Version 1.0



General Certificate of Education (A-level)
June 2011

Biology BIOL5

(Specification 2410)

Unit 5: Control in Cells and in Organisms

Final

Mark Scheme

Mark schemes are prepared by the Principal Examiner and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation events which all examiners participate in and is the scheme which was used by them in this examination. The standardisation process ensures that the mark scheme covers the candidates' responses to questions and that every examiner understands and applies it in the same correct way. As preparation for standardisation each examiner analyses a number of candidates' scripts: alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, examiners encounter unusual answers which have not been raised they are required to refer these to the Principal Examiner.

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 – 9, marks awarded will take in to account the quality of written communication. Credit will only be awarded where candidates have presented information clearly and coherently and have used the specialist vocabulary indicated in the mark scheme for this unit. Specific references to quality of written communication are indicated in the guidance notes.

<table>
<tr><th>Question</th><th>Marking Guidelines</th><th>Mark</th><th>Comments</th></tr>
<tr><td>1(a)(i)</td><td>Phosphate and ribose;</td><td>1</td><td>Accept in either order. Both correct for one mark.
For phosphate accept PO_4 / Pi / (P) but not P.
Do not accept phosphorus.
Ignore references to pentose / sugar.</td></tr>
<tr><td>1(a)(ii)</td><td>TAGGCA;</td><td>1</td><td></td></tr>
<tr><td>1(b)(i)</td><td>Does not contain hydrogen bonds/base pairs /contains codons / does not contain anticodon / straight/not folded / no amino acid binding site/longer;</td><td>1</td><td>Assume that “it” refers to mRNA
Do not accept double stranded.</td></tr>
<tr><td>1(b)(ii)</td><td>(pre-mRNA) contains introns / mRNA contains only exons;</td><td>1</td><td>Assume that “it” refers to pre-mRNA
Accept non-coding as equivalent to intron.</td></tr>
<tr><td>1(c)(i)</td><td><table><tr><th>Part of chromosome</th><th>U</th></tr><tr><td>Middle</td><td>18</td></tr><tr><td>End</td><td>21</td></tr></table></td><td>1</td><td>One mark for both figures correct</td></tr>
</table>

1(c)(ii)	1. Different genes; 2. Have different (base) sequences / combinations of (bases); 3. (Pre-mRNA) transcribed from different DNA/codes for different proteins;	2 max	Note this question is not about the position of bases on genes. 1. Telomere on end is equivalent

<table>
<tr><th>Question</th><th>Marking Guidelines</th><th>Mark</th><th>Comments</th></tr>
<tr><td>2(a)(i)</td><td>Hormones have widespread effect / affect different organs / affect different parts of the body / affect distant organs / only affect cells with right receptor;</td><td>1</td><td>Assume “they” refers to hormones</td></tr>
<tr><td>2(a)(ii)</td><td>1. Hormones in blood;
2. Local chemical mediators spread by diffusion / spread directly;</td><td>2</td><td>1. May be awarded where candidates refer to both as “they”.</td></tr>
<tr><td>2(b)</td><td>1. (Acetylcholine) released from/in presynaptic side;
2. Diffusion from higher concentration/to lower concentration;
3. Receptors in postsynaptic (side) / binds on postsynaptic (side);</td><td>2 max</td><td>2. Mark for diffusion only awarded in context of unidirectional movement.</td></tr>
<tr><td>2(c)(i)</td><td>1. Rapid response;
2. Short duration;</td><td>2</td><td>Specific wording is not important. It is the principles that matter here.
Points may be made by referring to figures.</td></tr>
<tr><td>2(c)(ii)</td><td><table><tr><td></td><td>1</td><td>2</td><td>3</td></tr><tr><td>Percentage</td><td>80</td><td>0</td><td>0</td></tr></table></td><td>1</td><td>Ignore % sign</td></tr>
</table>

Question	Marking Guidelines	Mark	Comments
3(a)	Diffusion;	1	Ignore references to simple/facilitated Accept active transport
3(b)	1. Causes plant to bend/grow towards light / positive phototropism; 2. (Light) required for photosynthesis;	2	
3(c)	1. More kinetic energy; 2. Faster movement of molecules; 3. More diffusion;	2 max	Ignore references to opening stomata Answer should be in context of more but comparative statement only necessary once.
3(d)(i)	1. Thick cuticle on upper surface / thin cuticle on lower surface / few stomata on upper surface / no stomata on upper surface; 2. More diffusion / shorter diffusion pathway (on lower surface);	2	1. Ignore cuticle only on upper surface. Ignore references to more or less waxy. 2. If candidate writes about stomata accept ref to greater area for diffusion.
3(d)(ii)	Different species have different (qualified) properties;	1	Eg cuticle thickness Leaf size Number of stomata

Question	Marking Guidelines	Mark	Comments
4(a)(i)	B;	1	
4(a)(ii)	Fall in progesterone / progesterone same as at start / progesterone low at 25 days;	1	Ignore references to oestrogen
4(b)	Answer showing understanding of positive feedback i.e. more produces more / differs further; Answer showing understanding of positive feedback correctly linked to oestrogen and LH i.e. more oestrogen produces more LH;;	2	1 mark for basic idea 2 marks for idea illustrated correctly by example of oestrogen and LH Answer must relate to oestrogen increasing not just high oestrogen
4(c)	1. Progesterone has negative feedback effect / inhibits secretion of FSH/LH; 2. (FSH) stimulates follicle development / (LH) stimulates ovulation;	2	

Question	Marking Guidelines	Mark	Comments
5(a)(i)	1. Has the restriction site (cut by *Kpn*1); 2. Once; 3. 1000bp from *Kpn*1 on site of plasmid / ⅓ way along;	2	2. Must be explicit. Has a restriction site is point 1 only.
5(a)(ii)	(Most of) plasmid and rest of unknown DNA / rest of recombinant plasmid / rest of plasmid but not 1000 bp part;	1	Looking for idea rather than precise wording
5(b)	2;	1	
5(c)(i)	Give one mark for answer confined to smaller fragments move further/faster; Give two marks for comparing with distance/speed moved by fragments of known size/markers / DNA ladder;;	2	
5(c)(ii)	1. Large pieces of DNA present; 2. Add up to more than total length of original DNA / plasmid plus inserted DNA; 3. Because this would add undigested to total (original) length;	2	

Question	Marking Guidelines	Mark	Comments
6(a)	1. Gives rise to new plants/plantlets; 2. So must be able to develop into different tissues / other specialised cell types / differentiate;	2	1. Ignore references to leaves/callus
6(b)	Two marks for 5 : 1 / 50 :10 / 1 : 0.2;; One mark for ratio correctly identified but expressed incorrectly as 1 : 5 / 10 : 50 / 0.2 : 1;	2	
6(c)(i)	1. Meiosis; 2. Independent assortment / crossing over; 3. (Fusion of) genetically different gametes / random fertilisation;	2 max	
6(c)(ii)	Will be clones / produced by mitosis / will be genetically identical / less variation / all plants will have desired characteristics;	1	If the reference is to identical must be genetically identical, but allow less variation without the reference to genetical.

Question	Marking Guidelines	Mark	Comments
7(a)(i)	1. (Increased temperature) increases rate of reactions / increases kinetic energy / increases metabolism; 2. More energy/more ATP; 3. Oxygen consumption linked to respiration;	3	2 Needs reference to the idea of more.
7(a)(ii)	Units given per gram / per unit mass / mass is standardised / variation in mass taken into account;	1	Accept weight/size. Ignore references to other size-related parameters
7(b)(i)	Further away from the optimum, the greater the movement/least/no movement at optimum;	1	
7(b)(ii)	1. (Outside optimum temperature) moves (between sun and shade); 2. Warm up or cool down;	2	Accept converse of Does not move; At optimum temperature;
7(c)	1. Evaporation (of water from lining of mouth); 2. Heat transferred from blood;	2	

Question	Marking Guidelines	Mark	Comments
8(a)	1. Bind to DNA/gene; 2. At specific region/base sequence/promoter sequence; 3. Stimulate transcription / prevents transcription / turn on gene / turn off gene;	2 max	1. Generally attaching to DNA 2. At specific place 3. Accept description of transcription. Do not accept protein synthesis
8(b)(i)	Has complementary base sequence;	1	
8(b)(ii)	1. No longer able to make specific protein / cannot make whole protein / mRNA cannot be translated; 2. Because mRNA has been cut into pieces;	2	1. Reference to transcribes negates this point. 2. Do not accept mRNA destroyed / do not accept gene not expressed. Reference to target gene broken down negates this point.
8(b)(iii)	1. Some diseases are genetic / caused by mutations; 2. siRNA will stop product of this gene / the protein being produced / stops translation;	2	

Question	Marking Guidelines	Mark	Comments
9(a)	1. Hydrolysis breaks proteins / hydrolyses proteins / produces amino acids (from proteins); 2. Protein synthesis involves condensation; 3. Hydrolysis of polysaccharides/lipids linked to energy source (for synthesising proteins);	2 max	Do not award any credit if hydrolysis and condensation confused. 3. Accept hydrolysis of other molecules if related to protein synthesis
9(b)	Amino acids (from calliphorin) can be joined in different sequences/rearranged;	1	
9(c)	1. Fall, rise and fall; 2. Rise after 40 and fall after 80;	2	Ignore concentration values
9(d)(i)	Fall / increase then fall ; Lysosomes associated with tissue breakdown;	2	
9(d)(ii)	1. Tissues/cells are being broken down; 2. RNA is digested/hydrolysed/broken down; 3. By enzymes from lysosomes; 4. New proteins not made / no new RNA made;	2 max	
9(e)	1. (RNA) associated with making protein; 2. New / adult tissues are forming;	2	

9(f)	1. In the first 6 days no/little oxygen supplied / with breakdown of tracheae, no/little oxygen supplied; 2. (Without tracheae) respire anaerobically; 3. Anaerobic respiration involves reactions catalysed by enzyme **B** / conversion of pyruvate to lactate/involves lactate production; 4. Enzyme **A**/Krebs cycle is part of aerobic respiration;	4	Or, with emphasis on aerobic respiration: 1. Tracheae supply oxygen / after 6 days oxygen supplied; 2. (With tracheae) tissues can respire aerobically;

Additional notes on marking Question 10

Care must be taken in using these notes. It is important to appreciate that the only criteria to be used in awarding marks to a particular essay are those corresponding to the appropriate descriptors. Candidates may gain credit for any information providing that it is biologically accurate, relevant and of a depth in keeping with an A-level course of study. Material used in the essay does not have to be taken from the specification, although it is likely that it will be. In fact, extra credit is given for those who show evidence of a greater breadth of study.
These notes must therefore be seen merely as guidelines providing an indication of areas of the specification from which suitable factual material might be drawn.

In determining the mark awarded for breadth, content should ideally come from each of the areas specified if maximum credit is to be awarded. Where the content is drawn from two areas, two marks should be awarded and where it is taken only from a single area, one mark should be awarded. However, this should only serve as a guide. This list is not exhaustive and examiners should be prepared to offer credit for the incorporation of relevant material from other areas of study.

Essay A	**Using DNA in science and technology**
Section	
	DNA and classification
2.2	Structure of DNA
2.3	Differences in DNA lead to genetic diversity
2.9	Comparison of DNA base sequences
	DNA hybridisation
	Genetic engineering and making useful substances
1.3	Plasmids
5.8	The use of recombinant DNA to produce transformed organisms that benefit humans
	Other uses of DNA
2.5	Cell cycle and treatment of cancer
5.8	Gene therapy;
	Medical diagnosis and the treatment of human disease;
	The use of DNA probes to screen patients for clinically important genes;

Essay B	**A cycle is a biological pathway or process in which the end product of one cycle becomes the starting point for the next. Write an essay about cycles in biology.**
Section	
	Ecological cycles
4.6	Nutrient cycles
	Carbon cycle
	Nitrogen cycle
	Biochemical cycles
1.2	Enzyme action
4.2	Synthesis of ATP from ADP
4.3	Light-independent reaction
4.4	The Krebs cycle
	Physiological and genetic cycles
1.4	The mechanism of breathing
1.5	The cardiac cycle
2.5	The cell cycle
5.3	Muscle contraction
5.5	Oestrous cycle

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