

# Answers to end-of-chapter questions

## Chapter 21: Biotechnology

- 1 fungus, ethanol, carbon dioxide, biofuel, amylase, maltose, carbon dioxide
- 2 a They cut DNA. This is done to cut out the desired gene, and then to cut a plasmid so that the desired gene can be inserted into it. The restriction enzymes leave sticky ends, which will help to 'stick' the desired gene into the plasmid.
- b This is used to join two pieces of DNA together, in particular to join the desired gene to plasmid DNA.
- c Plasmids are used to transfer the desired gene into a bacterial cell.
- 3 a selective breeding involves choosing two parents with desired characteristics to breed; repeated over several generations; no knowledge of the genes involved in producing the characteristics is needed; genetic engineering involves identifying a particular gene; extracting the gene and placing it into another organism; selective breeding can be done by anyone, but genetic engineering requires specialist laboratory facilities; selective breeding has been done for thousands of years but genetic engineering is a recent innovation; [max 5]
- b *the example should include:*  
the name of the crop plant that has been genetically engineered;  
the new feature that has been introduced to it;  
an outline of how this was done (e.g. the source of the introduced gene);  
how the process has led to increased yields; [4]
- c *answers will vary according to the example used: credit should be given to:*  
statements about three different advantages;;  
statements about three different disadvantages;; [max 5]
- 4 a greater volume with enzyme than without;  $(15 - 6 =) 9 \text{ cm}^3$  more;  
clearer liquid with enzyme than without; [3]
- b i *x*-axis labelled pH and *y*-axis labelled volume of apple juice collected /  $\text{cm}^3$ ;  
suitable scales on both axes (using more than half the paper, scales go up in equal intervals);  
all points plotted accurately;  
either best fit line or ruled point-to-point line, clean and clear; [4]
- ii 5; [1]
- iii enzyme activity increases as pH increases from 3 to 5, and decreases as pH increases from 5 to 7;  
enzyme works best in acidic conditions;  
at high or low pH, enzyme molecules lose their shape;  
ref. denaturation;  
substrate no longer fits in active site; [max 2]
- c enzyme concentration;  
mass of apple pulp;  
temperature;  
type of filter paper;  
age / type, of apples; [max 4]