OCR
Oxford Cambridge and RSA

GCSE

Biology B

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

General Certificate of Secondary Education

Mark Scheme for June 2016

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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.

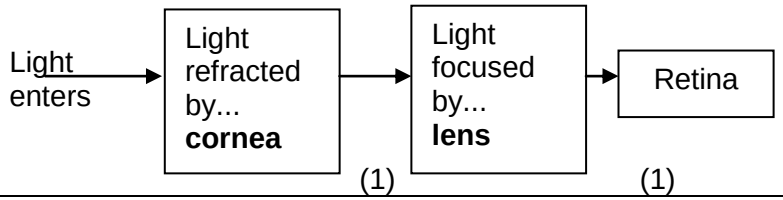
1. Annotations used in scoris

Annotation	Meaning
BP	**Blank Page – this annotation must be used on all blank pages within an answer booklet (structured or unstructured) and on each page of an additional object where there is no candidate response.**
	correct response
	incorrect response
BOD	benefit of the doubt
NBOD	benefit of the doubt **not** given
ECF	error carried forward
^	information omitted
I	ignore
R	reject
CON	contradiction

2. 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

MARK SCHEME

Question	Answer	Marks	Guidance
1 a	part A = control size of pupil / amount of light into the pupil / eye (1) part B = contains light receptors / sensitive to light (of different colours) (1)	2	**allow** protects eye from too much light **ignore** prevents damage to the eye **ignore** allows light into the eye **allow** photosensitive cells / rods and cones **allow** detects light **allow** converts light into impulses / sends impulses to optic nerve **ignore** forms an image
b		2	
c	**any two from:** mutations (1) different alleles / different **versions** of same gene (1) gamete formation / meiosis (1) fertilisation (1)	2	**allow** mutagens **allow** several alleles for different colours **allow** alleles can be combined in different ways **allow** one has recessive alleles, one has dominant alleles / different order of bases **ignore** different genes **allow** different sperm / eggs made
d	(brain) compares images from each eye (1) **but** the more similar the images the further away object is / ORA (2)	2	**allow** both eyes see different images **allow** overlapping field of view from each eye / different angles / triangulation
	Total	**8**	

Question	Answer	Marks	Guidance
2 a	auxin(s) (1)	1	**allow** IAA / gibberellins.
b	Charlotte's is best match because: She has correctly identified that the roots (are negatively phototropic) grow away from light (1) She is correct with (positively geotropic) roots grow down due to gravity / Alan's incorrect with negatively geotropic (1)	2	**If Alan identified as best match then zero** **If no other mark awarded allow** Charlotte's correct for both / Alan's only correct for one (1)
	Total	**3**	

Question	Answer	Marks	Guidance
3 a i	33 (g) (1)	1	
a ii	increases due to more demand for **protein** (1)	1	**correct explanation is needed for mark** **allow** due to increasing mass **ignore** breastfeeding
b	50% / ½ / 1 in 2 / 0.5 (1) correct genetic diagram (1)	2	**allow** **F f** **f Ff ff** **f Ff ff** **ff Ff** **f f F f** **Ff Ff ff ff**
c	50% / ½ / 1 in 2 / 0.5 (1) **Tt** is identified as club thumb in offspring (1)	2	**allow** **T t** **t Tt tt** **t Tt tt** **tt Tt** **t t T t** **Tt Tt tt tt**
	Total	**6**	

Question	Answer	Marks	Guidance
4 a	(the drug) is a stimulant (1) because it has caused more **neurotransmitter** to be released (across the synapse) (1)	2	**ignore** caffeine unqualified **allow** increased neurotransmission **ignore** increased activity in synapse **ignore** neurotransmitter faster/more active
b	**[Level 3]** Describes more than one feature of design **and** provides more than one explanation of results. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **[Level 2]** Describes one feature of design **and** provides one explanation of results. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **[Level 1]** Describes one feature of design **or** provides one explanation of results. 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 may include:** **Design** • to test the effects of a placebo on reaction time • placebo effect when given/not given any nicotine • need to use a method to make sure that human mind / psychological effects / bias has not influenced results • placebo used to compare effectiveness of nicotine / show the effect of nicotine **Results** • faster reaction times with nicotine / ORA • faster reaction time if they think they have nicotine • placebo has an effect on results • placebo has less of an effect than nicotine • results show that nicotine has a bigger effect than placebo even when people are told they've been given a placebo If no other mark awarded then: • to test the effects of nicotine Level 1 for 1 mark **Use the L1, L2, L3 annotations in Scoris. Do not use ticks**.
	Total	**8**	

Question	Answer	Marks	Guidance
5 a	tiger habitat smaller area / fragmented area / has reduced to critical level / drastically fallen between 1900 and 1990 (1) **max two for explanation:** increased competition (1) reduced variation (1) too few survive to maintain a population / reduced breeding success (1)	3	**allow** habitat are changing / habitat destruction is too high **allow** tigers have less space/less places to live/more confined spaces **allow** food shortage / water shortage **allow** reduce gene pool **allow** fragmented populations more at risk **allow** cannot adapt quick enough (1) **allow** disease spreads more easily (1) **allow** easier to be hunted in a smaller area (1)
b	**any two from:** cyclical pattern shown (1) description of pattern (1) the idea that tiger and prey populations are out of phase with each other AW (1)	2	**allow** predator-prey relationship examples when there is more prey (available for food) there are more tigers / ORA when there are less tigers (for predation) there is more prey / ORA **reject** responses that imply prey eat tigers **allow** when there is more prey tigers increase slightly after / ORA (2)
	Total	**5**	

Question	Answer	Marks	Guidance
6 a	kingdom **phylum** class **order** family **genus** species (2)	2	all correct = 2 marks 2 or 1 correct = 1 mark
b	**Any two from:** organisms cannot exchange genes with wider population AW (1) mutations / organisms adapt to change / different selective pressures (1) features have changed so much can't **successfully** interbreed AW (1)	2	 **allow** changes to DNA / genes evolve **allow** examples of selective pressure e.g. different food source **allow** speciation (1)
ci	they are different species (requiring the same resources) (1)	1	**allow** competition between different species (for same food) **allow** compete with other species e.g. bees
cii	they have very similar features/ they do the same job / similar feeding requirements / live in the same place AW (1)	1	**allow** they all feed on nectar
ciii	feeds on tree sap not nectar / feeds in a different way to the other butterflies / lives in a different type of habitat (1)	1	**allow** mouthparts specialised for feeding off tree / different foods/ flowers in woodland are different **allow** evolving to suit food
	Total	**7**	

Question	Answer	Marks	Guidance
7 a i	1940 to 1980 (1)	1	**allow** correct answer ringed, ticked or underlined
a ii	**any two from:** food shortage / famine (1) water shortage (1) more disease (1) lack of space / overcrowding (1) lack of resources / poor sanitation / lack of health care (1) increased pollution (1)	2	**allow** overpopulation **allow** increased waste production
a iii	0.0075 (billion per year) (2) but $\frac{0.6}{80}$ (1)	2	**allow** range from 0.00625-0.00750 billion per year. **allow** range $\frac{0.5}{80}$ to $\frac{0.6}{80}$ (1)
b	if the population is too large resources would not meet demand (1) because the time to replenish resources would be too long (1)	2	**allow** not enough resources to go around **allow** trees take too long to grow to meet needs **allow** demands of a large population outstrip production (2)
	Total	**7**	

Question	Answer	Marks	Guidance
8	**[Level 3]** Calculation of energy efficiency **and** two ways that energy is lost between each trophic level **and** idea that insufficient energy left (due to energy transfers). Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **[Level 2]** Calculation of energy efficiency **and** one way that energy is lost between each trophic level **or** idea that insufficient energy left due to energy transfers. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **[Level 1]** Explains at least one way energy is lost **or** calculates the energy efficiency **or** explains why length of chain is limited. 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 2 and 3 may include:** **energy loss** • lost as heat / from respiration • lost in excretion • lost in egestion • not all parts of plant / sheep are eaten / digested **calculation** • $\frac{4000 \times 100}{200000}$ = 2% efficiency from plants to sheep **length of chain** • very little energy gets passed from one level to the next • not enough energy left to support another trophic level no calculation/ incorrect calculation limit to level 1 **Use the L1, L2, L3 annotations in Scoris. Do not use ticks.**
	Total	**6**	

Question	Answer	Marks	Guidance
9 a i	D (1) it has a thick(er) wall / muscle	2	2nd mark is dependent on the 1st **allow** more muscular

	OR it should be C but the heart is reversed (1)		
ii	idea that heart would need to be turned round / placed back to front (1) to allow connection to the correct blood vessels (1)	2	**allow** put the heart in face down / flipped over / reversed / inverted **allow** idea that would need to extend / reach the blood vessels to the heart (1) to allow them to reach the correct chambers (1) arteries / veins need to be swapped around (1)
b i	6300 (1)	1	
ii	**any two from** (yes) x-rays are routine / easy to do (1) idea that information will help doctors (1) idea that although SI only affects 1 in 10,000 that's still 6,300 people which is a lot (1) (no) x-rays are expensive / harmful (1) SI isn't dangerous in itself (1) idea that although it's 6300 people that's only a small proportion of the population / rare condition(1)	2	**allow** children can wear medical tags **ignore** it's common **allow** children live healthily with SI
	Total	**7**	

Question	Answer	Marks	Guidance
10 a	**[Level 3]** Describes more than one advantage **and** one disadvantage of the aspen reproducing by cloning. **OR** Describes at least one advantage **and** more than one disadvantage of the aspen reproducing by cloning. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **[Level 2]** Describes one advantage **and** one disadvantage of the aspen reproducing by cloning. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **[Level 1]** Describes at least one advantage **OR** at least one disadvantage of the aspen reproducing by cloning. 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 C** **Indicative scientific points may include:** Advantages • can reproduce even though all plants are male / sexual reproduction is unlikely • more reliable than seeds • less energy wasted than reproducing sexually / producing seeds • reproduction is quicker • if these trees are adapted to this environment then any new ones will also be adapted Disadvantages • lack of genetic variation • if one tree gets a disease then all may get it • if one is affected by any environmental change then they will all be susceptible • dispersal limited **Use the L1, L2, L3 annotations in Scoris; do not use ticks.**

Question	Answer	Marks	Guidance
b	idea that (many) plants/plant cells retain ability to differentiate but animals/animal cells do not (1)	1	**allow** idea that plant cells can switch genes back on but animal cells can not **allow** plants have more stem cells **ignore** no objections/easier etc.
c i	measures biomass / wet mass is too variable (1)	1	**ignore** more accurate unqualified **allow** dry mass not affected by the weather / water availability
ii	have to kill / destroy the tissue or organism (1)	1	**allow** idea that it is more time-consuming **ignore** difficult to dry out
	Total	**9**	

Question	Answer	Marks	Guidance
11 a	idea it's the amount of oxygen needed if all the energy released was from aerobic respiration (1)	1	**allow** difference between oxygen supply and demand for oxygen **allow** amount of oxygen needed to break down lactic acid
b	the oxygen needed to repay the oxygen debt (1)	1	**allow** the oxygen needed to break down the lactic acid **ignore** extra oxygen needed to stop oxygen debt
c	lactic acid (1) produced during exercise (because of anaerobic respiration) **and** removed after exercise / when resting (1)	2	2nd mark is dependent on the 1st **allow** lactate **allow** carbon dioxide **allow** produced during exercise and removed during recovery (1)
	Total	**4**	

Question	Answer	Marks	Guidance
12 a	2784, because each amino acid is coded for by 3 bases (1)	1	**correct explanation is needed for mark** **allow** other answers if explanation includes start / stop codons e.g. 2790, because there are also start and stop codons
b	(they will have) different shapes / different functions (1)	1	**allow** different active sites **allow** coded for by different genes / different base sequences
c	DNA unzips (1) forms single strands (1) new **complementary** bases added (1)	3	**allow** any of these points in a clear diagram **ignore** unravels / unwinds **allow** examples of complementary base pairing, e.g. A-T or C-G
	Total	**5**	

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