

Mark Scheme

Combined Science GCSE

Genetics Test

(Levels 4-9)

	Answer	Marks
1. (a)	B Meiosis produces four genetically different daughter cells. D Meiosis produces gametes. E Meiosis produces haploid daughter cells.	(3)
1. (b)	An egg cell: • is haploid • has half the number/half a set of chromosomes • has 23 chromosomes A body cell: • is diploid • has a full set of chromosomes • has 46/23 pairs of chromosomes	(4)

(Total for Question 1 = 7 marks)

	Answer	Marks
2. (a)	D in the nucleus of all cells.	(1)
2. (b)	B the whole DNA of a single organism.	(1)
2. (c)	• Polymer. • Two coiled strand/double helix. • Complimentary base pairs. • (Base pairs) joined by weak hydrogen/h bonds.	(4)
2. (d)	• Short/small section of DNA. • Codes for specific protein. • Hereditary unit.	(2)

(Total for Question 2 = 8 marks)

	Answer	Marks
3.	Stages must be given in the correct order. Award 6 marks for all stages in the correct order. Max 4 marks if any stages are missing/out of sequence. • Mash up/blend the fruit. • Mix salt water and detergent with the fruit. • Leave for 15 minutes at 60°C/in a water bath. • Filter the mixture. • Pour iced ethanol onto the filtrate/place on ice and add ethanol.	(6)

(Total for Question 3 = 6 marks)

	Answer	Marks
4. (a)	• Each person has two copies of a gene/two alleles. • Parents have different alleles for hair colour gene. • Children have expressed allele for brown hair/children have shown brown hair in their phenotypes.	(2)
4. (b)		(4)

(Total for Question 4 = 6 marks)

	Answer	Marks													
5. (a)	Award 1 mark per correct row. <table><tr><td colspan="2" rowspan="2"></td><td colspan="2">Parent 1 ♂</td></tr><tr><td>B</td><td>B</td></tr><tr><td rowspan="2">Parent 2 ♀</td><td>B</td><td>BB</td><td>BB</td></tr><tr><td>b</td><td>Bb</td><td>Bb</td></tr></table>			Parent 1 ♂		B	B	Parent 2 ♀	B	BB	BB	b	Bb	Bb	(2)
				Parent 1 ♂											
		B	B												
Parent 2 ♀	B	BB	BB												
	b	Bb	Bb												
5. (b)	(i) Black hair (ii) Black hair (iii) Parent 1	(3)													
5. (c)	• Father/parent 1 is homozygous dominant. • Father/parent 1 will always pass on allele for black hair. • Black hair allele is dominant so only 1 copy is needed.	(2)													
5. (d)	50% or $\frac{1}{2}$	(1)													

(Total for Question 5 = 8 marks)

	Answer	Marks									
6. (a)	Accept either version of the diagrams below. Award 1 mark for correct identification of the gametes from each parent. Award two marks for every 2 correct offspring combinations. Award 1 mark for all offspring phenotypes correctly labelled. <table border="1"> <tr> <td></td><td>X</td><td>y</td></tr> <tr> <td>X</td><td>XX (girl/female)</td><td>XY (boy/male)</td></tr> <tr> <td>X</td><td>XX (girl/female)</td><td>XY (boy/male)</td></tr> </table>		X	y	X	XX (girl/female)	XY (boy/male)	X	XX (girl/female)	XY (boy/male)	(4)
	X	y									
X	XX (girl/female)	XY (boy/male)									
X	XX (girl/female)	XY (boy/male)									
6. (b)	• Probability of a male/female is 50%. • Probability is mutually exclusive/for each offspring separately. • Each pregnancy has a 50% chance of male/female offspring.	(2)									

(Total for Question 6 = 6 marks)

	Answer	Marks						
7. (a)	<table><tr><th>Genetic causes</th><th>Environmental causes</th></tr><tr><td>mutation</td><td>lifestyle</td></tr><tr><td>sexual reproduction</td><td>climate</td></tr></table>	Genetic causes	Environmental causes	mutation	lifestyle	sexual reproduction	climate	(2)
Genetic causes	Environmental causes							
mutation	lifestyle							
sexual reproduction	climate							
7. (b)	D sexual reproduction.	(1)						
7. (c)	• Height • Weight • Agility Any other appropriate answer.	(2)						

(Total for Question 7 = 5 marks)

Question	Answer	Marks
8.	• Gene therapy. • Replace faulty genes. • Treat inherited conditions. • Early diagnosis/prevention of disease carried in families. • Patients can make informed choices for preventative treatment e.g. removal of breast tissue to prevent breast cancer.	(4)

(Total for Question 7 = 4 marks)

TOTAL FOR PAPER = 50 MARKS