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 mm Mm; G m M m; O Mm mm; Ph Marfan / eq unaffected;	G. Clear separation of gametes Ph. Allow half Marfan and half unaffected even if not linked to genotypes Allow max from Punnett square Allow 3 max for TE Allow other symbols	4
(b) (i)	some people do not have obvious symptoms / some people with symtoms/long fingers/tall do not have condition / heart problems/eyesight problems may have other causes / eq;		1
(ii)	1. look at parents / family history; 2. genetic test / analyse DNA / eq; 3. look for combination of symptoms / look for tall and eyesight / eq;	3. Allow any 2 symptoms	2

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

<table>
<tr><th>Question number</th><th>Answer</th><th>Notes</th><th>Marks</th></tr>
<tr><td>4 (a)</td><td>
<table>
<tr><th>Genotype</th><th>Alleles</th><th>Expected number of digits per hand</th></tr>
<tr><td>(homozygous dominant)</td><td>DD;</td><td>(s</td></tr>
<tr><td>homozygous <u>recessive</u>;</td><td>(dd)</td><td>5 / five;</td></tr>
<tr><td>(heterozygous)</td><td>(Dd)</td><td>6 / six;</td></tr>
</table>
</td><td></td><td>4</td></tr>
<tr><td>(b)</td><td>
<table>
<tr><th>Parent genotypes</th><th>Probability of child with polydactyly</th></tr>
<tr><td>(Dd x DD)</td><td>1.0;</td></tr>
<tr><td>(Dd x dd)</td><td>(0.5)</td></tr>
<tr><td>(Dd x Dd)</td><td>0.75;</td></tr>
</table>
</td><td></td><td>2</td></tr>
<tr><td></td><td></td><td></td><td>Total 6 marks</td></tr>
</table>

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

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

(d)	1. lls/harms other organisms / not specific / eq; 2. fect food chain / bioaccumulation / eq; 3. sistance;	Ignore pollution / harm to sheep or crops or meat or wool or humans Ignore immune Ignore cost / reapplication	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