AQA, OCR, Edexcel

A Level

# A Level Biology

## Gene Technology Answers

Name:

M M E

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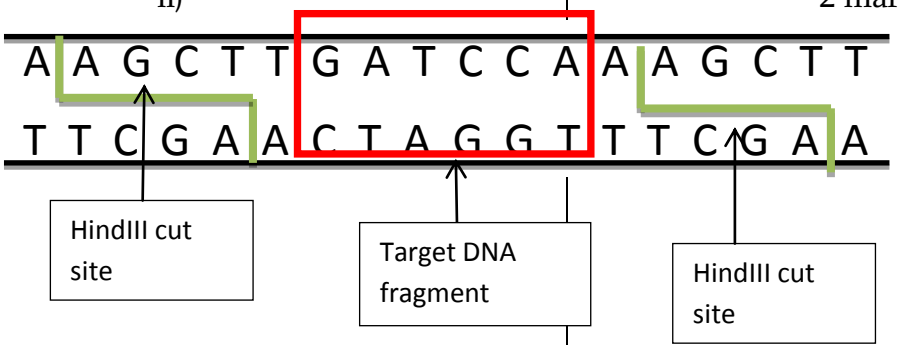
Total Marks: /33

# Gene Technology

| Answer | Marks |
|---|---|
| 1.<br>a)<br>i)- uses mRNA molecules containing the gene as a template<br>- Enzyme reverse transcriptase makes DNA from RNA using free DNA nucleotides<br>- DNA produced is call cDNA (complementary) | 3 marks |
| ii) –Each cell only has two copies of each gene but there are many mRNA molecules<br>-mRNA has no introns | 2 mark |
| b)<br>i) Restriction endonucleases recognise specific palindromic sequences of DNA<br>- Palindromic sequence consist of antiparallel base pairs<br>- Enzymes cut/digest the DNA at these places | 3 marks |
| ii)<br>  <br> | 2 marks |
| iii) Sometime the cut by the RE leaves unpaired bases at the end/sticky ends<br>-these can be used to bind to complementary sticky ends of another DNA fragment | 2 marks |

| | |
|---|---|
| c)<br>i) -DNA sample<br>-Free nucleotides<br>-Primers<br>-DNA polymerase | 2 marks |
| ii) -DNA mixture y to 95 degree s C which breaks the hydrogen bonds between the two strands of DNA<br>-Mixture is then cooled to 60 degrees C so that the primers can anneal<br>-Reaction is heated to 72 degrees C so DNA polymerase can work<br>-Free DNA nucleotides line up alongside complementary bases on template strand forming a new strand<br>-Phosphodiester bond catalysed by DNA polymerase.<br>-This cycle is then repeated many times | 5 marks |
| iii) Even if a small amount of DNA was obtained from a crime scene it can be amplified to create many copies for forensic analysis. | 1 mark |
| 2.<br>a)<br>i) Something used to transfer foreign genetic material into an organism. | 1 mark |

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| ii) –mRNA is incubated with reverse transcriptase to create cDNA strand (complementary)<br>- The cDNA is the converted to a double strand of DNA containing the insulin gene.<br>-Using DNA Polymerase<br>-Sticky ends/unpaired DNA bases are added at either end of the gene<br>-Copies are made using PCR<br>-Plasmids are extracted from bacteria<br>-The plasmid is cut open using a specific restriction enzyme that leaves sticky ends complementary to those on the insulin gene<br>-DNA ligase joins the insulin gene into the plasmid | 6 marks |
| iii) –When the insulin gene is inserted into the plasmid so are genetic markers<br>-named marker e.g. antibiotic resistance, GFP, Lac, enzyme<br>-Plasmids are then inserted into E. coli bacterium.<br>-E.Coli are then screened to see which have the genetic marker.<br>-these E.Coli are then replicated for commercial use | 4 marks |
| iv) – Insulin produced by gene technology is identical to human insulin so no issues with immune rejection<br>-Fewer ethical issues<br>-No issues from religious/animal rights groups<br>-Large quantities can be produced more quickly and easily | 2 marks |