Question Number	Answer	Acceptable answers	Mark
1(a)(i)	**C** ☒ parasite		(1)

Question Number	Answer	Acceptable answers	Mark
1(a)(ii)	A suggestion linking **two of the following:** • suckers on the head /adaptation of the head (1) • attaches to the intestine (1) OR • a very long thin shape / large surface area (1) • for absorption (1) OR • surface / skin (1) • resistant to enzymes (1)	Accept hooks, teeth for suckers Reject large intestine Accept long flexible shape Ignore references to resistance to stomach acid Ignore references to larvae, eggs and reproduction	(2)

Question Number	Answer	Acceptable answers	Mark
1(a)(iii)	A suggestion including two of the following: • cooking meat thoroughly (1) • do not eat meat /become a vegetarian / vegan(1) • destroy/don't eat the cysts in the meat(1) • prevent animals from eating tapeworm eggs (1) • worm the animal (1)	Accept food/pork for meat	(2)

Question Number	Answer	Acceptable answers	Mark
1(b)	An explanation including **three** of the following: • (chemosynthetic) bacteria live in (the gut of) the tube worms (1) • the bacteria convert sulphurous / hydrogen sulphide compounds (1) • into food for the tube worms (1) • the tube worms provide place for the bacteria to live / provides oxygen for bacteria (1) • this is a mutualistic relationship (1)	**Accept sulphur** Accept bacteria make food for worms **Accept protection** Accept mutualism / mutual benefit / mutual relationship	(3)

Total for Question 1 = 8 marks

Question Number	Answer	Acceptable answers	Mark
2a(i)	**C** ☒ nitrification		**(1)**

Question Number	Answer	Acceptable answers	Mark
2a(ii)	an explanation to include the following points • used to make protein (1) • for growth (1)	**Ignore references to use as food (plants do not feed)** accept amino acids/ chlorophyll /DNA ignore references to photosynthesis / respiration	**(2)**

Question Number	Answer	Acceptable answers	Mark
2a(iii)	A description linking **four** of the following points (nitrates) leach/flow into water (1) algae and small plants grow **rapidly** /algal bloom (1) **underwater** plants cannot photosynthesise (1) (lack of photosynthesis / sunlight) causes plants to die (1) decomposers / (decomposing) bacteria break down the dead material / plants (1) these bacteria use up oxygen during respiration(1)	accept fertilisers for nitrates	**(4)**

Question Number	Answer	Acceptable answers	Mark
2(b)	An explanation to include three of the following points bacteria use nitrogen / nitrogen fixing bacteria (1) make ammonia / ammonium / nitrogen compounds /nitrates for use by plants (1) bacteria protected (within the root nodule) (1) bacteria obtain chemical substances / glucose / sugar from the plant (1) this is called a mutualism / symbiosis(1)	**Ignore food/nutrients** **reject parasitism**	**(3)**

Total for question 2 = 10 marks

Question Number	Answer	Acceptable answers	Mark
3(a)(i)	B - eutrophication		**(1)**

Question Number	Answer	Acceptable answers	Mark
3a(ii)	Any **two** from the following: • (over use of) nitrates / phosphates fertilisers (1) • leaching into the lake(1) • sewage leakage into the lake (1)	flowing into lakes / washing into lakes (accept streams, rivers for lakes)	**(2)**

Question Number	Answer	Acceptable answers	Mark
3a(iii)	(plant growth) is increased / protein is made(1)	excessive/overgrowth of algae/plants on the surface	**(1)**

Question Number	Answer	Acceptable answers	Mark
3b(i)	An explanation linking **three** of the following points: • decomposers /decomposer bacteria (1) • bacteria /they break down dead animal and plant matter in the soil (1) • into ammonia (1) • {ammonia / nitrites} is/are converted into nitrates (1) • by nitrifying bacteria (1)	ref to nitrogen fixing bacteria (fixing nitrogen) (1)	**(3)**

Question Number	Answer	Acceptable answers	Mark
3b(ii)	denitrifying (bacteria) (1)	named bacteria e.g *Thiobacillus denitrificans, Micrococcus denitrificans, Serratia, Pseudomonas,* and *Achromobacter*	**(1)**

(Total for question 3 = 8 marks)

Question Number	Answer	Acceptable answers	Mark
4(a)(i)	substitution (1) 11.8 + 10.3 + 11.2 = 33.3 evaluation (1) 33.3 / 3 = 11.1(cm) (1)	 e.c.f if substitution answer is incorrect give full marks for correct answer, no working	 **(2)**

Question Number	Answer	Acceptable answers	Mark
4(a)(ii)	An explanation linking the following points • (plant B) leaves are larger because they have a higher concentration of nitrate (1) • (nitrates are) required for making protein / growth (1)	 mean is higher as plant has more nitrates	 **(2)**

Question Number	Answer	Acceptable answers	Mark
4(b)	D		**(1)**

Question Number	Answer	Acceptable answers	Mark
4(c)	an explanation linking the following points • nitrogen fixing bacteria (1) • fix nitrogen gas for the plant (1) • decomposing bacteria / decomposers (1) • decompose / break down animal / plant matter / protein / urea (1) • into ammonia (1) • (then) nitrifying bacteria (1) • convert ammonia / nitrites into nitrates (1)	nitrogen fixing bacteria convert nitrogen into nitrates / nitrogen compounds (2)	**(4)**

Question Number	Answer	Acceptable answers	Mark
4(d)	respiration / respiring / respire decomposition /decomposing / decompose	any reasonable spelling of either term	**(1)**

(Total for question 4 = 10 marks)

Question Number	Answer	Acceptable answers	Mark
5(a)(i)	increase in CO_2 concentration (over time)	positive correlation	**(1)**

Question Number	Answer	Acceptable answers	Mark
5(a)(ii)	355 ppm (1990) – 339 ppm (1980) (1) 16 (1)	**Accept:** tolerance 14 -18 2 marks for overall correct answer	**(2)**

Question Number	Answer	Acceptable answers	Mark
5(a)(iii)	Any **three** from the following points: • seasonal / weather changes (1) • due to less leaves on trees/less plants less photosynthesis and CO_2 removed from the atmosphere (1) • more fossil fuels / wood may be burned during colder weather (1)	Accept refs to summer / winter more photosynthesis in the summer more car usage in summer / winter	**(3)**

Question Number		Indicative Content	Mark
QWC	**5 (b)**	A description including some of the following points: • photosynthetic material/plants will remove CO_2 from the atmosphere • these plants will use the CO_2 to make glucose • plant respiration will release CO_2 into the atmosphere • animals will eat the plants- which contain carbon • animals and plants will eventually die and decay due to microbial/bacterial action releasing CO_2 • the combustion/burning of fossil fuels will release CO_2 into the atmosphere • the burning of carbon based products made from trees will release CO_2 into the atmosphere	**(6)**
Level	**0**	No rewardable content	
1	**1 - 2**	• a limited description of **one** of the processes of the carbon cycle • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	
2	**3 - 4**	• a simple description of **two** of the processes of the carbon cycle including one method of adding carbon dioxide and one method of removing carbon dioxide • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy	
3	**5 - 6**	• a detailed description of **most** of the processes of the carbon cycle that releases and removes carbon dioxide • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately to describe the carbon cycle • spelling, punctuation and grammar are used with few errors	

(Total for question 5 = 12 marks)