Cambridge Assessment International Education

Cambridge International AS & A Level

BIOLOGY **9700/51**

Paper 5 Planning Analysis and Evaluation **October/November 2020**

MARK SCHEME

Maximum Mark: 30

Published

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Examples of how to apply the list rule
State **three** reasons…. [3]

A

1. Correct	✓	**2**
2. Correct	✓	
3. Wrong	×	

B **(4 responses)**

1. Correct, Correct	✓, ✓	**3**
2. Correct	✓	
3. Wrong	ignore	

C **(4 responses)**

1. Correct	✓	**2**
2. Correct, Wrong	✓, ×	
3. Correct	ignore	

D **(4 responses)**

1. Correct	✓	**2**
2. Correct, CON (of 2.)	×, (discount 2)	
3. Correct	✓	

E **(4 responses)**

1. Correct	✓	**3**
2. Correct	✓	
3. Correct, Wrong	✓	

F **(4 responses)**

1. Correct	✓	**2**
2. Correct	✓	
3. Correct CON (of 3.)	× (discount 3)	

G **(5 responses)**

1. Correct	✓	**3**
2. Correct	✓	
3. Correct Correct CON (of 4.)	✓ ignore ignore	

H **(4 responses)**

1. Correct	✓	**2**
2. Correct	×	
3. CON (of 2.) Correct	(discount 2) ✓	

I **(4 responses)**

1. Correct	✓	**2**
2. Correct	×	
3. Correct CON (of 2.)	✓ (discount 2)	

Mark scheme abbreviations

;	separates marking points
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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 accepted)
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Question	Answer	Marks
1(a)(i)	*independent* concentration / molarity, of sucrose (solution) **;** *dependent* change in mass / AW **;**	**2**
1(a)(ii)	1 five stated concentrations **and** units (from 1.0 mol dm^{-3} downwards **;** 2 *idea of* evenly spaced **;** 3 method for dilution shown for at least 2 intermediates **;**	**3**

Question	Answer	Marks
1(b)	*any **six** from:* 1 *idea of* tissue cut to (approximately) same / equal / AW, size / mass **;** 2 tissue taken from the same, pepper / age of pepper / state of pepper **;** 3 set up containers / named containers, containing different sucrose concentrations **;** 4 same / stated, volume of sucrose solution **or** enough (sucrose solution) to, cover / immerse, the tissue **;** 5 covering container (to prevent evaporation) **;** 6 leaving tissue (in solution) for same time **;** 7 method of maintaining a constant temperature **;** 8 mass of tissue measured / recorded, before **and** after immersion **;** 9 tissue dried (with paper towel / AW) before weighing **;** 10 minimum of 3 repeats **and** calculate mean **;** 11 low risk **or** medium risk qualified **;**	**6**
1(c)(i)	$\frac{\text{final mass} - \text{initial mass}}{\text{initial mass}} \times 100$ *1 of:* (initial) masses, are / maybe, variable / not the same **;** allows qualified comparisons to be made (between masses) **;**	**2**

Question	Answer	Marks
1(c)(ii)	1 x-axis labelled **and** unit **;** 2 line crosses *x*-axis (only once) **and** trend downwards (from left to right) **;** 3 *idea of* indication that interception on the *x*-axis shows water potential **;**	**3**
1(d)(i)	–860kPa **;**	**1**
1(d)(ii)	*any **three** from:* *all idea that* 1 difficult to, place / release, drop at same point in solution **;** 2 judgement (of position of drop) by eye / method 2, is, subjective / qualitative / subject to human error **;** 3 measurement of mass / method 1, is, objective / quantitative **;** 4 method 1 can (more easily) plot a graph (to estimate water potential) **;** 5 drop might disperse / disintegrate / is unstable /AW **;** 6 method 2 does not take into account different masses of tissue (before initial soaking) **;** 7 importance of mixing solution once tissue removed in method 2 **;** 8 method 2 has not been repeated **;**	**3**

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Question	Answer	Marks
2(a)(i)	*any **three** from:* 1 length of transect **;** 2 sampling intervals / AW (on transect) **;** 3 *idea of* orientation / aspect / AW of, line / transect **;** 4 time of year / season / AW, (of sampling) **;** 5 number of sampling points on each line / transect **;** 6 size of sampling area / quadrat, (at the sampling point) **;** 7 number of (line) transects **;** 8 location of transect (in study area) / AW **;**	**3**
2(a)(ii)	*idea of* use of, random numbers / coordinates **;**	**1**
2(b)	*(identify all the plant species present and)* count, number of individuals / population, of each (plant) species (n) **;**	**1**
2(c)	185.7 / 186 (%) **;**	**1**

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Question	Answer	Marks
2(d)	*any **four** from:* max 3 *for supports **and** p value statement* *supports* 1 *idea that* there is a, correlation / relationship, between increase in red quinine ground cover and loss of ground cover of other species (1998 – 2003/5) **;** 2 *idea of* as ground cover of red quinine increases, (ground cover of) other species decreases (1998 – 2003/5) **;** 3 as cover of red quinine increases, cover of, bare ground / no plants, increases (1998 – 2003/5) **;** 4 there is a, large / AW, decrease in, biodiversity / species diversity, between 1998 and, 2003/5, (when red quinine cover increased) **;** 5 there is, little difference / AW, in biodiversity / species diversity, between 2003 and 2005 (when quinine cover does not change) **;** 6 correct data quote to support argument **;** *correct use of p value award unlinked to support / not support* 7. correct use of p = < 0.001 with regards to significance (1998 – 2003) **;** 8. correct use of p = > 0.05 with regards to significance (2003 – 2005) **;** *at least 1 of:* *does not support* 9 no causal relationship demonstrated **;** 10 no data on animal species diversity **;** 11 no data on ecosystem / habitat / genetic biodiversity **;**	**4**

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D **(4 responses)**

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2. Correct, CON (of 2.)	×, (discount 2)	
3. Correct	✓	

E **(4 responses)**

1. Correct	✓	**3**
2. Correct	✓	
3. Correct, Wrong	✓	

F **(4 responses)**

1. Correct	✓	**2**
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G **(5 responses)**

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Question	Answer	Marks
1(a)	*idea that* (cortex / pith / cells) are turgid / contain water **and** enlarge / contain water **and** expand ; *idea that* cuticle is waterproof / reduces, water loss / transpiration **or** epidermal cells do not expand (as much) ; *idea of* vascular tissue / xylem, provides mechanical support / strength ;	**2**
1(b)(i)	five stated concentrations with units ; reasonably evenly spaced ; method for proportional dilution for **minimum** two intermediate concentrations to produce total of 50 cm^3 ;	**3**
1(b)(ii)	*independent variable:* sucrose concentration / molarity ; *dependent variable:* *idea of* (degree of / angle of) curvature / bending (of the strip) ;	**2**

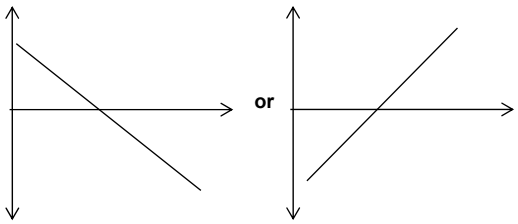
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Question	Answer	Marks
1(b)(iii)	*any **seven** from:* 1 strips same length / size ; 2 strips taken from same (type of) plant / stalk / species / age (of plant) ; 3 Petri dishes / containers, containing different sucrose concentrations ; 4 same / stated volume of sucrose solution / enough to cover the strips of stalk ; 5 strip(s) placed in different concentrations ; 6 cover container (to prevent evaporation) ; 7 (leave strips immersed for) same / stated, time ; 8 maintaining a constant temperature **and** a suitable method ; 9 record direction in which strip curved ; 10 measure / calculate (angle / degree of), curvature / bending ; 11 repeat experiment at least twice / three replicates, **and** finding mean ; 12 *ref. to* low risk ;	**7**

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Question	Answer	Marks
1(c)(i)	1 *x-axis* sucrose concentration **and** mol dm^{-3} **;** 2 *y-axis* degree / angle of curvature / bending **;** 3 line drawn crossing *x*-axis **once ;** 4 label identifying intersection (on *x*-axis) as water potential equivalent to the cells **;** e.g. degree angle of curvature  **or** sucrose concentration + mol dm^{-3}	**4**
1(c)(ii)	straight **or** no, curvature / bending **;**	**1**

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Question	Answer	Marks
2(a)(i)	*any **two** from:* to kill any remaining, weevils / insects ; *In context of treatment 3 compared to treatment 1:* to assess effect on scars / petiole length, caused by insecticide / AW ; *In context of treatment 3 compared to treatments 4,5,6:* to assess effect on scars / petiole length, caused by (added) weevils ;	**2**
2(a)(ii)	*treatment 2* to see if effect on scars / petiole length, is caused by (added) weevils ; *treatments 4, 5 and 6* to see how long the insecticide lasts ;	**2**
2(a)(iii)	shows, spread of data around the mean / variation in the results about the mean ; *any **one** from:* overlapping shows that there may be / is, **no** significant difference between the means ; no overlap shows that there may be a significant difference between means ;	**2**
2(a)(iv)	*any **one** from:* 1 treatments have little / no effect on the petiole length ; 2 treatments / insecticides reduce the number of the scars ; 3 weevils (only) cause scars when no insecticide is used / AW ; 4 insecticide kills weevils ; 5 insecticide remains effective for (at least) 3 weeks ;	**1**

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Question	Answer	Marks
2(b)(i)	Use of formula $\frac{a-b}{b} \times 100$; (increases by) 178 ;	2
2(b)(ii)	*any **one** from:* data has a normal distribution ; comparing (two) means ; continuous data ;	1
2(b)(iii)	*any **one** from:* number of plants sampled before **and** after treatment ; number of plants sprayed **and** not sprayed ; number of plants sampled, in each / both groups / experiments ;	1

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G **(5 responses)**

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1(a)(ii)	1 five stated concentrations **and** units (from 1.0 mol dm^{-3} downwards **;** 2 *idea of* evenly spaced **;** 3 method for dilution shown for at least 2 intermediates **;**	**3**

Question	Answer	Marks
1(b)	*any **six** from:* 1 *idea of* tissue cut to (approximately) same / equal / AW, size / mass **;** 2 tissue taken from the same, pepper / age of pepper / state of pepper **;** 3 set up containers / named containers, containing different sucrose concentrations **;** 4 same / stated, volume of sucrose solution **or** enough (sucrose solution) to, cover / immerse, the tissue **;** 5 covering container (to prevent evaporation) **;** 6 leaving tissue (in solution) for same time **;** 7 method of maintaining a constant temperature **;** 8 mass of tissue measured / recorded, before **and** after immersion **;** 9 tissue dried (with paper towel / AW) before weighing **;** 10 minimum of 3 repeats **and** calculate mean **;** 11 low risk **or** medium risk qualified **;**	**6**
1(c)(i)	$\frac{\text{final mass} - \text{initial mass}}{\text{initial mass}} \times 100$ *1 of:* (initial) masses, are / maybe, variable / not the same **;** allows qualified comparisons to be made (between masses) **;**	**2**

Question	Answer	Marks
1(c)(ii)	1 x-axis labelled **and** unit **;** 2 line crosses *x*-axis (only once) **and** trend downwards (from left to right) **;** 3 *idea of* indication that interception on the *x*-axis shows water potential **;**	**3**
1(d)(i)	–860kPa **;**	**1**
1(d)(ii)	*any **three** from:* *all idea that* 1 difficult to, place / release, drop at same point in solution **;** 2 judgement (of position of drop) by eye / method 2, is, subjective / qualitative / subject to human error **;** 3 measurement of mass / method 1, is, objective / quantitative **;** 4 method 1 can (more easily) plot a graph (to estimate water potential) **;** 5 drop might disperse / disintegrate / is unstable /AW **;** 6 method 2 does not take into account different masses of tissue (before initial soaking) **;** 7 importance of mixing solution once tissue removed in method 2 **;** 8 method 2 has not been repeated **;**	**3**

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Question	Answer	Marks
2(a)(i)	*any **three** from:* 1 length of transect **;** 2 sampling intervals / AW (on transect) **;** 3 *idea of* orientation / aspect / AW of, line / transect **;** 4 time of year / season / AW, (of sampling) **;** 5 number of sampling points on each line / transect **;** 6 size of sampling area / quadrat, (at the sampling point) **;** 7 number of (line) transects **;** 8 location of transect (in study area) / AW **;**	**3**
2(a)(ii)	*idea of* use of, random numbers / coordinates **;**	**1**
2(b)	*(identify all the plant species present and)* count, number of individuals / population, of each (plant) species (n) **;**	**1**
2(c)	185.7 / 186 (%) **;**	**1**

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Question	Answer	Marks
2(d)	*any **four** from:* max 3 *for supports **and** p value statement* *supports* 1 *idea that* there is a, correlation / relationship, between increase in red quinine ground cover and loss of ground cover of other species (1998 – 2003/5) **;** 2 *idea of* as ground cover of red quinine increases, (ground cover of) other species decreases (1998 – 2003/5) **;** 3 as cover of red quinine increases, cover of, bare ground / no plants, increases (1998 – 2003/5) **;** 4 there is a, large / AW, decrease in, biodiversity / species diversity, between 1998 and, 2003/5, (when red quinine cover increased) **;** 5 there is, little difference / AW, in biodiversity / species diversity, between 2003 and 2005 (when quinine cover does not change) **;** 6 correct data quote to support argument **;** *correct use of p value award unlinked to support / not support* 7. correct use of p = < 0.001 with regards to significance (1998 – 2003) **;** 8. correct use of p = > 0.05 with regards to significance (2003 – 2005) **;** *at least 1 of:* *does not support* 9 no causal relationship demonstrated **;** 10 no data on animal species diversity **;** 11 no data on ecosystem / habitat / genetic biodiversity **;**	**4**