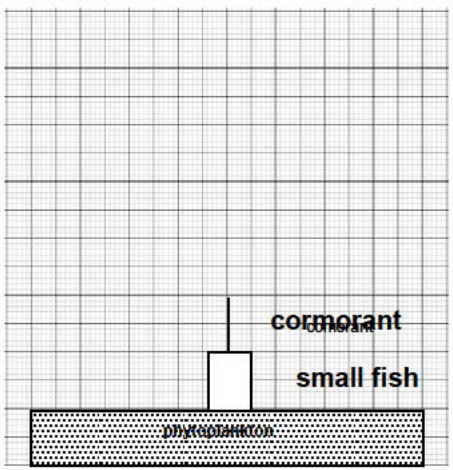
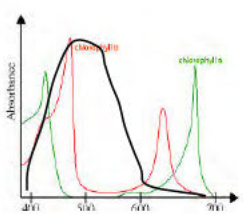
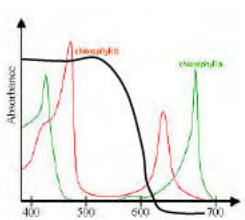
Question	Answer	Marks	Guidance
1 a i	 correct size bars (1) correct labels (1)	2	**ignore** asymmetry small fish = 8 small squares (16mm) wide by 5 small squares (10mm) high +/- ½ mm square cormorant = between a single line and max of 1 square wide (2mm) by 5 small squares (10mm) high or 4 small squares +/- ½ mm square
ii	humans are involved in other food chains / more than one trophic level (1) taking dry mass of humans / whales would be very difficult (1)	2	**allow** humans eat other things / have a varied diet **allow** can't dry out a human **allow** not allowed to kill whales / humans **allow** difficulty to catch / weigh whales
b	numbers were very low (1) protection has allowed numbers to recover (1) numbers are now high enough so no longer endangered (1)	3	**allow** between 1940 and 1980's numbers were at critical level / risk of extinction **allow** pre 1940 hunting/poisoned/habitats destroyed **allow** examples of protection e.g. banning poaching/captive breeding allowed the numbers to recover **allow** between 2000 and 2007 numbers no longer at critical level / risk of extinction **allow** disease / disaster could wipe out small population (1) **allow** reduced gene pool when population is low (1) **ora**
	Total	**7**	

Question	Answer	Marks	Guidance
2 a	*Lactobacillus* bacteria → used in yoghurt making bacteria that rot organic material releasing methane → used in biogas production bacteria that produce toxins → used in production of antibiotics *Penicillium fungus* → cause diseases such as cholera or food poisoning	2	three or four correct = 2 marks two correct = 1 mark
b	similarity: make their own food / are producers (1) difference: bacteria obtain energy from chemical reactions / bacteria do not use light / do not photosynthesise(1)	2	**allow** autotrophic / chemosynthetic / make sugar **ignore** they both take in gases / both take in CO_2 / both need energy **ignore** they both get food **allow** reverse arguments referring to plants assume unqualified answers refer to bacteria
	Total	**4**	

Question	Answer	Marks	Guidance
3 a	humus (1)	1	**ignore** detritus / compost
b i	particles of different density (1) BUT particles of greater density sink faster/further (2)	2	**allow** mass/weight as alternatives to density **allow** sand particles are heavier / clay lighter = 1 **allow** sand particles are heavier so sinks faster/further / ORA =2 **ignore** references to particle size
ii	answer in range 34-36 (%) (2) BUT in working, measurement in range 17 to 18 (mm) (1)	2	 **allow** 1.7 – 1.8 but must say cm **ignore** 17 or 18 % (on answer line)
iii	loam (1)	1	If answer is sandy, then **allow** ecf if % in (ii) is >55
	Total	**6**	

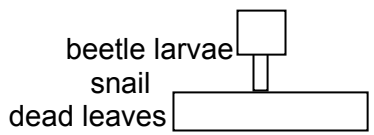
Question	Answer	Marks	Guidance
4 a	**[Level 3]** Calculation of energy efficiency **and** idea that energy is lost between each trophic level **and** idea that insufficient energy left (due to energy transfers). Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **[Level 2]** Calculation of energy efficiency **and** idea that energy is lost between each trophic level **or** idea that insufficient energy left due to energy transfers. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **[Level 1]** Idea of whales being top predator **or** idea that insufficient energy left due to energy transfers. 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 at level 2 and 3 may include:** **calculation** 22.5 x100 = 10% or just 10% 225 • 10% of energy of herring is going into salmon • much of the energy is transferred to less useful forms e.g. heat through respiration/excretion/egestion • a similar reduction from salmon to seal would mean that the amount of energy getting to next trophic level is insufficient to sustain another trophic level **Indicative scientific points at level 1 may include** No calculation/ incorrect calculation limit to level 1 **Use the L1, L2, L3 annotations in Scoris. Do not use ticks.**
b	**any two from:** idea of it's cruel / unethical / immoral (1) whales are an intelligent mammal (1) lack of freedom / large animal confined in small area / shorter lifespan in captivity(1)	2	**allow** shouldn't make money from trapping wild animals **allow** whales become distressed **allow** they should be allowed to live in the oceans

Question	Answer	Marks	Guidance
	not enough genetic variation in captivity / idea of disease wiping them out (1) less likely to survive in the ocean if released (1) will affect the food chains in the wild (1)		
	Total	**8**	

Question	Answer	Marks	Guidance
5 a	outside cells (1)	1	**allow** on the surface / on the leaf / on the outside **allow** secrete enzymes
b	low rate of (aerobic) respiration / need oxygen for (aerobic) respiration / ORA (1) low rate of growth/reproduction OR need oxygen for growth/reproduction (1)	2	**allow** no respiration **allow** need oxygen for metabolism/energy **allow** no growth / no reproduction
c	water **moves** into cells on outside / water **moves** out of cells on inside (1) (because) solute moves into cells on outside / solute moves out of cells on inside (1) solute moved by active transport (1)	3	 **allow** valid example of solute e.g. sugar / ions
d	a line that falls to (or almost to) zero in the red part of the spectrum (1)  or 	1	
	Total	**7**	

Question	Answer	Marks	Guidance
6 a i	lacewings increase, aphids decrease or lacewings decrease, aphids increase or aphids decrease followed by lacewings decrease (1) idea that lacewings eat/ kill aphids (1)	2	**allow** more lacewings, fewer aphids **ignore** aphids dying out (but allow lacewings increase, aphids die) **allow** fewer aphids followed by fewer lacewings **ignore** actual data **allow** lacewings are predators of aphids OR aphids are prey/food of lacewings
ii	(growing buckwheat / graph B) increases the number of lacewings (overall) (1) (growing buckwheat / graph B) decreases the number of aphids (overall) (1) but no evidence about crop yield (1)	3	**ignore** buckwheat attracts lacewings (in question) **allow** reverse arguments for no buckwheat **allow** no evidence about crop damage **allow for additional marking point** if fewer aphids then (can assume) more crop yield / less crop damage (1)
b	idea that anomalous results have less impact / anomalous results can be identified or discounted (1)	1	**ignore** more evidence / improves accuracy (in question) **ignore** simply improves reliability **allow** idea that small sample may not be representative / ORA
	Total	**6**	

Question	Answer	Marks	Guidance
7 a	protein coat / protein outer layer / AW (1) (containing) genetic material (1)	2	protein cell wall = 0, but protein wall =1 **allow** DNA or RNA **allow** genes **ignore** chromosomes
b i	**any two from** idea that only estimates / not completely accurate as some sufferers might not go and see a doctor / not everyone is tested (for salmonella) (1) (flu estimate less reliable as) flu-like symptoms may not be flu (1) (salmonella more likely to be accurate as) positive tests for salmonella (bacteria) (1)	2	
ii	idea that flu more common in winter / salmonella more common in summer / ORA (1) (flu more common in winter) because more likely to be indoors/on buses or trains so flu more likely to be passed on / ORA (1) (salmonella more common in summer) because of BBQs / food may not be kept cold enough / ORA (1)	3	**ignore** simply food not cooked properly / stored at incorrect temperature (in question)
	Total	**7**	

Question			Answer	Marks	Guidance
8	(a)	(i)	(no) because larger number of beetle larvae would feed on a smaller number of snails / snails would have more biomass than beetle larvae (1)	1	**allow** energy between snail and beetle larvae decreases but numbers would increase **not** yes **allow** correct drawings of pyramid of number  **allow** correct description of bar lengths
		(ii)	**any two from:** heat / from respiration (1) excretion (1) egestion (1)	2	**allow** some lost by decay or decomposition **not** growth **allow** named excretory product e.g. urine / sweat **allow** faeces **allow** uneaten parts **ignore** movement / digestion / reproduction **ignore** waste products unless qualified
	(b)	(i)	8.3 (1)	1	
		(ii)	only transferring around 8% so not enough energy to support a fifth level (1) (8% of 50kJ) is approx. 4 kJ (1)	2	**allow** ecf on calculation **allow** 7.2 – 8.3 / ORA **allow** between 3.6 and 4.3
			Total	**6**	