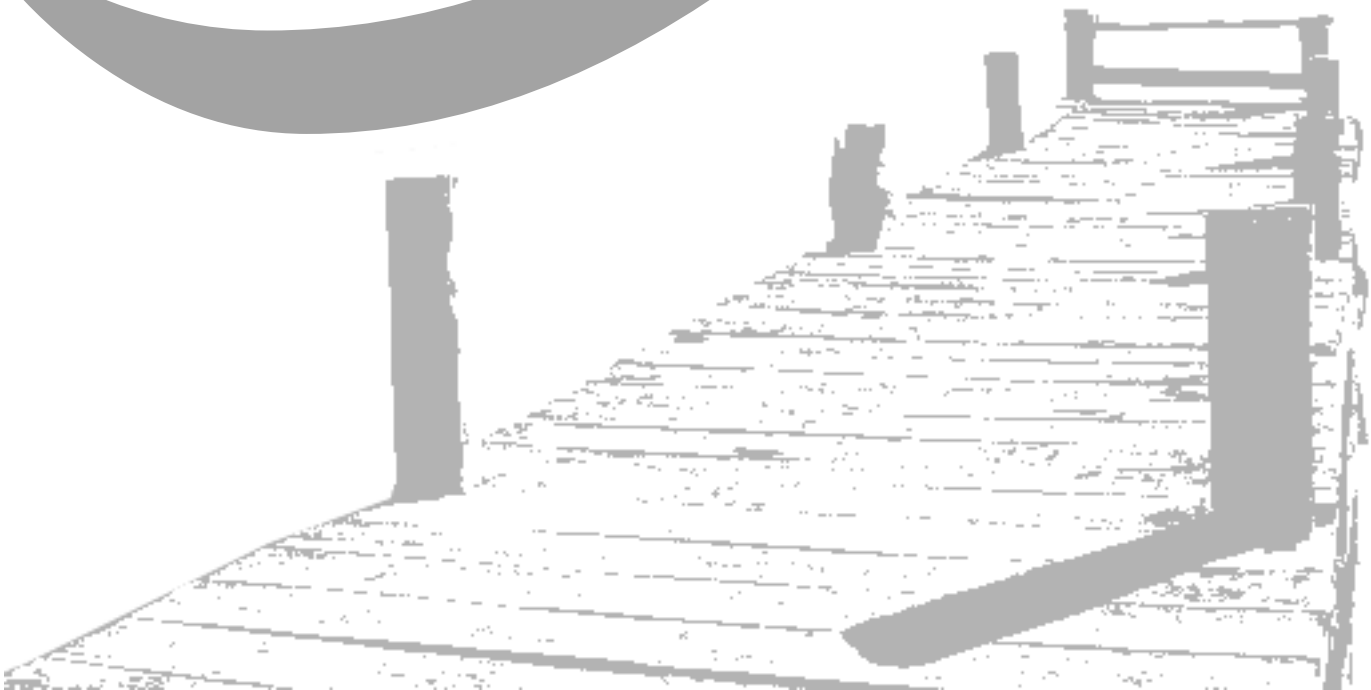
GCE
AS and A Level

Biology

AS exams 2009 onwards
A2 exams 2010 onwards

Unit 4:
Specimen mark scheme

Version 0.4



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ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Education

Biology

BIOL4 Populations and environment

Mark Scheme

Specimen Paper

Mark schemes are prepared by the Principal Examiner and considered, together with the relevant questions, by a panel of subject teachers. The specimen assessment materials are provided to give centres a reasonable idea of the general shape and character of the planned question papers and mark schemes in advance of the first operational exams.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of candidates' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

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*Although specific marks are not awarded in this unit, marks awarded will take into account the quality of written communication. Credit will only be awarded where candidates have presented information clearly and coherently and used the specialist vocabulary indicated in the mark scheme for this unit. Specific references to quality of written communication are marked **Q** in this mark scheme.*

Question 1

(a) Normal sight; 1

(b) **Nn;**
Must have at least one **N** allele as she has the condition and must pass on an **n** allele to her normal sighted children; 2

(c) Two marks for correct answer of ¼ / 0.25 / 25%;
One mark for incorrect answer that determines probability of next child having night blindness as ½ / 0.5 / 50%; 2 max

Total 5

Question 2

(a) (i) Some carbon dioxide will be produced in respiration;
Used in photosynthesis; 1 max

(i) Rate of increase of photosynthesis decreases/curve flattens;
Something other than carbon dioxide concentration/temperature/ Light becomes limiting; 2
(***Q*** *answers which describe the rate of photosynthesis decreasing should not be awarded credit)*

(b) Link establishes between carbon dioxide concentration, photosynthesis and yield of grain;
Link established between carbon dioxide and global warming;
As curve starting to flatten (at current carbon dioxide) concentrations
Increase in yield may not be very large;
Other factors/named factor linked to higher carbon dioxide concentration/ temperature might have adverse effect;
Harvest will be earlier as identified stages become shorter;
Although not significant as already at higher temperatures; 4 max

Total 7

Question 3

(a)	(i)	**F**;	1
	(ii)	**B**;	1
(b)	(i)	Conversion of nitrate to nitrogen; Use nitrate for respiration;	2
	(ii)	Denitrifying bacteria found in anaerobic conditions; Sandy soils contain more oxygen; *(**Q** Accept converse argument for clay soils but answer must relate to denitrifying bacteria)*	2
(c)	(i)	111 (kg ha^{-1})	1
	(ii)	Suggests that less fertiliser might be applied/parts above ground not required could be ploughed in;	1
			Total 8

Question 4

(a)	Glycolysis; Glucose and pyruvate/pyruvic acid;	2
(b)	Light-independent reaction; Ribulose bisphosphate/RuBP and carbon dioxide;	2
(c)	Light-independent reaction; Triose phosphate and glucose/hexose; *(**Q** Do not accept sugar or carbohydrate as alternative for glucose)*	2
		Total 6

Question 5

(a)	(i)	Two marks for correct answer of 1760 (seals per year) One mark for incorrect answer showing clear evidence of calculating rate by dividing number by time; *(**Q** Note that working mark cannot be awarded unless method is shown clearly and unambiguously)*	2
	(ii)	Fewer whales means more krill; More krill-feeding fish; More food for seals;	2 max
(b)		Data can be collected rapidly; Does not require defining individual plants;	2

(c) Change in species composition;
Greater area of bare ground;
Lower diversity; 3
*(**Q** Credit should not be given for imprecise answers relating to "plants". Final point requires specific reference to diversity)*

(d) Seals produce nitrogenous waste/urine/faeces;
Produces ammonium ions/nitrates by decomposition/nitrification; 2

Total 11

Question 6

(a) (i) Avoid bias/can only apply statistical test/Hardy-Weinberg expression to randomly collected data; 1

(ii) Give credit for any method which would ensure collection of a random sample from trees e.g. beating tray; 1
*(**Q** Note that specification does not require specific knowledge therefore the use of specific terminology such as "beating tray" is not required here.)*

(b) Two marks for correct answer of 49% red and 51% black;
One mark for incorrect answer in which p/frequency of black allele/B is Identified as 0.3 and q/frequency of black allele/B as 0.7; 2

(c) (i) Increase in the frequency of the red/b allele from autumn to spring/ in all years;
Therefore frequency of black/B allele decreased and fewer black ladybirds in spring; 2
*(**Q** The terms allele and gene must be used correctly but penalise only once)*

(ii) Black ladybirds would become more active so respiration rate increases;
Deplete food reserves; 2

Total 8

Question 7

(a) (i) Accurate means without error/free from mistakes when callipers used;
Reliable means that figure can be reproduced when measurement Repeated/show little variation about true value; 2

(ii) If data unreliable, there will be a wide range of values;
Large standard deviation;
The higher the figure on the top line of the equation, the greater The percentage measurement error; 2 max

(b) (i) Plot graph of mean skull breadth against mean cranial volume/ scatter diagram;
Draw line of best fit / calculate coefficient of correlation;
Look for figures close to +1 or -1; 2

(ii) Skull breadth is a linear measurements/can be measured with a single measurement/less prone to error/Cranial volume more difficult to measure because…; 1

(iii) Could distinguish between large male polecats and small female ferrets;
Little overlap in standard deviations;
Mean measurements for female polecats and male ferrets are very similar; 3

(c) Scientists could use method suggested/protocol established in earlier paper (thus saving time);
Findings more likely to be reliable if they replicate the findings of others; 2

(d) Some stomachs may contain more than one type of prey item; 1

(e) Unidentified bird remains small percentage of total prey/found in few stomachs;
Significant numbers of rabbits/rats eaten and these are pests; 2

Total 15

Question 8

(a) 1 Sample of ground beetles captured and counted (a);
2 Released and second sample captured;
3 Count total number of beetles (B) and number marked (b);
4 Total population (A) estimated from the relationship $\frac{a}{A} = \frac{b}{B}$;
5 Detail of method e.g. pitfall trap/marking with tippex;
6 Refinement to ensure greater accuracy e.g. large number/marking in position such that does not affect survival; 5 max

(b) 1 Mowing prevents growth of woody plants;
2 By cutting off growing point;
3 The longer the interval between mowing, the further succession can progress;
4 With frequent mowing diversity of plants will be less;
5 Fewer insect inhabitants/niches available; 5

*(**Q** Since this is an ecological question, use of appropriate ecological terminology is expected. Credit such terms as producer, consumer, habitat, and niche. Do not credit inappropriate terminology such as "places" to live and "fighting for food".)*

(c) 1 Higher carbon dioxide concentration at night/during darkness;
2 Photosynthesis only takes place during light;
3 Photosynthesis removes carbon dioxide and respiration adds carbon dioxide;
4 Respiration taking place throughout 24 hours;
5 Quantitative consideration such as that in plants overall photosynthetic rate greater than respiration rate;
6 Human effect such as additional carbon dioxide from heavy daytime traffic/street lighting could prolong photosynthesis; 5 max

Total 15