

Question number	Answer	Notes	Marks
1 (a)	1. . parents are BB and bb; 2. . first generation is Bb;	no TE	2
(b)	1. . gametes B and b; 2. second generation BB, Bb, Bb and bb;	allow TE for 1 mark for correct offspring from incorrect gametes	2
(c)	1. sperm; 2. fertilisation / fusion; 3. zygote; 4. diploid; 5. mitosis; 6. 40 / forty / 20 pairs;		6

Total 10 marks

Question number	Answer	Notes	Marks
2(a) (i)	47;		1
(ii)	male;		1
(b)	1. has more than 46 / has extra chromosome / trisomy; 2. (which is) sex chromosome / Y / eq;	Ignore 47 alone Has an extra sex chromosome =2	2
(c) (i)	meiosis;		1
(ii)	1. failure of chromosomes to separate / eq; 2. (gamete) has an extra chromosome / YY; 3. normal egg/gamete fertilised by abnormal sperm/gamete;		2

Total 7 marks

Question number	Answer	Notes	Marks
3(a)	<p>P mm Mm;</p> <p>G m M m;</p> <p>O Mm mm;</p> <p>Ph Marfan / eq unaffected;</p>	<p>G. Clear separation of gametes</p> <p>Ph. Allow half Marfan and half unaffected even if not linked to genotypes</p> <p>Allow max from Punnett square</p> <p>Allow 3 max for TE</p> <p>Allow other symbols</p>	4
(b)	<p>(i) some people do not have obvious symptoms / some people with symptoms/long fingers/tall do not have condition / heart problems/eyesight problems may have other causes / eq;</p> <p>(ii)</p> <ol style="list-style-type: none"> 1. look at parents / family history; 2. genetic test / analyse DNA / eq; 3. look for combination of symptoms / look for tall and eyesight / eq; 	<p>3. Allow any 2 symptoms</p>	<p>1</p> <p>2</p>

Question	Answer	Notes	Marks
(c)	1. condition present in offspring but not in parents; 2. it skips generations / eq; 3. carriers (present);		3

Total 10 marks

Question number	Answer	Notes	Marks												
4 (a)	<table border="1"> <thead> <tr> <th data-bbox="562 353 833 545">Genotype</th> <th data-bbox="833 353 1010 545">Alleles</th> <th data-bbox="1010 353 1218 545">Expected number of digits per hand</th> </tr> </thead> <tbody> <tr> <td data-bbox="562 545 833 656">(homozygous dominant)</td> <td data-bbox="833 545 1010 656">DD;</td> <td data-bbox="1010 545 1218 656">(six)</td> </tr> <tr> <td data-bbox="562 656 833 766">homozygous <u>recessive</u>;</td> <td data-bbox="833 656 1010 766">(dd)</td> <td data-bbox="1010 656 1218 766">5 / five;</td> </tr> <tr> <td data-bbox="562 766 833 833">(heterozygous)</td> <td data-bbox="833 766 1010 833">(Dd)</td> <td data-bbox="1010 766 1218 833">6 / six;</td> </tr> </tbody> </table>	Genotype	Alleles	Expected number of digits per hand	(homozygous dominant)	DD;	(six)	homozygous <u>recessive</u> ;	(dd)	5 / five;	(heterozygous)	(Dd)	6 / six;		4
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(b)	<table border="1"> <thead> <tr> <th data-bbox="465 843 842 954">Parent genotypes</th> <th data-bbox="842 843 1218 954">Probability of child with polydactyly</th> </tr> </thead> <tbody> <tr> <td data-bbox="465 954 842 1025">(Dd x DD)</td> <td data-bbox="842 954 1218 1025">1.0;</td> </tr> <tr> <td data-bbox="465 1025 842 1096">(Dd x dd)</td> <td data-bbox="842 1025 1218 1096">(0.5)</td> </tr> <tr> <td data-bbox="465 1096 842 1165">(Dd x Dd)</td> <td data-bbox="842 1096 1218 1165">0.75;</td> </tr> </tbody> </table>	Parent genotypes	Probability of child with polydactyly	(Dd x DD)	1.0;	(Dd x dd)	(0.5)	(Dd x Dd)	0.75;		2				
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(Dd x DD)	1.0;														
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			Total 6 marks												

Question number	Answer	Notes	Marks
5	<p>C leaves from top and bottom;</p> <p>O same species / same tree / same age of tree / eq;</p> <p>R repeat / many trees / many leaves / eq;</p> <p>M1 METHOD OF MEASUREMENT: chlorophyll / colour / chromatography / eq;</p> <p>M2 METHOD OF EXTRACTION: (heat with) ethanol / crush / eq;</p> <p>S1+S2 same location / soil / time of year / day / mass / surface area / eq;;</p>		6
			Total 6 marks

Question number	Answer	Notes	Marks
6 (a)	1. source of food / source of nutrients / eq; 2. smell / eq;		1 max
(b)	1. Cheviot and East Friesian (chosen); 2. (parent sheep with) bare legs <u>and</u> (parent sheep with) bare backsides; 3. cross breed / mate / eq; 4. <u>select/choose/use</u> offspring with bare legs <u>and</u> bare back side; 5. repeat / many generations / eq;		4 max
(c)	1. farmer / humans / you (choose parents) / eq; 2. faster process / eq; 3. does not affect survival / no survival of fittest / no competition / adaptations may not improve survival / eq;	Allow converse	2

(d)	<ol style="list-style-type: none"> 1. kills/harms other organisms / not specific / eq; 2. affect <u>food chain</u> / bioaccumulation / eq; 3. resistance; 	<p>Ignore pollution / harm to sheep or crops or meat or wool or humans</p> <p>Ignore immune</p> <p>Ignore cost / reapplication</p>	2 max
			Total 9 marks

Question number	Answer	Notes	Marks
7	humans / people / farmers / scientists / breeders / eq; characteristics / features / named feature / traits / qualities / eq; offspring / eq; repeated / continued / done / carried on / ongoing / eq;	ignore genes / genetics ignore successful	4
		Total	4