# AQA A2 Biology Worksheet

Biotechnology and Genetic Engineering - Recombinant DNA Technology | A2 Level | Spec Ref: 3.8.3

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Student Name: _____ Date: _____ Total: 54 marks

**1.** **[1 mark]**

Define the term *recombinant DNA*.

**2.** **[2 marks]**

Explain the role of a vector in gene technology.

**3.** **[3 marks]**

Describe the function of restriction endonucleases in creating recombinant DNA.

**4.** **[4 marks]**

Explain why 'sticky ends' are advantageous in the formation of recombinant DNA.

**5.** **[5 marks]**

A student is attempting to insert a human gene for insulin production into a bacterial plasmid. Outline the key steps involved in this process, starting from the isolated human gene and bacterial plasmid.

**6.** **[2 marks]**

State two features of plasmids that make them suitable as vectors in genetic engineering.

**7.** **[4 marks]**

Explain the importance of using the same restriction endonuclease to cut both the desired gene and the plasmid vector.

**8.** **[3 marks]**

Describe the role of DNA ligase in the formation of recombinant DNA.

**9.** **[6 marks]**

Scientists used recombinant DNA technology to insert a gene for herbicide resistance into a crop plant. The process involved several stages, including transformation and selection. Explain how marker genes are used to identify successfully transformed cells.

**10.** **[5 marks]**

A genetic engineer has isolated a gene of interest and wants to amplify it using the Polymerase Chain Reaction (PCR).

| **Component** | **Concentration (μmol $dm^{-3}$)** | **Volume (μL)** |
|---|---|---|
| Template DNA | 0.01 | 2 |
| Forward primer | 10 | 2 |
| Reverse primer | 10 | 2 |
| dNTPs | 2.5 | 4 |
| Taq polymerase | 0.05 units/μL | 1 |
| Buffer | 10× | 5 |
| Sterile water | - | X |
| **Total reaction volume** | - | 50 |

Calculate the volume of sterile water (X) required for this PCR reaction. Show your working.

**11.** **[7 marks]**

Discuss the ethical considerations surrounding the use of recombinant DNA technology in agriculture, specifically focusing on genetically modified (GM) crops.

**12.** **[4 marks]**

Explain the purpose of a promoter region and a terminator region in the expression of a foreign gene in a host cell.

**13.** **[8 marks]**

Describe the process of gene cloning using a bacterial plasmid, from the isolation of the desired gene to the production of multiple copies of the gene within bacterial cells. Include details on how the desired gene is identified and selected.

**Total marks: _____ / 54**