

4(a)(i)	0.3 ;
4(a)(ii)	any four from: 1 genetic drift ; 2 (drift as) frequency, fluctuates / decreases and increases / shows random changes / does not change markedly in just one direction ; 3 <u>directional</u> selection ; 4 from (generation) 2 to 7 / at first, T decreases as, T is selected against <u>and</u> from (generation) 7 to 13 / later, T increased as, T is selected for; 5 may be, stabilising selection / selection for heterozygotes ; 6 (stabilising selection) keeps relative allele frequencies roughly the same ;
4(b)	any three from: 1 small(er) population ; 2 causes (genetic) bottleneck (effect) ; 3 chance events, have greater relative effect on / cause larger fluctuations in, allele frequency ; 4 more likely for one allele to, replace another / go extinct / become fixed ; 5 by chance T organisms, did not mate / pass on T allele or by chance offspring with T died ;
4(c)	<u>Hardy-Weinberg</u> ;

3(a)	<u>dominant</u> ; 3 / daughter, has disease but, 2 / father, does not or 3 / daughter, could not have the disease if allele were recessive ;
3(b)	any three from: 1 founder effect ; 2 allele / variegate porphyria, present in, migrants / settlers / founding population ; 3 higher frequency than in, Dutch / Europeans / original population ; 4 genetic drift has large effect in small, population / gene pool ; 5 inbreeding / migrants married within their own population ; 6 high frequency of allele maintained over, time / generations ; 7 AVP ;
3(c)	any four from: 1 use mRNA (from person's cells) to make, cDNA / ssDNA ; 2 add fluorescent, label / tag / dye / chemical / marker, to (this ss) DNA ; 3 cDNA / ssDNA, hybridises with / binds to / complementary base pairs with, probe(s) / microarray ; 4 fluorescence shows, disease / mutant, gene / allele, expression / transcription ; 5 AVP ;
3(d)	any one from: 1 find out / diagnose, person's disease ; 2 so can, choose / develop, right treatment ; 3 global, research resource / access ;
3(e)	any three from: 1 change from T to C or replacement / substitution, of T, with / by, C or substitution of C for T ; 2 functional / working / correct / normal, enzyme / protein, produced ; 3 <u>gRNA</u>, is specific to / only finds / just alters, CEP / disease / mutant, allele / gene or <u>gRNA</u> does not bind to genes other than CEP ; 4 AVP ;