Model Answers: Hard

1a

a) Genetic engineering gave MON810 the trait of insect resistance as follows...

Any **four** of the following:

- A gene is taken from another (named) species; [1 mark]
- Restriction enzymes/endonucleases are used; [1 mark]
- A plasmid / virus / gene gun / vector is used; [1 mark]
- (DNA) ligase (joins the ends of the gene and the vector); [1 mark]
- New gene / recombinant DNA/plasmid enters the maize cells / DNA; [1 mark]
- The gene is expressed / transcribed (and translated) to make protein / toxin; [1 mark]
- Marker genes are used (to identify transformed cells) **OR** promoters are inserted (to ensure gene expression); [1 mark]

[Total: 4 marks]

1b

b) The data in Table 1 suggests the following about the social and ethical implications of growing GM maize...

Any **four** of the following:

Data description

- A ban on / 0 % GM maize growth decreases yield; [1 mark]
- Increased / 88 % GM maize growth increases yield; [1 mark]

Social implications of data

- GM crops increase food supply; [1 mark]
- GM crops decrease food cost (because food availability has increased); [1 mark]
- GM crops increase a country's wealth (because they do not need to import as much food / can export food); [1 mark]

Ethical implications of data

- GM crops relieve hunger/starvation (because of the increased food supply and decreased cost); [1 mark]
- GM crops reduce land area needed for crops (because existing land becomes more productive) **SO** farmers can conserve habitats / protect biodiversity / allow land to be used for biofuels; [1 mark]

[Total: 4 marks]

The tricky element of this question is that it is not just asking for a general list of social and ethical implications of GM use; it is asking for social and ethical implications that can be **directly related to the data** shown in Table 6.1.

The data shows that increasing the use of GM crops **increases the yield** of maize in all of the countries shown. Your answers must therefore all clearly relate to the benefits of an increased maize yield, e.g. an increased food supply and decreased food costs (social benefits) that will decrease starvation and potentially free up land for other, more sustainable uses (ethical benefits).

More generic answers, e.g. the increased cost to farmers of buying GM seed, or concerns about long-term health benefits to humans, or superweeds, are not relevant as they cannot be directly linked to an increased maize yield.