Cambridge International AS & A Level

Cambridge Assessment International Education
Cambridge International Advanced Subsidiary and Advanced Level

BIOLOGY **9700/51**

Paper 5 Planning, Analysis and Evaluation **October/November 2019**

MARK SCHEME

Maximum Mark: 30

Published

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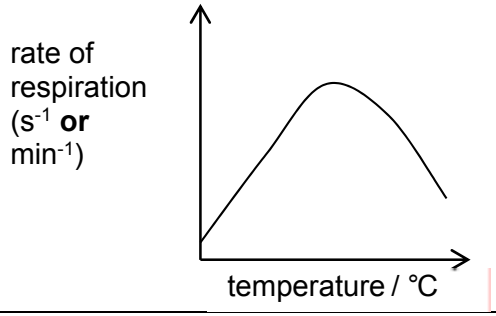
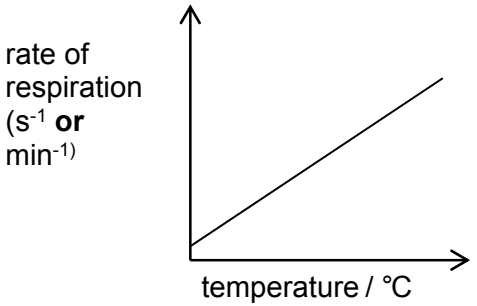
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Question	Answer	Marks
1(a)(i)	as temperature increases, the carbon dioxide increases / increases and then decreases/levels off / AW **;**	**1**
1(a)(ii)	*independent variable:* temperature **;** *dependent variable:* colour / pH **;**	**2**
1(a)(iii)	any 7 of: **1** *ref. to* setting up at least 5 water-baths at different temperatures **;** **2** *ref. to* a suitable range of temperatures with units **;** **3** same / stated / known, volume / concentration of hydrogencarbonate / indicator (solution) to each test-tube **;** **4** *ref. to* adding oxygen into indicator solution **;** **5** *ref. to* indicator starting at same colour or pH in all test-tubes **;** **6** *ref to* foil, mix, (immediately) start timing / mix, (immediately) foil, (immediately) start timing **;** **7** use same / stated / known, volume of *Chlorella* **;** **8** *ref. to* putting indicator and *Chlorella* in separate tubes in a water-bath to reach desired temperature / fixed time **;** **9** mix *Chlorella* and indicator and *ref. to* a specific end point to be measured **;** **10** (*ref. to* a control using), killed / boiled / dead, *Chlorella* (of same volume) **;** **11** (if time / pH) at least three replicates / repeats and finding mean (of time or pH) or identify / eliminate / remove anomalies **or** (if colour) *ref. to* using at least three replicates / repeats **;** **12** *ref. to* low risk **;**	**7**

Question	Answer	Marks
1(b)(i)	1 time (to reach standard colour / pH) **;**	**1**
1(b)(ii)	temperature on *x*-axis **;** labelled axis **and** units **;** appropriate curve for named axis **;** e.g.   	**3**
1(c)(i)	0.31 **;**	**1**
1(c)(ii)	there is no, (significant) correlation / relationship, between the cell density and the rate of carbon dioxide production **or** the correlation / relationship between cell density and the rate of carbon dioxide production is not significant **;**	**1**
1(c)(iii)	strong **;** positive correlation **;**	**2**

Question	Answer	Marks
1(c)(iv)	*any 2 of:* **1** correlation does not mean causation **;** **2** fewer than number of paired observations (recommended) for Pearson test **;** **3** no replicates / no repeats / only done experiment once **;** **4** only narrow range of cell densities **;** **5** bacteria / other microorganisms present that are respiring **;**	**2**

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<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
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Question	Answer	Marks
2(c)(i)	*any 3 of:* **1** probes / known DNA sequences attached to plate / slide / AW **;** **2** *ref. to* (probe) DNA is single stranded **;** **3** mRNA from resistant **and** non-resistant plants are extracted **;** **4** mRNA converted to cDNA **;** **5** cDNA / single strand of DNA (from samples) labelled with **different** colour (fluorescent) dyes (for resistant **and** non-resistant plants) **;** **6** cDNA / single strand of DNA (from sample), allowed to hybridise with probe / added to plates / added to probes **;** **7** fluorescence identifies presence of genes **;**	**3**
2(c)(ii)	3 : 1 **;**	**1**
2(c)(iii)	67 / 66.6 **;**	**1**
2(c)(iv)	at 24 hours, genes expressed more rapidly / more genes expressed, in resistant variety **compared** to non-resistant variety / **ora** **or** at 48 hours, less genes expressed, in resistant variety **compared** to non-resistant variety / **ora ;** number of genes expressed decreases in resistant variety as time increases **;**	**2**

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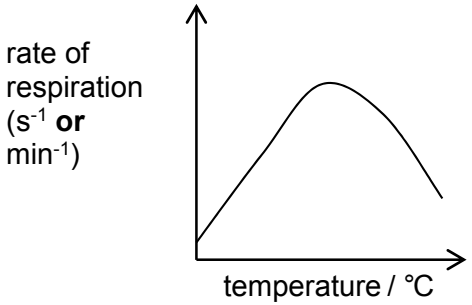
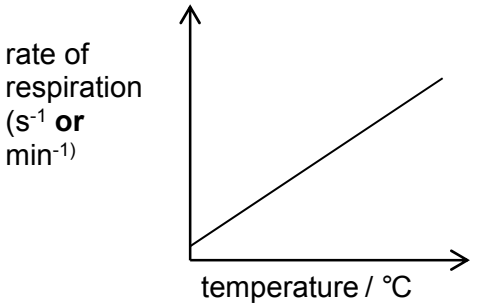
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Mark scheme abbreviations

;	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 accepted)
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

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Question	Answer	Marks
1(a)(i)	*independent:* mass / biomass, of yeast **;** **or** concentration of, yeast / suspension / culture **;** *dependent:* absorbance / colour (change / of indicator) **;**	**2**
1(a)(ii)	*any two of:* volume of water (added) / volume of yeast suspension **;** (same) indicator / TTC **;** (same) temperature **;** (same) time / period, of incubation **;** colorimeter zeroed **;**	**2**
1(a)(iii)	*one of:* *replace (live) yeast by:* boiled / dead / inactivated / AW, yeast (of the same mass) **;** sterile / inert / glass beads / AW, material (of same mass) **;**	**1**
1(a)(iv)	axes labelled *x* =, time / t, *y* =, absorbance / Ab **;** line to show absorbance shows an increase **;** **ecf** if axes inverted but shape (related to axes) correct = 1 **ecf** if axes wrong but shape correct (related to those axes) = 1	**2**

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Question	Answer	Marks
1(b)	*any seven of:* 1 same / stated / known, mass / volume (suspension), of each yeast (added to separate flasks) **;** 2 same / stated / known, concentration of, nutrient solution / glucose **;** 3 same / stated / known, volume of, nutrient solution / glucose **;** 4 *ref. to* method to maintain temperature **;** 5 suitable temperature in range 15 °C–80 °C **;** 6 *idea of* equilibration / bringing yeast suspension **and** nutrient solution, to temperature, before mixing **;** 7 add TTC / redox indicator, to yeast / yeast and nutrient mixture **;** 8 *time for recording absorbance* **either** record (absorbance) at, regular / stated, time intervals **or** leave for set time (if stated max = 1 hour) **and** record (absorbance) **;** 9 *ref. to* method of maintaining homogeneity (of yeast) **;** 10 *ref. to* method of maintaining oxygen concentration **;** 11 use (at least) 3 replicates / repeats **and** find mean **or** identify / eliminate / remove, anomalies **;** 12 *ref. to* low risk **;** **or** **A** named hazard and risk and precaution e.g. yeast **and** allergy **and** wear gloves / mask / goggles e.g. TTC **and** irritant **and** wear gloves / mask / goggles	**7**
1(c)(i)	i*dea of* how close the (sample) mean, is to the, true / population, mean **;**	**1**
1(c)(ii)	**either** 95% of, the / all / repeated, data, would be expected to lie within this range **;** **or** At 1 / 3 / 4, hours, the (sample) mean, was reliable / AW, because the, confidence intervals / CI, do not overlap **;**	**1**

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Question	Answer	Marks
1(c)(iii)i	*from the graph* / *Fig. 1.3* / *experiment 1* pH 6.0 gives the highest absorbance at 4 hours incubation **;** **or** *from the table* / *Table 1.1* / *experiment 2* at 30°C at pH 6 absorbance is highest **;** *from the graph* / *Fig. 1.3* / *experiment 1* the CI / (standard) error bars, (for pH 6), do not overlap (at 4 hours) **;** **or** *from the table* / *Table 1.1* / *experiment 2* standard errors / S_M, do not overlap (with other, temperatures / pHs) **;**	**2**

Question	Answer	Marks
2(a)(i)	plant nurseries = (–) 69 (%) **; ;**	**2**
2(a)(ii)	*descriptions of:* woodland **and** roadside, increase in number of cases, (over 2013–2015) ***or*** nurseries (**and** gardens) **and** farmland, decrease in number of cases (over 2013–2015) **;** *explanations as ideas of:* 1 (more) difficult to manage, 'wild' environments / woodland / roadside, **ora** ***or*** 2 as woodland and roadside, cover a large area / far from centres of habitation, so, many trees to get infected / hard to get access for management difficult to access, **ora** ***or*** 3 disease spreads (more) easily, in, dense woodland, **ora** **or** 4 ref to burying diseased trees could provide a reservoir of infection ***or*** 5 *idea of* number of reported findings have increased as awareness of ash dieback has spread / AW **;**	**2**

Question	Answer	Marks
2(b)(i)	complementary base pairing **;**	**1**
2(b)(ii)	*idea of* intensity / brightness, of, fluorescence / fluorescent dye / colour **or** difference in intensity of, fluorescence / fluorescent dye / colour, (between healthy and diseased samples) **;**	**1**
2(c)(i)	(these trees) are (likely to be) tolerant / resistant **or** (these trees could be) a source of, tolerance / resistance, genes / alleles / mRNA / DNA **or** *idea of* comparing non-diseased and diseased trees **;**	**1**
2(c)(ii)	*any two of:* multiple / several / many / 4, locations **;** varying ages **;** from differently sized populations **;** from, different countries / from across Europe **;** varying degree of damage / healthy and non-healthy, sampled **;** **A** description of a suitable, random / systematic, sampling technique for 1 mark *if no other mp awarded.*	**2**
2(c)(iii)	*any one of:* to allow (easier) comparison of data (from different sites) **;** to allow (easier) analysis (of results) **;** (easier) to plot, as graph / bar chart **;** *idea of* (bioinformatic) analysis will be carried out by a computer **;**	**1**
2(d)(i)	guanine / G **;**	**1**
2(d)(ii)	*idea of* (mutation causes) a change in, protein / polypeptide / enzyme, which changes, function / tolerance / resistance **or** (mutation causes) a change in, protein / polypeptide / enzyme, that allows the plant to, respond to infection / repair damage **or** (mutation causes) a change in, protein / polypeptide / enzyme, that prevents the pathogen from, entering / spreading in, the ash plants **;**	**1**

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