UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Advanced Subsidiary Level and GCE Advanced Level

MARK SCHEME for the May/June 2008 question paper

9700 BIOLOGY

9700/05 Paper 5 (Planning, Analysis and Evaluation), maximum raw mark 30

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International Examinations

1 (a) (i) independent variable – amount/percentage/cover/of Fucus spiralis/seaweed/algae;
reject number

dependent variable – numbers of *Littorina littorea*/mollusc; [1]
ignore mean

(ii) two of:
ignore in all cases reference to means/climate/same beach/weather
mark the first answer on each line

ref. to size/use of same quadrat;

ref. to line/transect parallel to sea;

ref. to repeat lines/transects at same distance from the sea;
ignore ref. to experiment/it measurement/repeated

ref. to 20 sets/lots of data (per transect);
ref. to regular systematic placement (of quadrats);

allow description/every metre intervals [2]

(b) (i) answers must relate to specific data in the table
one of:
samples at 6 and 7/around the same value, have (3) molluscs;

sample at 16/0 cover, has molluscs;

percentage cover too high, should have molluscs;

does not fit a general correlation/does not follow trend, expect some molluscs/
this has 0 molluscs;

allow ref. to mean values rounded down to zero; [1]

(ii) *x*-axis – mean percentage/amount of *Fucus spiralis*/%; allow seaweed/algae
y-axis – mean number of *Littorina littorea*; allow mollusc [1]

Mark (iii) and (iv) together. Read the whole answer and look for two ideas. One idea that relates to the pattern of data and one idea that relates to the support/no support of hypothesis.

(iii)

(iv) **Route 1**
there may be no relationship/data is scattered;
does not support the hypothesis as there is no proportion/not a straight line relationship between the two species;

Route 2
there is a slight (positive)/partial correlation;
limited support for hypothesis as there a correlation/proportion at higher percentage cover/data quoted;

allow: **Route 3**
described pattern e.g. as steps/increases unevenly;
not supporting hypothesis as increase in cover is not necessarily followed by increase in *Littorina*; [2]

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(v) one of:
a suitable abiotic/position on beach factor;
(e.g. temperature/heat, exposure, desiccation/light/rocks/rock pools/
distance from sea/wave action/pollution)

a suitable biotic factor;
(e.g. predation/competition other species for food source/human activities AW) [1]

[Total: 8]

2 (a) (i) Look for what the candidate is going to do, not just that the variables are listed.
reference to eight of:

ref. to varying the independent variable:

1. suitable method of providing different concentrations of carbon dioxide;
   (e.g.(sodium) hydrogen carbonate/calcium carbonate/baking powder/
   gas cylinder/bubbler) allow HO_3^-
2. at least 5 concentrations of carbon dioxide;
3. ref. to measuring/maintaining each carbon dioxide concentration with the probe;

ref. to measuring dependent variable:

4. amount of gas produced in known time/time to collect a known amount of gas;

ref. to controlling *any 2* of the key variables:

5. method of standardising pond weed;
   (e.g. mass/length/same piece/same number of leaves/same species)
6. method of maintaining constant light intensity;
   (e.g. light fixed distance from plant) – no fixed time limit on light exposure
7. method of maintaining temperature;
   (e.g. water bath/insulator) allow – air conditioned room
8. method of standardising water;
   (e.g. same volume/removing gases by boiling)

ref. to *any 2* procedures of using apparatus:

9. use of pond weed and syringe;
   (e.g. cutting pond weed and inserting into syringe under water/solution)
10. time for equilibration of pond weed in different carbon dioxide concentrations;
11. working in a dark room/green illumination/enclosing apparatus in a box to eliminate any other light sources;
12. ref. to 3 sets of measurements and a mean/average

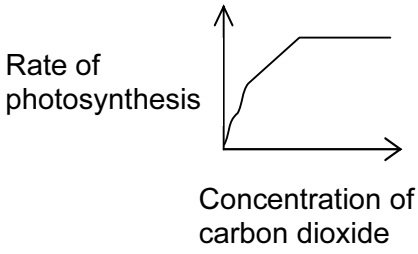
ref. to *any 1* safety issue and precaution:

13. idea of a low risk experiment;
14. ref. to potential risks;
    (e.g. electric shocks faulty equipment/wet wiring/handling chemicals/cutting pond weed and sensible precautions)

[8]

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(ii) graph axes correct orientation and labelled and shape of curve correct;



(photosynthesis) rate is proportional to carbon dioxide concentration/carbon dioxide is limiting at low concentration;

until another factor becomes <u>limiting</u> (at high concentration.);

(b) (i) volume of oxygen obtained by subtracting reading after adding oxygen absorbent from initial reading of syringe;

rate of photosynthesis = $\frac{\text{mass/volume of oxygen } (\text{cm}^3)}{\text{time (mins)}}$; reject amount

allow fixed volume oxygen, rate is 1 divided by time [2]

(ii) any one of:
water used to make solutions contains air; allow nitrogen
unused carbon dioxide gas from the solution;
plant contains air which may be given off with oxygen; allow nitrogen
air may remain in syringe when setting up the apparatus;
allow respiration of microorganisms produces carbon dioxide;
reject plants respire [1]

[Total: 14]

3 (a) (i) ref. to measuring (tubules/lumens/sections) with eyepiece graticules;

ref. to using stage micrometer and eyepiece graticule;
e.g.; calculating the number of eyepiece graticule units per stage micrometer unit
allow formula:
$\frac{\text{number of stage micrometer divisions}}{\text{number of eyepiece graticule units}} \times \text{value of 1 micrometer division}$ [2]

(ii) the spread of data around the mean/(data with) a narrow spread is more reliable than that with a wide spread;

allow with reference to data in table, e.g. tubule diameter is more reliable as spread of data/standard deviation is less [1]

(iii) significant difference/not due to chance AW;
because t > critical value (at 40 degrees of freedom/between 30 and 40 degrees of freedom); [2]

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(b) mark together – for maximum marks,

- look for one statement that supports validity or reliability
- one other statement that either supports or does not support validity or reliability

These can be awarded in the first part of the question.

- one statement that does not support either validity or reliability

This can only be awarded in the last part of the answer.

support for reliability:

1. sufficient measurements made;
2. two dimensions measured/reference to standard deviation;
3. all available types of tubule measured;

allow reverse arguments for 1 and 2 as marks for against reliability/validity

support for validity:

4. ref. to *t*-test;

allow ecf from **(b)(iii)** reject if linked to reliability

against either reliability or validity:

5. size of the columnar cells was not measured;
6. the brush border was not measured /not visible;
7. ref. idea of difficulties in measuring diameter accurately from sections;
8. ref. to difficulty in recognising types of tubules;
9. (student) assumes that the difference in diameter of the total wall is entirely due to columnar cells; [3]

[Total: 8]

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