RECOGNISING ACHIEVEMENT

2806/03 Biology Practical Examination (A2)

June 2003

Mark Scheme

ADVICE TO EXAMINERS ON THE ANNOTATION OF SCRIPTS

1. Please ensure that you use the **final** version of the Mark Scheme.
   You are advised to destroy all draft versions.

2. Please mark all post-standardisation scripts in red ink. A tick (✓) should be used for each answer judged worthy of a mark. Ticks should be placed as close as possible to the point in the answer where the mark has been awarded. The number of ticks should be the same as the number of marks awarded. If two (or more) responses are required for one mark, use only one tick. Half marks (½) should never be used.

3. The following annotations may be used when marking. No comments should be written on scripts unless they relate directly to the mark scheme. Remember that scripts may be returned to Centres.

   x = incorrect response (errors may also be underlined)
   ^ = omission mark
   bod = benefit of the doubt (where professional judgement has been used)
   ecf = error carried forward (in consequential marking)
   con = contradiction (in cases where candidates contradict themselves in the same response)
   sf = error in the number of significant figures

4. The marks awarded for each part question should be indicated in the margin provided on the right hand side of the page. The mark total for each question should be ringed at the end of the question, on the right hand side. These totals should be added up to give the final total on the front of the paper.

5. In cases where candidates are required to give a specific number of answers, (e.g. 'give three reasons'), mark the first answer(s) given up to the total number required. Strike through the remainder. In specific cases where this rule cannot be applied, the exact procedure to be used is given in the mark scheme.

6. Correct answers to calculations should gain full credit even if no working is shown, unless otherwise indicated in the mark scheme. (An instruction on the paper to 'Show your working' is to help candidates, who may then gain partial credit even if their final answer is not correct.)

7. Strike through all blank spaces and/or pages in order to give a clear indication that the whole of the script has been considered.

8. An element of professional judgement is required in the marking of any written paper, and candidates may not use the exact words that appear in the mark scheme. If the science is correct and answers the question, then the mark(s) should normally be credited. If you are in doubt about the validity of any answer, contact your Team Leader/Principal Examiner for guidance.

Abbreviations, annotations and conventions used in the Mark Scheme	/	=	alternative and acceptable answers for the same marking point
	;	=	separates marking points
	NOT	=	answers which are not worthy of credit
	R	=	reject
	( )	=	words which are not essential to gain credit
	___	=	(underlining) key words which **must** be used to gain credit
	ecf	=	error carried forward
	AW	=	alternative wording
	A	=	accept
	ora	=	or reverse argument

Planning Exercise

The mark scheme for the planning exercise is set out on page 4. The marking points **A** to **U** follow the coursework descriptors for Skill P.

Indicate on the plans where the marking points are met by using a tick and an appropriate letter. There are 14 marking points for aspects of the plan and two marks for quality of written communication (QWC).

Pages 5 to 8 have the mark scheme for Questions 1 and 2 for the Practical Test.

A2 Biology. Planning exercise.

Checking Point	Descriptor	The candidate
A	P. 1a	Plans a suitable procedure that involves measuring rate of mass loss from batches of two different species over time**;**
B	P. 1a	Gives a prediction about different rates of mass loss / food utilisation (**A** null hypothesis)**;**
C	P. 1b	Selects appropriate equipment for carrying out investigation**;**
D	P. 1b	Selects seeds of named appropriate species**;**
E	P. 3a	Describes how to obtain dry mass readings**;**
F	P. 3a	Identifies **two** key factors to control e.g. temperature / watering regime / depth of planting / batch of seeds (**R** light intensity)**;**
G	P. 3a	States basis of possible differences between species e.g. food reserves / rate of respiration / type of germination**;**
H	P. 3b	Samples batches at reasonable and stated time intervals (minimum 12 hrs)**;**
I	P. 3b	Takes minimum 10 seeds of each species in each sample**;**
J	P. 5a	Uses appropriate (A2) scientific knowledge and understanding**;**
K	P. 5a	Uses results from preliminary work, previous practical work or identified secondary source in developing a plan**;**
L	P. 5a	Refers to safety aspect by stating hazard and precaution e.g. scalpels pointing away from body / allergies use gloves**;**
*M**	*P. 5b*	*Gives a clear account, logically presented with accurate use of scientific vocabulary (QWC)*;
N	P. 5b	States way of obtaining precise results by checking for constant mass when drying seeds**;**
O	P. 5b	Describes procedure to investigate possible differences between species e.g. food tests / respirometer**;**
P	P. 7a	Uses information from at least two identified sources, e.g. preliminary work / class practical / textbook / website etc**;**
Q	P. 7a	Shows how data are to be presented in form of a table / graph**;**
*R**	*P. 7a*	*Uses spelling, punctuation and grammar accurately (QWC)***;**
S	P. 7a	Explains how data collected would be used to calculate rate of mass loss, in appropriate units / percentages**;**
T	P. 7a	Explains how mass loss data will be correlated with possible differences**;**
U	P. 7b	Comments on precision or reliability with justification, e.g. cooling in desiccator to prevent water gain by seeds**;**

Point mark up to **14** by placing letters (A to U **excluding M and R**) in the margin at appropriate points.
Then award **1** mark for each of M and R (QWC). **Total: 16**

Question		Expected Answers	Marks
1	(a)	period of equilibration stated; count made for *stated* time period / time taken for *stated* no of bubbles; more than 1 minute / more than five bubbles; method for achieving standardised measurement e.g. bubble detaches; repeated readings;	**max 4**
		rate at 35 (±2)°C in bubbles per unit time;	**1**
	(b)	four other temperatures used; effective use of range (temperatures stated); flush with air between repeat readings; fresh sample at each temperature; use of constant temperature; method of achieving it stated e.g. water bath; equilibration period before *each* reading; same, volume / height of water, in test tube (to control pressure);	**max 7**
	(c)	appropriate format (informative, column/row, headings, no units in, columns/rows); table design (temperature in first column/row, more than two columns/rows, individual results if averages recorded); inclusion of 35 ±2 °C result; means included; correct trends in results with lower rate below 35 °C;	**5**
	(d)	*two* comments on *rate*;; reference to figures - both temperature and number of bubbles must be given; **A** e.g. at 10 °C no bubbles; reference to effect of temperature increasing reaction rate; e.g. more kinetic energy / more collisions / more enzyme-substrate complexes comment on closeness to expected trend; decrease at higher temperatures due to enzyme denaturation; **R** yeast denatures	**max 5**

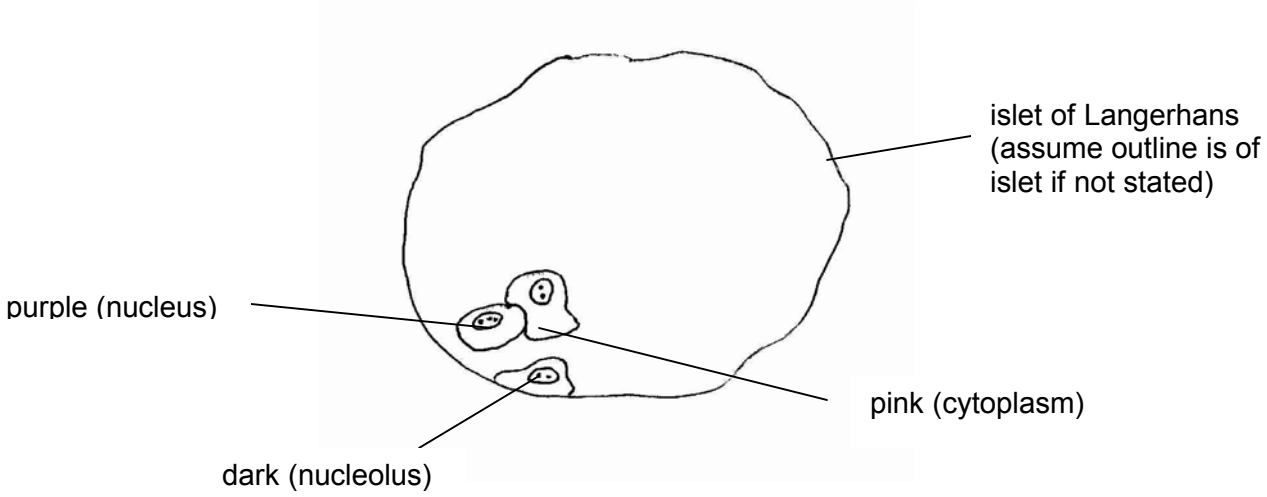
(e) glucose / yeast, concentration may differ with each fresh sample**;**
glucose concentration decreases (in syringe)**;** **A** substrate for glucose
oxygen concentration decreases (in syringe)**;**
carbon dioxide builds up**;**
pH decreases**;**
alcohol / ethanol, builds up**;**
difficulty in controlling temperature**;**
variation in bubble detachability / AW**;**
variation in bubble size**;** **max 5**

(f) increase, volume of glucose / ratio of glucose to yeast (to make glucose concentration non-limiting)**;**
increase volume of reaction container (to prevent, oxygen depletion / carbon dioxide build up)**;**
use buffers (to control pH)**;**
use a regulated water bath (to control temperature)**;**
measure, amount of / volumes of, gas evolved e.g. in a gas syringe**;**
R respirometer
plot graphs, cumulative no of bubbles / volume of CO_2 against time, at each temperature**;**
compare gradients**;**
repeats (more readings at each temperature)**;**
compare means using a named statistical test**;** **R** chi squared
take more temperature readings within the range**;**
greater range (below 10 ^{o}C and/or above 70 ^{o}C)**;** **max 7**

[Total: max 30]

Question		Expected Answers	Marks
2	(a)	different colour / paler; cells more loosely packed / capillaries present / AW; more obvious nuclei; more (prominent) nucleoli; an islet is bigger than the surrounding, acini / described;	max 2
	(b) (i)	*see drawing on page 8* *Drawing* cells drawn with irregular shapes; with large spaces between them; nuclei with 2 to 6 nucleoli; *Annotations* pale / pink, cytoplasm; dark / blue / purple, nucleus; dark nucleoli;	6
	(ii)	*either* spaces / blood vessels; for, hormone distribution / amino acid delivery / detect blood glucose concentration; *or* intracellular vesicles / AW; for hormone release; *or* large nuclei / prominent nucleoli; indicate secretory function;	2
	(c) (i)	chromosomes visible / chromatids visible / nucleus not visible; ref to chromosomes pairs / crossing over; different / named, stage(s) of division; diads or tetrads / described;	max 2
	(ii)	arrow anywhere in anther except central area (connective);	1
	(iii)	products are haploid (not diploid) / AW; genetically different (not identical) / AW;	2
			[Total: max 14]

(b) (i)


islet of Langerhans
(assume outline is of
islet if not stated)
purple (nucleus)
pink (cytoplasm)
dark (nucleolus)