Question	Answer	Marks	Guidance
1 a i	CFCs (1) aerosols / refrigeration (1)	2	if mention global warming / greenhouse gases max 1 mark **allow** (ozone) is broken down to oxygen / reacts to form oxygen (1)
ii	South America (1) (people will be more) exposed to UV radiation / (more at risk from skin) cancer (1)	2	 **allow** mutation / DNA damage as alternative to cancer
b	**[Level 3]** Identifies the names of both types of competition **and** shrinking ice caps means **competition is greater** between polar bears **in a smaller territory/area**. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **[Level 2]** Identifies the names of both types of competition **or** shrinking ice caps means **competition is greater** between polar bears **in a smaller territory/area**. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **[Level 1]** Identifies one type of competition **or** idea of **more** of polar bears **on smaller ice caps/in a smaller area.** Quality of written communication impedes communication of the science at this level. (1 – 2 marks) **[Level 0]** Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)	6	**This question is targeted at grades up to A*.** **Indicative scientific points at level 2 and 3 may include:** • competition between polar bears in a smaller territory greater. • competition between polar bears is intraspecific. • competition between polar bears and killer whales is interspecific. **Indicative scientific points at level 1 may include:** • competition between polar bears is intraspecific / within a species • competition between polar bears and killer whales interspecific / between species • idea of less land for polar bears • idea of competition between polar bears is on land and between polar bears and killer whales is in water **Use the L1, L2, L3 annotations in Scoris. Do not use ticks.**
	Total	**10**	

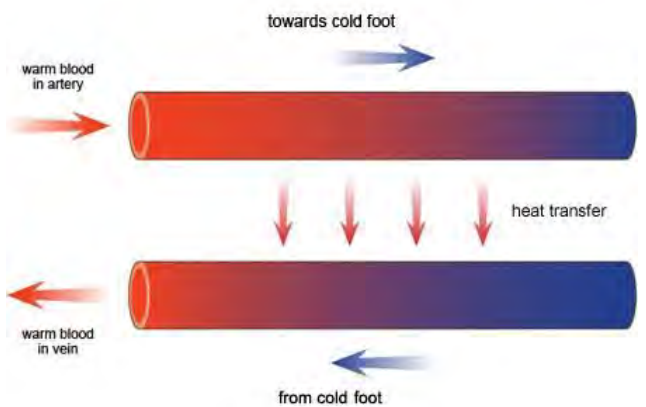
Question			Answer	Marks	Guidance
2			**(Level 3)** Answer suggests factory was about 8/9/10km away **and** explains the patterns to include decay **and** explains the pattern in terms of oxygen levels. Quality of written communication does not impede communication of the science at this level. **(5–6 marks)** **(Level 2)** Answer suggests factory was about 8/9/10km away. **Also** Explains the patterns to include decay **or** explains the pattern in terms of oxygen levels. Quality of written communication partly impedes communication of the science at this level. **(3–4 marks)** **(Level 1)** Answer suggests factory was about 8/9/10km away **or** explains the patterns to include decay **or** explains pattern in terms of oxygen levels. Quality of written communication impedes communication of the science at this level. **(1–2 marks)** **(Level 0)** Insufficient or irrelevant science. Answer not worthy of credit. **(0 marks)**	6	**This question is targeted at grades up to C** **Indicative scientific points may include:** (algae/plants grow using the nutrient from the fertiliser, and block light) • algae/plants die and are decayed by bacteria so bacteria numbers go up • decay/ bacterial respiration uses up oxygen • fish can't respire so die • further away fertiliser levels decrease, fewer bacteria, higher oxygen levels, more fish **ignore** fertiliser kills fish If get the wrong distance in level 3 but have valid explanations, award 5 marks. **Use the L1, L2, L3 annotations in scoris; do not use ticks.**
			Total	**6**	

Question			Answer	Marks	Guidance
3	(a		water would be lost (when soil is burnt) / some of the loss in mass could be from water / to remove the mass of water / different soils have different amounts of water (1)	1	**ignore** simply 'soil contains water'
	(b)		3.10 (2) **but** if answer incorrect 1.74 ÷ 56.10 x 100 (1)	2	**note –** two decimal places needed **allow** 3.1016 or rounding to anything other than 2 decimal places (1)
	(c)		**A** because it had a high(er) **humus** content (1)	1	letter **and** explanation needed for mark
	(d)		idea that larger soil particles have more air spaces / larger air spaces (1) **plus** so the water will drain through / water not retained **or** idea that there is more space for water to occupy / can take up more water **or** less water can cling to soil particles (1)	2	**allow** reverse argument e.g. smaller particles have smaller air spaces (1) hold onto water better (1) **second mark is dependent on first**
			Total	**6**	

Question			Answer	Marks	Guidance
4	(a)		analyse their DNA / model multiple characteristics by computer (1)	1	**allow** analyse their genes **allow** see if they can interbreed to produce fertile offspring (1)
	(b)	(i)	(more similar so) they will require more similar resources (1)	1	**allow** intraspecific competition is stronger than interspecific **allow** foxes have different prey
		(ii)	prevent damage to food chains / may be used as food for humans / may attract tourists / may be useful for medical reasons (1)	1	**ignore** to prevent extinctions **ignore** affects food chain unless qualified **allow** to maintain biodiversity / prevent reduction of gene pool **allow** cultural and heritage reasons use of animal needs to be qualified
			Total	**3**	

Question	Answer	Marks	Guidance
5 a	**any two from:** the closer to the factory the higher the mercury concentration in the soil /ORA (1) the closer to the factory the higher the mercury concentration in the lichens/ ORA(1) more mercury in lichens than in soil close to factory / ORA (1)	2	responses must be comparative **allow** negative correlation between distance from factory and mercury concentration in soil **allow** negative correlation between distance from factory and mercury concentration in lichens **ignore** references to numbers of lichen **allow** mercury concentration follows a similar pattern for both (1) **if no other** mark **allow** mercury concentration decreased further from the factory (1)
b	**any two from:** there is a correlation between the levels of mercury in lichens and soil (1) cannot be used close to factory as idea that there is no evidence (1) idea that there is more variation in soil data so better to use lichens / ORA (1)	2	**allow** lichen good indicator particularly at middle distances (1)
	Total	4	

Question	Answer	Marks	Guidance
6 a	Any **two** from: cyclical pattern shown (1) description of pattern (1) the idea that snowy owl and lemming populations are out of phase with each other AW (1)	2	**allow** predator prey relationship **examples** when there are more lemmings (available for food) there are more snowy owls / ORA when there are less snowy owls (for predation) there are more lemmings / ORA **reject responses that imply lemmings eat owls** **allow** when there are more lemmings snowy owls increase slightly after / ORA (2) **allow** possible emigration of owls so lemmings population allowed to increase again (1)
b	**any two from:** covered in fur so that its well-insulated/reduced heat loss/keeps it warm (1) builds up fat layer so that its well-insulated/reduced heat loss/keeps it warm (1) has very small snout/legs/ears/small SA/V ratio so reduced heat loss (1)	2	**ignore** unqualified features **allow** higher level responses linked to metabolic rate **allow** large V/SA **allow** idea of huddling to use mutual body heat / living in a burrow/nest material to conserve heat (1)

Question	Answer	Marks	Guidance
c	**any two from:** idea that it warms the cold blood entering the rest of the body (1) cools the blood entering the penguin foot (1) so reduces heat loss from penguin foot area (1) blood vessels close together / arteries close to veins (1)	2	**allow** labelled diagram **allow** warms up blood as it goes back to body to minimise any decrease in core temperature (1) 
	Total	6	

Question	Answer	Marks	Guidance
7 a i	fertiliser / sewage (1)	1	**allow** nitrates / phosphates / any correct mineral **allow** nitrogen / phosphorous / potassium / magnesium **allow** detergents
ii	**any two from:** (dead) plants/algae rot/decompose/breakdown/decay (1) (by) decomposers / bacteria (1) (so) less oxygen (1) (so) fish can not respire (1)	2	**if no other mark awarded allow 1 mark for** lack of food for fish (1)
b i	**algae** numbers will change at different times due to sunlight / temperature (1)	1	**ignore** fair test **allow** idea that **algal** growth varies seasonally **allow** idea that visibility of **disc** may vary seasonally
ii	pollution increases (1) BUT idea pollution increases initially and then levels off/improves (2) idea that more **algae** will make the water less clear / decrease (maximum) depth that disc can be seen (1)	3	
iii	1988 (1)	1	
	Total	**8**	