PEARSON EDEXCEL GCSE BIOLOGY (HIGHER) · 1BI0

BIOLOGY



MARK SCHEME

TOPIC 9: ECOSYSTEMS AND MATERIAL CYCLES (PACK 3)

SCORE	PERCENTAGE
/68	%

STEMUP

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Mark Scheme

Q1.

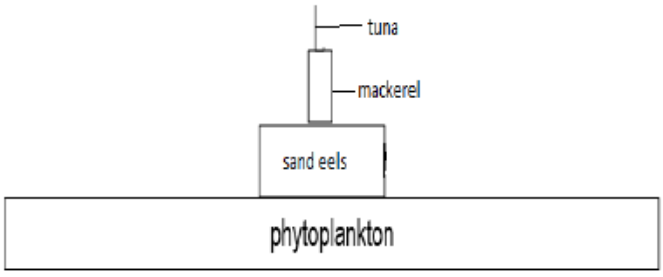
	Answer	Acceptable answers	Mark
(a)(i)	**C** ☒ parasite		**(1)**
(a)(ii)	A suggestion linking **two of the following:** • suckers on the head /adaptation of the head (1) • attaches to the intestine (1) OR • a very long thin shape / large surface area (1) • for absorption (1) OR • surface / skin (1) • 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)**
(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)	Accept food/pork for meat	**(2)**

	• prevent animals from eating tapeworm eggs (1) • worm the animal (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)**

Q2.

Question number	Answer	Additional guidance	Mark
	An explanation that combines identification – application of knowledge (1 mark) and reasoning/justification – application of understanding (1 mark): • woodland provides a different type of habitat (1) • allows different {animal/plant} species to live in the park (1)	 accept the idea that human intervention is controlled accept specific example e.g. nesting site for birds	**(2)**

Q3.

Question Number	Answer	Mark
	correct shape (exact widths not required) (1) – ignore pyramid drawn as a triangle correct labels (1)  	**(2)**

Q4.

Question Number	Answer	Mark
	An explanation that combines identification - understanding (1 mark) and reasoning/justification - understanding (1 mark): • enzymes cause the breakdown of large biological molecules into smaller biological molecules (1) • as temperature rises there are more reactions between the enzymes and biological molecules in the fruit (1) OR • microorganisms reproduce faster (1) • more breakdown of large molecules into smaller molecules (1)	**(2)**

Q5.

	Answer	Acceptable answers	Mark
(i)	• number of **species**increase / go up (1)	Ignore number of weeds	**(1)**
(ii)	Suggestions including two of the following linked points • increased use of herbicideresistant crops (1) • increased use (concentration / time) of herbicide (1) • ref to transfer of genes into weeds from other plants / cross pollination (1) • mutation(1)	Ignore ref to evolution / natural selection Ignore immune (to herbicide) Accept a description eg continued use of herbicide Accept cross breeding / reproduction / contamination	**(2)**

Q6.

Question Number	Answer	Additional Guidance	Mark
(i)	(the gardener thought) they were experts / it was a reliable source	accept the content has been checked / peer review	**(1) AO2 1**

Question Number	Answer	Additional guidance	Mark
(ii)	An answer including: • to introduce microorganisms / decomposers (1) • to provide oxygen (1)	 accept bacteria / worms for decomposers accept for respiration	**(2) AO2 1**

Question Number	Answer	Mark
(iii)	B respiration occurred and this is an exothermic reaction **The only correct answer is B** ***A*** *is not correct because respiration is not endothermic* ***C*** *is not correct because it is not photosynthesis* ***D*** *is not correct because it is not photosynthesis*	**(1) AO2 1**

Question Number	Answer	Mark
(iv)	D 0.13 kg per day **The only correct answer is D** ***A*** *is not correct because 8/60 is not 1.8* ***B*** *is not correct because 8/60 is not 0.66* ***C*** *is not correct because 8/60 is not 0.53*	**(1) AO2 1**

Q7.

	Answer	Acceptable answers	Mark
(i)	A description including two of the following points • 0 to 10/11 no effect / change / difference (1) • 10/11 to 28 / 29/30 decrease in mass / yield (1) • Over 28 / 29/30 no change (1)	Accept decreases for 1 mark (if no other marks awarded) ecf throughout	**(2)**
(ii)	B - 30 arbitrary units		**(1)**

Q8.

Question Number	Answer	Mark
	An explanation that combines identification via a judgement (1 mark) to reach a conclusion via justification/reasoning (3 marks): • high-protein diet (1) • because the tuna reach 35kg in approximately three months (1) • whereas the medium-protein diet the tuna take four and a half months to reach this mass (1) • on the low-protein diet the tuna do not reach 35kg (1)	**(4)**

Q9.

	Answer	Acceptable answers	Mark
	An explanation including **three** of the following: • (chemosynthetic) bacteria live in (the gut of) the tube worms (1) • the bacteria convert	**Accept sulphur** Accept bacteria make food for worms **Accept protection**	**(3)**

	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 mutualism / mutual benefit / mutual relationship	

Q10.

Question Number	Answer	Additional Guidance	Mark
(i)	X – decomposers Y – nitrifying (bacteria)	accept fungi / decomposing bacteria accept named nitrifying bacteria reject denitrifying bacteria / nitrogen-fixing bacteria	**(2)** **AO1 1**

Question Number	Answer	Additional guidance	Mark
(ii)	An explanation linking **three** from: • leguminous crops planted (1) • that have nitrogen-fixing bacteria (1) • in root (nodules) (1) • which fix nitrogen (gas) (1)	accept named leguminous crops accept use nitrogen from the air / use atmospheric nitrogen / make ammonia ignore produce nitrates	**(3)** **AO1**

Question Number	Answer	Additional Guidance	Mark
(iii)	An explanation linking: • nitrates are needed to make {protein / amino acids} (1) • which are needed for growth (1)	accept for DNA / genetic material	**(2)** **AO1**

Q11.

	Answer	**Acceptable answers**	**Mark**
(i)	**C** ☒ nitrification		**(1)**
(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)**
(iii)	A description linking **four** of the following points (nitrates) leach/flow into water (1)		**(4)**

	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	

Q12.

Question Number	Answer	Additional Guidance	Mark
(i)	nettles → caterpillars → ladybirds → beetles → toads (3)	If food chain is incorrect allow 1 mark for each correct link up to a maximum of 2 marks.	**(3)** **AO2 1**

Question Number	Answer	Additional Guidance	Mark
(ii)	substitution 60 ÷ 750 = 0.08 (1) x100 8 (%)	award full marks for the correct answer with no working	**(2)** **AO2 1**

Question Number	Answer	Additional Guidance	Mark
(iii)	Any **two** from: • not all the beetle is eaten (1) • not all the beetle can be digested (1) • movement (1) • respiration (1) • (transferred to surroundings) as heat (1)	ignore maintaining body temperature	**(2)** **AO2 1**

Q13.

Question number	Answer	Mark
(i)	(belt) transect	(1)

Question number	Answer	Mark
(ii)	An explanation that combines identification via a judgement (1 mark) to reach a conclusion via justification/reasoning (2 marks): • number of poppy plants decreases (closer to the woodland) (1) and • trees block light (1) • light is needed for photosynthesis (1) or • competition (with other species/trees) (1) • for resources/named resource (1)	(3)

Question number	Answer	Mark
(iii)	An answer that combines the following points to provide a plan: • **randomly** place the quadrat several times (1) • record the number of poppy plants in each quadrat (1) • method for scaling up the area sampled to the total area of the field (1)	(3)

Q14.

Question Number	Answer	Mark
(i)	D mutualism **The only correct answer is D** ***A*** *is not correct because it is not parasitism* ***B*** *is not correct because it is not indigenous* ***C*** *is not correct because it is not biodiversity*	**(1)** **AO1**

Question Number	Answer	Additional Guidance	Mark
(ii)	7500 (µm)	accept 7.5×10^{3} reject $7.5 \times \mathbf{10^{-3}}$	**(1)** **AO1 1**

Q15.

Question number	Answer	Mark
(i)	all the oxygen had been used up / no oxygen left	**(1)** AO2 2

Question number	Answer	Additional guidance	Mark
(ii)	An explanation linking: • the **plant** produced oxygen (1) • through photosynthesis (1)	 ignore plant removes carbon dioxide	**(2)** AO2 1

Question number	Answer	Additional guidance	Mark
(iii)	Any two from: • light intensity (1) • temperature (1) • size of bell jar / same volume of air (1) • {size/type} of candle /length of the wick (1) • **level** of liquid/water in the container (1)	 accept same volume of gas in bell jar	**(2)** AO2 2

Q16.

Question Number	Answer	Additional guidance	Mark
(i)	Any **two** from: • temperature (1) • water availability (1) • pH of soil (1) • area of leaves in contact with the soil (1) • {mineral ions / nitrates} in the soil (1) • oxygen concentration (1)	 accept humidity accept light intensity (1)	**(2)** **AO2 2**

Question Number	Answer	Additional guidance	Mark
(ii)	An explanation linking: • repeat the investigation / have more than one tray of each type of leaf (1) • obtain more data / to calculate a mean / identify anomalies (1) **OR** • a variable that can be controlled (1) • **linked to why** this would improve the investigation and make the results more comparable (1)	accept so that the data is more reliable e.g. accept use the same mass for each type of leaf e.g. accept use the same {mass / type} of soil (1) e.g. accept as leaves can be different sizes (1) e.g. accept so that the number of decomposing organisms is the same (1) ignore references to valid / accurate / precise	**(2)** **AO3 3b**

Q17.

		Indicative Content	
QWC	*	A explanation to include some of the following Air pollution • Humans burn more fossil fuels coal/oil/gas • nitrogen oxides in car exhausts • Releasing sulfur dioxide • Which causes acid rain • carbon dioxide gas • causes climate change	

		• deforestation causing increase in carbon dioxi • increased population – increased respiration m dioxide Water pollution • Humans produce sewage • Sewage contains phosphates • Phosphates are water pollutants • Nitrate pollution can be caused by the overuse • Nitrate pollution causes eutrophication
Leve l	**0**	No rewardable content
1	**1 - 2**	• a limited explanation of how humans effect po pollution in either air or water • the answer communicates ideas using simple limited scientific terminology • spelling, punctuation and grammar are used w
2	**3 - 4**	• a simple explanation of both air and water pol effects of one air and one water pollutant or a either air or water pollution • the answer communicates ideas showing som and organisation and uses scientific terminolo • spelling, punctuation and grammar are used w
3	**5 - 6**	• a detailed explanation of the effect of humans pollution including the role of sulphur dioxide nitrates or phosphates • the answer communicates ideas clearly and co of scientific terminology accurately • spelling, punctuation and grammar are used w

Q18.

Question Number	Answer	Acceptable answers	Mark
	An explanation linking **three** of the following: eutrophication (1) causes an algal bloom (1) plants {at the bottom of the lake / underneath the algae} cannot get light to photosynthesise (1) plants at the bottom of the lake die and microorganisms break them down (1) microorganisms respire removing oxygen from the water (1) reduction in biodiversity (1)	accept: **increase**d growth of algae accept: decomposers for microorganisms Ignore references to fish suffocating / dying this is insufficient for this marking point	**(3)**

Q19.

Question Number	Answer	Acceptable answers	Mark
a(i)	(49 + 64 + 58) / 3 or 171 / 3 (1) = 57	Correct bald answer award 2 marks ecf applies if incorrect total is calculated but divided correctly by 3 for 1 mark	**(2)**

Question Number	Answer	Acceptable answers	Mark
a(ii)	An explanation to linking four of the following points: nitrates leaked/leached into river (between the two sites) (1) causing eutrophication (1) algae block light to underwater plants / underwater plants cannot photosynthesise (1) (dead plants / algae) broken down by microorganisms (1) microorganisms respire (1) causing oxygen depletion / less oxygen available for the fish (1)	 accept fertiliser for nitrates allow bacteria/decomposers	**(4)**

Question Number		Indicative Content	Mark
QWC	* **(b)**	A description to include some of the following points • indicator species used • number of indicator used as an assessment of pollution level Water pollution – polluted • bloodworms / sludgeworms /other named species • their presence signify high water pollution • they can survive in low oxygenated waters Water pollution – clean • freshwater shrimp / stonefly (larvae) / other named species • their presence signify low water pollution • they can only survive in areas of high oxygen (thus low pollution) Air pollution • blackspot fungus found on roses • blackspot fungus grows on roses in unpolluted areas because it is killed by the presence of sulfur dioxide that would be found in polluted air. • lichen – certain types of lichen can survive in polluted areas – so depending on the type of lichen found will be used to assess the pollution level of air	**(6)** **Exp**

Level	0	No rewardable content
1	1 – 2	• a limited description of the use of indicator species no names of species needed • 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 the assessment of air or water pollution and the name/s of the species used with some idea of the level of pollution they respond to • 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 the assessment of both air and water pollution and the names of indicator species with clear indication of polluted water and/or unpolluted water organisms as well as the response of lichen or blackspot fungus to sulphur dioxide • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors

Q20.

	Answer	Acceptable answers	Mark
	An explanation linking three of the following: • plants use /nitrogen taken in as nitrates (1) • fertilisers / compost (1) • nitrogen fixation / nitrogen fixing bacteria / lightning (1) • nitrification /nitrifying bacteria (1) • absorption through the roots (1) • by active transport (1)	Accept nitrates in the correct context	**(3)**

Q21.

Question Number	Answer	Acceptable answers	Mark
(a)	**D** leaf palisade cell		**(1)**

Question Number	Answer	Acceptable answers	Mark
(b)	An explanation linking two of the following: • by osmosis • from an area of high **water** concentration to an area of low **water** concentration • through (partially permeable) membrane	Ignore references to diffusion reject active transport accept water moves down a concentration gradient	**(2)**

Question Number	Answer	Acceptable answers	Mark
(c)(i)	• all four bars plotted correctly (+/- 1/2 small square) (1) • X axis correctly labelled for plotted bars , eg North A, North B, South A, South B (1)		**(2)**

Question Number	Answer	Acceptable answers	Mark
(c)(ii)	**D** a quadrat		**(1)**

Question Number	Answer	Acceptable answers	Mark
(c)(iii)	A suggestion including two of the following: • Species B **is able to** grow on both (North and South) sides (1) • (there are more) on the south side because of a specific difference in a named abiotic factor eg lighter /darker on South side , temperature, pH, water level, (1) • there are fewer on the north side because they are out competed by species A / idea of eaten more on North side (1)	Ignore species B is found / grows on both sides Ignore carbon dioxide concentration Accept less pollution / less sulphur dioxide on South side	**(2)**

Q22.

	Answer	Acceptable answers	Mark
(a)	**C** ☒ nitrification		**(1)**
a(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)**
a(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)**
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 = 10 marks

Q23.

Question Number	Answer	Additional guidance	Mark
	Any **one** from: bacteria / fungi / decomposers / prokaryotes	 accept microorganisms accept named decomposing organisms e.g. worms	**(1)** **AO1 1**

Q24.

	Answer	Acceptable answers	Mark
(i)	**A** ☒ living indicators		**(1)**
(ii)	An explanation linking the correct species with the reason: • species 2 (1) reason • coal powered power stations produce sulfur dioxide gas (1) • species 2 is tolerant of sulfur (1)	 Accept sulphur for sulphur dioxide Note mark points are independent 1 mark can be attained for candidate stating that sulphur dioxide gas is produced by coal powered power stations	**(2)**

Q25.

	Answer	Acceptable answers	Mark
	An explanation to include three of the following points bacteria use nitrogen / nitrogen fixing		**(3)**

	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**	