

Genetic inheritance (dominant/recessive alleles, Punnett squares, family trees)

Q1. (2020)

05.3	<p>both parents shown as heterozygous</p> <p>derivation correct to show 1 unaffected, 2 carriers and 1 affected offspring.</p> <div><div>Woman</div><table><tr><td></td><td>T</td><td>t</td></tr><tr><td>T</td><td>TT</td><td>Tt</td></tr><tr><td>t</td><td>Tt</td><td>tt</td></tr></table><div>Man</div></div> <p>tt identified as offspring with CF</p> <p>correct ratio / probability from their derivations of tt e.g. 1:3, 1 in 4, 25%, 0.25</p>		T	t	T	TT	Tt	t	Tt	tt	<p>allow correct derivation from incorrect gametes</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p>	<p>AO2</p> <p>AO2</p> <p>AO2</p> <p>AO3</p> <p>4.6.1.5</p> <p>4.6.1.4</p>
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Q2. (2020)

A)

05.4	<p>any three from:</p> <ul style="list-style-type: none"> does not need IVF which is stressful / invasive higher chance of successful pregnancy as risk of miscarriage is low compared to (30%) success rate of IVF the test is freely available the test can be carried out even once the mother is pregnant 	<p>allow method 2 is not available to all couples who want it</p>	<p>3</p>	<p>AO3 4.5.3.5 4.6.1.5</p>
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B)

05.5	<p>any one from:</p> <ul style="list-style-type: none"> child will (definitely) not have CF do not need to consider termination it is a way to have a child if couples are having fertility problems 		<p>1</p>	<p>AO3 4.5.3.5 4.6.1.5</p>
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Q3. (2021)

06.1	any one from: <ul style="list-style-type: none"> • (having two) different alleles for a gene / trait / characteristic / disorder • (having) the dominant and recessive allele for a gene / trait / characteristic / disorder 	ignore examples such as Hh ignore having two different alleles unqualified	1	AO1 4.6.1.4
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Q4. (2021)

06.2				
	father / person 7 hh	} allow hh and Hh parental genotypes with each parent unidentified or reversed for 1 mark	1	AO2
	mother / person 8 Hh		1	AO2
	(possible offspring correctly derived) hh (× 2) Hh (× 2)	allow correctly derived offspring from incorrect parental genotype(s)	1	AO2
	(each different phenotype identified) hh = has the disorder Hh = does not have the disorder	allow from incorrectly derived offspring if incorrectly have HH = does not have the disorder	1	AO2
	0.5	allow 50% or $\frac{1}{2}$ or 1:1 or 1 out of 2 or 1 in 2 do not accept 1:2	1	AO3
	(probability of male with disorder) 0.25	allow probability of having disorder correctly derived from incorrect parental genotypes		
		allow 25% or $\frac{1}{4}$ or 1:3 or 1 out of 4 or 1 in 4 do not accept 1:4	1	AO3
		allow probability of male with disorder correctly derived from incorrect probability of having the disorder		4.6.1.4 4.6.1.5 4.6.1.6

Q5. (2023)

A)

01.3	heterozygous	ignore dominant / recessive	1	AO2 4.6.1.4
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B)

01.4	(parents gamete genotypes shown) D d and d d	allow in either position in Punnett square	1	AO2
	(possible offspring genotypes correctly derived) Dd Dd dd dd	allow correct derivation of offspring genotypes from incorrect gametes allow 3 correct offspring genotypes for 1 mark	2	AO2
	correct identification of Dd offspring as having polydactyly	if derivation not correct and shows DD and Dd , both must be identified as having polydactyly	1	AO2
	probability must match derived offspring genotypes	if no derivation shown allow 0.5 or 50% or 1 in 2 or 1:1 or ½ do not accept 1:2 allow correct probability from incorrectly derived offspring	1	AO3 4.6.1.4 4.6.1.5

Q6. (2024)

02.3	a gamete contains half of the number of chromosomes		1	AO1 4.6.1.1 4.6.1.2
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Q7. (2024)

A)

03.1	parents of child with AKU / disorder do not have AKU / disorder	allow A and B do not have AKU, but child / D does (have AKU) allow F and G do not have AKU, but child / children / K / L does (have AKU)	1	AO3 4.6.1.4
	or child(ren) with AKU / disorder have parents who do not	allow child(ren) with AKU / disorder have parents who are carriers		

B)

03.2	G		1	AO2 4.6.1.4
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C)

03.3	(parental gametes) (female) a and a (male) A and a	allow 1 mark for a a and A a parental gametes reversed	1 1	AO2 AO2
	offspring correctly derived Aa Aa aa aa	allow correctly derived offspring from incorrect parental gametes	1	AO2
	offspring phenotype correctly derived Aa = no AKU aa = AKU	allow correctly derived phenotypes from incorrect parental gametes or incorrect offspring genotypes allow inclusion of AA = no AKU, if their cross derives this genotype ignore reference to carriers	1	AO2
	(probability =) 0.5	allow 50% or $\frac{1}{2}$ or 1 in 2 or 1:1 or 50:50 probability must match offspring genotype do not accept 1:2 or 50/50	1	AO3 4.6.1.4