no, competition (with, weeds / unwanted plants) ;

Solution 8

- 4
- ref. to (sun)light / water / (named) soil minerals ;
- 5
- higher yield or more crop, harvested / produced ;
- 6
- AVP ;
- 4

Solution 8

(b)(i)

Mark scheme

- restriction, enzyme / endonuclease ;
- 1

(b)(ii)

Mark scheme

- (DNA) ligase ;
- 1

Solution 8

(c) Mark scheme

- any three from:
- some / other / 21, countries:
- 1
- may, have, unsuitable / described problem in, climate / weather / soil ;
- 2
- no regulatory approval / may have banned (GM / Liberty Link) ;
- 3
- may have, (activist) groups / people, opposed to GM crops ;

Solution 8

- 4
- may not have land space available ;
- 5
- may have banned, herbicide / glufosinate ;
- 6
- AVP ;
- 3
- 9700/41
- October/November 2025

Question 5

9700/42 N25 ■ Q5 ■ 14 marks

Metachromatic leukodystrophy (MLD) is a genetic disease that affects the nervous system.

MLD is caused by mutations in the *ARSA* gene located on chromosome 22. The *ARSA* gene, which is 3150 base pairs (bp) in length, includes 8 exons and is shown in Fig. 5.1. A genetic test using DNA sequencing is available to identify mutations associated with MLD in the *ARSA* gene. The sequencing method can only work if a DNA fragment size is less than 1000 bp.

The test involves a number of different stages:

Question 5

- Genomic DNA is extracted from a blood sample.
- Polymerase chain reaction (PCR) using 5 pairs of primers selects 5 different DNA fragments of the *ARSA* gene.
- Gel electrophoresis is carried out on the DNA fragments.
- The DNA fragments are sequenced and analysed for mutations.

Table 5.1 shows the length of the DNA fragments and the exons present in each DNA fragment.

Table 5.1

fragment number	DNA fragment length / bp	exons in DNA fragment
1	405	1
2	737	1-2
3	706	2-4
4	860	5-7
5	916	7-8

Question 5

(a) Genomic DNA and primers are added to the PCR machine.

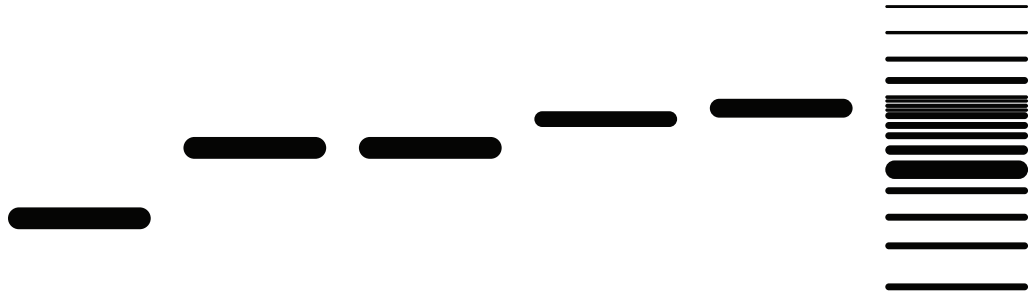
Name **two** other substances that are added to the PCR machine, **and** explain why each substance is added.

[4]

Question 5

fragment number	DNA fragment length / bp	exons in DNA fragment
1	405	1
2	737	1-2
3	706	2-4
4	860	5-7
5	916	7-8

Question 5



Question 5

