

8(a)	<i>any four from:</i> (Liberty Link soybean / it, is) not harmed by / not killed by / resistant to, herbicide / glufosinate ; - herbicide / glufosinate, kills, weeds / unwanted plants ; - reduces / removes / less / no, <u>competition</u> (with, weeds / unwanted plants) ; <i>ref. to</i> (sun)light / water / (named) <u>soil</u> minerals ; - higher yield or more crop, harvested / produced ; - AVP ;
8(b)(i)	restriction, enzyme / endonuclease ;
8(b)(ii)	(DNA) ligase ;
8(c)	<i>any three from:</i> <i>some / other / 21, countries:</i> - may, have, unsuitable / described problem in, climate / weather / soil ; - no regulatory approval / may have banned (GM / Liberty Link) ; - may have, (activist) groups / people, opposed to GM crops ; - may not have land space available ; - may have banned, herbicide / glufosinate ; - AVP ;

5(a)	<i>any four from:</i> <i>mark as pairs</i> <i>Name</i> 1 dNTPs / <u>DNA</u> nucleotides ; <i>Explanation</i> 1 to, anneal / bind, to complementary bases ; <i>Name</i> 2 Taq polymerase ; <i>Explanation</i> 2 to make, phosphodiester bonds / the sugar phosphate backbone / double-stranded DNA / a complementary strand of DNA or <i>ref. to</i> functioning at higher temperature / does not denature at the higher temperature / is thermostable ; <i>Name</i> 3 buffer ; <i>Explanation</i> 3 to provide, optimum / suitable / constant, pH for, polymerase / DNA or prevents, denaturation of polymerase / damage to DNA ;
5(b)(i)	<i>any two from:</i> (DNA ladder) compared to (other fragments) ; <i>ref. to</i> (estimate) length of (DNA) fragment / to identify the fragment number ; <i>ref. to</i> show electrophoresis worked correctly ;

5(b)(ii)	<i>any three from:</i> (PCR) amplifies / makes many copies of, DNA (fragments) ; (PCR) <i>ref. to</i> selecting fragments, small enough / less than 1000 bp / not more than 916 bp (for sequencing) ; (electrophoresis) separate the (DNA) fragments ; (electrophoresis) confirms / identifies, fragment lengths / fragment number / PCR worked correctly ;
5(c)	$(2^{35} \approx) 3.4 \times 10^{10}$;
5(d)	<i>any four from:</i> - child may have disease when, neither parent has the disease / no family history ; - early, detection / treatment (for gene therapy to work) ; - improve, quality of life / life expectancy ; <i>ref. to</i> informs family planning (for future pregnancies) ; <i>idea that</i> it does not involve additional sampling ; (screening is) expensive ; - treatment / gene therapy, expensive ; - test may not always be accurate ; - long-term effect of treatment, unknown / negative ;

3(a)	<i>any five from:</i> <u>restriction endonuclease</u> ; (RE) cuts, bacterial / herbicide-resistance, gene / DNA ; (RE) cuts a, plasmid / vector ; <u>DNA ligase</u> joins, new / bacterial / foreign, gene to, plasmid / vector ; <i>ref. to</i> joining / adding, of <u>promoter</u> ; (promoter / regulatory sequence) ensures expression of (new / bacterial / foreign / prokaryotic) gene ;
3(b)	73 / 100×123.5 or 90.155 million ; $(90.155 \times 2 \approx) 180.31$ million ;
3(c)	<i>any four from:</i> <i>positive implications:</i> - more food / higher yield (per hectare) ; (farmers) use less, insecticide / pesticide ; - cheaper food prices for consumers ; - less land needed to grow food leaves more for, biodiversity / conservation ; - improved food nutritional value ; <i>negative implications:</i> - food allergies ; - greater quantity of herbicide residue on food ; (evolution of) resistance in, insects / weeds / fungi / pests ; - pollen drift to / cross-breeding with, organic / non-GM / conventional, crops ; - GM crops may become invasive weeds ; - consumer mistrust / GM food must be clearly labelled ;