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OCR
RECOGNISING ACHIEVEMENT

GCE

Biology

Advanced Subsidiary GCE

Unit **F212:** Molecules, Biodiversity, Food and Health

Mark Scheme for June 2011

Oxford Cambridge and RSA Examinations

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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.

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Question			Expected Answers		Mark	Additional Guidance
1	(a)		photosynthesis ; starch ; nucleic acids ; monomers ; cellulose ;		5	**Mark the first answer in each space.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **ACCEPT** minor mis-spellings
1	(b)		**1**	without fertiliser <u>yield</u> falls (over time) / fertiliser maintains <u>yield</u> / AW ;	3 max	**IGNORE** 'nutrients/ minerals' throughout **1** **ACCEPT** it / nitrate / nitrogen as AW for fertiliser **ACCEPT** fertiliser increases yield
			2	application of fertiliser replaces lost , nitrogen / nitrates ;		**2** **ACCEPT** it / nitrate / nitrogen as AW for fertiliser
			3	nitrogen / N, required for **,** amino acids / (named) protein / growth / (named) nucleic acids / (named) nitrogenous base ;		**3** **IGNORE** 'development' **IGNORE** fertiliser / nitrate / N_2
			4	*idea that* nitrogen / N / nitrate / $NO_3^{(-)}$, removed (from soil / system) by , plant / harvesting ;		**4** Answers must refer to depletion (from soil) 'used' alone does not imply depletion
			5	*idea of* denitrification ;		
			6	nitrates / $NO_3^{(-)}$, are soluble ;		
			7	nitrates / $NO_3^{(-)}$, are **,** leached / washed from soil ;		

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Question			Expected Answers		Mark	Additional Guidance
1	(c)					**ACCEPT** 'tolerance' as AW for resistance If candidates write 'immunity' penalise once and then ecf
			1	natural selection ;		
			2	insecticide is the , selective agent / selection pressure ;		
			3	*idea of* mutation / (genetic) variation ;		3 **DO NOT CREDIT** idea of insecticide or natural selection *causing* mutation **DO NOT CREDIT** variation that could be environmental
			4	random / naturally occurring ;		
			5	resistant survive / non-resistant die ;		5 **ACCEPT** AW for resistant, e.g. 'the ones with the mutation'
			6	(resistants will) pass on , allele / mutation , for resistance (to offspring) ;		6 **ACCEPT** gene for resistance **IGNORE** 'pass on resistance / trait'
			7	higher proportion of / more , resistant individuals in population ;		7 **CREDIT** refs to increased allele / gene frequency **ACCEPT** 'the whole population becomes resistant'
			8	*idea that* resistance allele confers resistance only to a small dose of insecticide ;		
					4 max	
				Total	[12]	

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Question			Expected Answers		Mark	Additional Guidance
2	(a)		(enzymes are) proteins / used in metabolism / used in named metabolic pathway ; alter rate of (chemical) reaction / lowers activation energy / provides alternative route for reaction / is not changed / is not used up ;		2	**ACCEPT** 'used in reactions , in organisms / in the body' **IGNORE** 'biological / enzyme / in nature' **ACCEPT** does not take part in reaction **Note** 'speed up metabolic reactions' **= 2 marks**
2	(b)	(i)	time ;		1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **IGNORE** 'how long' **IGNORE** correct units
2	(b)	(ii)	**P1** ***One of*** **M1** **M2** **M3** **M4** **M5**	*idea of* different samples have different concentrations of, catalase / enzyme ; source the extract for the whole experiment from a single source ; thorough , mixing , required before use ; filter / purify , extract ; *idea of* using , known / standard , concentration of enzyme ; commercial source of catalase ;	2	The M mark can be awarded without a correct P mark **P1** Look for the idea of variation within the sample (e.g. different amounts) **CREDIT** examples of lack of uniformity such as: breakage of cells / surface area / mixing / disruption of lysosomes / changes to enzyme shape (caused by blending process) / presence of other substances interfering with reaction **IGNORE** refs to celery being a poor source of catalase **M1 ACCEPT** 'from same plant'

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Question			Expected Answers	Mark	Additional Guidance
2	(b)	(iii)	repeat / replicate ; compare replicate values / identify anomalous results ; mean / range / standard deviation / error bars / % error ; compare results with , others / book / internet , values / results ;	2 max	e.g compare replicates with Table 2.1 **IGNORE** average Must contain the idea of other investigators **ACCEPT** 'look up normal values on the internet'
2	(c)	(i)			**IGNORE** explanations
		1	rate , rises / increases , initially ;		1 **DO NOT CREDIT** if 'rate' not stated for this mp only
		2	peak at / maximum at / highest at / decrease after, 40(^{o}C) ;		2 **ACCEPT** optimum
		3	(overall) fall more rapid than rise ;		3 Look for a comparative statement
		4	*idea that* before peak / after peak , temperature increase has increasing effect on rate ;		4 **ACCEPT**, e.g., line is steeper between 30 and 40 than between 10 and 20.
		5	comparative figures to support any point ;		5 Two temperatures and two rates, **with units**. Or calculated difference with appropriate units, e.g. rate doubles between 10 and 20°C **or** Q_{10} = 2
		6	no , reaction / oxygen produced , at 60(^{o}C) ;	4 max	6 **ACCEPT** rate is 0 at 60
2	(c)	(ii)	2 ;	1	**IGNORE** units
2	(c)	(iii)	temperature ; maximum / peak / V_{max} ; denatured ; active ;	4	**Mark the first answer for each letter.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **ACCEPT** kinetic energy / KE **ACCEPT** optimum / optimum temperature **IGNORE** descriptions
			Total	[16]	

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Question			Expected Answers		Mark	Additional Guidance
3	(a)	(i)	D ; A ; F ;		3	**Mark the first answer for each letter.** If an additional answer is given then = **0 mark**
3	(a)	(ii)	B ; E ; F ; F ;		4	**Mark the first answer for each letter** If an additional answer is given then = **0 marks**
3	(b)		**1** insoluble ; **2** does not , change / affect , water potential / Ψ , of cell ; **3** can be , broken down / hydrolysed / built up , quickly / easily ; **4** lots of branches for enzymes to attach ; **5** compact ; **6** (therefore) high energy content for mass / energy dense / AW ;		3 max	**2** **ACCEPT** osmotically inactive / AW **3** Answers must contain the idea of ease or speed of breakdown **IGNORE** broken up Answers must imply density, e.g. 'it is compact and so stores a lot of energy' = 2 marks

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Question			Expected Answers	Mark	Additional Guidance
3	(c)	(i)	α /alpha , glucose ;	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **ACCEPT** 'a'
3	(c)	(ii)	**1** respiratory substrate / used for respiration ; **2** source of / releases / provides, energy ; **3** formation of ATP ; **4** conversion into named compound ;	1 max	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **DO NOT CREDIT** any answer that clearly states that glucose **is** energy, **makes** energy, **produces** energy or **creates** energy **1** **ACCEPT** used in respiration **ACCEPT** 'releases energy for respiration' **2** **IGNORE** used for energy **4** e.g. starch / cellulose / polysaccharide / disaccharide / glycogen / protein / lipid / sucrose / maltose / fructose / fat
3	(c)	(iii)	D ;	1	**Mark the first answer.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **ACCEPT** F **IGNORE** triglyceride / fat / lipid / haemoglobin

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<table>
<tr><th colspan="3">Question</th><th>Expected Answers</th><th>Mark</th><th>Additional Guidance</th></tr>
<tr><td>3</td><td>(d)</td><td></td><td>
<table>
<tr><th>glycogen</th><th>cellulose</th><th></th></tr>
<tr><td>no hydrogen bonding</td><td>hydrogen bonding</td><td></td></tr>
<tr><td>α / alpha , glucose</td><td>β / beta , glucose</td><td>;</td></tr>
<tr><td>1,4 <u>and</u> 1,6-glycosidic bonds
or
1,6-glycosidic bonds present</td><td>1,4-glycosidic bonds (only)
or
1,6-glycosidic bonds not present</td><td>;</td></tr>
<tr><td>branched</td><td>not branched / linear / straight</td><td>;</td></tr>
<tr><td>no , fibres / fibrils</td><td>fibres / fibrils</td><td>;</td></tr>
<tr><td>granules</td><td>no granules</td><td>;</td></tr>
<tr><td>all glucose units in same orientation</td><td>adjacent glucose units in opposite orientation</td><td>;</td></tr>
</table>
</td><td>3 max</td><td>Comparative statements must be made on the same line
Award 1 mark for each correct side by side comparison. ALLOW two valid comparisons in the same pair of boxes, e.g
<table><tr><td>α-glucose in a branched chain</td><td>β-glucose in a straight chain</td></tr></table>= 2 marks

ACCEPT ‘a’ and ‘b’

ACCEPT helical / spiral / coiled vs linear / straight
DO NOT CREDIT α-helix</td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>[16]</td><td></td></tr>
</table>

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Question			Expected Answers		Mark	Additional Guidance
4	(a)	(i)				**Mark the first answer on each numbered line.**
			1	the elderly / older people **;**		**1 ACCEPT** ref to any age over 50
			2	'at risk' children / young people **;**		**2 ACCEPT** the young / infants / babies **IGNORE** refs to age
			3	pregnant women **;**		
			4	those with compromised immune systems **;**		**4 ACCEPT** weak **ACCEPT** e.g. with AIDS / HIV / on immunosuppressant drugs / ref cancer
			5	those with chronic diseases **;**		**5 ACCEPT** e.g. heart conditions / lung conditions / asthma / diabetes
			6	health workers **;**		
			7	poultry workers / pig farmers **;**	**2 max**	**7 ACCEPT** other professions working with animals, e.g. vets
4	(a)	(ii)	different strains of the virus / virus mutates (each year) **;**			**IGNORE** 'different types' or 'virus changes' or 'different strands' **ACCEPT** (influenza) pathogen
			(new strains have) different antigens **;** *idea that* antibody produced **,** needs to match new strain / antigen **; ora**		**2 max**	**CREDIT** antigenic shift / drift **ora** original antibody does not match new antigen

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Question			Expected Answers		Mark	Additional Guidance
4	(a)	(iii)	secondary response **,** starts earlier / has shorter delay before response **;** **ora** secondary response **,** more rapid / faster **;** **ora** secondary response **,** higher / produces more antibodies **;** **ora**		**2 max**	**Mark the first <u>two</u> differences** **IGNORE** answers, e.g. 'size of response' or 'response is faster' that do not refer to a feature of the secondary or primary response **CREDIT** 'shorter lag time' **ACCEPT** steeper **ACCEPT** bigger **IGNORE** 'secondary response lasts longer' as this is not clear from graph
4	(a)	(iv)	**1**	recognise **,** virus / antigen / pathogen **;**	**3 max**	**1** **ACCEPT** description of recognition **IGNORE** find / detect
			2	produce a clone **;**		**2** **ACCEPT** ref to clonal expansion **ACCEPT** 'divide by mitosis to produce large numbers'
			3	can , change to / form **,** plasma cells (on infection) **;**		
			4	make antibodies (against influenza **,** virus / antigen) **;**		**4** **IGNORE** 'reproduce antibodies' **IGNORE** 'release antibodies'
			5	responsible for secondary response / destroy virus before symptoms appear **;**		**5** **IGNORE** refs to speed of response unqualified
			6	can , change to / form **,** named T-cell **;**		

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Question			Expected Answers		Mark	Additional Guidance
4	(b)	(i)	(antibiotics) are, not effective against viruses / effective (only) against bacteria (and fungi / protozoa) ;		1	**ACCEPT** antibiotics do not kill viruses **IGNORE** viruses are resistant to antibiotics **ACCEPT** correct ref to detail of antibiotic action, e.g. 'antibiotics attack cell wall which is not present in influenza (virus)'
4	(b)	(ii)	**1**	Tamiflu® is , competitive / non-competitive inhibitor ;		
			2	correct detail of inhibition method that does not contradict stated type of inhibition ;		**2** e.g. fits or binds to active site / complementary shape to active site / competes for the active site **OR** fits into allosteric site or site other than active site **/** changes shape of active site
			3	prevents , substrate binding to active site / formation of enzyme-substrate complex / formation of ESC ;	2 max	**3** **IGNORE** substrate binding to enzyme
4	(b)	(iii)	fewer , viruses / pathogens , produced ; fewer , viruses / pathogens , (in droplets) when , sneezing / coughing ; (as) viruses / pathogens , cannot leave cell ; (so) cannot , infect / spread to , other cells ; *idea of* treating , large / proximate , population ;		2 max	**IGNORE** herd immunity / ring vaccination
4	(c)		(plants) already identified as likely to have , medicinal properties / few side effects / AW ; reduces , time / effort , in finding , plants / active chemicals ; (possibly) reduces cost ;		2 max	**ACCEPT** 'known / proven to work' **ACCEPT** reduced time for testing
				Total	[16]	

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Question			Expected Answers	Mark	Additional Guidance
5	(a)	(i)	both rise (between 1920 and 1960) **;** men started smoking before, ca. 1900 / women's smoking started increasing after 1920 - 1925 **;** similar levels of smoking (in men and women) by 1990 **;** smoking in men **,** levelled off / plateaued **OR** smoking in women continues to rise **;**	**2 max**	Needs direct comparison in single statement **ACCEPT** comparative statement, e.g. 'women started smoking later than men' **ACCEPT** 5000 in both by the end of the 1980s **DO NOT CREDIT** if plateau described before 1940
5	(a)	(ii)	(positive) correlation / similar pattern **,** between smoking and lung cancer **;** *idea that* increase in incidence of lung cancer lags behind increase in smoking **;** *idea of* once smoking has levelled off there is a corresponding levelling off in incidence of lung cancer **;** *idea of* men always smoking more and men having higher rates of cancer **; ora**	**2**	**ACCEPT** similar shaped graphs **IGNORE** 'as smoking increases, so does lung cancer' **ACCEPT** followed by **ACCEPT** if answer implies levelling off at same time

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Question			Expected Answers		Mark	Additional Guidance
5	(b)		1	tar / (cigarette) smoke **,** contains <u>carcinogen</u>s / is <u>carcinogen</u>ic **;**		1 **IGNORE** cigarettes
			2	benzopyrene / formaldehyde / other e.g. **;**		
			3	enters **,** lung / epithelial **,** <u>cells</u> **;**		
			4	*idea that* destroyed cilia prevent removal of **,** carcinogens / tar **,** which then have greater contact time with epithelial cells **;**		
			5	enters nucleus / in contact with DNA **;**		5 'contact with DNA' needs to be stated not implied
			6	causes <u>mutat</u>ion **;**		6 **IGNORE** description
			7	proto-oncogenes to oncogenes **;**		7 **ACCEPT** switching on (proto)oncogenes
			8	uncontrollable **,** cell division / mitosis **;**		8 **ACCEPT** cell multiplication **IGNORE** growth **IGNORE** ref to speed of cell division
			9	formation of **,** tumour / mass of cells **;**		9 **ACCEPT** lump (of cells)
			10	no **,** programmed cell death / apoptosis **;**	**5 max**	
			QWC ~ showing link between smoking and lung cancer **;**		**1**	1 mark awarded from mps **1** to **5** **<u>and</u>** 1 mark awarded from mps **6** to **10**

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Question			Expected Answers	Mark	Additional Guidance
5	(c)				**Mark the first answer on each numbered line.**
			1 mouth / tongue / throat / oesophageal **,** cancer **;**		**1 ACCEPT** <u>secondary</u> cancers
			2 <u>chronic</u> bronchitis / COPD **;** **3** emphysema / COPD **;** **4** <u>ath</u>erosclerosis **;** **5** thrombosis **;** **6** coronary heart disease / CHD / angina / heart attack / myocardial infarction / MI **;** **7** stroke **;** **8** peripheral vascular disease / <u>arterio</u>sclerosis **;**	**max 3**	**2 DO NOT CREDIT** smoker's cough **3 CREDIT** COPD once only **5 IGNORE** thrombus **6 IGNORE** cardiovascular disease / hypertension / chronic heart disease
			Total	**[13]**	

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Question			Expected Answers	Mark	Additional Guidance
6	(a)	(i)	3 parts to body ; head + thorax + tail ; segmented ; lateral spines / spines from both sides of head ; thorax / tail , similar shape ;	3 max	**Mark the first answer on each numbered line.** **ACCEPT** wherever seen **ACCEPT** 'a lateral spine' **ACCEPT** description of thorax / tail shape
6	(a)	(ii)	anterior spine (from head) on A ; longer lateral spines on B ; less rounded / AW , head on B ; any other reasonable difference ; ;	2 max	**Mark the first answer on each numbered line.** Answers must state either species A or species B **ACCEPT** ora throughout e.g. (greater) fusion of tail segments in B grooves around edge of head in B outline of tail section (more) curved in A A has more segments **CREDIT** any clear description of a difference
6	(b)		***1*** *idea of* fossils show changes over time ; ***2*** *idea that* there are methods to date fossils ; ***3*** *idea of* simplest / most different from modern , species / AW , in oldest rocks ; ***4*** *idea of* showing , links / relationships , between , groups / species / organisms / taxa ; ***5*** many fossils organisms no longer exist ; ***6*** *idea of* compare DNA extracted from some fossils ;	2 max	**2** **ACCEPT** it is possible to date fossils **4** **ACCEPT** ref to common ancestor of two species Answers could refer to links between species A and species B
			Total	[7]	

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Question			Expected Answers	Mark	Additional Guidance
7	(a)				**Mark the first answer for each letter.** If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then **= 0 marks**
			X phosphate **;**		**DO NOT CREDIT** PO_4 or 'phosphate **,** molecule / backbone' **IGNORE** group
			Y deoxyribose **;**		**DO NOT CREDIT** deoxyribulose **IGNORE** (pentose) sugar
			Z thymine **;**	**3**	**DO NOT CREDIT** incorrect spelling **IGNORE** (nitrogenous) base / T

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Question			Expected Answers		Mark	Additional Guidance
7	(b)					**CREDIT** answers from clearly labelled diagram **IGNORE** anything after it becomes clear that a candidate is ***describing*** transcription
			1	semi-conservative (replication) **;**		
			2	(double) helix**,** untwists / uncoils / unwinds / unravels **;**		**2** **IGNORE** straightens **DO NOT CREDIT** α-helix
			3	hydrogen bonds (between bases) break **;**		**3** **IGNORE** unzips
			4	each strand acts as the template (for the formation of a new molecule) **;**		
			5	free (DNA) nucleotides (align with exposed bases) **;**		**5** **IGNORE** in cytoplasm
			6	complementary base pairing / purine to pyrimidine **;**		**6** **IGNORE** A to T / C to G (as given in Q) **ACCEPT** base pair rule
			7	hydrogen bonds (re)form **;**		
			8	sugar-phosphate backbone forms / adjacent nucleotides join **;**		**8** **CREDIT** formation of phosphodiester bond
			9	DNA polymerase joins **,** backbone / strands **;**		**9** **ACCEPT** in context of H bonds forming
			10	each new molecule has 1 old and 1 new strand **;**		**10** **DO NOT CREDIT** half old and half new strand
			11	AVP **;**		**11** e.g. correct ref to **,** (DNA) helicase (in context of unwinding or unzipping) / (DNA) ligase (in context of joining Okazaki fragments or role in backbone formation) / leading or lagging strand / 3' / 5' / antiparallel / activation of free nucleotides / 3 H bonds between C and G / 2 H bonds between A and T / Okazaki fragments / proof reading
					6 max	
			QWC ~ events in correct sequence so long as no ref to transcription / translation **,** seen **;**		**1**	1 mark from mps **2** to **4** ***then*** 1 mark from mps **5** to **7** ***then*** mp **8** or **9**
				Total	**[10]**	

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Question			Expected Answers	Mark	Additional Guidance
8	(a)		**1** different species **;** **2** different genus **;** **3** genetically incompatible **;** **4** (may have) different number of chromosomes **;** **5** physical / behavioural **,** reason for reproductive incompatibility **;**	**2 max**	**3 ACCEPT** 'DNA sufficiently different' **IGNORE** refs to meiosis **4 IGNORE** refs to meiosis **5** e.g. eggs remain unfertilised / different incubation patterns **IGNORE** refs to fertility of offspring
8	(b)	(i)	Convention (on) International Trade (in) Endangered Species **;**	**1**	**ACCEPT** Commission / Conference / Congress **ACCEPT** Trading **DO NOT CREDIT** Conservation / Countries
8	(b)	(ii)	**1** regulate / monitor **,** trade in selected **,** species / animals / plants / animal products **;** **2** *idea of* ensuring trade does not put wild populations at risk **;** **3** *idea of* prohibiting commercial trade in wild plants **;** **4** *idea of* allowing trade in artificially propagated plants **;** **5** *idea of* allowing trade in less endangered species subject to permit **;**	**2 max**	**Mark the first two answers only.** **IGNORE** trafficking throughout (as in stem) **1 ACCEPT** idea of species being on a list **ACCEPT** endangered **ACCEPT** prevent **IGNORE** illegal **IGNORE** animals / plants unqualified **3 ACCEPT** endangered plants

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Question			Expected Answers		Mark	Additional Guidance
8	(c)		unrelated / AW, individuals ; health ; of reproductive age ; selecting individuals of opposite sex (for breeding) ; select higher proportion of females ;		2 max	**ACCEPT** idea of individuals with sufficiently different genes **ACCEPT** 'whether they are healthy (or not)' **ACCEPT** fertility of individuals
8	(d)		**1** bird(s) healthy / quarantine before release ; **2** adequate (natural) food supply / provide food (if necessary) ; **3** protected reserve / no hunting / no poaching / legal protection ; **4** method to monitor population ; **5** raise public awareness / educate local population / educate collectors ; **6** method to prepare animals for survival in wild ; **7** *idea of* gradual introduction, e.g via semi-wild habitat ;		3 max	**1** **IGNORE** refs to ongoing health monitoring **3** **ACCEPT** ref to controlling predators **4** e.g. tag birds **5** **ACCEPT** involve local population **6** e.g. raise with minimal human contact, predator awareness training **ACCEPT** teaching it to find food
				Total	[10]	

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