CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Advanced Subsidiary Level and GCE Advanced Level

MARK SCHEME for the May/June 2013 series

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.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge will not enter into discussions about these mark schemes.

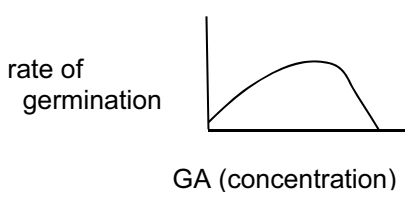
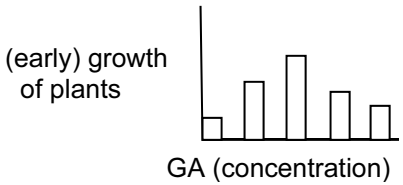
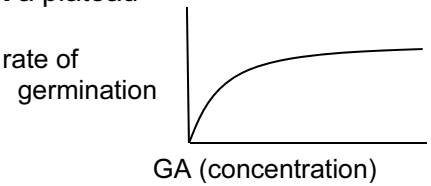
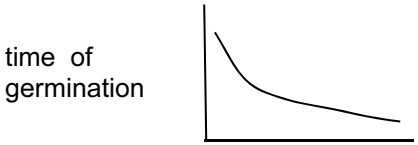
Cambridge is publishing the mark schemes for the May/June 2013 series for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level components and some Ordinary Level components.

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Mark schemes abbreviations:

;	separates marking points
/	alternatives answers for the same point
R	do not allow
A	allow (for answers correctly cued by the question, or guidance for examiners)
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
ecf	error carried forward

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Question	Expected answer	Extra guidance	Mark	AO
1 (a)	axes correctly orientated **;** line graph showing rise and fall / as concentration increases **;**  	*x*-axis concentration of GA, *y*-axis length / mass / size of young plant. *units not needed* **A** rate of germination / early growth **A** lines that start and / or end at origin **A** lines that start away from *y*-axis **A** bar charts. **A** charts with no bar at zero **A** a plateau  **A** time if germination as *y*-axis 	[2]	P
(b) (i)	*independent*: <u>concentration</u> of GA : *dependent:* ref. suitable dimension of young plant / time of emergence of suitable structure **;**	e.g. mass / length of shoots / length of roots / length of young plant **A** time taken for 'testa' to split	[2]	P

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Question	Expected answer	Extra guidance	Mark	AO
(ii)	7 of: *independent variable:* 1. ref. to a method of diluting the (3 mmol dm^{-3}) GA to give a minimum of (any) five dilutions **;**	**A** *fruits, seeds for barley grains in any answer* 1. 0 and original (3 mmol dm^{-3} dm^{-3}) can be included in the number of dilutions, allow original by implication **A** serial / series / simple / proportional dilution as a method or a description or a formula		
	2. ref.to concentrations (other than 0) that fall in the range 3 mmol dm^{-3} to any value above 0 with units (μmol dm^{-3} / mmol dm^{-3} / g dm^{-3})	2. minimum of 2 stated values that are not higher than 3 mmol and are above 0 maximum 3000 μmo dm^{-3} / 1 g dm^{-3} 1 mmol dm^{-3} = 1000 μmol dm^{-3} / water 1 μmol dm^{-3} = 0.001 mmol dm^{-3}		
	3. ref. to soaking grains (in GA solutions) for min 24 hours / max 72 hours **;**	3. If pre-soaked in water for 24 hour and then in GA, must be **minimum** of 1 hour GA		
	4. ref. to (removing from GA and) growing in soil / suitable containers on paper /cotton wool **and** kept dark **;**	4. **A** other planting media e.g. compost, vermiculite, sand. **R** if kept immersed in water or GA		
	5. ref. to one stated (germination) temperature **;**	5. any one temperature in the range 15–20°C. Must be **one** number with units. *ignore* room temperature		
	6. ref. to a **control** using seeds soaked in water **;**	6 **A** a description of a control e.g. to compare with the seeds in GA		

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	dependent variable 7. ref. to a suitable method of measuring young plant **;**	7. e.g. mass **with** balance / scales / weighing machine length of shoot / length of roots **with** callipers / ruler (*ignore* metre ruler) **A** micrometer / eyepiece graticule **A** *idea of:* checking at specified time and / or daily for a stated first indication of germination **with** timer e.g. root /shoot to appear. **Or** record number of days taken for specific number of seeds to germinate in each dish		
	standardising variables ***(max 3, mp 8–12)****:* 8. ref. to using same / stated number of barley grains for each concentration **;**	8. must be more than one grain. *ignore* same size / amount. **A** quantity		
	9. ref. to suitable stated / same volume of each soaking solution / GA **;**	9. **A** *idea of:* being submerged / covered.		
	10. ref. to method of maintaining the germination temperature **;**	10. e.g. incubator, temperature-controlled room environment / environmental chamber / propagator. **A** water-bath / thermostat, *ignore* air conditioning		
	11. ref. to leaving for stated number of days (for germination / growth) **;**	11. any value in the range 3 - 20 days		
	12. ref. to (regularly) adding stated / same volume of water **;**	12. *ignore* any unrealistic value *ignore ref. to:* nutrients		
	safety: 13. ref. to low risk investigation / hazard and suitable safety precaution **;**	13. e.g. cutting away from hands / using tile for cutting. *ignore* gloves for cutting. GA irritant and gloves / eye protection **A** allergy and wearing gloves / mask/ eye protection **R** no risk		
	reliability 14. ref. to replicates and mean / to identify or eliminate anomalies **;**	14. must be a minimum of 3 (data sets), allow as original and 2 more / several **A** outliers for anomalies	[7]	M

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(c) (i)	(mean) **experimental /treated** - (mean)**control / untreated** (mean) **untreated** / **control** plants **;** × 100 **;**	**R** final – initial **A** *for denominator:* subtraction in either direction , 'difference between the treated and untreated.	[2]	D
(ii)	*idea of:* making comparisons **;** *idea that:* the control is a base line for the growth of embryos with endogenous GA **;**	*ignore* any ref. to reliability / accuracy / fair test **A** in the context of 'seeing the effect of extra GA ' / taking the 'normal GA into account'	[2]	D
(d) (i)	growth (of grains) gives a normal distribution / means of two sets of plants are being compared **;**	**R** continuous variable **A** data is not categoric / is continuous data	[1]	D
(ii)	*idea of:* there is no significant difference in between 'x' in the plants from untreated / control barley and treated / experimental barley **;** 'x' can be size / length / mass/ rate of growth / percentage growth / germination (rate) / time taken for germination, AW	**R** if 'percentage difference is in the answer' **A** the difference in 'x' is due chance	[1]	D
		Total	[17]	

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Question	Expected answer	Extra guidance	Mark	AO
2 (a)	any ref. to oxygen / O_2 ;	must be correct formula if used. *ignore* air	[1]	P
(b)	1. *pH constant*: as variation in pH changes enzymes activity / growth (rate) of cells ; 2. *sterile:* so no other organisms competing **or** chemicals from other organisms may effect results **or** only measuring one organism ; 3. *Steady slow stirring:* ensures (named) nutrient /oxygen / heat/ waste / (bacterial) cells evenly distributed (so growth rate same) ;	**A** *idea that:* pH may denature enzymes / kill cells *ignore* impurities / foreign bodies **A** 'stop bacteria clumping ' *ignore* damage to bacteria	[3]	E
(c)	*3 of*: 1. ref. to diluting the sample ; 2. ref. to a uniform sample ; 3. ref. counting cells ; 4. ref. to any systematic counting process ; *2 of:* 5. ref. to grid volume 0.2 mm × 0.2 mm × 0.1 mm / 0.004 mm^3 / 4×10^{-3} mm^3 ; 6. ref. to dividing the number of cells by the grid volume ; 7. × 1000 (and dilution factor) **or** multiply number of cells by 250 000 **or** by $\frac{1}{0.0004}$	**A** *any point using the number of cells in the Fig 2.1 (10, 16, 17 not 22)* 2. e.g. shaking / stirring (before being counted) 4. e.g. exclusions e.g. omit top and LHS on lines / only squares at corners and middle of grid 5. **A** 4×10^{-6} cm^3 *ignore* other grid volumes **A ecf** for other grid volumes e.g. 0.05 × 0.05 × 0.1 **A** 6 and 7 from a general formula e.g. $\frac{\text{number of cell}}{0.004} \times 1000$ **or** $\frac{\text{number of cells}}{4 \times 10^{-6}}$	[3] [2]	M D
(d)	no indication of replicates / only one set of data ;	*ignore ref. to:* no means / standard deviation / statistical tests	[1]	E

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Question	Expected answer	Extra guidance	Mark	AO
(e)	3 of : 1. statement of time when oxygen / air was introduced **;** 2. using (mainly) anaerobic (respiration) up to 220 min / after 220 min (mainly) aerobic (respiration) **;** 3. <u>little</u> energy release / ATP from anaerobic respiration so slow increase in population (of bacteria) **;** **or** <u>large</u> energy release /ATP from aerobic respiration so fast increase in population (of bacteria) **;** 4. (population growth rate) slows down with time as nutrient runs out / waste builds up **;**	1. e.g. between 220 and 250 min, or a stated value between these two times 3. if refer to growth, must be related to the population of bacteria **not** the bacteria cell **R** if energy is produced	[3]	C
		Total:	[13]	

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