**Review Worksheet ANSWERS: Recombinant DNA Technology**

1: What is a gene?

*A gene is a series of bases (1) that code for the production of a particular protein (1)*

2: What are the four bases that make up the DNA code?

*Adenine (1) Thymine (1) Cytosine (1) and Guanine (1)*

3: Which bases are able to pair together?

*Adenine – Thymine (1), and Cytosine –Guanine (1)*

4: What are Restriction Enzymes?

*Restriction enzymes are enzymes that cut the DNA (1) when they encounter specific base sequences (1).*

5: Restriction enzymes cut in a specific location. What is it called?  
  
 *The recognition site (1)*

6: When creating recombinant DNA, how do scientists ensure that the two pieces of DNA they are combining will fit together?

*They use the same restriction enzyme (1) on both pieces of DNA, producing identical staggered cuts and sticky ends (1), and therefore allowing them to fit together (1)*

7: Once the two pieces of DNA are fitted together, what makes the connection permanent?

*The enzyme DNA Ligase (1) fuses the two pieces of DNA together (1) at the recognition site.*

8: Recombinant DNA technology allows scientists to insert the gene for human insulin production into a bacterium. Which part of the bacterium is used for this procedure?

*The plasmids (1), small, circular strands of DNA (1) in the cytoplasm.*

9: Describe in detail the process involved in producing synthetic Growth Hormone using recombinant DNA technology.

*The gene that codes for human growth hormone is isolated from a healthy human cell. (1)*

*This happens using a restriction enzyme (1) that cuts at recognition sites (1) either side of the human growth hormone gene (1), separating the gene from the rest of the DNA strand (1). The restriction enzyme used produces staggered cuts with sticky ends (1) that match other strands that may be cut with the same restriction enzyme.*

*A plasmid is isolated from a bacterium (1), and cut using the same restriction enzyme (1) to produce matching staggered cuts and sticky ends (1). The plasmid DNA and the Human Growth Hormone gene are now placed together, matching the sticky ends (1).*

*The spliced DNA is then fused using DNA Ligase (1). The plasmid with the human growth hormone gene is a vector (1) that carries the gene into a new bacterium.*

*The plasmid containing the human growth hormone gene is then placed into a new bacterium (1). The bacterium will now reproduce, with each new bacterium containing a copy of the growth hormone gene. (1). The bacterial colony will then produce large amounts of growth hormone (1).   
  
The insulin produced by the bacteria is extracted (1) and refined (1), so that it can be used as a medication to treat Growth Hormone Deficiency. (1)*