PEARSON EDEXCEL GCSE BIOLOGY (HIGHER) · 1BI0

# BIOLOGY



## MARK SCHEME

### TOPIC 9: ECOSYSTEMS AND MATERIAL CYCLES (PACK 2)

| SCORE | PERCENTAGE |
| --- | --- |
| /58 | % |

STEMUP

# These questions belong to Pearson Edexcel, not to us.

The examination questions, mark schemes and examiner comments in this pack were written and published by Pearson Edexcel. They are past assessment materials, reproduced here so that students can revise from them.

## What we do not own

STEMUP is not affiliated with Pearson Edexcel and does not own, and makes no claim to own, any of the question, mark scheme or examiner report material in this pack. Pearson Edexcel has not endorsed, approved or been involved in the production of it. Pearson Edexcel and the qualification titles used here belong to their respective owners and appear for identification only.

## Where to find the originals

Pearson Edexcel publishes its past papers, mark schemes and examiner reports. Always check the current specification at qualifications.pearson.com before you revise, because content and wording can change between series.

If you hold the rights to any material in this pack and would like it amended or removed, contact admin@stemup.co.uk and we will act on it.

# Mark Scheme

Q1.

| Question number | Answer | Additional guidance | Mark |
|---|---|---|---|
| (i) | An explanation that combines identification – application of knowledge (1 mark) and reasoning/justification – application of understanding (1 mark):<br><br>• by reducing the water content it reduces the number of microorganisms that can reproduce (1)<br>• because there is a reduction of microorganisms this reduces the decay process/preserves the food (1) | accept bacteria/pathogens for microorganisms | (2) |

| Question number | Answer | Mark |
|---|---|---|
| (ii) | to kill unwanted micro-organisms | (1) |

Q2.

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| | An explanation linking **two** from:<br><br>• leaching / run off / fertilisers / dead organic matter (1)<br><br>• (causes) a build up of nitrates / nitrates in the water (1) | accept {sewage / mineral ions}<br><br>accept phosphates<br>ignore nutrients | **(2)**<br>**AO1** |

Q3.

| Question number | Indicative content | Mark |
|---|---|---|
| * | **AO1 6 marks**<br>**Reforestation**<br>• reforestation is planting of trees<br>• trees take up water from the soil<br>• prevents erosion and reduces flooding<br>• trees can be used for renewable resources<br>• provides habitats<br>• increases the rate of photosynthesis<br>• removes carbon dioxide and releases oxygen<br>• reduces greenhouse gases / global warming<br>• provides a source of medicines / food for consumers<br><br>**Animal conservation**<br>• increase numbers of endangered species / prevent extinction<br>• through controlled breeding programmes /reduction in poaching /maintaining habitats<br>• generating income to fund conservation projects through zoos / animal parks / ecotourism<br>• improves the number of animals / range of species<br>• maintains the food web<br>• maintains genetic diversity<br>• allows re-introduction of animals into the wild | (6) |

| Level | Mark | Descriptor |
|---|---|---|
| | 0 | • no rewardable material. |
| Level 1 | 1-2 | • demonstrates elements of biological understanding, some of which is inaccurate. Understanding of scientific ideas lacks detail.<br>• presents an explanation with some structure and coherence. |
| Level 2 | 3-4 | • demonstrates biological understanding, which is mostly relevant but may include some inaccuracies. Understanding of scientific ideas is not fully detailed and /or developed.<br>• presents an explanation that has a structure which is mostly clear, coherent and logical. |
| Level 3 | 5-6 | • demonstrates accurate and relevant biological understanding throughout. Understanding of the scientific ideas is detailed and fully developed.<br>• presents an explanation that has a well-developed structure which is clear, coherent and logical. |

**Additional Guidance**

| | | |
|---|---|---|
| Level 1 | 1-2 | • A brief explanation of either the benefits of reforestation OR animal conservation projects.<br>• The response refers to changes in atmospheric gases OR photosynthesis OR HOW animal conservation improves biodiversity |
| Level 2 | 3-4 | • A brief explanation of the benefits of reforestation AND animal conservation projects<br>• The response refers to changes a named atmospheric gas OR photosynthesis OR HOW animal conservation improves biodiversity |
| Level 3 | 5-6 | • A detailed explanation on the benefits of reforestation and animal conservation projects<br>• The response refers to changes in both named atmospheric gases AND HOW animal conservation improves biodiversity including why endangered species are preserved or the impact on food webs |

| Level | Marks | Possible responses |
|---|---|---|
| Level 1 | 1<br><br>2 | • Animal conservation protects endangered species / reforestation provides habitats for animals<br>• Reforestation is planting trees which take in carbon dioxide / reforestation provides habitats for animals and reduces greenhouse gases |
| Level 2 | 3<br><br><br><br>4 | • Animal conservation protects endangered species and reforestation provides habitats for animals / Animal conservation protects endangered species from hunting. Reforestation is the planting of trees which provides habitats for animals.<br>• Animal conservation protects endangered species so the numbers increase and reforestation is the planting of trees. The trees take in carbon dioxide and provide habitats for animals |
| Level 3 | 5<br><br><br><br>6 | • Animal conservation protects endangered species so the numbers increase by protecting them from hunting and maintaining habitats. Reforestation is the planting of trees. The trees take in carbon dioxide and provide habitats and food source for animals.<br>• Animal conservation protects endangered species so the numbers increase by protecting them from hunting and maintaining habitats. Reforestation is the planting of trees. The trees release oxygen and take in carbon dioxide. They also provide habitats and food source for animals. |

Q4.

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| (i) | An explanation linking:<br><br>• as light intensity decreases the number of (small) plants (per $m^2$) decreases (1)<br><br>• because the (small) plants will not be able to photosynthesise enough (1) | accept reverse argument | **(2)**<br><br>**AO3 1ab** |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| (ii) | Any **one** from:<br><br>• same time of day (1)<br><br>• same meter (1)<br><br>• same position(s) in area / measure the same size area (1)<br><br>• same person makes the readings (1)<br><br>• meter held vertically each time (1) | accept other valid variables that should be controlled | **(1)**<br><br>**AO3 1ab** |

Q5.

| Question number | Answer | | Mark |
|---|---|---|---|
| (i) | An explanation linking:<br><br>• largest amount of growth seen with the highest concentration of nitrates / the higher the concentration of nitrates the more growth /ORA (1)<br><br>• nitrates are needed to make proteins (1) | accept faster growth for more growth<br><br>accept nitrates stimulate growth<br><br>accept amino acids | **(2)**<br><br>AO 3 2a<br>AO 3 2b |

| Question number | Answer | Additional guidance | Mark |
|---|---|---|---|
| (ii) | An explanation that links the following:<br><br>• by the roots/ root hair cells (1)<br><br>AND<br><br>• by diffusion (1)<br><br>• from a high concentration to a low concentration / down the concentration gradient (1)<br><br>OR<br><br>• by active transport (1)<br><br>• from a low concentration to a high concentration / against the concentration gradient / using energy (1) | <br><br><br><br><br>reject osmosis<br><br><br><br>reject osmosis | **(3)**<br><br>AO 2 1 |

Q6.

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| | An explanation linking:<br><br>• blackspot **fungus** present (1)<br>• which indicates clean air / low sulfur dioxide (1) | <br><br><br><br>accept high / good air quality | **(2)**<br>**AO3** |

Q7.

| Question number | Answer | Additional guidance | Mark |
|---|---|---|---|
| | An explanation linking three of the following:<br><br>• to increase nitrate/ammonia levels in the soil (1)<br><br>• because nitrogen fixing bacteria live in {colonies/root nodules} on the roots of pea and bean plants<br><br>• (nitrogen-fixing bacteria) produce {nitrates/ nitrogen compounds / ammonia} (1)<br><br>• from nitrogen {atmospheric/gas} (1) | ignore live in the roots | **(3)**<br><br>AO 1 1 |

Q8.

| Question Number | Answer | Mark |
|---|---|---|
| **(i)** | B non- indigenous species<br><br>**The only correct answer is B**<br><br>***A*** *is not correct because the species in not native*<br><br>***C*** *is not correct the species is invasive not non-invasive*<br><br>***D*** *is not correct because pathogens are disease causing organisms* | **(1)**<br><br>**AO1 1** |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| (ii) | An explanation linking:<br><br>• competition between species (1)<br><br>• for resources / named resources (1)<br>**OR**<br><br>• signal crayfish may carry {microorganisms / parasites} (1)<br><br>• which causes disease in the indigenous population (1) | <br><br><br><br>accept for food / habitat<br><br><br>accept signal crayfish have a disease | **(2)**<br><br>**AO2 1** |

| Question Number | Answer | Mark |
|---|---|---|
| (iii) | B conservation<br><br>**The only correct answer is B**<br><br>***A*** *is not correct because mutation is a change in DNA*<br><br>***C*** *is not correct because predation is eating other animals*<br><br>***D*** *is not correct because mutualism is two organisms working together for mutual benefit* | **(1)**<br><br>**AO1 1** |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| (iv) | An explanation linking **three** from:<br><br>• eutrophication causes oxygen levels to decrease (1)<br><br>• because nitrates levels in the water are increased (1)<br><br>• causing an overgrowth of algae (1)<br><br>• which blocks sunlight from the plants **in** the water (1)<br><br>• plants in the water die and are decomposed (1)<br><br>• by microorganisms for respiration (1) | ignore nitrogen<br><br>accept plants on the surface for algae<br><br>accept plants die because they can't photosynthesise<br><br>accept decomposers for microorganisms | **(3)**<br><br>**AO2 1** |

Q9.

| Question number | Answer | Additional guidance | Mark |
|---|---|---|---|
| | An explanation linking the following points:<br><br>• increased levels of (aerobic) bacteria (1)<br><br>• use oxygen from the water in respiration (1)<br>OR<br><br>• prevent plants from getting light/kills plants (1)<br><br>• so no oxygen produced by photosynthesis (1) | <br><br>accept microorganisms / bloodworms / sludgeworms / decomposers<br><br><br><br><br>accept plants broken down by decomposers | **(2)**<br>**AO 2.1** |

Q10.

| Question number | Answer | Mark |
|---|---|---|
| | An explanation including three of the following:<br>• because {conditions / named conditions} are suitable for {growth / photosynthesis} /conditions similar to native conditions /it is adapted to the conditions (1)<br>• it outcompeted the natural plants (1)<br>• therefore, it {grows / reproduces} (1)<br>• as no natural herbivores {eat it / restrict it} (1) | **(3)**<br>**AO2.1** |

Q11.

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **(i)** | An explanation that combines identification - application of knowledge (1 mark) and reasoning/justification – application of understanding (1 mark):<br>• to restrict movement (1)<br>• so less energy is lost (1)<br>Or<br>• to prevent predators entering (1)<br>• so fish not harmed / higher yield (1) | accept other relevant explanations | **(2)** |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **(ii)** | increasing world population / humans eating a high protein diet / increase preference for fish protein | accept other relevant reasons | **(1)** |

Q12.

| Question Number | Answer | Acceptable answers | Mark |
|---|---|---|---|
| | **A discussion to include a maximum of two from Advantages:**<br><br>removes $CO_2$ when growing (1)<br><br>less use of {fossil fuels/named fuel} (1)<br><br>reduced $SO_2$ emissions (1)<br><br>renewable / can be regrown quickly /sustainable (1)<br><br>**A discussion to include a maximum of two from Disadvantages:**<br><br>reduced food production (1)<br><br>takes up land (1)<br><br>reduced biodiversity (1)<br><br>crop growth is weather dependent (1) | <br><br>accept carbon neutral<br>**reject** $CO^2$<br><br><br><br>**reject** $SO^2$<br><br><br><br><br><br>accept deforestation<br><br><br><br><br><br>ignore references to cost and energy content | **(4)** |

Q13.

| Question number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **(i)** | eutrophication / nitrification<br><br>accept phonetic misspellings | | **(1)**<br>**AO1.1** |

| Question number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **(ii)** | water is moving (so the nitrates are moved away) (1) | accept the water in lakes is still/not moving | **(1)**<br>**AO2.1** |

Q14.

| | Answer | Acceptable answers | Mark |
|---|---|---|---|
| **(a)** | A suggestion including any three linked points<br>• ref to use of enzymes (1)<br>• isolate / remove /cut out gene / DNA (for resistance)(1)<br>• (coding for) enzyme (1)<br>• from bacteria (1)<br>• insertion of gene / DNA into crops / plants (1) | Any named enzyme must be in correct context.<br>Ignore plasmids<br>Reject replace | **(3)** |
| **(b)** | • in the phloem (1) | Accept phonetic spelling e.g. phloem /flowem | **(1)** |
| **(c)(i)** | A description including two of the following points<br>• 0 to 10/11 no effect / change / difference (1)<br>• 10/11 to 28 / 29/30 decrease in mass / yield (1)<br>• Over 28 / 29/30 no change (1) | Accept decreases for 1 mark (if no other marks awarded)<br>ecf throughout | **(2)** |
| **(c)(ii)** | B - 30 arbitrary units | | **(1)** |
| **(d)(i)** | • number of **species**increase / go up (1) | Ignore number of weeds | **(1)** |
| **(d)(ii)** | Suggestions including two of the following linked points<br>• increased use of herbicideresistant crops (1)<br>• increased use (concentration / time) of herbicide (1)<br>• ref to transfer of genes into weeds from other plants / cross pollination (1)<br>• mutation(1) | Ignore ref to evolution / natural selection<br>Ignore immune (to herbicide)<br>Accept a description eg continued use of herbicide<br>Accept cross breeding / reproduction / contamination | **(2)** |

Q15.

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| (i) | Any two from:<br>• size of banana (1)<br>• age / ripeness of bananas (1)<br>• size of box / available oxygen in box (1)<br>• humidity inside box (1) | accept other relevant factors | (2) |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| (ii) | as the temperature increases the rate of decomposition increases (1) | accept a conclusion based on data e.g. the banana decomposed fastest at 40 °C | (1) |

Q16.

| Question Number | Answer | Mark |
|---|---|---|
| | C urea into ammonia<br><br>**The only correct answer is C**<br><br>***A*** *is incorrect because this is the role of nitrogen fixing bacteria*<br><br>***B*** *is incorrect because this is the role of denitrifying bacteria*<br><br>***D*** *is incorrect because decomposers produce ammonia not urea* | **(1)**<br><br>**AO1 1** |

Q17.

| Question Number | Answer | Mark |
|---|---|---|
| **(i)** | D ash leaves<br><br>**The only correct answer is D**<br><br>***A*** *is incorrect because beech leaves decompose the slowest*<br><br>***B*** *is incorrect because oak leaves decay at a slower rate than ash leaves*<br><br>***C*** *is incorrect because sycamore leaves decay at a slower rate than ash leaves* | **(1)**<br><br>**AO3 1a** |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **(ii)** | selection<br>(28.2 – 19.7 =) 8.5 (1)<br><br>calculation<br>(8.5 ÷ 40 =) 0.213<br><br><br><br>units<br>grams per day (1) | <br><br><br><br>accept 0.213 for two marks<br>award one mark for 0.2125<br><br>accept g/day | **(3)**<br><br>**AO1 2** |

Q18.

| Question Number | Answer | Mark |
|---|---|---|
| Q0c | | (1) |

| condition | indicator species |
|---|---|
| clean water | stonefly (larvae / nymph)/ (freshwater) shrimp / mayfly larvae/nymph/ caddis fly larvae / dragonfly nymph / damselfly nymph / riffle beetle / water penny larvae / |
| polluted water | bloodworm / sludgeworm / algae / rat tailed maggot / water louse/ leeches/ planarian worms / aquatic worms / |

(1)

Ignore general references to organisms such as frogs / snails/ squid the answers need to be specific indicator species.

If unsure of an organism then please put into review

Q19.

| Question Number | Answer | Mark |
|---|---|---|
| (i) | D sludgeworm<br><br>**The only correct answer is D**<br><br>***A*** *is not correct because fertiliser is not an indicator species*<br><br>***B*** *is not correct because lichen is an air pollution indicator*<br><br>***C*** *is not correct because stonefly are clean water indicators* | **(1)**<br>**AO1 1** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **(ii)** | haemoglobin binds oxygen / increases the rate of diffusion / polluted water is low in oxygen | accept allows them to get more oxygen | **(1)**<br>**AO2 1** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **(iii)** | Any **two** from:<br>• concentration **gradient** (1)<br>• diffusion distance (1)<br>• surface area (1) | accept thickness of membrane<br>accept temperature (1) | **(2)**<br>**AO1 1** |

Q20.

| Question number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **(i)** | 29 ÷ 500 = 0.058 (1)<br>0.058 × 100 = 5.8 (1) | award full marks for correct numerical answer without working | **(2)** |

| Question number | Answer | Mark |
|---|---|---|
| **(ii)** | An explanation that combines identification via a judgment (1 mark) to reach a conclusion via justification/reasoning (1 mark):<br>• compost B (1) as it has the highest percentage water retained<br>• and there is a higher amount of water loss in the plants due to higher temperatures causing a {larger rate of evaporation of water/higher transpiration rates} (1) | **(2)** |

| Question number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **(iii)** | Use the same starting mass of compost (1) | accept any other relevant improvement | **(1)** |