A- LEVEL

Biology

BIOL5R – Control in cells and in organisms
Mark scheme

2410
June 2015

Version: 1 Final Mark Scheme

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<table>
<tr><th>Question</th><th>Marking Guidance</th><th>Mark</th><th>Comments</th></tr>
<tr><td>1(a)</td><td>
<table>
<tr><th>Function</th><th>Name</th></tr>
<tr><td>Attaches to Z line at the end of the sarcomere</td><td>1. Actin;</td></tr>
<tr><td>Breaks down ATP</td><td>2. ATPase / myosin (head);</td></tr>
<tr><td>Covers binding site on actin in relaxed myofibril</td><td>3. Tropomyosin;</td></tr>
</table>
</td><td>3</td><td>2. Accept water

3. Accept troponin</td></tr>
<tr><td>1(b)</td><td>1. Can’t form myosin/thick filaments;
2. Can’t pull/can’t move actin/slide actin past / (myosin) have to be joined/fixed to pull actin;
3. Myosin moves /if attached doesn’t move;
4. Can’t move actin towards each other/middle of sarcomere/between myosin/
can’t shorten sarcomere/can’t pull Z lines together;</td><td>3</td><td>Neutral: prevents actin and myosin sliding filament action
2. Accept: myosin can’t pull on each other

4. Accept: contract for shorten</td></tr>
</table>

Question	Marking Guidance	Mark	Comments
2(a)	1. Stimulates/causes ovulation/ /(secondary) oocyte(s); 2. Stimulates/causes formation of corpus luteum; 3. Stimulates/leads to production/release of oestrogen/progesterone;	2	1. Accept release of egg/ovum 1. Ignore references to follicle 3. Ignore: references to testosterone
2(b)	1. Inhibition of hypothalamus **so** less GnRH; 2. Inhibition of pituitary/less GnRH **so** less LH and FSH; 3. So no stimulation of testes to make testosterone;	3	Ignore references to negative feedback 1 and 2 must include all the statement 1 and 2 Accept none = less
2(c)	1. Keeps/makes/causes high testosterone; 2. So (keeps) inhibition of GnRH/LH/FSH;	2	1. Must have idea of high or higher 2. Accept: inhibits hypothalamus/pituitary gland 2. Accept less/no GnRH/LH/FSH

Question	Marking Guidance	Mark	Comments
3(a)(i)	1. (Tumour suppressor) gene inactivated/not able to control/slow down cell division; 2. Rate of cell division too fast/out of control ;	2	Ignore: references to growth 1 and 2 Accept: mitosis 1 and 2 Reject: meiosis
3(a)(ii)	1. (Genetic) code degenerate; 2. Mutation in intron;	1 max	1. Accept: codon for triplet 1. Accept description of degenerate code, e.g. another triplet codes for the same amino acid 2. Accept: mutation in non-coding DNA
3(b)	1. Antibody has specific tertiary structure/binding site/variable region; 2. Complementary (shape/fit) to receptor protein/GF/ binds to receptor protein/to GF; 3. Prevents GF binding (to receptor);	3	Do not accept explanations involving undefined antigen 2. Ignore: same shape as receptor protein/GF

Question	Marking Guidance	Mark	Comments
4(a)	Two suitable suggestions;; E.g. Parents/students might lie (about smoking)/don't know how much parents smoke / don't know what parents smoke / don't know strength of cigarettes parents smoke	2 max	Ignore: unqualified reference to bias / reference to sample size/ only one study/ not completing form correctly
4(b)	1. Children of parents who smoke likely to be/are exposed to more SHS/ have less expression of gene; 2. (Less expression of gene means) more likely to have allergic reaction; 3. Significant difference because SEs (or 2 × SE) do not overlap; 4. Large sample size, so data reliable;	3 max	1. Accept converse for parents who do not smoke Ignore: references to correlation and causation 3. Reject: results significant 3. Ignore: ref. to SDs
4(c)	1. Prevent binding of transcription factor; 2. Prevents RNA polymerase binding/working; 3. Prevents complementary/specific base-pairing; 4. (No transcription, so) no (pre)mRNA made; 5. No/less translation (of mRNA);	3 max	2. Ignore: references to polymerase bringing in complementary bases 3. Accept descriptions of base pairing – A with U or C with G 3. Accept complementary nucleotides 5. Accept description of translation/no protein synthesis

Question	Marking Guidance	Mark	Comments
5(a)	1. (Increased pressure) deforms/changes stretch-mediated sodium (ion) channel; 2. (Sodium channels open and) sodium ions flow in; 3. Depolarisation (leading to generator potential);	3	2. Accept Na^+ 3. Accept correct description of depolarisation
5(b)	Value between 2.17:1 and 2.29:1;; Values between 117 to 119 and between 52 to 54 found but ratio wrong way round = 1 mark	2	Accept rounding up to 2.2 or 2.3 Accept: number without : 1 Correct working showing answer but incorrect rounding in answer line = 1 Wrong way round gives answer between 0.35:1 and 0.46:1
5(c)	1. Parasympathetic greater effect than sympathetic; 2. Parasympathetic keeps heart rate down/lower/decreases heart rate (as blood pressure increases); 3. Sympathetic keeps heart rate up/higher/increases heart rate (as blood pressure increases); 4. Parasympathetic greatest/greater effect at high blood pressure/sympathetic greatest effect at low blood pressure;	3 max	Ignore: descriptions of graph 2. and 3. Accept converse for blood pressure decreases

Question	Marking Guidance	Mark	Comments
6(a)	One suitable suggestion; explained; Eg 1. Action potentials travel more slowly/don't travel; 2. So delay in muscle contraction/muscles don't contract/muscles contract slow(er); ***OR*** 3. Action potentials/depolarisation 'leaks' to adjacent neurones; 4. So wrong muscle (fibres) contract;	2 max	1. Accept: fewer/no saltatory movement of potentials 3. Accept: neurones not insulated
6(b)	Lipid-soluble / pass through phospholipid bilayer;	1	Not just 'pass through membranes'
6(c)	1. Prevents influx of calcium <u>ions</u> (into pre-synaptic membrane); 2. (Synaptic) vesicles don't fuse with membrane / vesicles don't release neurotransmitter; 3. Neurotransmitter does not diffuse across synapse/does not bind to receptors (on post-synaptic membrane); 4. No action potential/depolarisation (of post-synaptic membrane)/ sodium (ion) channels do not open / prevents influx of sodium <u>ions</u>;	4	1. Need idea of <u>moving into</u> pre-synaptic membrane/synaptic knob 1. Accept Ca^{++}/Ca^{2+} 2. Accept vesicles don't release acetylcholine 3. Accept: sarcolemma/muscle membrane for post-synaptic membrane 4. Accept Na^{+} 4. Accept prevents depolarisation of muscle cell Ignore: descriptions of events at post-synaptic membrane involving calcium ions and muscle contraction
6(d)	1. They won't affect synapses in brain; 2. They won't cause problems with the brain's function/won't damage brain; 3. (So only the) muscle/neuromuscular junctions treated/affected;	2 max	2. Accept: suitable named problem e.g. hallucination 2. Ignore: unqualified references to 'side effects' 2. Accept: reference to addiction/harm of smoking (cannabis)

Question	Marking Guidance	Mark	Comments
7(a)	1. Similarity – directional response (to a stimulus)/movement towards/away from a stimulus; 2. Difference – taxis (whole) organism moves and tropism a growth (response);	2	2. Must be clear which one, taxis or tropism, they are referring to 2. Taxis occurs in animals/motile organisms and tropism occurs in plants
7(b)	1. Grow in direction of/towards (pull of) gravity; 2. Grow away from salt; 3. Salt has more effect (than gravity);	3	Accept: tropism for growth Ignore: pulled by gravity 1. Accept: positively geotropic/gravitropic 2. Accept: negatively chemotropic/halotropic 1 and 2. Ignore: references to bends/moves 3. Accept: converse statement for gravity Note: all three points may appear in one sentence
7(c)	1. More carriers in (cell) **L**/lower in **R**; 2. (So) less IAA in (cell) **L**/more IAA in (cell) **R**; 3. (So) more (elongation) growth in **L**/less (elongation) growth in **R**;	3	Accept: left for **L** and right for **R**/side nearer salt for **L** 2. Accept: more IAA moves out of **L**/less IAA moves out of **R** 3. Accept: less inhibition of growth in **L**/more inhibition of growth in **R**;

Question	Marking Guidance	Mark	Comments
8(a)	1. Release of glucagon; 2. Leads to formation of glucose in liver (cells); 3. From non-carbohydrates/amino acids/fatty acids;	3	2. Reject: glucagon breaks down glycogen, or any other biological molecule 3. Accept: gluconeogenesis/references to glycogen as source of glucose
8(b)	1. Mutant mice (mRNA suggests) make a lot of (the) enzyme; 2. Mutant mice use kidney/intestine (cells) to make glucose; 3. Normal mice do this much less/normal mice use liver cells;	3	1. Accept: PCK1 made (for enzyme made) 2. Accept: use other organ (than liver)
8(c)	1. Differences significant; 2. Probability of difference being due to chance <u>less than</u> 0.01/1%/1 in 100 / probability of difference not being due to chance <u>more than</u> 0.99/99%/99 in 100;	2	Reject: references to results being significant once 2. Ignore: references to 0.05/5%/5 in 100

Question	Marking Guidance	Mark	Comments
9(a)	1. Cut (DNA) at same (base) sequence/(recognition) sequence; 2. (So) get (fragments with gene) **R**/required gene;	2	1. Accept: cut DNA at same place 2. Accept: 'allele' for 'gene'/same gene
9(b)	1. Each has/they have a specific base sequence; 2. That is complementary (to allele r or R);	2	2. Accept description of 'complementary'
9(c)	1. Fragments L from parent rr, because all longer fragments/195 base pair fragments; 2. Fragments N from parent RR, because all shorter fragments/135 base pair fragments; 3. (M from) offspring heterozygous/Rr/ have both 195 and 135 base pair fragments;	3	Ignore: references to fragments that move further/less, require identification of longer/shorter or 195/135 1 and 2 Accept: A3 for 195 and A4 for 135 1. Accept: (homozygous) recessive 2. Accept: (homozygous) dominant 3. Accept: have both bands/strips Reject: primer longer/shorter
9(d)	1. (Cells in mitosis) chromosomes visible; 2. (So) can see which chromosome DNA probe attached to;	2	

9(e)(i)	1. For comparison with resistant flies/other (two) experiments/groups; 2. To see death rate (in non-resistant)/ to see effect of insecticide in non-resistant/normal flies;	2	1. Ignore: compare results/data/no other factors Accept: 'pesticide' as 'insecticide' 2. Accept to see that insecticide worked/to see effect of enzyme

9(e)(ii)	(PM must be involved because) 1. Few resistant flies die (without inhibitor); 2. More inhibited flies die than resistant flies; 3. (PM) inhibited flies die faster (than resistant flies); (Other factors must be involved because) 4. Some resistant flies die; 5. But (with inhibitor) still have greater resistance/die slower than non-resistant flies;	4 max	5. Accept: (with inhibitor) die slower than non-resistant flies

Question	Marking Guidance	Mark	Comments
10(a)	10 (a) The importance of responses to changes in the internal and external environment of an organism. *Topic areas* **T -** 3.1.3 Transport in and out of cells (of specific substances) **I -** 3.1.6 Immune response **Hb -** 3.2.4 Haemoglobin **Tr -** 3.2.7 Transpiration – response to environmental factors – gas exchange in plants **B -** 3.2.9 Behaviour **A -** 3.2.10 Adaptation and selection **P -** 3.4.8 Changes in populations – selection pressures **R -** 3.5.1 Responses to stimuli – plants and tropisms – control of heart rate **Tk -** 3.5.1 Taxes and kineses **Rc -** 3.5.1 Receptors **H** – 3.5.2 Control of Heart Rate **Sn -** 3.5.1 and 2 Simple reflexes and neurones and synapses **Hr -** 3.5.2 and 5.4 Hormones and responses **C** – 3.5.2 Chemical mediators **Ho -** 3.5.4 Homeostasis – response to changes in internal environment **F -** 3.5.5 Feedback **G -** 3.5.7 Gene expression as part of response	25	

Question	Marking Guidance	Mark	Comments
10(b)	10 (b) The importance to humans of the control of growth, reproduction and development of organisms, including themselves. *Topic areas* **A -** 3.1.1 Pathogens (and invasion of human tissues) and 3.2.10 Antibiotic resistance – control of bacterial growth **Ch -** 3.1.3 Cholera **I -** 3.1.6 Immune response and vaccination (to control growth of pathogens) **B -** 3.2.11 Human influence on biodiversity **Hp -** 3.4.1 Human populations **Hf -** 3.4.5 Humans and farming practices – and 3.2.3 selective breeding **F -** 3.4.6 Use of fertilisers and pesticides **S -** 3.4.7 Succession – control of **G -** 3.4.8 Genetics – prediction of inherited conditions **Ge -** 3.5.7 Control of gene expression – stem cells **C -** 3.5.7 Regulation of gene expression – prevention, treatment and cure of cancer – and 3.2.5 Mitosis and cancer **Gc -** 3.5.8 Gene cloning and transfer **Gt -** 3.5.8 Gene therapy	25	