CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Advanced Subsidiary Level and GCE Advanced Level

MARK SCHEME for the October/November 2013 series

9700 BIOLOGY

9700/31 Paper 3 (Advanced Practical Skills 1), maximum raw mark 40

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Mark scheme abbreviations:

;	separates marking points
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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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1 (a) (i) at least three further concentrations made according to instructions
0.08 **+** 0.06 **+** 0.04 **+** (0.02);

correct volumes of ascorbic acid
(0.08) 16 **+** (0.06) 12 **+** (0.04) 8 **+** (0.02) 4;

total volumes made up 20; [3]

(ii) organised into table;

heading (column to left of data or top row) percent(age) or % concentration of ascorbic acid / **A** + (any column/row headed) time (/) s or sec(onds);

records results according to instructions i.e. for 0.10 + three further concentrations;

correct pattern of results records shortest time to end-point for highest concentration of A recorded;

records all results to whole numbers of seconds; [5]

(iii) cause of error + idea of error:

(independent)
range of concentrations **+** too narrow / not enough;

(dependent)
colour disappearance **+** not same or difficult to judge or varies or different;

timing **+** inaccurate as timing started when last piece put in;

(standardised)
size of agar piece / cutting **+** not same or varies or different;

agitating pieces of agar / ascorbic acid **+** not same or varies or different;

pieces of agar with stained side down or stick together **+** ascorbic acid not reaching indicator;

[max 2]

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(iv) (independent variable)
more or wider or different or larger or at least five different concentrations or gives five examples; **A** if no units **R** if incorrect units

(dependent variable)
use help or two people to record colour or video;
stagger start or do individually to prevent timing error;

(standardised variables)
cut agar block on graph paper or alternative method;
use electric or automatic shaker; [max 3]

(b) (i) line graph:
label on *x*-axis percent(age) ascorbic acid conc(entration /) % **+** label on *y*-axis vol(ume of) indicator (/) cm^3;

scale *x*-axis 0.2 to 2 cm labelled each 2 cm
+ *y*-axis 0.5 to 2 cm labelled each 2 cm;

correct plotting of five points as small cross or dot in circle;

ruled line of best fit through at least four plotted points **+** line less than 1 mm thick; [4]

(ii) shows clearly on graph with line or point on line;

estimate correct with reading at 0.86 cm^3 to 2 decimal places with %; [2]

[Total: 19]

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2 (a) (i) drawing and quality;

do not give mark for
- any shading
- any ruled lines
- smaller than 50 mm across widest dimension of largest enclosed area
- less than 3 lines

or any line
- is too thick
- has any feathery or dashed lines or gap in line
- has any overlaps;

no cells **+** correct quarter drawn;

layers of differing widths*;*

inner line drawn with indentations;

uses label line with label to muscle tissue; [5]

(ii) lumen; **+** presence of blood cells or AW or to ease flow or allow free movement of blood or less resistance;

thick (muscle) wall; **+** wall to withstand pressure or hold blood;

inner surface folded or crinkled or irregular **+** to allow tube to expand or widen or dilate; [max 2]

(b) (i) marks on blood cells counted in correct eighth;

shows number of whole cells counted multiplied by 8; [2]

(ii) correct measurement of line **r** + units mm;

correct answer for area to correct number of significant figures;

(measurement divided by 200)^2 × 3.14) [2]

(iii) shows number of blood cells (**(b)(i)**) divided by area (from **(b)(ii)**);

rounded to whole number for answer; [2]

(iv) as altitude / height increases (ascends) average number of red blood cells / rbc increases or rbc produced at faster rate;

as ascend / at altitude air is thin or less oxygen;

extra red blood cells help to supply enough oxygen to tissues or idea more oxygen carried; [3]

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(c) drawing and quality;

do not give mark
- any shading
- any ruled lines
- smaller than 20 mm across widest dimension of largest cell
- less than 4 enclosed areas

or any line
- is too thick
- has any feathery or dashed lines or gap in line
- has any overlaps;

draws only four whole cells + two of each type;

cells shown with correct relevant sizes;

(details of) nucleus different between two cells of one type of wbc (lobed nucleus in the two cells);

uses label line with label to one nucleus; [5]

[Total: 21]

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GCE Advanced Subsidiary Level and GCE Advanced Level

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9700 BIOLOGY

9700/33 Paper 3 (Advanced Practical Skills 1), maximum raw mark 40

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Expected answers

1 (a) (i) % concentration: 2 + 3 + 4;
(volume of milk:) 8 + 12 + 16 with (volume of water) 12 + 8 + 4; [2]

(ii) 5%; [1]

(iii) organised into table;
headings (top or to left of data) percentage concentration of triglycerides + (any column / row headed) time / seconds;
records results according to instructions, i.e. for 2, 3, 4, 5%;
correct pattern of results between first reading and last;
record all results as whole seconds; [5]

(iv) correct answer with units, s^{-1}; [1]

(v) replace milk / **M** with water / **W** or replace enzyme / **E** with water / **W**; [1]

(vi) one correct error such as difficult to judge end-point or equilibrate contents of all test-tubes; [1]

(b) (i) (*x*-axis) type of milk + (*y*-axis) time taken to reach end-point (/) seconds;

(*x*-axis) even bar widths up to 2 cm + (*y*-axis) 100 to 2 cm labelled each 2 cm except label at origin of 0;

correct plotting of each bar in order in the table with
- horizontal line
- ruled
- less than 1 mm;

bars, quality and labels:
- bars must have a space between
- all vertical bar lines drawn (including on axis if used), meet horizontal line, ruled lines,
- labels must be directly below correct bar or inside bar or shaded with key; [4]

(ii) fat concentration higher in evaporated milk (V) than in dried milk (D); [1]

(c) two correct variables identified;
correct description of how one variable standardized; [2]

[Total: 18]

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2 (a) (i) drawing and quality (LP of oleander leaf);
do not give mark if
- any shading
- drawn over print of question
- any ruled lines
- smaller than 60 mm at widest point on mid-rib
- less than 4 lines making up upper and lower epidermis

or if any part of the line
- is too thick
- has any feathery or dashed lines or gap in line
- has any overlaps;

no cells + at least 4 lines and an enclosed area + only part of wall;
wavy layer for lower mid-rib or detail of vascular bundle;
uses label line and label to epidermis; [4]

(ii) drawing and quality;
do not give mark if
- any shading
- drawn over print of question
- any ruled lines
- smaller than 40 mm across widest point of largest cell
- less than 4 enclosed areas

or if any outer lines of enclosed areas are
- too thick
- feathery or dashed or gap in line
- have overlaps

only four whole cells drawn + at least one cell touching one other vessel;
only four whole cells drawn + shape of cells appropriate to xylem vessels;
cells walls as double lines for all vessels + three lines where vessels touch;
uses label line and labels lumen; [5]

(b) (i) 0.2;
correct answer (0.126) to no more than 3 significant figures; [2]

(ii) marks the chloroplasts that were counted in the quarter shown;
multiplies the number of chloroplasts by 4;
shows number of chloroplasts divided by area from **(b) (i)**;
answer rounded to whole number; [4]

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2 (c) (i) mp1 organise as table with <u>three</u> columns or rows separated by lines + two columns headed <u>Fig. 2.3</u> and <u>Fig. 2.4</u> in any order + third column or row contains at least one feature;

mp	feature	Fig. 2.3	Fig. 2.4
mp2	**Q** / cilia	absent	present;
mp3	**R** / algae	absent	present;
mp4	**S** / vacuole	absent / few	present / many;
mp5	chloroplasts	present	absent;
mp6	cells	multicellular	unicellular;
mp7	shape	rectangular	oval / circular;
mp8	nucleus	absent	present;
mp9	contents	absent	present;

[max 5]

(ii) primary consumer or second trophic level;
engulfed green algae; [2]

[Total: 22]

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GCE Advanced Subsidiary Level and GCE Advanced Level

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9700 BIOLOGY

9700/34 Paper 3 (Advanced Practical Skills 2), maximum raw mark 40

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I	ignore

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1 (a) (i) reducing sugar or non-reducing sugar
or
named examples glucose, fructose, sucrose; [1]

(ii) vol(ume) of Benedict's;
temp(erature);
cm^3 or ml(s) + whole number or to 0.5, at least 1, up to 15 + (temperature of Benedict's waterbath) whole number or to 0.5 80 to 100; [3]

(iii) 'before' labelled above 'after';
do not give mark if both levels below the top of Visking tubing which contains **P** or if both levels drawn above Visking tubing; [2]

(iv) organised into table;
heading (column to left of data or top row) time (/) min(utes) + (any column / row headed) (observation of) colour (change) or time (to first colour change /) s(econds);
records results according to instructions; i.e. for 0, 5, 10, 15 minutes;
correct pattern of results between first reading and last;
records results for reducing sugar only (ignore non-reducing sugar);
recorded either as colour
can have only green or yellow or orange or red or brown or any combination; **I** *brick*
or
as whole numbers with units s or sec [5]

(v) reducing sugar(s); [1]

(vi)

idea of at 5 mins	*+ compared to end / 15 mins where*
no change or negative or more time to change or example of lower colours	change in colour or positive or less time to change or example of red or brown;

[1]

(vii) *idea that*
times would become closer together or about the same or no quicker / faster
or
more precipitate or more red or darker red
or
colour changes quicker; [1]

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(viii) mp1 (independent variable)
(using reducing sugars or named reducing sugar / glucose / standard solutions)
at least 5 sugar concentrations
or
at least five examples of concentrations;
mp2 (how made)
serial dilution or simple dilution or described method for making different concentrations;

mp3 (dependent variable)
idea of
compare results / colour of plant extracts / samples / unknown with known (standard) solutions; [3]

(b) (*x*-axis) type of fruit + (*y*-axis) percent(age) or % (of) sugar(s);

(*x*-axis) even bar widths up to 2 cm + (*y*-axis) 2.0 to 2 cm labelled each 2 cm except label at origin of 0;

correct plotting of each bar with
- horizontal line
- ruled;

bars + quality + labels;
- bars must have a space between
- all vertical bar lines drawn (including on axis if used), meet horizontal line, ruled lines not too thick
- any clear labels must be directly below correct bar or inside bar or shaded with key [4]

[Total: 21]

2 **(a)** drawing + quality (plan of stomach wall);
do not give mark if
- any shading
- drawn over print of question
- any ruled lines
- smaller than 50 mm at widest point on wall
- less than 4 lines or 3 lines and 1 enclosed area

or if any part of line
- is too thick
- has any feathery or dashed lines or gap in line
- has any overlaps

no cells + only part of wall;
smooth layer at top + lowest layer is thicker than all other layers;
uses label line and correct difference (e.g. lowest layer) thickest or folds; [4]

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(b) (i) correct measurement of line **Y**;
60 or 60.5 or 61 or 61.5 or 62 or 62.5 or 63
or
6(.0) or 6.05 or 6.1 or 6.15 or 6.2 or 6.25 or 6.3;

correct precision with mm or with cm;

shows length of **Y** divided by 310;

shows correct conversion of either (mm to μm) × 1000 or (cm to μm) × 10 000 [4]

(ii) feature + how this would increase absorption;
e.g. folds increase surface area [1]

(iii) mp1 organise as table with three columns or rows separated by lines + two columns headed **M1** / slide and Fig 2.1. in any order + third column or row contains at least one feature;

mp	feature	**M1** / slide	Fig 2.1
mp2	folds number or spacing	more or lots or many close together	few(er) or not many or about 2; further apart;
mp3	folds shape or length	thin(ner) or narrow(er) or long(er)	thick(er) or wide(r) or short(er);
mp4	(cell) packing or shape	close together long or thin(ner)	further apart round(er) or thick(er);
mp5	number of layers	more	less or none;
mp6	goblet cells / **X**	few(er) or no(ne) or absent	more or lots or yes or present;

[4]

(c) (i) correct label to goblet cell; [1]

(ii) drawing and quality;
do not give mark if
- any shading
- drawn over print of question
- any ruled lines
- smaller than 60 mm across widest point of largest cell
- less than 6 outer enclosed areas

or if any outer lines of enclosed areas are
- too thick
- feathery or dashed or gap in line
- have tails or overlaps

only three whole cells drawn + one goblet cell + drawn as single touching group;
(nucleus of cell below goblet cell) touches cell membrane adjacent to goblet cell + triangular area;
triangular area drawn under goblet cell;
uses label line and labels nucleus; [5]

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1 (a) (i) (labels under correct sequence of beakers)
correct halving 3 + 1.5 + 0.75 with % once;
transfers 20 from second beaker to third, third to fourth etc. + cm^3;
adds 20 (distilled) water to each beaker + cm^3; [3]

(ii) organised into a table;
heading (column to left of data or top row) percentage or % concentration of hydrogen peroxide or **H** + (any column / row headed) height or length of foam + mm;
records results according to instructions i.e. 4 concentrations with highest concentration first and lowest concentration is last;
correct pattern of results, records a value for 6% which is higher than any one of the other results;
only recorded the processed maximum height + values to whole mm or 0.1 cm; [5]

(iii) cause of error + idea of error:

bubbles / foam at top + not same or difficult to judge or varies or different;
tube + changes as held or not vertical or not the same;
holding / hand + may warm up tube or temperature changes;
test-tubes + different or vary or not same;
stirring + different or vary or not the same;
drops of detergent + different sizes / volumes / detergent sticks to the sides;
timing + different or vary or not the same / reaction started before timing; [max 2]

(iv) (independent variable)
at least five differerent concentrations of copper sulfate or gives five examples;
(how made)
serial dilution or simple dilution or method must match any examples of concentrations given in mp1,
do not give mark if stated concentrations cannot be made by the stated dilution method (e.g. serial dilution cannot make 20%, 30%, 40%, 50%, 60%)

any of the following:
same volume / concentration of hydrogen peroxide or example given
or
same volume of copper sulfate or example of a volume given
or
same volume / concentration of plant extract or example given; [3]

(b) (i) *line graph:*
label on *x*-axis time (/) s or sec(onds) + label on *y*-axis number of bubbles of oxygen released;
scale *x*-axis 50 to 2 cm labelled each 2 cm + *y*-axis 20 to 2 cm labelled each 2 cm;
correct plotting of five of the plotted points as small cross or dot in circle;
ruled lines through five plotted points for distilled water;
ruled lines must not be too thick [4]

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(ii) *(idea of)* binds or fits enzyme or active site
or
alters or changes the shape of the enzyme or active site or denatures enzyme;
H or substrate no longer fits active site or fewer or no Enzyme-Substrate Complexes / ESCs are formed or described;
inhibition or inhibitor; [3]

[Total: 20]

2 (a) (i) drawing and quality;

do not give mark for
- any shading
- any ruled lines
- smaller than 60 mm across widest dimension of largest enclosed area
- less than 2 lines for the upper epidermis and 2 lines for the lower epidermis

or if any line
- is too thick
- has feathery or dashed lines or gap in line
- has any overlaps;

no cells + at least 4 lines and one enclosed area + midrib with lamina each side;
convex top and bottom line across midrib;
third line under the upper epidermis (for palisade layer);
uses label line with label to vascular bundle; [5]

(ii) drawing and quality;

do not give mark for
- any shading
- any ruled lines
- smaller than 40 mm across widest dimension of largest cell
- less than 6 cells / enclosed areas

or if any line
- is too thick
- has any feathery or dashed lines or gap in line
- has any overlaps

draws only three palisade cells and three epidermal cells + as one group (all cells touch at least one other cell);
no more than one rectangular (palisade cell) + palisade cells should all touch an (epidermal) cell;
all cells must be drawn with double lines + three lines where cells touch;
uses label line with label to only one palisade cell. [5]

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(b) (i) 1 0.8;

2 2 or 2.0 or 2.01; [2]

(ii) marks on stomata that were counted in quarter;
show a whole number multiplied by 4 (only);
shows any whole number divided by answer from **2 (b) (i)**;
rounded to whole number for answer; [4]

(c) mp1 organise as table with three columns separated by lines or three rows separated by lines no cell lines needed + two columns headed Fig 2.3 and Fig 2.4 in any order + third column or row contains at least one feature;

Any two of:

mp	feature	Fig. 2.3	Fig. 2.4
mp2	number of stomata	more or example of a number closer packed / nearer /gap narrower / clustered	few(er) or example of a number;
mp 3	size of stomata or epidermal cells or guard cells	small(er)	large(r);
mp 4	shape of stomata	oval or slit or elongated	round(er) or circular;
mp 5	guard cell shape stomata or guard cells	oval or elongated (more) closed or fewer open	round(er) or circlular; (less) open or more open;
mp 6	epidermal cell shape or pattern of lines	very irregular or not clear folded	clear or angular or corners smoother;
mp 7	epidermal cell walls	thin(ner)	thick(er);

[max 4]

[Total: 20]

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1 (a) (i) **B** volume same as sample or **B** volume more than sample + temperature 80 °C to 100 °C; [1]

(ii) (labels under correct sequence of beakers)
(G2) 0.2%, + (G3) 0.1%, + (G4) 0.05%;
transfers 10 from second beaker to third, third to fourth + cm^3;
adds 10 cm^3 distilled water / **W** to each of three beakers; [3]

(iii) organised into table;
heading (column to left of data or top row) time (/) sec(onds) + (any column / row headed) percentage concentration of reducing sugar;
records results according to instructions i.e. for 0.4% and three other concentrations;
correct pattern of results: highest concentration shorter time than next concentration;
records all results as whole seconds; [5]

(iv) correct **E** has the shortest time;
correct % estimate for **E**; [2]

(v) use of iodine solution;
sampling at equal time intervals;
time until iodine remains same colour; [3]

(b) (i) label on *x*-axis <u>percentage of beads with iron sulfate</u> + label on *y*-axis <u>mass of (reducing sugar) produced / μ moles min^{-1}</u>;
(*x*-axis) 10 to 2 cm labelled each 2 cm + (*y*-axis) 20 to 2 cm labelled each 2 cm;
correct plotting of five points as small cross or dot in circle;
ruled lines through the 5 points; [4]

(ii) as % of beads with iron sulfate increases mass of reducing sugar decreases; [1]

(iii) iron sulfate inhibits reaction;
alters active site or binds to enzyme or fewer Enzyme-Substrate Complexes; [2]

[Total: 21]

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2 **(a)** drawing and quality;

do not give mark if
- any shading
- drawn over print of question
- any ruled lines
- smaller than 50 mm at widest point of wall
- less than 4 lines or 3 lines + 1 enclosed area

or if any part of line
- is too thick
- has any feathery or dashed lines or gap in line
- has any overlaps

no cells + only part of wall;
draws at least 6 lines or 5 lines + 1 enclosed area;
innermost layer thin + draws at least 6 lines or 5 lines + 1 enclosed area;
uses label line + labels lumen; [5]

(b) drawing and quality;

do not give mark if
- any shading
- drawn over print of question
- any ruled lines
- enclosed area smaller than 30 mm at widest point
- less than 4 enclosed areas

or if any part of line
- is too thick
- has any feathery or dashed lines or gap in line
- has any overlaps

at least 4 enclosed areas;
draws at least 4 nuclei;
draws at least 2 nuclei that are not circular or oval;
uses label line + labels nucleus; [5]

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(c) (i) correct measurement of **Y** (in mm 119 or 119.5 or 120 or 120.5 or 121 or cm 11.9(0) or 11.95 or 12(.0) or 12.05 or 12.1(0))
+ **Z** (in mm 16 or 16.5 or 17 or 17.5 or 18) or cm 1.6(0) or 1.65 or 1.7(0) or 1.75 or 1.8(0);
correct precision with mm or correct precision with cm;
shows ratio correctly; [3]

(ii) correct observable feature e.g. large lumen; [1]

(iii) mp1 organise as a table with three columns or rows separated by lines
+ two columns headings **N1** / slide and Fig 2.2 in any order
+ third column or row contains list of features;
mp2 includes at least one similarity;

mp	feature	N1 /slide	Fig. 2.2
mp3	lumen	present large	present large;
mp4	more than one tissue layer or thickness of wall or innermost layer	present or thick or thin	present or thick or thin;
mp5	(lumen) shape	rounded or 'C' 'U' shape or irregular or folded	oval or circular or regular or not folded;
mp6	cartilage / chondrocytes	present	absent;
mp7	ref. to layers e.g. number of layers e.g. air spaces	more 3 present	less 1 absent;
mp8	contents or valve or nucleus	nothing absent present	present present absent;
mp9	ref. to thickness of wall e.g. ratio of thickness of any wall to lumen e.g. outer wall (**Z**)	thinner or thicker	thicker or thinner;

[max 5]

[Total: 19]

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