**UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS**

**GCE Advanced Subsidiary Level and GCE Advanced Level**

# MARK SCHEME for the May/June 2007 question paper

## 9700 BIOLOGY

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

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.

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**1 (a)** Two from:
Pale yellow/orange/orange brown;
(all) starch broken down/hydrolysed;
no lead nitrate to inhibit enzyme; [max. 2]

**(b) (i)** Six from:
All data recorded in table;
Concentration of lead nitrate in first column/top row;
Column headings include concentration with percentage and colour;
At least three dilutions;
At least two readings for each solution;
Estimate of degree of blackness/differences in colour described;
Decrease in reaction with increasing lead nitrate/colour yellow/orange etc. to blue/black;
[max. 6]

**(ii)** Lead nitrate slows down the reaction/lead nitrate is an inhibitor; [1]

**(c) (i)** Buffer/named example; [1]

**(ii)** Two from:
Difficulty in judging colour;
Difficulty in having same time;
One example of inaccuracies in equipment/syringe;
Inaccuracies in preparing serial dilution; [max. 2]

**(d) (i)** Reading should have been lower/AVP;
Accept reading anomalous/not reliable unqualified [1]

**(ii)** (20+21+18)/3= 19.66666666etc.
should be 20 as only 2 sig. figs [1]

**(iii)** **O/A** orientation and axes labels
transmission/arbitrary units on *y*-axis, lead nitrate/% on *x*-axis; [1]

**S** scale data spans half of grid width and height, appropriate 1:10, 1:5, 1:2; [1]
R awkward scales such as 3:10, 7:10, 8:10
A scales not starting at 0

**P/L** accurate plots within 1mm/half square, using crosses or circle with dot and line points joined with straight ruled lines OR fine curve drawn through data points; [1]

R any extrapolation beyond first or last point, line of best fit

**(e)** As lead nitrate concentration increases the activity of amylase decreases; [1]

**(f)** IDEA that data does not support the student's hypothesis;
IDEA of enzyme becoming gradually denatured as lead nitrate concentration increases; [1]

**(g)** Accept improvements that would enhance the reliability or accuracy
Three in outline or one or two explained??

Three from:
measure volumes accurately; using pipette ? is excuse
keep at same pH, using buffer;
use more replicates/repeat more times at each concentration;
use wider range of concentrations/particular %'s suggested; [max. 3]

**[Total: 22]**

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**2 (a) (i)** *Ligustrum leaf*

Two from:
correct section recognisably drawn with correct orientation i.e. stomata at bottom;
proportions of layers correct i.e. palisade and mesophyll about 8/10 and epidermal layer less than 1/10;
vascular bundles shown; [max. 2]

**(ii)** Correct measurement of line shown on drawing to + or – 1 mm AND measurement of thickness of specimen 1 mm or less; [1]

Working shows measurement from drawing divided by measurement from slide; [1]

**(iii)** Their measurement from **(ii)** ± 0.2 and 0.5 mm; [1]

**(iv)** One from:
User not viewing at right angles;
Thickness of ruler lines;
Difficult to focus both ruler and specimen at same time; [max. 1]

**2 (b) (i)** Four at least:
At least half of area of available space used;
Two guard cells plus two epidermal cells;
Cuticle shown on epidermal cells;
Cells include cell walls;
Clear outline drawings, sharp pencil, no shading; [4. max]

**(ii)** Cells wider;
Cells deeper; [2]

**(c) (i)** Table used to present data;
R comparative lists

| | T1 | Fig 2.2 |
|---|---|---|
| Location | Lower surface,<br>None on upper surface, | Lower surface;<br>None on upper surface; |
| Stomata | Closed, | Open; |
| Guard cells | Shape box-like,<br>Level/below epidermis; | <br>Come above epidermis; |
| Air space | different shape, | Same shape; |
| spacing | More epidermal cells between stomata, | Next to each other/fewer epidermal cells between stomata; |
| Midrib/vein | No stomata, | No stomata; |
| position | Not in grooves/leaf flat/not sunk; | In grooves/inside rolled leaf/sunken?; |

[max. 4]

**(ii)** Stomata inside rolled leaf;
Hairs;
Leaf rolled;
Thick upper cuticle; [max. 2]

**[Total: 18]**

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# MARK SCHEME for the May/June 2007 question paper

## 9700 BIOLOGY

**9700/32** Paper 32 (Advanced Practical Skills 2), maximum raw mark 40

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**1 (a)** Description of Benedict's test that works; [1]
Reducing sugar present; [1]
But not much; [1]

**(b) (i)** All data recorded in a table; [1]
Table allows comparison between serial dilutions and fruit juice; [1]
At least two readings for each solution to check result; [1]
at least three different dilutions tested; [1]
one dilution greater than 0.2% and one less: [1]
column headings include concentration with units and colour; [1]

**(ii)** correct value/range for fruit juice concentration i.e. >0.1 and < 0.5; [1]

**(c) (i)** Volume of solutions measured and constant for each test
AND
Volume of Benedicts constant for each test; [1]
R Keep all volumes the same

**(ii)** **Two** from:
Inaccuracies in preparing solutions;
Difficulty in judging colour;
Time spent boiling; [1]

**(d)** *accept improvements that would enhance the reliability or accuracy of the experiment – three in outline or one or two explained – could be related to errors identified earlier or others*

**Three** from:
use more accurate measuring device e.g. colorimeter/compare colour chart;
method for measuring volumes more accurately;
use more replicates/repeat more times at each concentration of glucose;
use wider range of solutions at different concentrations;
alternative method proposed; [max. 3]

**(e) (i)** time for that pH should be much quicker/AVP (accept reading anomalous/not reliable unqualified) ; [1]

**(ii)** 9.6 with appropriate working shown; [1]
R more than two significant figures

**(iii)** independent variable (pH) on *x*-axis, dependent variable (mean time/min-1) on *y*-axis
AND axis labels appropriate (accept ecf from table if already penalised in **(b) (i)**); [1]
scale should be chosen so that data spans at least half of the width and height of the grid
AND scale appropriate such as 1:10, 1:5 or 1:2 (R awkward scales such as 3:10, 7:10, 8:10) (scale does not need to start at 0); [1]
data plotted accurately to within 1mm, using crosses or circle-with-dot
AND points joined with straight ruled lines OR fine curve drawn through the data points, not extrapolated beyond the first or last point; [1]

**(f)** at high and low pH reaction rate decreases
AND optimum/fastest reaction at pH 7 /AW; [1]

**(g)** IDEA OF at optimum pH or pH 7 the data supports the student's hypothesis
AND above and below pH7 the hypothesis is not supported; [1]
IDEA OF enzyme becoming gradually denatures at low and high pH; [1]

**[Total: 23]**

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**2 (a) (i)** root cap; [1]

area of mitosis correctly shown; [1]

**(ii)** Working shows number of micrometre divisions divided by number of eyepiece divisions; [1]

Diameter of specimen correct with units; [1]

**(iii)** their reported measurement ± 0.5 μ; [1]
(accept answers between ± 0.2 μ and ± 0.5 μ)

**(iv)** thickness of scale lines/matching the scales/AVP; [1]

**(b) (i)** table used to present data;
(R comparative lists without lines to divide information)
both similarities and differences;
vacuolation;
cells longer;
cells wider;
Nucleus same size; [max. 4]

**(ii)** Cells get longer; [1]
Absorb water; [1]

**(c)** **Five** from:
at least half of area of available space used to represent/describe the cells;
drawings/descriptions of cells including cell walls, and nuclear material;
two different stages represented with chromosomes;
some chromatids shown in 'spindle pulling apart' pattern;
accurate pattern of chromosomes;
drawing used to represent observations – clear outline drawings, sharp pencil and no shading; [max. 5]

**[Total: 17]**

**[Paper total: 40]**

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