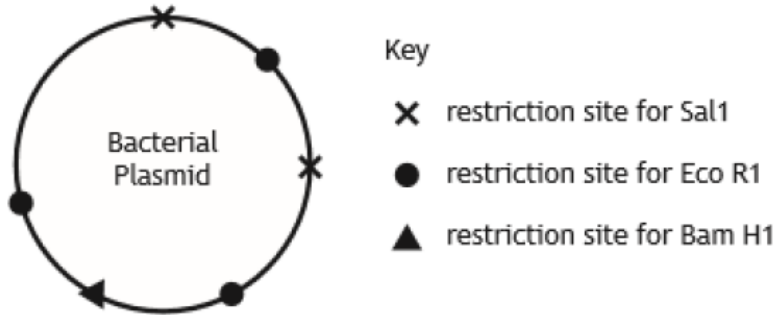


Unit 2 Key Area 7 Genetic Control of Metabolism

1. The diagram shows a bacterial plasmid with restriction sites for three different restriction endonucleases, Sal1, Eco R1 and Bam H1.

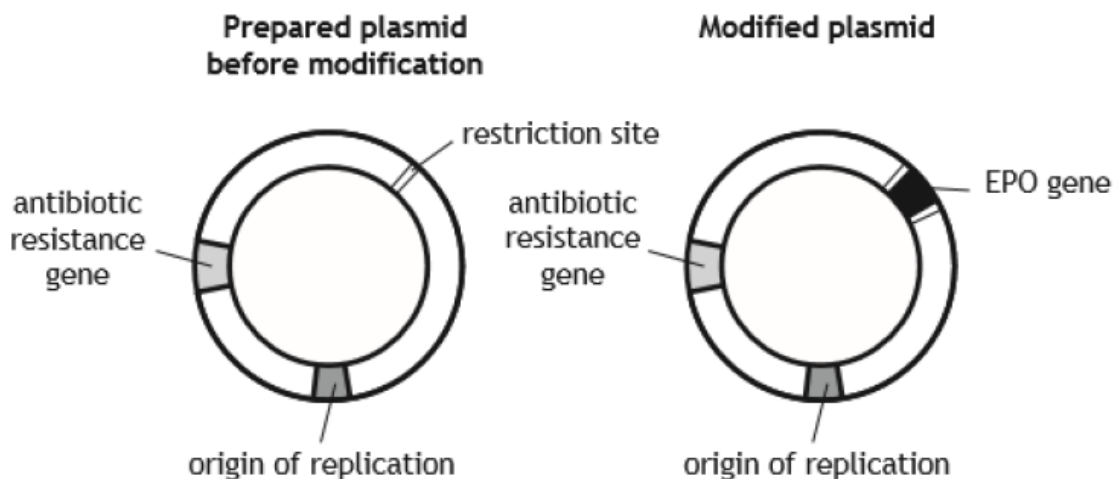


Which row in the table identifies the number of fragments produced if the plasmid was cut with the combinations of restriction endonucleases shown?

	Combination	
	Sal1 and Bam H1	Sal1 and Eco R1
A	3	4
B	3	5
C	4	4
D	4	5

1

2. Erythropoietin (EPO) is a protein synthesised in the kidneys which is involved in red blood cell production. Some individuals with kidney disease have low red blood cell counts and can be treated with EPO. EPO can be produced by recombinant DNA technology in which the human EPO gene was inserted into a specially prepared bacterial plasmid. The diagram below shows the prepared bacterial plasmid before and after it was modified by the insertion of a human EPO gene.



2 continued

(a) Explain the importance of removing the EPO gene from a human chromosome with the same restriction endonuclease that was used to open the bacterial plasmid.

_____ **1**

(b) Name the enzyme used to seal the EPO gene into the bacterial plasmid.

_____ **1**

(c) Modified plasmids were mixed with bacteria. Some bacterial cells were transformed by taking up the modified plasmids but others were not. Use information from the diagram to suggest how a culture containing only the transformed bacteria was obtained.

_____ **1**

(d) Identify the section of the modified plasmid shown in the diagram which ensured that it could be copied and passed to daughter cells when transformed bacteria divided.

_____ **1**

(e) The EPO protein produced by the transformed bacteria is inactive.

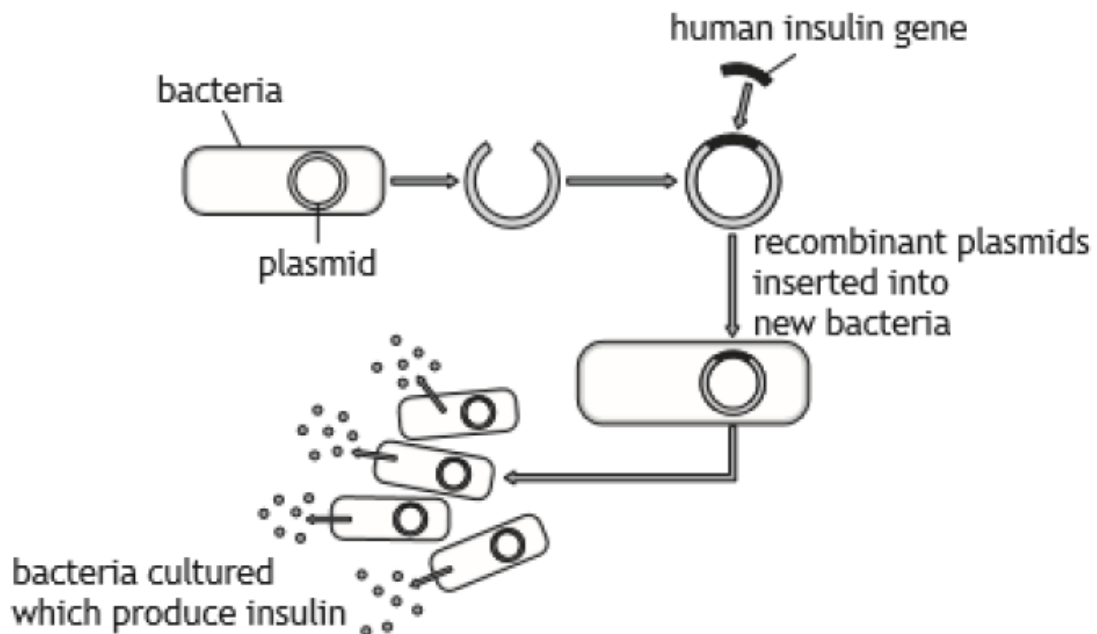
(i) Suggest a reason why bacteria produce EPO protein which is inactive.

_____ **1**

(ii) Suggest how recombinant DNA technology could be used to produce an active form of the EPO protein.

_____ **1**

3. The diagram below shows how a human gene can be inserted into bacteria to produce human insulin using recombinant DNA technology.



(a) Name one enzyme used in this process and state its function.

Name _____

Function _____

2

(b) The recombinant plasmid also contains a gene for resistance to the antibiotic, ampicillin.

Describe a procedure which would allow only cells containing the recombinant plasmid to be selected.

1

(c) When culturing the bacteria which produce insulin, sterile conditions are maintained.

Explain why this is important.

1