MARK SCHEME for the October/November 2011 question paper

for the guidance of teachers

9700 BIOLOGY

9700/53

Paper 5 (Planning, Analysis and Evaluation), maximum raw mark 30

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes must be read in conjunction with the question papers and the report on the examination.

• Cambridge will not enter into discussions or correspondence in connection with these mark schemes.

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Mark scheme abbreviations:

- ; separates marking points
- *I* alternatives answers for the same point
- R reject
- A accept (for answers correctly cued by the question, or guidance for examiners)AW alternative wording (where responses vary more than usual)
- <u>underline</u> actual word given must be used by candidate (grammatical variants excepted)
- **max** indicates the maximum number of marks that can be given
- ora or reverse argument
- **mp** marking point (with relevant number)
- ecf error carried forward
- I ignore
- **AVP** alternative valid point (examples given as guidance)

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Question	Expected answer	Extra guidance	Mark
1 (a) (i)	 the pigments (present in the leaves) / varieties of leaf / types of leaves / colours of leaves / source of chloroplasts / chloroplasts from different types of leaves / AW ; the wavelength of light ; 	 A named pigments. R chlorophyll A colours of light 	[2]
(ii)	time taken for the decolourising of methylene blue / time for loss of blue (colour);	 A idea of allows the methylene blue to work as a hydrogen acceptor A rate of photosynthesis 	[1]
(iii)	one of: mass of leaves ; volume of methylene blue ; start time of exposure to light ; intensity of light source / distance from lamp / wattage of bulb ; volume / length of extract ; (same) species of plant ;	R temperature A pH R amount for methylene blue or leaves ignore length of capillary R mass of extract	[max 1]
(b) (i)	idea of keeping the organelles intact / AW;	A explanations in terms of osmosis or water potential or pH or enzymes. ignore ref. to phosphate needed to make ATP	[1]
(ii)	<i>idea of</i> inhibiting enzymes / slowing or stopping reactions ;	R prevents denaturing A if answer in terms of slowing / stopping photosynthesis	[1]
(iii)	<i>idea of</i> mesh traps cell debris but allows organelles through / AW ;	ora that paper may not let chloroplasts through R impurities unqualified / chloroplast molecules / precipitate	[1]

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Question			Expe	ected	d ans	wer					Extra guidance	Mark
(c) (i)	2 of:										If more than 2 identified :	
	time taken /				secon	ıds (s	5)			If all correct, allow both marks incorrect answers cancel correct e.g. 2 right and 1 wrong		
	source of chloroplasts 1 mark											
	wave length of light / nm	da	ark re leaf		yel	low l	eaf	-	een a ite str leaf	iped		
	440	9	10	12	28	26	26	13	12	12		
	500	14	15	13	29	31	33	16	17	15		
	530	45	44	43	52	45	44	45	43	52		
	570	32	34	33	34	34	44	34	33	3		
	650	25	18	17	25	18	16	17	17	1		
	750	Rer	maine	ed blu	ue af	ter 10	00 se	econd	ls			[max 2]
(ii)	$\frac{\frac{43+45}{2}}{\frac{1}{44}} = 0.0$										 A alternative ways of setting out working as long as some correct working shown correct mean, no working = 1 mark A 0.021 if 52 is included in the calculation – max 1 A 0.021 in box if no calculation – max 1 A 0.022 for adding 1 divided by each value and then dividing by 3 – max 1 	[2]

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Question	Expected answer	Extra guidance	Mark
(d) (i)	7 of: independent variable:	Some points might be gained from a diagram e.g. mp 8.	
	 ref. to using (a sample from) all three leaves ; ref to same quantity / amount of each (leaf type) ; 	 A in terms of mass or number ecf if only two leaf types mentioned 	
	dependent variable:		
	 ref. to observing / measuring / marking / finding, position of the pigments / colours / spots (on the chromatogram); 	 A if refer to Rf values or measure distance to the pigments. A pattern for position A results for pigments, etc. 	
	procedure:		
	 ref. to a method of extracting pigments (from the leaves); 	 4. e.g. grind / crush / AW, leaves (separately or with solvent) / use a blender. A crushing directly onto paper A boil / heat in ethanol / alcohol / solvent 	
	 ref. to filtering / centrifuging to, remove debris / obtain pigments; 	 A 'extract' / supernatant, for pigments 	
	6. ref. to method of concentrating extract ;	6. e.g. by evaporating ,heating, partitioning with different solvents or (many spots) at the same point or pressing with a coin several times	
	7. ref. to a method of applying sample ;	 7. e.g. capillary tube / fine or small dropper / small or fine paint brush / pin head A ref to keeping spot small / thin line on origin 	
	8 ref. to suitable placing in solvent ;	 e.g. solvent level below, sample / origin ignore names of solvents 	
	 ref. to using the same solvent (if separate chromatograms) / spots at same level if all on one paper ; 	9. ignore names of solvents including water, but must use water as a solvent for all chromatograms	
	10. ref. to running (chromatograms) to a set distance ;	 10. e.g. before solvent front reaches the end / pre-marked line. A running for same times for 2 or more chromatograms but not if all on one, ignore any specific time 	
	11. ref. to covering container (prevents evaporation);	11. A airtight container. close with a stopper / cork	

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Question	Expected answer	Extra guidance	Mark
	reliability:		
	12. ref. to repeating to, compare / find anomalies;	12. ignore ref. to mean unqualified	
		A means of Rf values / AW	
	safety (max 1):		
	13. ref. to solvents / leaves + suitable precaution ;	13. e.g. flammable – no naked flames / AW	
		toxic – in fume cupboard / ventilated space / covered	
		containers / gloves / goggles	
	14. ref. to safe disposal of solvent ;	corrosive or allergy to leaves or solvent – gloves / goggles	F7 1
		ignore low risk / radiation	[max 7]
(ii)	red leaf has pigment 2 (not present the other two leaves);	ora pigment 5 only in red and green and white leaf	
	vollow loof doos not have nigment 5 (found in the other	ignoro rof to nigmont 7	
	yellow leaf does not have pigment 5 (found in the other two leaves);	ignore ref. to pigment 7	[2]
			[2]
		Total:	[20]

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Question	Exp	ected answ	ver		Extra guidance	Mark
2 (a) (i)	3 of: cross 1. offspring of cats crossed together have o cross 2. offspring of cats together are always 'with	ffspring with s 'with tails'	n tails' (rece (recessive)	ssive);	A cross 1 – always more without tails / AW A ora 'none without tails'	
(ii)	<i>idea of</i> 'with tails' (recest phenotypes occur in (a) each sex / 1:1 ratio in each cross 4: male 'without ta tail' (recessive). If it wer tailed. (This is not so), s	pproximatel ach sex / 1:1 ail' (dominar e sex linked	y) equal nui :1:1 / AW ; nt) and fema l all males w	mbers in ale 'with	 must have idea that ratio is between male and female not just that there are the same number (approximately) of 'tail' to 'without tail unqualified as this seems to imply regardless of gender. 1:1:1:1 implies gender so does not need qualifying. Could apply to either <i>cross 3 or 4</i> a male 'without tail' cannot pass this allele to the male offspring if it is sex linked 	[max 3]
(b) (i)	1 of: the data is categoric / dis looking for a 'goodness of and observed results ma significant difference bet results ;	of fit' / idea o atch or not /	whether the	ere is a	 A discontinuous data / discontinuous distribution / not continuous R discontinuous <u>variation</u> R stating there are O and E values, must have idea of matching ratios (of offspring) Ignore ref. to null hypothesis 	[max 1]
(ii)	offspring phenotype	0	E	$\frac{\left(O-E\right)^2}{E}$	1 mark E column 1 mark $\frac{(O-E)^2}{E}$ column. <i>ecf from E</i>	
	offspring with tail 40 28 5.14				A as fractions	
	offspring without tail 72 84 ; 1.71			1.71 ;	ignore decimal places 1 mark correct addition to χ^2 to 2 decimal places ecf from column $\frac{(O-E)^2}{E}$	
			$\chi^2 =$	6.85 (/6) ;	E	[3]

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Question	Expected answer	Extra guidance	Mark
(iii)	<i>idea of</i> : one less degree of freedom than the number of categories / AW ;	A there are two, types of data / types of offspring / phenotypes / rows / (sets of) observations / categories / (sets of) results / samples ignore any formula unqualified e.g. 2 – 1	[1]
(iv)	1 of: significant ; a factor other than chance is causing the deviation from the expected ratio ;	ignore references to probability A reverse argument A ecf on candidates calculated chi squared value R answers which: quantify significance. e.g. more / less significant qualify significance. e.g. 'there is a significant difference between the means' 'it is significant which improves reliability / accuracy / AW'	[max 1]
(v)	<i>Idea that</i> (the homozygous genotype) stops development / lethal gene / AW ;	 A any ref. to die during development / will not develop / ref. to specific possible defects e.g. abnormal spine, provided clear they kill <i>in utero</i> / gamete incompatibility R (gene) mutation R infertile 	[1]
		Total:	[10]