Question Number	Answer	Mark
1 (a)	1. appearance / the outward expression (of a cell or organism) / eq ; 2. reference to {genotype / eq} contribution ; 3. reference to environmental factors ;	**max (2)**

Question Number	Answer	Mark
1 (b)(i)	1. n smokers / eq ; 2. id that it acts as a comparison / shows the situation without smoking ;	**(2)**

Question Number	Answer	Mark
1 (b)(ii)	lung cancer / no lung cancer ;	**(1)**

Question Number	Answer	Mark
1 (b)(iii)	1. the more (packs) smoked, the higher the chance of developing lung cancer / positive correlation / eq ; 2. small increase in risk if smoke up to 20 packs per year / eq ; 3. greater increase in risk if smoke 21 or more (packs) per year / eq ; 4. linear increase for 21 or more / eq ; 5. credit correct manipulation of the data e.g. 35X greater;	**(2)**

Question Number	Answer	Mark
1 (b)(iv)	1. idea tha increased chance of lung cancer if close relative has cancer 2. for those that do t smoke there is risk if cancer in family / eq ; 3. that close famil members will have more alleles in common (with those involved in the investigation) ;	**max (2)**

Question Number	Answer	Mark
1 (b)(v)	in the 1-20 (packs) smoked per year cohort, there was a {lower risk of getting lung cancer if a close relative has had cancer / higher risk if no close relative with cancer} / eq ;	**(1)**

Question Number	Answer	Mark
1 (b)(vi)	idea that the more (packs) smoked per year, the greater the risk of getting lung cancer ;	**(1)**

Question Number	Answer	Mark
2 (a) (i)	1. alleles ; 2. loci / locations / positions / eq ;	**(2)**

Question Number	Answer	Mark
2 (a) (ii)	1. 174 (cm) ; 2. 172 (cm) ;	**(2)**

Question Number	Answer	Mark
2 (b) (i)	1. {genotype / eq} ; 2. {environment / eq} ;	**(2)**

Question Number	Answer	Mark
2 (b) (ii)	C ; A ; B ;	**(3)**

Question Number	Answer	Mark
3(a)	1. idea that these cells are {easy / painless} to collect ; 2. idea that a relatively {large amount of DNA / large number of cells} can be collected ; 3. they {contain diploid cells / have (23) pairs of chromosomes} ; 4. cells {are genetically identical / have same DNA / have same alleles} ; 5. any {recessive allele / mutated (CF) gene} will be present in them / eq ; 6. idea that if the gametes were tested they may not contain the {recessive allele / mutated (CF) gene}(as they are haploid) ;	**maximum (2)**

Question Number	Answer	Mark
3(b)	1. cystic fibrosis results from one of a number of possible mutations (of this gene) /eq ; 2. idea that testing for only one will miss other recessive alleles ;	**(2)**

Question Number	Answer	Mark
3(c)	1. ref to false negatives / eq ; 2. idea that the screening programme does not test for all the possible mutations that can cause cystic fibrosis ; 3. idea that a mutation may occur in the formation of the gametes ; 4. idea of mutation in both gametes ; 5. idea that a mutation may occur after fertilisation ;	**maximum (2)**

Question Number	Answer	Mark
3(d)	1. idea that any other family member could be a carrier ; 2. idea that informed choices can be made about having children (if they know that they are carriers) ;	**(2)**

Question Number	Answer	Mark
3(e)	1. heterozygous genotype of both parents shown or stated ; 2. possible alleles carried in the gametes shown (can be shown in a Punnet square) ; 3. possible genotypes of offspring clearly shown (can be shown in a Punnet square) ; 4. corresponding phenotypes given ; 5. (probability of having child with cystic fibrosis is) 25% / 1 in 4 / ¼ / 0.25 / ;	**maximum (5)**

Question Number	Answer	Mark
4(a)(i)	1. an allele is the {different form / eq} of a gene / eq ; 2. a gene is {a section of DNA / sequence of bases} that codes for a {polypeptide / eq} /occupies a particular {locus / eq} on a chromosome / eq ;	**(2)**

Question Number	Answer	Mark
4(a)(ii)	(allele) that is only expressed (in the phenotype of an organism) if the dominant allele is not present / eq ;	**(1)**

Question Number	Answer	Mark
4(b)(i)	alleles (of a particular gene) are the same / eq ;	**(1)**

Question Number	Answer	Mark
4(b)(ii)	1. Cara and Jasjeet ; 2. {Naveeda / one child} is an albino so must have inherited an albino allele from each parent / eq ; 3. Daniel ; 4. Cara must have inherited the albino allele from her father (as Susan was an unaffected homozygote) / eq ;	**(4)**

Question Number	Answer	Mark
4(c)	1. idea that {fewer albino squirrels survive / squirrels may not breed so frequently} ; 2. a suitable reason given (e.g. more predation, less camouflage) ; 3. idea of {frequency of albinism allele in squirrel (population) is lower / chances of two squirrels with the allele less likely to mate} ; 4. comment on the lower mutation rate (in squirrels) ;	**max (2)**

Question Number	Answer	Mark
4(d)	1. idea that dihydroxyphenyalanine cannot be synthesized from tyrosine if tyrosinase is absent ; 2. idea that precursor of melanin is dihydroxyphenylalanine / melanin only made if DHPA present ; 3. enzymes are (substrate) specific therefore no other enzyme will breakdown tyrosine / tyrosine does not breakdown on its own ;	**max (2)**