Q	Answer as per MS	Marks	NOTES
1 a.i	0.2		0.2.
a.ii	pyramid shape with four trophic levels widest at the bottom ; bars drawn at correct width (half a small square) ; each bar labelled with trophic level ;		
b.i	Decomposer		Decomposer
c.i	photosynthesis ; ref. to chlorophyll ; light energy is transferred to chemical energy ; (named) glucose formed (from carbon dioxide and water) ; named example of carbohydrate molecule used to make biomass ;		Organisms in the first tropic level, known as produces have chlorophyll which is used to trap solar energy and convert it to chemical energy by the formation of glucose from carbon dioxide and water in a process known as photosynthesis. The glucose is converted to other carbohydrate such as starch for storage and other compounds such as proteins and fats, all of which form the biomass.
c.ii	energy is lost between the trophic levels / energy decreases up the trophic levels ; not all of the organism is, eaten / digested / absorbed ; energy is lost, as heat / in respiration / in metabolic processes / named metabolic process / movement ; energy lost in, excretion / faeces / urine ; (so) less energy to support the next trophic level ;		Energy is last between trophic levels as heat in metabolic reactions. Not all of the organisms is eaten. Hence , less energy passes on to the next trophic level. Thus , the fourth level has least biomass.

d	**1** prevents extinction / protection of endangered species **;** **2** maintains genetic diversity / biodiversity / AW **;** **3** maintaining habitat / ecosystem / breeding grounds **;** **4** maintain, nutrient recycling **;** **5** maintain, resource provision / food / drugs **;** **6** maintain, food chains / food webs / trophic levels / description of **;** **7** prevent soil erosion / flooding **;** **8** AVP **;** as a leisure facility / tourism / education		The woodland maintains biodiversity by maintaining habitat and prevents extinction of species. Wood lands also maintain resource provision, food chains and prevent soil erosion . woodlands also promote tourism and , there for , need to be conserved.
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2 a.i	(during the day they) remain in a burrow / stay in the shade / stay inactive / sleep / AW **;** light colour / pale / yellow / white (fur / hair) / AW **;** thin / long, tail / legs **;** thin / short / little, fur **;** no fur on legs **;** fur on feet **;** large, ears / pinna(e) **;** little / no, fat **;** large surface area: volume ratio **;** produces, little / concentrated, urine **;** AVP **;**		1. During day time remain in a burrow . 2. Have light colour so as to absorb little heat .
a.ii	big eyes / large pupils / good eyesight **;**		1. Big eyes

	whiskers ; lots of rods (in the retina / fovea) ; large ears / good sense of hearing / sensitive ears ; good sense of smell ;		Large ears for sensitivity .
b.i	block added to the top of the pyramid that is 4 small squares wide ; labelled carnivores ;		
b.ii	(detritivores) eat (mainly), plants / producers ; (detritivores) feed, at second trophic level / as primary consumers ; detritivores are eaten by, third trophic level / secondary consumers ;		Detrivores eat mainly plants and feed at the second trophic level. They are eaten by third trophic level i.e. secondary consumers, hence , quality, as herbivores .
b.iii	little energy is transferred from one trophic level to the next ; **ora** not all of the organisms are, eaten / digested / absorbed ; named example of energy loss ; *idea that* not enough energy to support higher trophic levels ;		Energy is lost at each trophic level to metabolic reactions and waste. By the time the fourth or fifth trophic level is reached , there is hardly energy left to support another trophic level.
b.iv	*idea that* in a pyramid of numbers one large individual is shown in the same way as one very tiny individual ; **ora** biomass indicates how much food there is, available / left ; biomass is an indicator of the energy available ;		In a pyramid of number , an individual having large biomass is shown in the same way as another having very little biomass , which does not indicate the energy available correctly. Moreover, pyramid of biomass assumes the correct pyramid shape whereas pyramid of numbers may not always do so .

	pyramid of biomass is pyramid shaped whereas a pyramid of numbers is not always **; ora** AVP **;**		
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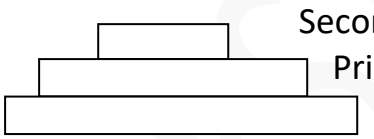
3a.i	1.1 (g) ;;		$\frac{8000 \times 1000}{7500000} = 1.1\ g$.
a.ii	Bottom bar is narrowest ; Middle bar is widest ; Correct numbering of trophic levels ;		 Secondary consumer Primary consumer Producers
a.iii	Pyramid of biomass is pyramid – shaped (any pyramid of number is not) ; ora Mangrove trees have a larger biomass (than crabs); ora So one tree provides food for many crabs / AW ; (total) crap biomass is greater than (total) seagull biomass ; ora Comparative data to support an argument with units ;		The pyramid for biomass would have the bottom bar widest as the mangrove trees have the largest biomass, the middle bar is narrow and the top bar narrowest in keeping with the biomass of different trophic levels.
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4	temperature **;** light (intensity) **;** water (supply) / *idea that* water is not available (as frozen) **;** (named) soil feature **;** (named) mineral ion **;** carbon dioxide **;** grazing / predation **;** (competition for) space **;** disease **;**		1. Temperature 2. Light intensity Water supply .

	(named) pollutant ;		
b	little energy available from, herbivores / primary consumers / lower trophic level(s) ; few producers / low population of producers / AW ; energy is lost, between / within, trophic levels / along food chain ; **ora** ref to 10 % energy transfer / 90% energy loss (between trophic levels) ; **ora** energy lost, in named process ;;; low numbers of, prey / (primary) consumers / food ; wolves not very successful at catching prey ; reason why ; e.g. prey are widely dispersed / larger animals lower reproductive rate / higher mortality of wolves ; hunting / killed by people ; reason why ; e.g. for fur / compete with humans for food habitat destruction (by humans) ; reason why ; e.g. road building / oil exploration / melting of snow disruption of food web (described) ;		Population of producers is low in the tundra due to unfavourable environment conditions. Therefore number of primary consumer is also low. The energy transferred (10 %) from each trophic level is barely sufficient to support the third trophic level which result in a very small number of wolves .

	disease ; inbreeding / reduced genetic diversity ; climate change / global warming ;		
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5	1 to prevent extinction (of many species) / maintain (bio)diversity ; 2 ref to preventing disruption of food, chains / web ; 3 provide, habitats (for shelter / breeding grounds / AW) for many species ; 4 and 5 ecosystems provide, 'service', for humans ; ; 6 idea of areas for, recreation / (eco)tourism / education ; 7 ethical reasons / aesthetic reasons / AW ;		Ecosystem provide habitat for many species. Concentration on one species would disrupt the food chain and cause extinction of many species.
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6	$200 \div 0.0001 = 2 \times 10^6$		$200 \div 0.001 = 2 \times 10^6$ $. GJ\ per\ ha\ .$
	www.igcse.net		
7 a	1 overall carbon dioxide concentration increases ; 2 at a steady rate ; 3 there are minor fluctuations in carbon dioxide concentration ; 4 the fluctuations occur, regularly / yearly / seasonally ; 5 use of comparative figures with year and concentration with units ;		The overall carbon dioxide concentration rate increases steadily from 313 ppm in 1958 to 388 ppm in 2010. There are minor fluctuations in 1964 , 1974 , 1994 and 2004 showing slight rise.

b.i	Methane.		Methane.
b.ii	1 radiation / light from the Sun hits, Earth / atmosphere ; 2 (named) short-wave radiation passes through carbon dioxide layer ; 3 re-radiated / reflected, from the ground as long-wave radiation / infrared / heat energy ; 4 long-wave radiation / infrared / heat energy, trapped / prevented from escaping from atmosphere by carbon dioxide ;		Radiation from the sun , in the form of short – wave radiation , penetrates the carbon dioxide layer surrounding the earth. It is reflected from the earth surface as long – wave radiation which is unable to pierce the carbon dioxide layer and circulates below the layer to heat up the atmosphere . this is called green house effect.
c	1 fertiliser / nutrients, leached into / enter, rivers / streams / lakes ; 2 causing algal bloom / algae growth ; 3 algae block sunlight from entering water ; 4 so rooted plants unable to photosynthesise ; 5 so plants die ; 6 bacteria, decompose / feed, on dead plants ; 7 so bacterial population increase ; 8 bacteria respire aerobically ; 9 bacteria use up the oxygen in the water ;		Nutrients from fertilisers get leached into water bodies causing increased algal growth . the algae block sunlight from entering water , so rooted plants are unable to photosynthesis , and die . bacteria respire aerobically , using up the oxygen in the water scarcity of oxygen causes fish and other aquatic creatures to die or migrate.

	10 organisms / fish / creatures, die / suffocate / migrate, due to lack of oxygen ;		

8	1. to prevent extinction; 2. maintain biodiversity; 3. provide feeding grounds for animals / ref. to disruption of food, chains / web; 4. provide, breeding grounds / places for breeding; 5. provide, habitats / shelter; 6. vulnerable to the effects of, development / drainage / AW; 7. ref to flooding / natural disasters; 8. ref to nitrogen cycle; 9. ref to maintenance of water cycle; 10. ref to carbon cycle; e.g. greenhouse gas / carbon storage / carbon sink 11. waste disposal; 12. provide, resources / food / fuel / drugs / raw materials; 13. idea of areas for, recreation / (eco)tourism / education; 14. ethical reasons / aesthetic reasons / AW; 15. AVP; e.g. soil erosion		Wetlands need to be conserved to maintain bio diversity and prevent extinction of many species. Wetlands provide feeding grounds. Breeding grounds and habitates for a large number of species. They are vulnerable to the effects of development and natural disasters. Wetlands are also vulnerable to waste disposal and conservative method need to be taken . destruction of wetlands will have adverse effects on nutrients cycles.

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