

Answers to examination-style questions

Answers	Marks	Examiner's tips
1 a) i) respiration / decomposition	1	The release of carbon dioxide is from respiration by plants and microorganisms in the soil.
ii) nitrogen fixation / death of animals / excretion by animals	1	Nitrogen fixation is the ideal answer. However, excretion or death of animals would also add nitrogen to the soil. Nitrogen input from plants is already shown in the diagram and therefore not acceptable as an answer.
b) increase in photosynthesis; as enzyme activity increased	2	It is the light-independent reaction that is mainly enzymically controlled and therefore temperature dependent.
c) denitrification; denitrifying bacteria; convert nitrates into nitrogen	3	
2 a) excessive use of fertilisers; run-off / leaching	2	Other farming practices involving the use of organic fertilisers, such as manure or animal slurry would produce the same effect.
b) growth of algae / plants increased; death of submerged algae / plants; more bacteria / decomposers / decomposition; respiration uses oxygen; aerobic animals die	5	An 'algae bloom' refers to the rapid growth of surface algae. This blocks the light to submerged plants which then die. As oxygen levels decrease, due to decomposition by microbes, species' diversity will also decrease.
3 a) carbon dioxide taken in as a result of photosynthesis / more photosynthesis than respiration; idea that carbon is fixed / incorporated into compounds in the trees	2	A decrease in the carbon content of the atmosphere only begins after 2–3 years when overall photosynthesis exceeds respiration.

Answers to examination-style questions

Answers	Marks	Examiner's tips
b) $\frac{3800}{180 \text{ to } 184} = 20.65 \text{ to } 21.1$	2	Allow 20.7 to 20.11 but disqualify 20.6. Correct method of calculation = 1 mark; correct answer = 2 marks.
c) decomposition; synthesis of structural compounds / named compound; respiration provides energy for growth	3	Remember some of the carbon compounds in the pine leaves will be used in respiration to provide energy for the synthesis of organic compounds in the microorganisms.
d) higher temperatures, increasing enzyme activity	1	It is important to mention enzyme activity rather than simply stating that rate of decomposition or rate of photosynthesis is increased during the summer.
4 a) i) conversion of nitrates to nitrogen (gas); by denitrifying bacteria	2	
ii) insects contain proteins; digested to amino acids; which can be absorbed / diffuse into leaf	2 max.	Sundew is adapted to living in soil that has a low nitrogen content.
b) high proportion of carbohydrate / starch plant tissues; cellulose (in cell walls); more protein in animal cells (such as muscle)	2 max.	The presence of cellulose cell walls around plant cells is the main factor in explaining the higher ratio in plant tissue.
c) proteins / amino acids broken down; by saprophytes / decomposers; deamination / ammonium compounds / ammonia formed; ammonia converted to nitrate; by nitrifying bacteria; nitrite as intermediate; nitrate can be absorbed by roots	6 max.	You do not need to know the names of individual species of microorganisms. However you need to know the types, such as nitrifying bacteria, and what they do.
5 a) i) mass produced increases then levels off at 17.1 kg m^{-2} / concentrations above 40 kg ha^{-1}	1	It is important to specify precisely where the mass produced levels off to gain the mark.

Answers to examination-style questions

Answers	Marks	Examiner's tips
<p>ii) replaces nutrients removed; fertiliser provides nitrate needed for amino acid / protein production; as more fertiliser is added, there is more growth / protein / amino acid / yield</p>	2	The stem of the question provides the clue here. The fertiliser contains sodium nitrate, a nitrogen source for protein synthesis.
<p>iii) plants already have enough nitrate / nitrate no longer limiting; another named factor / element is limiting growth</p>	2	As an increase in nitrate does not increase the mass of the crop, it must no longer be a limiting factor.
<p>b) because cattle excreted / produced faeces/ droppings / cowpats / manure; in field B crop used elements / minerals / nitrates / nutrients last year</p>	2	The manure is acting as a natural fertiliser in field A. In field B, the nutrients removed had not been replaced.
<p>c) advantages: easy to handle / apply / transport / store; known chemical content / can supply specific needs; easy to control mass that is added / less mass needed; releases ions / nutrients quickly / soluble</p>	2	The specification refers to natural and artificial fertilisers. Here the organic fertilisers are natural and the inorganic fertilisers are artificial.
<p>c) disadvantages: expensive / more readily leads to eutrophication / environmentally damaging / uses resources to make it / does not add to soil structure / lacks some nutrients</p>	1	As in many answers the converse would be credited.