RECOGNISING ACHIEVEMENT

2805/03 Environmental Biology

June 2005

Mark Scheme

Abbreviations, annotations and conventions used in the Mark Scheme	/	=	alternative and acceptable answers for the same marking point
	;	=	separates marking points
	NOT	=	answers which are not worthy of credit
	R	=	reject
	( )	=	words which are not essential to gain credit
		=	(underlining) key words which **must** be used to gain credit
	ecf	=	error carried forward
	AW	=	alternative wording
	A	=	accept
	ora	=	or reverse argument

Question	Expected Answers	Marks
1 (a)	very high temperature ; enzymes would denature ; no water (vapour) present / no water in liquid state ; consequences / effect on metabolism ; consequence of high carbon dioxide concentrations ; acidic atmosphere ; lack of oxygen ; lack of nitrogen fixation ; ref to high pressure ; ref to day length / increased day length ; consequence to photosynthesis ; synchronisation of life cycles / AW ; ref to comparative data ;	**max 4**
(b) (i)	volcanic eruptions release large quantities of, carbon dioxide / other greenhouse gases ; *increase* in the layer / blanket of carbon dioxide / other named gases, around Venus; (allows) high energy / short wavelength, rays from the sun to enter Venus's atmosphere ; (when these are) reflected / radiated, from the surface of the Venus ; **R** heat energy they have lost energy ; (and) the longer wavelength rays / infra-red rays, cannot escape through the blanket of gases ; this causes global warming ;	**max 5**

(ii) *carbon dioxide*

(increased) burning of fossil fuels ;
deforestation ;

methane

(increased) amount of decomposing, rubbish / waste ;
increased numbers of cattle ;
increased areas of rice paddy fields;
ref to landfill sites ;
melting of permafrost ;

nitrous oxides

increased, use of vehicles / air travel ;

CFCs

aerosols ;
refrigerators / cooling systems ;
disposal of polystyrene ; **max 3**

(iii) melting of polar ice caps ;
thermal expansion of water ;
expansion of water in oceans / rising sea levels ;
flooding (of lowland / coastal areas) ;
climatic changes / AW ;
effects on biodiversity / distribution of (plant / animal) species ;
(certain) pests / diseases, may thrive in warmer conditions ;
e.g. malarial spread / ref to fungal diseases ;
named effect on agriculture ;
AVP ; e.g. effect on Gulf Stream, effects on life cycles, increased levels of desertification **max 3**

[Total: 15]

Question			Expected Answers	Marks
2	(a)		*accept reverse arguments for all responses* poorer drainage (of A) ; higher water table (in A); flooding (into A) ; run-off from moor (into A) ; clay soil (in A) / sandy soil (in B) ;	**max 2**
	(b)	**1**	weigh sample of soil ;	
		2	heat until constant mass ;	
		3	calculation of percentage explained / use of <u>correct</u> formula ;	
		4	ref to repetitions ;	
		5	means / averages, calculated ;	
		6	SD of means ;	
			water	
		7	place sample in oven / incubator *or* heat to 60 - 110^{o}C ;	
		8	loss in mass = water in sample ;	
			organic matter / mineral matter	
		9	place <u>dried</u> soil in oven ;	
		10	heat strongly / burn ;	
		11	loss in mass = organic matter ;	
		12	mass remaining after above processes = mineral matter ;	
			air	
		13	measure volume of a (soil) sample ;	
		14	of core / undisturbed soil / AW ;	
		15	add / place into, a <u>measured</u> volume of water ;	
		16	total volume – (volume of soil + water) = volume of air ;	
			marking points 1-6 are awarded <u>once only</u> for either the water <u>or</u> organic/mineral matter methods	**max 9**
			QWC – clear, well organised using scientific terms ;	**1**
			only award the QWC mark if answer is well structured and all four aspects are covered	
	(c)	(i)	anaerobic conditions encourage denitrifying bacteria ; convert nitrate ions to (gaseous) nitrogen ; reduces available nitrogen ; sundew does not rely on, soil nitrate / soil nitrogen ; ref to, hydrolysis / digestion / use of enzymes, on insect proteins ; releasing amino acids ; ref to deamination ; *max 3*	**max 4**

(ii) Reduces amount of air in soil ;
roots starved of oxygen ;
respiration becomes anaerobic ;
insufficient energy released ;
not able to absorb (enough), ions / named ion ;
via active transport ; **max 3**

[Total: 19]

Question			Expected Answers	Marks
3	**(a)**		set out a grid in each area *or* site / description of how the grid is established ; use random numbers ; how generated ; e.g. random number tables / use of calculator to give co-ordinates ; at that point / co-ordinate, measure nearest plant ; repeat (14 times) ;	**max 4**
	(b)	**(i)**	total heights ; divided by the number of plants (in the sample) ; provides an average height for the sample ;	**max 2**
		(ii)	measure of, variability / spread of heights (in sample) ; **R** range sum of differences from the mean ; 68% of values lie within mean ± 1 S.D. ; 95% of values lie within mean ± 2 S.D. ;	**max 2**
	(c)		greater spread from mean in site **B** / *ora* ; **R** range height of plants in site **B** is more variable / *ora* ;	**max 1**
	(d)	**(i)**	that there is no significant difference ; between the mean height in site **A** and the mean height in site **B** ; **A** results any difference is entirely due to chance ;	**max 2**
		(ii)	there is a significant difference between the means at the two sites ; the difference is due to something other than chance ; reject the null hypothesis ; with 28 degrees of freedom; at the 5% confidence level ; **A** $p<0.05$ / <0.01 / <0.001 the critical t value is, 2.05 / 2.76 / 3.67 ; calculated value, exceeds / is much higher than, this ; assuming the sample shows a normal distribution ;	**max 4**

[Total: 15]

Question		Expected Answers	Marks
4	(a)	(existence of many) different species ; with (a wide range of) different, genes / alleles ; live / co-exist, in (many different), habitats / ecosystems ; **A** environment	**max 2**
	(b)	*ecological* **1** prevents disruption of food, chains / webs ; **2** maintenance of, ecosystems / habitats ; **3** interdependence of species / AW ; **4+5** credit two good examples ; ; e.g. dispersal of seeds, pollination **6** AVP ; *max 3*	
		economic **7** importance of gene pool ; **8** some species, may be of use in the future / not yet discovered ; **9** for medicinal purposes ; **10** example ; **11** fishing / agricultural / silvicultural, purposes ; **12** could be crossed with existing agricultural, species / strains ; **13** to improve yield ; **14** increase hardiness ; **15** increase, disease / pest resistance ; **16** tourism ; **17** AVP ; *max 4*	
		ethical **18** reduction in biodiversity is a result of human activity, so have a moral responsibility to try to put things right / AW ; **19** for future generations ; **20** AVP ;	**max 8**
		QWC – legible text with accurate spelling, punctuation and grammar ;	**1**
	(c)	purchase of land ; setting up, nature reserves / bird reserves / nesting sites ; managing of such reserves / full time wardens ; recruiting / training, volunteers ; education / raising public awareness ; through advertising / national campaigns ; giving talks / lectures ; publishing magazines ; bird / wildlife, surveys ; selling products ; e.g. nest boxes, bird feeders lobbying Members of Parliament ; **R** Government monitoring any activities which might harm, wildlife / habitats ; prosecuting, egg collectors / dealers in endangered species ; AVP ; e.g. rehabilitation of injured wildlife, captive breeding and release programmes	**max 4**
			[Total: 15]

Question			Expected Answers	Marks
5	(a)		*accept reverse arguments if responses are referring to cereal plants* both have root nodules ; with *Rhizobium* bacteria ; which are nitrogen-fixing ; convert nitrogen (gas), to nitrate ions / ammonium compounds ; **A** NO_3^- / NH_4^+ **R** ammonia / NH_3 plants convert these to amino acids ; which are used to make protein ; high levels of proteins stored in seeds ;	**max 4**
	(b)		organic manure of variable composition ; (manure) difficult, to control amount applied / to apply evenly ; (manure too) bulky ; (manure) needs heavy machinery to apply on farms ; more labour intensive ; lower yield / more land required ; (products have) shorter shelf lives / more blemishes ; (products have) higher prices in shops ; more problems, with pests / diseases, in or on the produce ;	**max 3**
	(c)	**(i)**	intercropping ;	**1**
		(ii)	different crops (species) may be harvested at different times so land is always under cultivation ; reduces soil erosion (in long term) ; some (species of crops) may offer, protection / support / shelter, to other species ; predators of pests of one crop (species) may live on other crop (species) ; different crop species have different mineral requirements ; which helps to maintain soil fertility ; ref to legumes ; nitrogen fixation ; increases, nitrogen / nitrate, in the soil (for other crop species) ;	**max 5**
				[Total: 13]

Question			Expected Answers	Marks
6	(a)		*award two marks if correct answer (9 600 – 10 4 00) is given* *incorrect answer but correct working = 1 mark* *ecf rules apply for 1 mark max* diameter of oocyst in photo = 50 mm / 5 cm / 50 000 μm ; **A** +/- 2mm magnification = 50 000 / 5 ; **A** 48 000 – 52 000 / 5 = x 10 000 ; **A** 9 600 – 10 400	**max 2**
	(b)	**(i)**	nucleus ; membrane-bound organelles / named organelle ; named eukaryotic feature ;	**max 1**
		(ii)	disease-causing / AW ;	**1**
	(c)	**(i)**	chlorine ; ultra-violet light ; ozone ;	**max 2**
		(ii)	faeces from infected, cattle / sheep ; contain oocysts ; rainwater, washes / AW, these from fields ; into reservoirs ; water treatment ineffective / oocysts resistant ; oocysts enter domestic water supply ; human error ;	**max 3**
	(d)		those infected with HIV / immuno-compromised ; old people / elderly ; infants / babies ; **R** children pregnant women ; AVP ; e.g. people recovering from surgical procedures	**max 2**
	(e)		pesticides ; lead / heavy metals ; nitrate ; PCBs / PBBs ; AVP ; e.g. chlorine, fluoride	**max 2**
				[Total: 13]