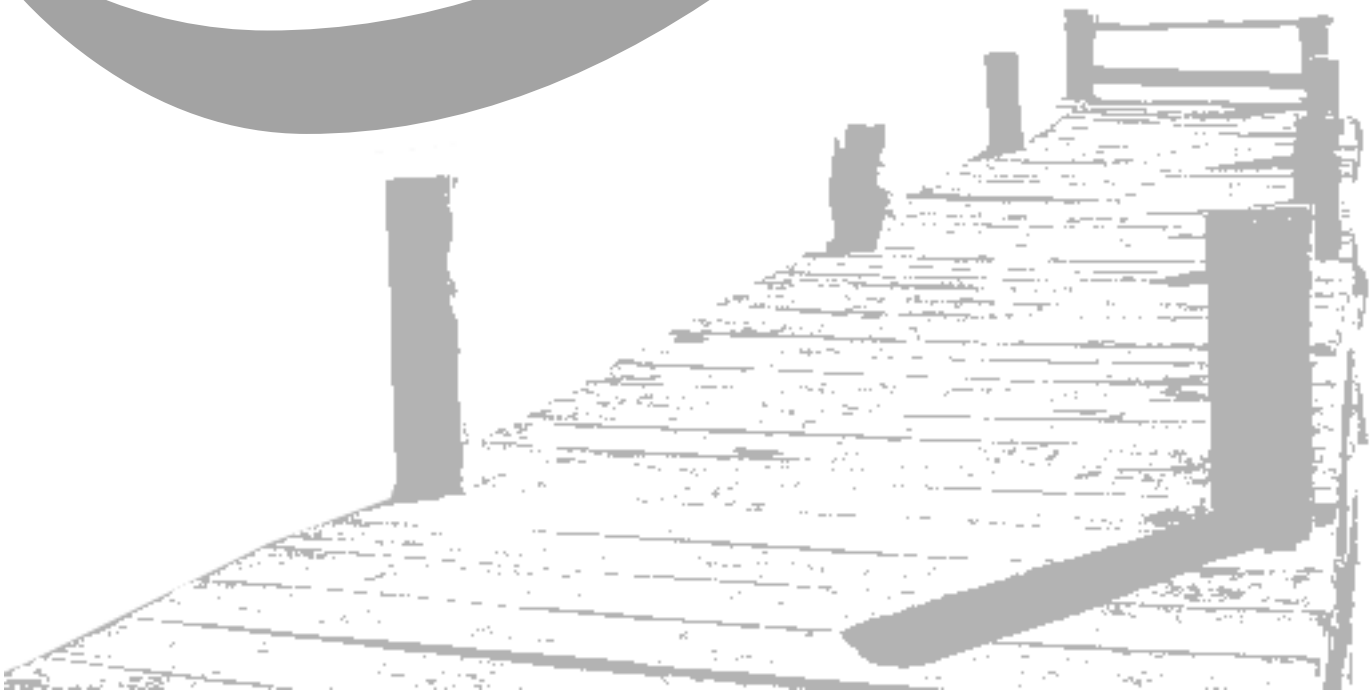
GCE
AS and A Level

Biology

AS exams 2009 onwards
A2 exams 2010 onwards

Unit 5:
Specimen mark scheme

Version 0.2



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ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Education

Biology

BIOL5 Control in cells and in organisms

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 questions 1 to 10, 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) (i) ACG; 1

(ii) Serine; 1

(b) DNA contains introns / (pre) mRNA is edited; 1

(c) (Tetracycline) binds to/blocks mRNA triplet;
Anticodon/tRNA triplet cannot pair with mRNA triplet;
Amino acid not added to polypeptide chain;
Translation prevented; 3 max

Total 6

Question 2

(a) (i) Motor; 1

(ii) Gland / glandular; 1
(Q Answers that name a specific gland may be awarded credit.)

(b) Hormones reach all cells (via blood);
Neurotransmitters secreted directly on to target cell;
Different hormones specific to different target cells; 3

Total 5

Question 3

(a) Glucose (from digestion of meal) absorbed; 1

(b) taken up by cells;
used in respiration / converted to glycogen; 2

(c) 09:00 to 11:00 glucagon secreted;
(Glucagon) stimulates breakdown of glycogen to glucose;
11:00 to 12:00 insulin secreted;
Insulin stimulates uptake of glucose by cells / conversion to glycogen;
Explanation of negative feedback; 4 max
*(**Q** For the first marking point, answers must refer to glucagon. References to spelling alternatives, such as glycogen, glycogon or glucose should not be awarded credit)*

Total 7

Question 4

(a)	(i)	Increases surface area <u>to volume ratio</u>; *(**Q** Answers that fail to refer to the <u>surface area to volume ratio</u> should not be awarded credit)*	1
	(ii)	Reduces distance for diffusion (of digested food products); In absence of circulatory system; *(**Q** Credit should not be awarded where answers contain only an unqualified reference to the distribution of food)*	2
(b)	(i)	Avoids predators / avoids damage by light; *(Accept any reasonable suggestion)*	1
	(ii)	Random / chance; small sample size / experiment not repeated; *or* Chemical attraction; (chemical / attractant) in mucus; *or* Temperature; heat from lamp (on illuminated side); *or* Tactile / touch; some flatworms in contact;	2
	(iii)	Record number of turns / rate of movement; Kinesis is non-directional / taxis is directional;	2

Total 8

Question 5

(a)	(i)	Sodium ions move out of axon; By diffusion/down concentration gradient; Through sodium ion channels/sodium ion channels open;	2 max
	(ii)	Potassium ions enter / potassium ion channels open;	1
(b)		Myelin insulates axon / ions can only pass through (plasma membrane of axon) at gaps in myelin sheath; (Gaps in sheath are called) nodes of Ranvier; *(**Q** The second marking point should be awarded only where answers include the correct scientific term.)*	2

Total 5

Question 6

(a) Strand of DNA;
Short strand / up to 20 bases long;
With base sequence that is complementary to part of target gene;
Radioactive labelling / fluorescent labelling; 3 max

(b) Identify carrier (of cancer gene);
Identify which (cancer) gene present;
Identify most effective treatment; 2 max

Total 5

Question 7

(a) (i) **W** = actin; 1

(ii) **X** = myosin; 1

(b) In Fig 6.2, only actin / thin filaments present;
In Fig 6.3, actin / thin filaments and myosin / thick filaments present;
Actin /thin filaments have moved into myosin / thick filaments; 2 max

(c) Hydrolysis/breakdown of ATP provides energy;
(Energy) for power stroke / breakage of actin-myosin cross bridges;
Calcium ions activate ATPase;
Calcium ions cause tropomyosin molecules to move / expose myosin-binding sites on actin; 4
*(**Q** Do not allow reference to ATP making energy.*
As calcium ions is given in the question, allow references to 'calcium' (i.e. without ions) in points 3 and 4.)

Total 8

Question 8

(a) Easy to manage / can be kept safely in small space;
Genome / strains well known;
Physiology similar to humans / can be used to predict human behaviour; 2 max

(b) Same as control but inject with equal volume of solvent only; 1

(c) (i) Heat lost from tail;
By conduction / convection / radiation; 2
*(**Q** Award credit to answers that refer to the evaporation of sweat from the tail.)*
*(**Q** Award credit to answers that are the converse of the above, relating to the rectal temperature)*

(ii) Standard deviations show mean rectal temperatures are significantly different (in the two groups);
Rectal temperature indicates core temperature / heat generation;
Tail temperatures not significantly different (in the two groups);
Tail temperatures indicate no difference in heat loss;
None of the mice died (in this experiment); 3 max
*(**Q** If candidates fail to gain credit above, they can be awarded one mark for a clear statement that MDMA increases heat production but does affect not heat loss.)*

Total 8

Question 9

(a) (i) Hydrolysis; 1

(ii) Shape / configuration complementary to (shape of) active site of enzyme; 1
*(**Q** Credit must not be awarded to answers that state the shapes are the same.)*

(iii) Consists of six antiparallel base pairs / six base pairs that read the same in opposite directions; 1

(b) (i) 3; 1

(ii) Partial digestion produced fragments of other lengths;
e.g., (3+2=5) / (4+1=5) / (4+2=6) / (3+2+1=6) / (4+3=7) / (4+3+2=9); 2

(iii) 3 kb fragment is the smallest to be radioactive (so must be on left);
4 kb fragment is next smallest to be radioactive (so 1 kb fragment must be attached directly on to 3 kb fragment); 2
(**Q** *Credit should be given where answers show a clear understanding that the 3 kb and 4 kb fragments are the smnallest to be radioactive and that the 4 kb fragment must be formed by the 3 kb and 1 kb fragments joined together.)*

Total 8

Question 10

(a)	(i)	Prevents sideways movement of IAA;	1
	(ii)	Light does not destroy/change IAA; Diagram **D** shows total amount of IAA unchanged (by unilateral light); Light causes IAA to move to shaded side of shoot tip; Diagram **C** shows movement is in tip/not in agar block;	3 max
(b)	(i)	Used in respiration / as energy source; *(**Q** Answers that refer to <u>making</u> energy should not be awarded credit.)*	1
	(ii)	**Q** contains tip/site of IAA production; Addition of further IAA has little effect; *(**Q** Accept clear converse argument for **P**)*	2
	(iii)	Inhibits (growth of) both in sucrose solution; Stimulates (growth of) both in sucrose and IAA solution; Greater effect in **P**;	3
(c)	(i)	Uptake by active transport; (Evidence is that) heat-killed wild type has low/no uptake;	2
	(ii)	Mutation increases number / frequency of proton/hydrogen ion pumps; (Which explains) increased uptake of IAA without DNP; DNP reduces uptake by mutant cells (to wild type value);	3

Total 15

Question 11

General principles for marking essay questions

Four skill areas will be marked:

Scientific content (**S**)
Breadth of knowledge (**B**)
Relevance (**R**)
Quality of written communication (**Q**)

These skill areas are marked independently of each other. Providing that there is sufficient evidence, and the subject content is relevant to the question answered, it is possible for candidates to obtain maximum credit for skill areas **B**, **R** and **Q**, even if they gain little credit for Scientific content.

The following descriptors will form the basis for marking.

Scientific content (Maximum 16 marks)

Mark	Descriptor
16	Material accurate and of a high standard throughout, reflecting a sound understanding of the principles involved and a knowledge of factual detail fully in keeping with a programme of A-level study. In addition, there are some significant references to material which indicates greater depth or breadth of study.
14	
12	Most of the material is of a high standard reflecting a sound understanding of the principles involved and a knowledge of factual detail generally in keeping with a programme of A-level study. Material accurate and free from fundamental errors, but there may be minor errors which detract from the overall accuracy.
10	
8	A significant amount of the content is of appropriate depth. Shows a sound understanding of most of the principles involved and a knowledge of factual detail generally in keeping with a programme of A-level study. Most of the content is accurate with few fundamental errors.
6	
4	Material presented is largely superficial with only occasional content of appropriate depth. Shows some understanding of some of the basic principles involved. If a greater depth of knowledge is demonstrated, then there are many fundamental errors.
2	
0	Such material as is relevant is both superficial and inaccurate, rarely demonstrating evidence of knowledge in keeping with a programme of A-level study.

Note: Only 0, 2, 4 marks etc. are awarded. This limits the number of categories and improves the consistency of marking.

Marks intermediate between descriptors may be awarded.

Breadth (Maximum 3 marks)

Mark	Descriptor
3	A balance account making reference to most areas that might realistically be covered in an A-level course of study.
2	A number of areas covered but a lack of balance. Some topics essential to an understanding at this level not covered.
1	Unbalanced account with all or almost all material based on a single aspect.
0	Material entirely irrelevant.

Relevance (Maximum 3 marks)

Mark	Descriptor
3	All material presented is clearly relevant to the title. Allowance should be made for judicious use of introductory material.
2	Material generally selected in support of title but some of the main content of the essay is only of marginal relevance.
1	Some attempt made to relate material to the title but considerable amounts are largely irrelevant.
0	Material entirely irrelevant or too limited in quantity to judge.

Quality of written communication (maximum 3 marks)

Mark	Descriptor
3	Material is presented in clear, scientific English. Technical terminology has been used effectively and accurately throughout.
2	Account is logical and generally presented in clear, scientific English. Technical terminology has generally been used effectively and is usually accurate.
1	The essay is poorly constructed. Often fails to use an appropriate scientific style and terminology to express ideas.
0	Material entirely irrelevant or too limited in quantity to judge.

Total 25