

Question Number	Answer	Mark
1(a)	<ol style="list-style-type: none"> 1. reference to {restriction enzyme / endonuclease} ; 2. to cut gene out of animal DNA ; 3. idea of amplification using DNA polymerase (in PCR) ; 4. (enzymes) open plasmid ; 5. (same endonuclease) to produce 'sticky ends' /description / at selected base sequence ; 6. H bonds formed between bases at 'sticky ends' ; 7. ligase ; 8. to join gene to plasmid / eq ; 9. reference to {phosphodiester / eq} bond ; 	(5)

Question Number	Answer	Mark
1(b)	<ol style="list-style-type: none"> 1. (small) {circle /eq} of DNA ; 2. containing bacterial (survival) genes and {protein / animal} gene ; 3. marker gene / description given ; 	(2)

Question Number	Answer	Mark
1(c)	<ol style="list-style-type: none"> 1. idea of easier to manage growth e.g. do not need sterile conditions ; 2. idea that it is safer (than bacteria) ; 3. idea of more protein can be made /eq ; 4. bacteria may not have correct amino acids to make protein / eq ; 5. idea that it could produce edible drugs ; 6. idea that plants have introns/bacteria do not so gene does not need modifying ; 7. idea that it is cheaper ; 	(2)

Question Number	Answer	Mark
1(d)	<ol style="list-style-type: none"> 1. idea of gene transfer to other {species / eq} ; 2. idea of consequence of transfer e.g. resistance to pesticide / antibiotics, superweeds ; 3. idea of possible harmful effects from genes e.g. biochemical changes to substances that could act as allergens, long term effects of consuming ; 4. idea that benefit focused on developed countries / converse ; 5. idea of risk related to use of viral vectors ; 6. idea of effect on organic farmers ; 	(2)

Question Number	Answer	Mark
2(a)	<ol style="list-style-type: none"> 1. tumour has {decreased in size / grown less / eq} ; 2. decrease in size quantified ; 3. rats survive longer / eq ; 4. idea that {more rats survive / higher survival rate / lower death rate} ; 5. 80% ; 	max (3)

Question Number	Answer	Mark
2(b)(i)	<ol style="list-style-type: none"> 1. reference to (virus acting as a) vector ; 2. idea that virus is used to get the {gene / DNA} into the cells ; 	(2)

Question Number	Answer	Mark
2(b)(ii)	reference to {neurones in spinal cord / endorphins being made in spinal cord / spinal cord connects to brain / eq} ;	(1)

Question Number	Answer	Mark
2(b)(iii)	idea that endorphins have pain-reducing properties / more {endorphins / endorphins secreting cells} produced ;	(1)

Question Number	Answer	Mark
2(b)(iv)	<ol style="list-style-type: none"> 1. {little change / eq} in control but treated rats {rise and fall / eq} ; 2. in first {2 weeks / ½ month} level of tolerance is {(almost) the same in both groups slightly higher in control group} / eq ; 3. after the first 2 weeks the level of tolerance is higher in the rats given gene therapy / eq ; 4. between 2 weeks and 2 months there is an increase in tolerance in rats given gene therapy but control group {remains the same / drops (slightly)} / eq ; 5. ref to decrease in tolerance in group given gene therapy {in last month / after two months} and (slight) increase in control group ; 6. credit correct comparative manipulation of figures ; 	max (3)