OCR
RECOGNISING ACHIEVEMENT

GCSE

Biology B

General Certificate of Secondary Education

Unit **B731/02:** Modules B1, B2, B3 (Higher Tier)

Mark Scheme for June 2013

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This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by examiners. It does not indicate the details of the discussions which took place at an examiners' meeting before marking commenced.

All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the report on the examination.

OCR will not enter into any discussion or correspondence in connection with this mark scheme.

For answers marked by levels of response:

a. **Read through the whole answer from start to finish**

b. **Decide the level** that **best fits** the answer – match the quality of the answer to the closest level descriptor

c. **To determine the mark within the level**, consider the following:

Descriptor	Award mark
A good match to the level descriptor	The higher mark in the level
Just matches the level descriptor	The lower mark in the level

d. Use the **L1**, **L2**, **L3** annotations in Scoris to show your decision; do not use ticks.

Quality of Written Communication skills assessed in 6-mark extended writing questions include:

- appropriate use of correct scientific terms
- spelling, punctuation and grammar
- developing a structured, persuasive argument
- selecting and using evidence to support an argument
- considering different sides of a debate in a balanced way
- logical sequencing.

Annotations

Annotation	Meaning
	correct response
	incorrect response
	benefit of the doubt
	benefit of the doubt **not** given
	error carried forward
	information omitted
	ignore
	reject
	contradiction
	Level 1
	Level 2
	Level 3

Abbreviations, annotations and conventions used in the detailed Mark Scheme.

/	=	alternative and acceptable answers for the same marking point
(1)	=	separates marking points
allow	=	answers that can be accepted
not	=	answers which are not worthy of credit
reject	=	answers which are not worthy of credit
ignore	=	statements which are irrelevant
( )	=	words which are not essential to gain credit
__	=	underlined words must be present in answer to score a mark (although not correctly spelt unless otherwise stated)
ecf	=	error carried forward
AW	=	alternative wording
ora	=	or reverse argument

Question			Answer	Marks	Guidance
1	(a)		prevents (nerve) impulses passing across synapses (1) the muscles cannot contract / motor neurones are not stimulated (1)	2	**allow** electrical signal **Ignore** no messages / no information **allow** cannot control muscles
	(b)		uses a drug and a placebo (1) neither the people **nor** the doctors should know which treatment is used (1)	2	 **allow** neither the patients nor the doctors know who gets the drug and who gets the placebo (2)
			Total	**4**	

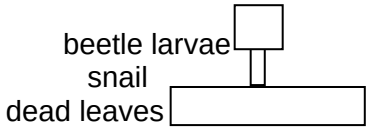
Question			Answer	Marks	Guidance
2	(a)		total protein eaten = 51(g) (1) EAR = 36(g) (1) correct deduction ie no, she is eating more than enough protein / too much protein (1)	3	**allow ecf** i.e two marks if there is a correct deduction but an error in either the calculation of EAR **or** protein eaten **allow** one mark if there is a correct deduction but an error in both the calculation of EAR **and** protein eaten no mark for deduction without figures for both protein and EAR to back it up **allow** yes, she is getting more than enough no mark for just 'no' but allow if a comparison is implied, e.g no, she needs 36 but is getting 51 = 3 marks
	(b)		Sue is pregnant / breast feeding / has a more physical mode of life / more exercise / recovering from injury (1) (needs more protein) as she is providing nutrition/milk (for her offspring) / needs to increase/repair her muscle / repair tissues / protein for growth of baby (1)	2	**ignore** Sue has had a baby **ignore** references to disease **ignore** supports the baby

Question			Answer	Marks	Guidance
	(c)		recognition that needs an alternative supply of **protein** / needs protein supplements (1) an example of such a source e.g dairy products / milk / cheese / eggs / tofu / beans / pulses / nuts / lentils / Quorn™ / avocado / broccoli / spinach / peas / asparagus / greens / (1)	2	**allow** recognition that meat is a good supply of protein **allow** fish **ignore** vegetables / fruit / plants / just 'meat substitute'/ 'vegetarian meat' **allow** protein shakes / protein drinks / myco-protein (2) **allow** need alternative source of iron / vitamin B6 / vitamin B12 (1) and example of such a source (1) **ignore** reference to other vitamins and minerals
			Total	**7**	

Question			Answer	Marks	Guidance
3	(a)		sweat **evaporates** (1) taking heat from the skin (1)	2	 **allow** heat is lost from the body **allow** takes heat from the body **ignore** cools body down as in stem of question
	(b)		50% / ½ / 1 in 2 (1) Gemma must be / heterozygous / (only) got one dominant allele and Leroy is / homozygous recessive / has no dominant allele (1)	2	**allow** 50/50 **allow** letters such as Hh and hh in a punnet square but must indicate which genotype belongs to who Look for correct labelling on diagram
	(c)	(i)	Gemma's phenotype but not her genotype (1) **last box**	1	
		(ii)	**any two from:** (antigens trigger) white blood cells release antibodies / antitoxins (1) antibodies / antitoxins lock on to antigens (and destroy them) (1) white blood cells engulf antigens (1)	2	 **allow** attach on to antigens **allow** phagocytosis / digest antigen **ignore** eaten **ignore** antibodies engulf antigens **ignore** pathogens
			Total	**7**	

Question			Answer	Marks	Guidance
4	(a)		**[Level 3]** Explains implications of all **three** conditions, at least one of them in detail **and** at least one **calculation** that indicates the number of people that may be involved. Quality of written communication does not impede communication of the science at this level. **(5–6 marks)** **[Level 2]** Explains implications of **two** conditions **and** at least one **calculation** that indicates the number or a **calculated** percentage of people that may be involved **or two** conditions at least one of them in detail. Quality of written communication partly impedes communication of the science at this level. **(3–4 marks)** **[Level 1]** Explains implications of at least **one** condition. Quality of written communication impedes communication of the science at this level. **(1–2 marks)** **[Level 0]** Insufficient or irrelevant science. Answer not worthy of credit. **(0 marks)**	6	**This question is targeted at grades up to A.** **Indicative scientific points at level 3 may include:** • plaque formation/fatty deposits in the coronary arteries can lead to reduced blood supply to heart muscle / lack of oxygen and or glucose to heart muscle / thrombosis • high blood pressure is linked to (an increased risk of) thrombosis / strokes / kidney damage • **allow** Type 2 diabetes causes kidney damage / blindness / poor circulation / ulcers **Indicative scientific points at level 1, 2 may include:** • too much cholesterol in the blood can form plaques in the walls of arteries **ignore** high blood cholesterol is linked to (an increased risk of) heart disease (low demand) • failure to respond to insulin is failure to control blood sugar levels / Type 2 diabetes • **ignore** failure to respond to insulin is diabetes (low demand) **Indicative scientific points at level 1 only:** • high blood pressure is linked to (an increased risk of) heart disease / heart attack • **allow** 1 mark for correct calculation only with no other explanations **example** of calculations • 30 000 people in Singapore have all three conditions (or similar calculation) • 330 000 have high blood pressure only • 68% have a single condition • 60% have at least one heart related / circulatory disease **Use L1, L2, L3 annotations in scoris; do not use ticks.**

Question			Answer	Marks	Guidance
	(b)		29% have two of the conditions only but we do not know which two (1)	1	**allow** some people have two conditions but we don't know which one
			Total	**7**	

Question			Answer	Marks	Guidance
5	**(a)**	**(i)**	(no) because larger number of beetle larvae would feed on a smaller number of snails / snails would have more biomass than beetle larvae (1)	1	**allow** energy between snail and beetle larvae decreases but numbers would increase **not** yes **allow** correct drawings of pyramid of number  **allow** correct description of bar lengths
		(ii)	**any two from:** heat / from respiration (1) excretion (1) egestion (1)	2	**allow** some lost by decay or decomposition **not** growth **allow** named excretory product e.g. urine / sweat **allow** faeces **allow** uneaten parts **ignore** movement / digestion / reproduction **ignore** waste products unless qualified
	(b)	**(i)**	8.3 (1)	1	
		(ii)	only transferring around 8% so not enough energy to support a fifth level (1) (8% of 50kJ) is approx. 4 kJ (1)	2	**allow** ecf on calculation **allow** 7.2 – 8.3 / ORA **allow** between 3.6 and 4.3
			Total	**6**	

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>6</td><td>(a)</td><td>(i)</td><td>
<table>
<tr><td>class</td><td></td></tr>
<tr><td>family</td><td></td></tr>
<tr><td>genus</td><td>1</td></tr>
<tr><td>kingdom</td><td></td></tr>
<tr><td>order</td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td>species</td><td>2</td></tr>
</table>
</td><td>1</td><td>ignore ticks</td></tr>
<tr><td></td><td></td><td>(ii)</td><td>it is the international basis of naming species / it shows or is based on relationships / removes confusion with colloquial names / universal name in all languages (1)</td><td>1</td><td>allow allows scientists all over world to know name of animal or plant
allow can group them based on relatives
allow idea that similar species can be in same genus</td></tr>
<tr><td></td><td>(b)</td><td></td><td>(its hooks allow anchorage / flattened body for crawling under stones) so are well suited (1)
for limited habitats such as fast water hiding under stones (1)</td><td>2</td><td>allow adapted to survive in specific habitat/environment (2)</td></tr>
</table>

Question	Answer	Marks	Guidance
(c)	**[Level 3]** Identifies presence or absence of more than one named indicator species and makes a clear conclusion about the level of pollution in all three sites. Quality of written communication does not impede communication of the science at this level. **(5–6 marks)** **[Level 2]** Identifies presence or absence of at least one named indicator species and links it to level of pollution at two sites. Quality of written communication partly impedes communication of the science at this level. **(3–4 marks)** **[Level 1]** Identifies the level of pollution at one site. Quality of written communication impedes communication of the science at this level. **(1–2 marks)** **[Level 0]** Insufficient or irrelevant science. Answer not worthy of credit. **(0 marks)**	6	**This question is targeted at grades up to A.** **Indicative scientific points at level 1, 2 and 3 may include:** consider following point with reference: • mayfly larvae only live in unpolluted water (high in oxygen content) • rat-tail maggots can survive very high pollution / low oxygen content • **allow** there are mayfly in unpolluted areas so downstream of factory must be polluted • **allow** higher level responses to Biochemical Oxygen Demand (BOD) being very high in polluted water • **ignore** factory poisons the stream. **Indicative scientific points at level 1 may include:** **example** rat-tail maggot found at factory site because of high level of pollution **Use L1, L2, L3 annotations in scoris; do not use ticks.**
	Total	**10**	

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>7</td><td>(a)</td><td>(i)</td><td>(July whale: food energy ratio =) 1:4 is worth (2)
but
if answer on line is incorrect allow 1 mark for 0.05:0.2 or 1:4 given in working</td><td>2</td><td>allow 0.05:0.2 (1)
allow 0.25:1 (2)
not 4:1
not 1:0.25</td></tr>
<tr><td></td><td></td><td>(ii)</td><td>any three from:
(overall) more whales if more food energy (1)

whales migrate to where there is more food energy (1)

(but) in October, there is less food energy than August but more whales (1)

ratios not constant / 1:1 in September and Oct but 1:2 in Aug (1)</td><td>3</td><td>
allow idea that food limits population size

allow idea of whales following food

allow but 1:4 in July</td></tr>
<tr><td></td><td>(b)</td><td></td><td><table>
<tr><td>2</td><td></td><td>competition for limited resources</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td>4</td><td></td><td>inheritance of ‘successful’ adaptations</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td>1</td><td></td><td>presence of natural variation</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td>3</td><td></td><td>survival of the fittest</td></tr>
</table></td><td>2</td><td>all 3 correct (2)
1 or 2 correct (1)</td></tr>
<tr><td></td><td>(c)</td><td></td><td>any two from:
layer of blubber/fat (for insulation) (1)
small SA / V ratio (1)
migratory habit to move to warmer areas (1)</td><td>2</td><td>

allow large volume to surface area
allow move to areas with longest day length – poles in summer as more photosynthesis for their food source/move away from poles as day length shortens (2)</td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>9</td><td></td></tr>
</table>

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>8</td><td>(a)</td><td></td><td><table><tr><td></td><td>Haploid</td><td>Diploid</td></tr><tr><td>egg cell</td><td>✓</td><td></td></tr><tr><td>sperm cell</td><td>✓</td><td></td></tr><tr><td>zygote</td><td></td><td>✓</td></tr><tr><td>cells in embryo</td><td></td><td>✓</td></tr><tr><td>cells in twin embryos</td><td></td><td>✓</td></tr></table>
all correct (2)
at least three correct (1)</td><td>2</td><td>more than one tick per line negates a correct tick</td></tr>
<tr><td></td><td>(b)</td><td></td><td>mitosis (1)</td><td>1</td><td>mark phonetically (look for a ‘t’)</td></tr>
<tr><td></td><td>(c)</td><td>(i)</td><td>higher pressure / greater rate of flow (1)</td><td>1</td><td>must be comparative
allow can have different pressures in lungs and body (1)
allow more efficient / more rapid transport of oxygen (1)
allow blood is pumped around faster
ignore blood is pumped fast</td></tr>
<tr><td></td><td></td><td>(ii)</td><td>idea that oxygen travels from (blood of) mother / to (blood of) foetus (1)

but

idea that oxygen moved from mother’s haemoglobin to foetus’ haemoglobin (2)</td><td>2</td><td>

allow maintains a concentration gradient across placenta (1)</td></tr>
<tr><td></td><td></td><td>(iii)</td><td>energy (source) (1)</td><td>1</td><td>allow valid named process eg active transport / movement / protein synthesis / DNA synthesis (1)
ignore simply ‘for growth’ / ‘for development’
ignore store</td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>7</td><td></td></tr>
</table>

Question			Answer	Marks	Guidance
9	(a)		Answer in range 11-12 (years) (1) idea of greatest difference between 95th and 5th percentile lines (1)	2	**allow** calculation of the difference anywhere in the 11-12 range
	(b)		(yes) because the mean / median values for boys > mean / median values for girls (1) (no) because some girls are taller than some boys (1)	2	**allow** value for boys at 50 percentile is higher than girls at 50 percentile **allow** some of the boys are same height as some of the girls ORA
	(c)	(i)	**max four from:** structural proteins (1) to build new **tissue** / named tissue e.g. skin (1) hormones (1) to **control** growth / control body processes / control named process e.g. puberty (1) carrier molecules / eg haemoglobin (1) to **transport** materials (needed for growth) (1) enzymes / catalysts (1) to control chemical reactions (involved in growth) (1)	4	can only get both marks for each type of protein if points clearly linked 'job' mark is dependent on 'type' mark max 2 for types of proteins given with no link to growth **allow** named enzymes or named reactions eg enzymes (1) that control respiration (1) **allow** specific examples eg insulin (1) to control blood sugar (1) collagen (1) to make skin (1) antibodies (1) to fight disease (1) clotting factor (1) to seal wounds (1) melanin (1) protect skin from UV (1) keratin (1) to make skin/hair (1) haemoglobin (1) carry oxygen (1) two specific examples of the same type can still gain full marks e.g protease to break down protein, carbohydrase to break down carbohydrates = 4 **ignore** hormones that are not proteins: progesterone / oestrogens / testosterone

Question			Answer	Marks	Guidance
		(ii)	it codes for the amino acid sequence / order (1) 3 bases / triplet codes for one amino acid (1)	2	**ignore** bases make amino acids **allow** higher level answers referring to role(s) of mRNA / tRNA (up to 2 marks for full explanation)
			Total	**10**	

Question			Answer	Marks	Guidance
10	(a)		**[Level 3]** At least one argument for **and** one argument against is given, to include at least one explanation of the problems of inbreeding. Quality of written communication does not impede communication of the science at this level. **(5–6 marks)** **[Level 2]** At least one argument for **and** one argument against is given **or** one argument for banning given, to include at least one explanation of the problem of inbreeding. Quality of written communication partly impedes communication of the science at this level. **(3–4 marks)** **[Level 1]** One argument for **or** against is given. Quality of written communication impedes communication of the science at this level. **(1–2 marks)** **[Level 0]** Insufficient or irrelevant science. Answer not worthy of credit. **(0 marks)**	6	**This question is targeted at grades up to A.** **Indicative scientific points at level 3 in addition to points at level 1 and 2 may include:** • (explanation of problem) reduction of gene pool • reduction in variation • accumulation of harmful recessive conditions **Indicative scientific points at level 1, 2 may include:** Arguments for banning breeding: • causes inbreeding • health problems can arise • it is cruel / harmful / unnatural / unethical Arguments against banning breeding: • health problems can be treated • caesarean operations are routine • out-breeding can be used • breeders should be able to do so if they wish / high demand for that breed • breed has been around for hundreds of years / wrong to consign the breed to extinction
	(b)		don't selective breed for large heads / flat faces / narrow hips / selective breeding for smaller heads / less flat faces / avoid breathing problems **/** wider hips / (1) better health care (1)	2	**allow** out-breeding/ORA (1) **allow** dog breeding authorities (eg kennel club) to re-define characteristics of bulldogs (1)
			Total	**8**	

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