

Inheritance

Mark Scheme 1

Level	IGCSE
Subject	Biology
Exam Board	CIE
Topic	Inheritance
Paper Type	(Extended) Theory Paper
Booklet	Mark Scheme 1

Time Allowed: 54 minutes

Score: /45

Percentage: /100

1 (a)	<i>gene</i> a length of DNA that codes for a protein ; <i>gene mutation</i> a change in <u>base</u> sequence of DNA ;	[2]	R chromosome / molecule of / genome
(b) (i)	1 Bb ; 2 bb ; 3 Bb ;	[3]	

Question		Mark	Guidance													
(ii)	<p>(Bb x bb)</p> <p>B , b + b , (b) ;</p> <p><i>offspring genotypes</i> Bb and bb ; A heterozygous and homozygous recessive</p> <p><i>offspring phenotypes</i> normal / carrier and acatalasia ;</p>	[3]	<table border="1"> <tr> <td colspan="2" rowspan="2"></td><td colspan="2">male gametes</td></tr> <tr> <td>B</td><td></td></tr> <tr> <td rowspan="2">female gametes</td><td>b</td><td>Bb</td><td></td></tr> <tr> <td>(b)</td><td>Bb</td><td>(bb)</td></tr> </table>			male gametes		B		female gametes	b	Bb		(b)	Bb	(bb)
		male gametes														
		B														
female gametes	b	Bb														
	(b)	Bb	(bb)													
(iii)	test (cross) ;	[1]														
		[Total: 9]														

Question		Marks	Guidance Notes
2 (a) (i)	1 cross / breed, (parent) plants with <u>desired</u> feature ; 2 (grow seeds and) chose offspring for (desired) feature(s) ; 3 cross (offspring) plants showing features with, original variety / self / each other ; 4 keep / many generations of, crossing and selecting ; 5 any detail ; e.g. bagging flowers / transfer of pollen (with paintbrush) / detail of seed collection	[max 3]	
(ii)	1 two parents / gametes, are required ; 2 variation in offspring / offspring might not all be red ; 3 time consuming ; 4 AV ; e.g. harvesting seeds / finding pollinators, can be difficult / limited number of seeds / wasteful in context of unused pollen	[max 2]	1 cost / energy
(b)	1 <u>reduction</u> / nuclear, division ; 2 chromosome <u>number</u> is halved ; 3 (diploid to) haploid ; 4 results in <u>genetically</u> different, cells / gametes / AW ;	[max 2]	
(c) (i)	$F^A F^N$;	[1]	
(ii)	pink (flowers) ;	[1]	ecf from (c)(i)
(iii)	<i>gametes:</i> F^A , F^N , F^A , F^A ; <i>offspring genotype:</i> $F^A F^A$, $F^A F^N$; <i>offspring phenotype:</i> red, pink ; <i>proportion of pure breeding carnation plants:</i> 50% / 1:1 / 0.5 / half ;	[4]	
		[Total:13]	

Question		Mark	Guidance									
3 (a)	<table><tr><td>gametes</td><td>\textcircled{X}</td><td>\textcircled{X}</td></tr><tr><td>\textcircled{X}</td><td>XX</td><td></td></tr><tr><td>$\textcircled{Y;}$</td><td>XY</td><td>XY;</td></tr></table> <p>offspring ratio = 1:1 / 50:50 / 50% male, 50% female / 2:2 ;</p>	gametes	\textcircled{X}	\textcircled{X}	\textcircled{X}	XX		$\textcircled{Y;}$	XY	XY;	[3]	
gametes	\textcircled{X}	\textcircled{X}										
\textcircled{X}	XX											
$\textcircled{Y;}$	XY	XY;										
(b) (i)	<p>cat 1 $X^bY;$</p> <p>cat 4 $X^BY;$</p> <p>cat 5 $X^BX^B;$</p>	[3]										
(ii)	<p>distinct, phenotypes / coat colours / categories ;</p> <p>no (continuous) range of colour / AW ;</p> <p>controlled by genes ;</p> <p>not affected by the, environment / AW / named example ;</p>	[3]	<p>A only orange, black and calico</p> <p>A inherited</p>									
		[Total: 9]										

4	(a) (i)	<i>Caenorhabditis</i> ;	[1]	
	(ii)	thread-like bodies/filamentous / filament-like ; unsegmented body ; hydrostatic skeleton ; body, tapers/is pointed, at, one/both, ends ; through gut/mouth and anus ; relatively large pharynx/sucking mouthparts ;	max [2]	
	(b)	prevents accumulation of dead matter/removes (organic) waste ; recycles nutrients/named nutrient(s) ; releases (carbon as) carbon dioxide ; (carbon dioxide) for photosynthesis ; decreases particle size of food for decomposers ; ref to energy flow in, food chain/food web/ecosystem ;	max [3]	R energy cycling/recycling
	(c) (i)	gametes from same individual ; self-fertilisation / described ; only new source of variation is mutation ; variation produced by meiosis ;	max [2]	
	(ii)	6 ;	[1]	

(iii)	<p>P <i>meiosis</i></p> <p>reduction division / chromosome number is halved ;</p> <p>prevents doubling of chromosome number, with each generation / when gametes fuse together / at fertilisation ;</p> <p>ref to haploid (cells / gametes / sex cells) ; gamete / sex cell, production ;</p> <p>Q <i>mitosis</i></p> <p>growth is taking place ; producing (genetically) identical cells ; more diploid cells ;</p>	max [3]	producing haploid gametes = 2
(d)	<p>in chromosomes ; in the nucleus ; in mitochondria ;</p>	max [2]	A in plasmids ;