

Question Number	Answer			Additional Guidance	Mark
1(a)	Labelled structure	Name of structure	One function	For A ACCEPT involuntary muscles or named e.g. swallowing, vomiting, sneezing IGNORE brain stem For cerebrum, reject cerebellum For cerebrum, accept frontal lobe/prefrontal / cerebral cortex	(4)
	A	Medulla (oblongata) ;	Controls {breathing / heart / eq} ;		
	C ;	Cerebral hemisphere/ cerebrum / frontal cortex ;	Feel emotions		

Question Number	Answer	Additional Guidance	Mark
1(b)(i)	1. idea that cuts at a specific sequence of bases ; 2. idea of (generates) sticky ends ; 3. so easier to join together / eq ;	1. ACCEPT DNA sequence 3. ACCEPT to produce {same / complementary / eq} sticky ends (in plasmid and (human) gene)	(2)

Question Number	Answer	Additional Guidance	Mark
1(b)(ii)	1. the chemical could be a {transcription factor / hormone} ; 2. idea of interaction at (bacterial) cell (surface) membrane ; 3. idea of transcription factor being activated ; (e.g. transcription initiation complex formed, binds to transcription factor) or counters inhibitor ; 4. ref to promoter region ; 5. idea of transcription occurs e.g. RNA polymerase binds, mRNA produced ;	2. ACCEPT binds to cell surface membrane/passes through 3. ACCEPT triggers secondary messenger to be released {into cytoplasm/from (inner side of) membrane} 5. OT DNA polymerase	(3)

Question Number	Answer	Additional Guidance	Mark
1(b)(iii)	(ribosome has) larger and smaller subunit / (ribosomal) protein and rRNA ;	ACCEPT ref to 2 subunits ACCEPT 30S and 50S subunits	(1)

Question Number	Answer	Additional Guidance	Mark
1(b)(iv)	1. larger lumen so easier to put into blood / eq ; 2. (less muscle / thinner wall) so easier to penetrate / eq ; 3. (blood) pressure less so less damage to vein / eq ; 4. idea that vein is easier to find;	ACCEPT converse when appropriate IGNORE ref to 'going to the heart' 3. ACCEPT (blood) pressure less so less blood loss 4. CCEPT nearer the skin surface/easier to access	(2)

Question Number	Answer	Additional guidance	Mark
2(a)	1. (the disorder results from a) defect in genes / eq ; 2. both (defective) alleles need to be present / homozygous / not expressed in the presence of a dominant allele / eq ;	1. AL W faulty allele	(2)

Question Number	Answer	Mark
2(b)(i)	A ;	(1)

Question Number	Answer	Mark
2(b)(ii)	C ;	(1)

Question Number	Answer	Mark
2(b)(iii)	A ;	(1)

Question Number	Answer	Mark
2(b)(iv)	D ;	(1)

Question Number	Answer	Additional guidance	Mark
2(c)QWC	<p>(QWC– Spelling of technical terms must be correct and the answer must be organised in a logical sequence)</p> <ol style="list-style-type: none"> 1. {isolation / identification / eq} of normal gene / eq ; 2. {inserted / eq} into vector / stem cells / eq ; 3. vector named as {liposome / virus} ; 4. injection of {vector / modified stem cells} into {blood / brain / target cells / eq} / eq ; 5. ref to use of control injection ; 6. further detail of control injection e.g. use empty liposome / virus without gene inserted ; 7. progression of disease monitored / eq ; 8. life spans recorded / eq ; 9. reference to appropriate comparison with control eg untreated sheep ; 10.idea that treatment needs to be repeated; 11.idea of replication of investigation; 	QWC penalise once if mark point is not in a logical position	(5)

Question Number	Answer	Mark
3 (a) (i)	all the {DNA / genes / eq} of (the human species) ;	(1)

Question Number	Answer	Mark
3 (a) (ii)	Any one from: 1. idea of discrimination e.g. insurers might have access to a person's DNA / 2. idea of who decides whether a person is tested / 3. idea of need for confidentiality / 4. expensive medical treatments might be restricted / eq ;	(1)

Question Number	Answer	Mark
3 (b) (i)	1. idea that (Human Genome Project) identifies allele related to melanoma e.g. mutant allele, aberrant allele ; 2. idea that drug targets this allele ; 3. (mutant) allele can no longer express itself / eq ; 4. idea of drug preventing translation ; 5. idea that such a drug is more effective ;	(3)

Question Number	Answer	Mark
3 (b)(ii)	<ol style="list-style-type: none"> 1. idea that drug affects expression of the allele ; 2. idea that protein not produced ; 3. idea that (melanoma) cells killed ; 4. idea that (melanoma) cells do not divide ; 5. idea that they are replaced with normal body cells ; 6. through mitosis / eq ; 7. description of specific part of mitosis affected e.g. no spindle fibres ; 	(4)

Question Number	Answer	Mark
3 (b)(iii)	<ol style="list-style-type: none"> 1. randomised trial / eq ; 2. {large number / eq} of patients ; 3. double blind / eq ; 4. idea of {use of placebo / use of current treatment} ; 5. testing how effective the drug is on patients / eq ; 	(2)

Question Number	Answer	Mark
3 (c)	<ol style="list-style-type: none"> 1. yeast cells have human collagen {gene / allele / DNA / eq} ; 2. idea that new collagen is recognised as 'self' e.g. has no non-self antigens ; 3. does not trigger immune response / eq ; 	(2)

Question Number	Answer	Mark
*4(a) QW	<p>(QWC - Spelling of technical terms (<i>shown in italics</i>) must be correct and the answer must be organised in a logical sequence)</p> <ol style="list-style-type: none"> 1. idea of (<i>mutation</i> / named mutation) causing different base sequence ; 2. reference to different {sequence of <i>amino acids</i> / <i>primary</i> structure} / eq ; 3. reference to {B chain / <i>haemoglobin</i> / <i>protein</i> / <i>polypeptide</i>} being the wrong shape ; 4. <i>haemoglobin</i> no longer binds oxygen / binds less <i>oxygen</i> / eq ; 5. {less / no } <i>oxygen</i> {supplied / carried / eq} (to the cells) / eq ; 6. correct reference to <i>respiration</i> / eq ; 7. idea of breathlessness due to body trying to take in more <i>oxygen</i> ; 8. idea of tiredness due to lack of energy ; 	max (4)

Question Number	Answer	Mark						
4(b)	<table border="1" style="margin-left: auto; margin-right: auto;"> <tbody> <tr> <td style="text-align: center;">25(%)</td> <td style="text-align: center;">25(%)</td> <td style="text-align: center;">50(%)</td> </tr> <tr> <td style="text-align: center;">no chance / 0 (%)</td> <td style="text-align: center;">no chance / 0 (%)</td> <td style="text-align: center;">100 (%)</td> </tr> </tbody> </table> <p>All 3 in a row = 2 marks 1 or 2 in a row correct = 1 mark</p>	25(%)	25(%)	50(%)	no chance / 0 (%)	no chance / 0 (%)	100 (%)	(4)
25(%)	25(%)	50(%)						
no chance / 0 (%)	no chance / 0 (%)	100 (%)						

Question Number	Answer	Mark
4(c) QWC	<ol style="list-style-type: none"> 1. reference to use of {normal / correct} {allele / gene}; 2. for {haemoglobin / B chain}; 3. reference to introduction of {gene / allele/ DNA} into cells ; 4. cells named as (bone) marrow / eq ; 5. reference to use of vector (to introduce gene into cells) ; 6. (named vector) e.g. virus, liposome ; 7. credit reference to appropriate mode of delivery of vector e.g. injection into (bone) marrow ; 8. reference to need for repeated treatment ; 	<p style="text-align: right;">max (4)</p>