Variation and Selection

Mark Scheme 2

Level	IGCSE
Subject	Biology
Exam Board	CIE
Topic	Variation and Selection
Paper Type	(Extended) Theory Paper
Booklet	Mark Scheme 2

Time Allowed: **60 minutes**

Score: **/50**

Percentage: **/100**

<table>
<tr><th colspan="3">Question</th><th>E Answers</th><th>Marks</th><th>Additional Guidance</th></tr>
<tr><td>1</td><td colspan="2">(a)</td><td>wings ;
beak ;
feathers / plumage ;
scales on, legs / feet ;</td><td>[3]</td><td>ignore adjectives such as grey / long / sharp</td></tr>
<tr><td></td><td colspan="2"></td><td></td><td></td><td></td></tr>
<tr><td></td><td>(b)</td><td>(i)</td><td>quantitative (feature) ;
range between two extremes ;
ref. to (many) intermediates ;
not in distinct groups ;
influenced by the environment (and genotype) ;</td><td>[2]</td><td>A answer in context of wing length</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td>(ii)</td><td>length of …… anything suitable

(body) mass ;
age ;</td><td>[max 1]</td><td>A height R any discontinuous variable, e.g. colour
A weight R size / size of …..
A height</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td colspan="2"></td><td></td><td></td><td></td></tr>
<tr><td></td><td>(c)</td><td>(i)
1
2

3

4

R ‘greater life expectancy’</td><td>
largest number of / most, birds trapped ;
oldest (mean age for) birds trapped ;

comparative data quote for numbers ;
accept fraction / percentage / proportion of total

comparative data quote for age ;</td><td>[max 4]</td><td>assume answer is about birds trapped unless stated otherwise

<table>
<tr><th>wing length at ringing / mm</th><th>number of birds trapped</th><th>mean age at trapping / days</th></tr>
<tr><td>less than 63</td><td>24</td><td>253</td></tr>
<tr><td>64</td><td>72</td><td>256</td></tr>
<tr><td>65</td><td>1</td><td>297</td></tr>
<tr><td>66</td><td>1</td><td>346</td></tr>
<tr><td>67</td><td>1</td><td>349</td></tr>
<tr><td>68</td><td>1</td><td>270</td></tr>
<tr><td>69</td><td>66</td><td>237</td></tr>
<tr><td>more than 70</td><td>23</td><td>199</td></tr>
<tr><td></td><td>total = 771</td><td></td></tr>
</table>
</td></tr>
</table>

Question			E	Answers	Marks	Additional Guidance
1		(ii)	1 2 3 4 5 6 7 8 9 10 11 12	number of young birds of each wing length ; wing lengths of birds that died ; length of life / length of life after trapping ; results for birds in West Africa ; effects of migration ; wing lengths of birds that breed ; number of times each bird is trapped ; effect of trapping on behaviour ; larger sample ; other locations in, Sweden / anywhere in Europe ; AVP ; AVP ;	[max 3]	*look for types of evidence, not assertions* **R** wing length of newly hatched birds **R** 'study should be repeated' e.g. number of eggs laid by birds of each wing length / te which birds fly furthest / test which birds best at catching food
		(d)		birds with wing length 66–67, survive / live longer ; breed / reproduce / have offspring ; pass on their allele(s) for wing length ; birds with smaller and larger wings, die ; do not reproduce (as successfully) ;	[max 4]	**A** gene(s) *wing length may be implied* **A** 'the others'
				[Total: 17]		

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Question	scheme		Guidance
2 (a) (i)	*any two suitable examples* flood ; tsunami / tidal wave ; monsoon ; volcanic eruption **;** **A** volcano(es) earthquake ; typhoon / hurricane / storm / cyclone ; fire ; drought **;** crop / animal, disease ; **R** disease unqualified plague of pests of, crops / animals **;** (e.g. locusts) AVP ;	[max 2]	**R** snowstorms / tornadoes / landslides / avalanches / mudslides
(ii)	drought ; soil erosion ; desertification ; salinity of soils ; global warming ; rise in sea levels ; AVP ;	[max 1]	**R** volcanoes / volcanic eruptions **R** famine **R** drying up of land
(b)	1 overall increase (over the time period of Fig. 6.1) ; 2 natural disasters, fluctuates / described / irregular ; 3 human induced, increase ; 4 comparative data quote for named cause *or for* total causes ; 5 sudden onset increase / ora ; 6 economic factors increase / ora ; 7 comparative data quote for same cause ;	[max 5]	2 increase + decrease is minimum 4 with year and number of shortages for each quote 7 as for 4

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Question	scheme		Guidance
2 (c)	1 land needed for, building / urbanisation / AW ; 2 (so) not enough land to grow crops ; 3 increase in food production damages land ; 4 salination ; 5 desertification / erosion ; 6 overgrazing ; 7 not enough water ; 8 *idea that* increase in demand for food makes food too expensive for poorer people to buy ; 9 richer nations take more of food / food crops exported (for foreign currency) / agricultural land used for, cash crops / non food crops ; 10 difficult to distribute food ; 11 increased competition / conflict, if food production stays the same while population increase ; 12 AVP **;** e.g. food production does not keep up with population growth, increase population leads to increase pollution	[max 3]	3 **A** overcultivation 7 disruption to water supply *or* e.g. such as dams
(d)	1 suitable named crop plant or domesticated animal ; 2 suitable feature to improve ; 3 select individuals for breeding ; 4 select offspring that show improvement ; 5 use these for future breeding / AW **;** **A** 'repeat the process'	[max 4]	**R** genetic modification **R** 'cows bred together' **A** cattle with high milk yield are bred together / high yielding corn are bred together = 3 marks **R** cow for milk x bull for meat
(e)	transfer of, a gene / an allele, from one species to another ; **A** 'type of organism' *or* 'from one variety to another'	[1]	
		[Total: 16]	

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3 **(a** osmosis **;**
water, diffuses / moves, down water potential gradient **; A** high to low water potential
R high water potential gradient to a low water potential gradient
through partially permeable membrane **; A** selectively / semi-
salts / sugars / solutes, in root hair cell (to lower water potential) **; [max]**

(b) 20.0 **; A** 20 *accept if not in table* **[1]**

(c) (rate of water) uptake increases / AW **;**
positive correlation / exponential / not linear / AW **; R** directionally proportional
comparative use of figures with units **;**
e.g. 0.4 mm min^{-1} at 0 m s^{-1} / no wind, 20 mm min^{-1} at 8 m s^{-1} **A** increase by ×50 **[2 max]**

(d) temperature **; R** heat
humidity **;**
light intensity **; R** amount / levels, of light **[2 max]**

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(e) **1** (raw material for) photosynthesis / forming glucose *or* carbohydrate **;**
2 turgidity / support **;**
3 transport of, solutes / named solute / food substances **;**
4 forming vacuoles / growth / (cell) expansion **;**
5 taking part in chemical reaction(s) **;** e.g. hydrolysis / breaking down food substance
6 medium for chemical reactions / AW **;**
7 AVP **;** e.g. activating enzymes

R 'to keep hydrated' / solvent unqualified **[2 max]**

(f) **1** loss of water (vapour) through stomata (in leaves) **;**
2 evaporation, from surfaces of (mesophyll) cells / into air spaces (in leaf) **;**
3 loss of water from leaf (cells) lowers <u>water potential</u> **;**
4 water moves into leaf (from xylem) **;**
5 (this) pulls on / creates tension (in water column in xylem) **;**
6 cohesion of water molecules / AW **;** **A** 'stick together', ref to polar

R root pressure / adhesion / capillarity **[4 max]**

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3 **(g)** *note question says **structural** adaptations*

leaves, small / reduced to spines / are needles **;** **A** small surface area
no leaves **;**
curled / rolled, leaves **;**
hairs on the, leaves / stems **;**
thick (waxy) cuticle **;** **R** 'skin' / waxy cuticle unqualified
sunken stomata / AW **;**
few stomata **;**
fleshy / succulent, leaves / stems **;** **A** described as reserves / stores of water
small surface area: volume ratio **;**
deep roots **;**
long / extensive, shallow roots **;** **A** long roots near the surface

AVP **;** e.g. photosynthesis i
AVP **;**

ignore stomata close during the day **[3 max]**

[Total: 17]