UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Advanced Subsidiary Level and GCE Advanced Level

MARK SCHEME for the May/June 2012 question paper

for the guidance of teachers

9700 BIOLOGY

9700/52 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.

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Mark scheme abbreviations:

;	separates marking points
/	alternative answers for the same point
R	reject
A	accept (for answers correctly cued by the question, or by extra guidance)
AW	alternative wording (where responses vary more than usual)
underline	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

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Question	Expected answer	Extra guidance	Mark
1 (a) (i)	*independent* : type / source of pollen ; *dependent :* number / number of chromosomes (in the embryo / seeds) ;	allow species **B** and **C** (pollen) do not allow: species unqualified do not allow amount	[2]
(ii)	idea of: the type / source of pollen on the stigma ;	allow independent variable do not allow: pollination unqualified	[1]
(b) (i)	ref. to: a suitable method of collecting pollen **and** transferring (to stigma) ;	*looking for a 'how' and a 'where'.* allow any method that would work e.g. brush / sticks / cotton wool buds or shaking anthers onto stigma, into bag containing the flower, into dish and then picking up on stigma. Ignore vacuum pumps and pollen traps.	[1]
(ii)	pollen or plant allergy / described allergic reaction **and** method of preventing pollen or plant contact ;	*method should relate to (b)(i) answer* e.g. wearing mask / doing pollen transfer in a fume cupboard / environmental chamber. wearing gloves or goggles for skin or eye irritation allow scalpels / knives if used to remove anthers and cutting on a tile / away from body / keeping blades covered	[1]

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(c)	max 5 of: 1. ref. germinating / growing seeds (to cause cell division) ; 2. ref. to using a region, showing cell division / mitosis / named example ; 3. ref. to a means of separating the cells / cutting sections / squashing; 4. ref. to staining / dying / (correct) named stain; 5. ref. to using microscope at high power / high magnification / × 400; 6. idea of: (counting) chromosomes at a named suitable stage of mitosis ; 7. ref. to (counting) several different embryos;	1. allow ref. to removing (whole or part of the) embryo 2. e.g. root tips / shoot tips / meristem / radicle / plumule do not allow: fruit 3. allow ref. of maceration / heating do not allow: centrifuging / grinding / scraping cells from an embryo 4. e.g. aceto-orcein, aceto-carmine, methylene blue do not allow iodine / ink / food dye / ninhydrin ignore glycerol; 5. allow any magnification from ×250 to ×1000 do not allow electron microscopes 6. e.g. anaphase or metaphase, allow prophase do not allow stages of meiosis	[max 5]
(d)	max 3 of: 1. cross **A** × **B** the chromosome number is a half the chromosome number of each parent ; 2. (due to) fusion of gametes with 6 chromosomes and gametes with 10 chromosomes ; 3. idea that, gametes / AW, are produced by meiosis **OR** idea that chromosome number is halved by meiosis ; 4. cross **A** × **C** the chromosome number is double the (expected) hybrid number / is tetraploid; 5. idea that mitosis (of the zygote / embryo) has involved non-disjunction / described;	1. looking for idea hybrid has half the total number of both parents together e.g. 6 plus 10 gives 16, the haploid number of the parents is the total of the hybrid 2. allow any idea that the gametes each contain half the chromosome number of the parents 3. allow: pollen / embryo sac / egg / sperm / AW do not allow : ovule / ovary / anther /stigma 4. do not allow polyploidy unless qualified e.g. 2 sets of chromosomes from each parent Allow 14 + 12 = 26 or 13 × 2 = 26 5. allow if non-disjunction is in gametes. This may also subsume mp3 if the answer refers to 'abnormal meiosis forming gametes' Allow marks on a fully annotated diagram.	[max 3]

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(e) (i)	***A** and **B*** – 8 / a variable number / any number between 0 and 16 **and** ***A** and **C*** – 13 ;	look for the idea that **A** × **B** will not be consistent number or cannot be predicted from the diploid number allow they will be the same (as the pollen)	[1]
(ii)	pollen of hybrid **A** × **B** has variable number of chromosomes ; pollen of hybrid **A** × **C** has the same (haploid) number ;	*ignore ref. to germination rates, although they can be a means of identifying each hybrid*	[2]
(f) (i)	mean = 46; mode = 48 **and** median = 46;	<table><tr><td>hybrid from the cross</td><td></td></tr><tr><td>Mean</td><td>**46;**</td></tr><tr><td>Mode</td><td>**48**</td></tr><tr><td>Median</td><td>**46;**</td></tr></table>	[2]
(ii)	comparing **means** (of two sets of data) / data is discrete / quantitative;	allow data is continuous / has a normal distribution. do not allow data is a continuous variable / continuous variation	[1]
(iii)	idea of: there is no <u>significant</u> difference in the (percentage) germination (of the two hybrids) ;	e.g. the difference in the germination (of the two hybrids) is <u>not significant</u> do not allow 'to find the difference'	[1]
(iv)	idea of: 11 sets of data – 1 in each group;	allow as a formula (11 – 1) + (11 – 1) / 22 – 2 = 20 not $(n_1 – 1) + (n_2 – 1) = 20$ unless 'n' is specified	[1]
		Total:	**21**

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2 (a) (i)	max 3 of: 1. same tissue surface area / mass / number / size of discs ; 2. ion / chloride content of water <u>at start</u> is zero / the same; 3. volume of water in all tubes <u>is the same</u> / 30 cm^3; 4. time for testing (30 min) <u>is the same</u> ; 5. same electrode;	*Looking for what has been done, rather than what should be done. If answer as what should be done, penalise once only.* 1. allow tissue from same plant / same tissue of plant. do not allow amount of tissue 3. allow if refer to water bath all having same volume	[max 3]
(ii)	idea of replicates; min of 3, to obtain a mean / identify anomalous results;	allow repeats, ignore replicated readings allow average for mean, outliers for anomalous	[2]
(b) (i)	chloride (ions) divided by time;	allow as a formula: <u>chloride (ions) at 30 min</u> or <u>chloride (ions)</u> 30 time allow concentration / amount / reading of the electrode do not allow volumes	[1]
(ii)	(rate at 50 °C =)14 (au) **and** (rate 60 °C =) 56 (au); increase in rate = <u>56</u> (au) = 4 ; 14	allow 400%	[2]
(c)	the rate of loss would increase;	allow: all the tubes would have the same result ignore any explanations of the prediction	[1]
		Total:	**9**

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