UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Advanced Subsidiary Level and GCE Advanced Level

MARK SCHEME for the May/June 2007 question paper

9700 BIOLOGY

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

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.

All Examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes must be read in conjunction with the question papers and the report on the examination.

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1 (a) (i) axes correctly orientated, suitable scale, labels;
all plots correct;
histogram drawn/plots adjoining; [3]

(ii)

number of beans per pod (x)	3	4	5	6	7	8	Total
frequency (f)	4	18	28	37	8	5	n = **100**
fx	**12**	**72**	**140**	222	56	40	∑fx = **542**

[1]

(iii) mean = 5.42;
ignore rounding up if working correct, allow ecf from **(ii)** [1]

(iv) 1 of:
the spread of data around the mean;
the spread for this data is 5.42 ± 1.15;
reject: reliability/accuracy/significance context [1]

(v) standard error = $\frac{s}{\sqrt{n}} = \frac{1.15}{\sqrt{100}} = \frac{1.15}{10} = 0.115$;
allow round up to 0.12,
allow ecf for n, for n = 6, $S_M = 0.469$ [1]

(b) 1 of:
not all the ovules may have been fertilised;
exposed to different environment/example of an environmental difference
and ref. to seeds not growing/developing; [1]

[Total: 8]

2 (a) (i) Reference to 10 of:

1. known mass of invertebrate/invertebrate weighed; allow a reasonable value;
2. same mass of germinating seedlings; reject number
3. use seedlings before plumule emerged/if green, cover to keep out the light;
4. dye at end of capillary tube furthest from tube; allow ref. to moves to the left
5. must be airtight;
6. temperature constant;
7. ref. to safety of carbon dioxide absorbent and suitable method of protection;
8. ref. to time for organism to adjust;
9. ref. to closing clip before taking measurements;
10. measure distance moved by dye for standard time/measure time taken to move standard distance;
11. repeat (at least 3 times);
12. ref. to the idea of reset by releasing clip;
13. replace carbon dioxide absorbent between measurements;
14. calculate volume by measuring diameter capillary and multiplying by the length/distance moved;
15. named carbon dioxide absorbent used;

[10]

(ii) *Marks awarded for explanation related to any 1 of:*

germinating seeds faster –
growing (actively);
use more energy (for growth);

invertebrates faster –
moving around/muscles; allow more active
requires more energy (for contraction);

both the same –
seeds growing + invertebrates moving;
both processes use same amount of energy [2]

(b) (i) measure carbon dioxide produced, divide by oxygen consumed;
accept formula [1]

(ii) invertebrates using carbohydrate/glucose/glycogen/sugar;
reject starch
seeds using lipids/fatty acids/triglycerides; [2]

[Total: 15]

3 **(a)** 2 of:
quantity of substrate – same concentration/same volume;
temperature – use water bath;
allow other methods of maintaining temperature e.g. incubator
enzyme – same volume/number of immobilised balls;
flow rate through column – add at constant speed;
time – substrate in contact with enzyme same time;
pH – use a buffer [2]

(b) **(i)** 2 of:

	enzyme concentration				enzyme concentration			
	$0.2/gdm^{-3}$		$0.4/gdm^{-3}$		$0.2/gdm^{-3}$		$0.4/gdm^{-3}$	
	substrate conc. g/dm^3				product conc. g/dm^3			
	r 1	r 2	r 1	r 2	r 1	r 2	r 1	r 2
Student A	24	26	14	13	32	33	60	64
Student B	25	22	12	12	34	39	60	63
Student C	22	23	10	13	35	32	59	61
Student D	18	24	11	12	34	33	62	68
Student E	25	28	13	18	30	32	65	64

more than 2 given – all correct – allow both marks
mixture of right and wrong – wrongs cancel rights [2]

(c) **(i)** 1 of:
all results for product are approximately double;
the average product is approximately double;
allow reference to correct numbers
allow answers using substrate halving as enzyme doubles [1]

(ii) ref. to more repeats with an appropriate reason;
e.g. increase the certainty that the results are consistent/
so that anomalous results can be removed/permit variance from mean;
allow reference to taking a mean

extend range further, at least 3 equal increments/
example of range – at least 3 more (0.6, 0.8, 1.0) [2]

[Total: 7]