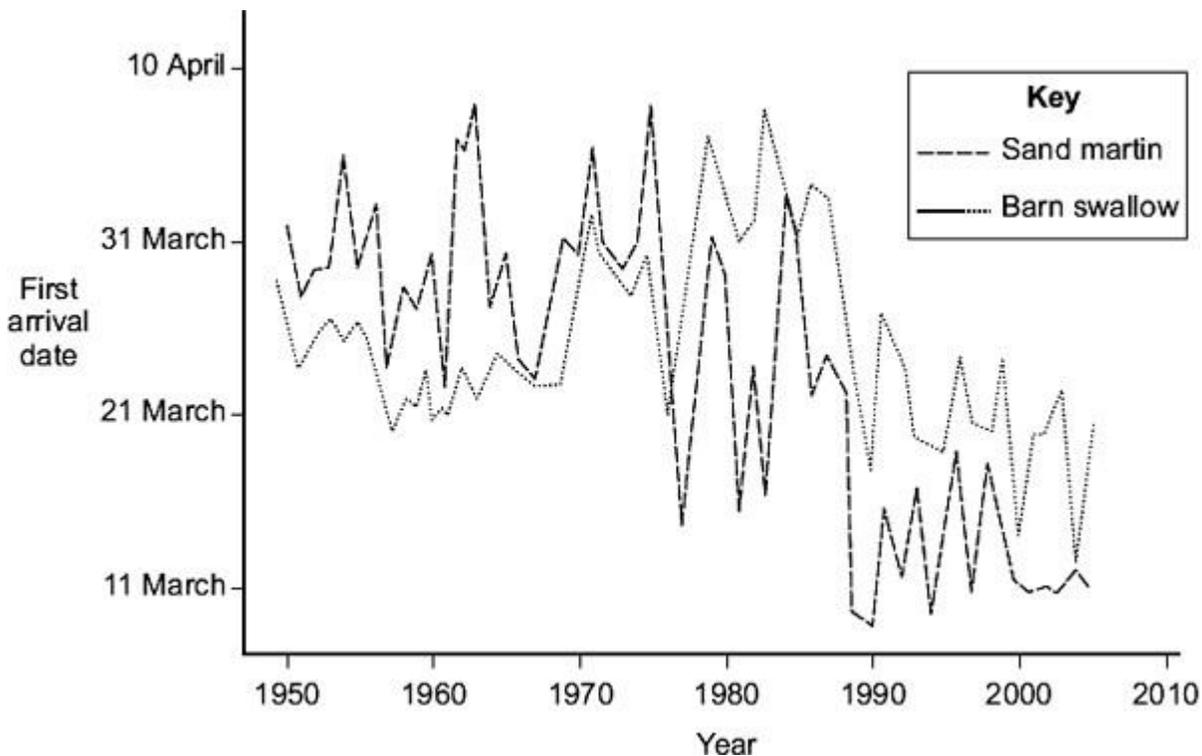


3

Scientists have observed changes in the migration patterns of some species of birds.

The graph shows the arrival dates in the UK of two species of birds, the Sand martin and the Barn swallow.

Both birds feed on flying insects.



(a) Give **two** changes in migratory patterns shown in the data.

(2)

(b) Suggest reasons for the change in the migration pattern of the Sand martin.

(2)

(Total 4 marks)

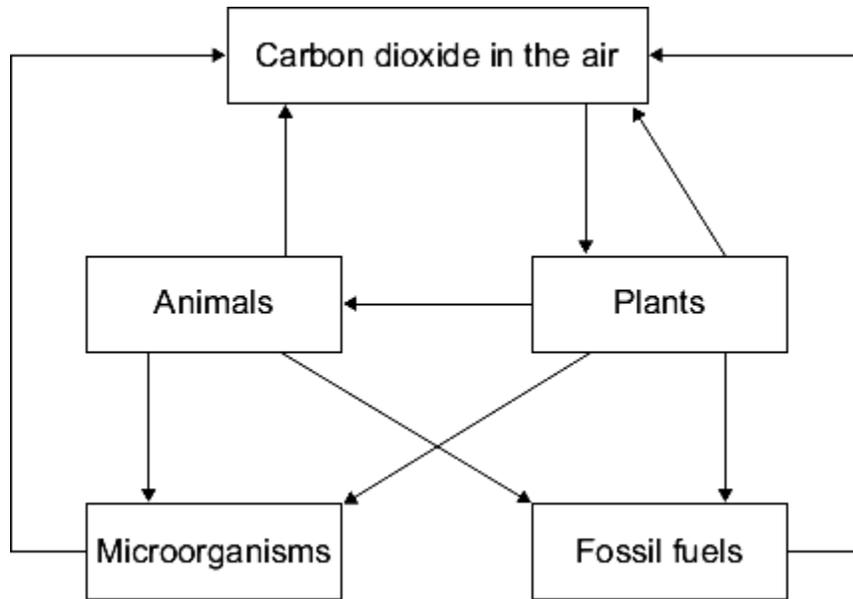
4 Approximately a third of UK domestic rubbish is organic matter such as food waste and gardening rubbish.

Many councils have started industrial composting schemes to decompose these wastes. One product of the decomposition is compost (decaying organic matter).

Use this information and your own knowledge to suggest reasons why more councils should be encouraged to start industrial composting schemes.

(Total 3 marks)

5 The diagram shows part of the carbon cycle.



The results for the two groups are shown in the table.

	Concentration of oxygen in arbitrary units			
Sampling position	W	X	Y	Z
Group 1	9.4	9.3	9.4	8.5
Group 2	9	9	9	9

- (a) The results of **Group 2** did not show any difference in the concentration of oxygen at the four different sampling positions. The results of **Group 1** did show differences.

Suggest why.

(1)

- (b) The results of **Group 1** show the lowest concentration of oxygen was at sampling position **Z**.

Suggest why.

(3)

- (c) The students also counted the number of different invertebrates living in the river at points **W, X, Y** and **Z**.

The results are shown in the table.

Invertebrate	Sampling position			
	W	X	Y	Z
Stonefly larva	4	5	4	0
Water snail	16	15	16	10
Bloodworm	0	0	0	25
Freshwater louse	6	5	7	5

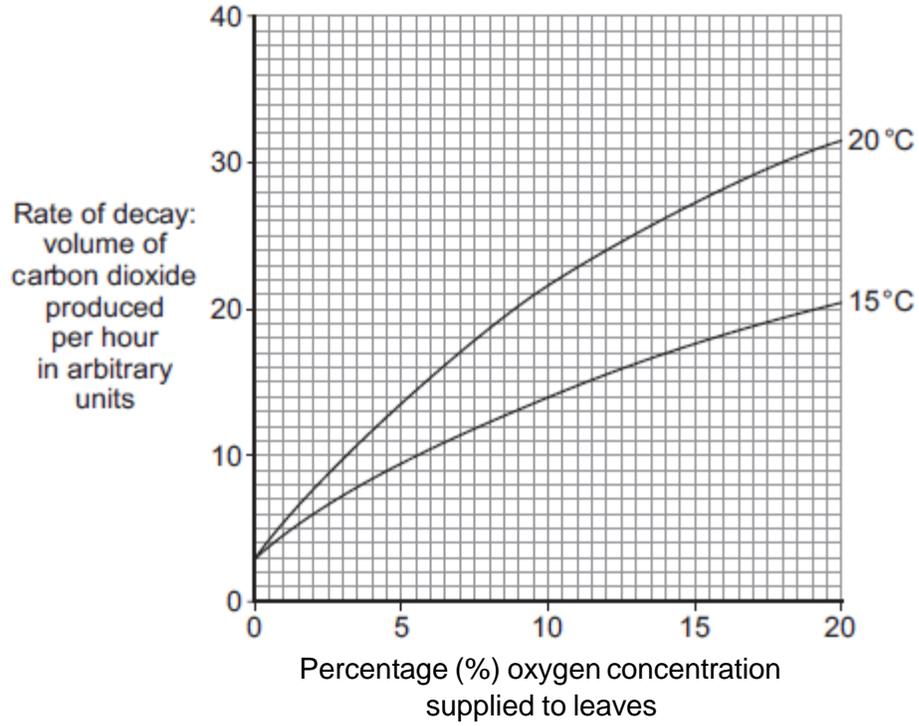
From these results, which invertebrate is **not** suitable as an indicator of oxygen concentration in water?

Give a reason for your choice.

(1)
(Total 5 marks)

7 A scientist investigated the effect of oxygen concentration and temperature on the rate of decay of leaves in a container.

The scientist's results are shown in the graph.



(a) The rate of decay is measured as the volume of carbon dioxide produced per hour.

Explain why carbon dioxide is produced during the process of decay.

(3)

(b) Give **two** conclusions that can be made from the results shown in the graph.

(2)

(Total 5 marks)

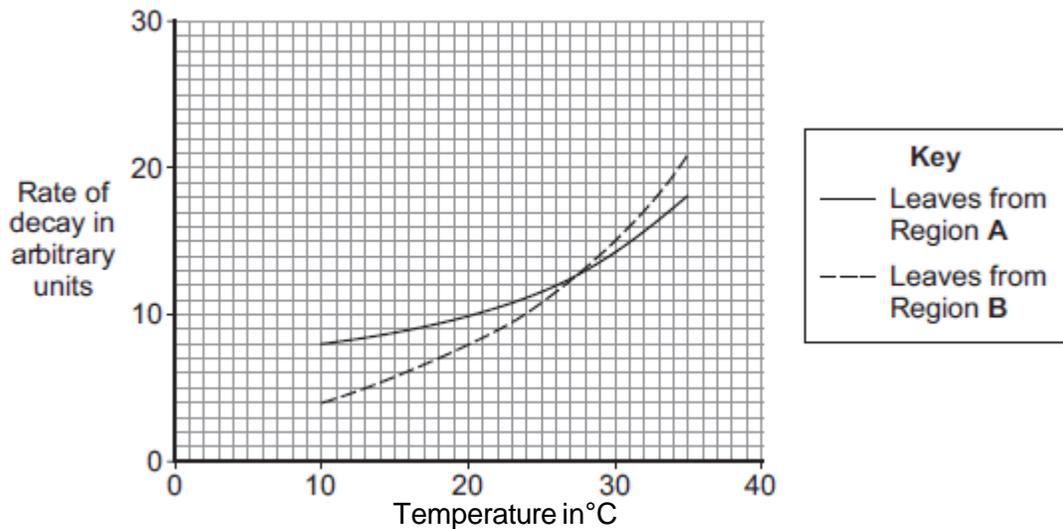
8

Scientists collected leaves that had fallen from beech trees in two different parts of the UK, Region **A** and Region **B**.

Equal masses of leaves from the two regions were put in incubators at different temperatures. All other conditions were the same.

The leaves decayed in the incubators. The rate of decay of the leaves was measured.

The results are shown in the graph.



Give **two** conclusions you can make from the data and suggest a reason for each conclusion.

(Total 4 marks)

Mark schemes

1 any **six** from:

*only credit release of carbon dioxide **once** when linked to a correct process*

ignore references to burning

- (plants) photosynthesis
- (plants) take in carbon dioxide
- (plants) produce carbohydrates / fats / proteins
accept produce glucose
- (carbon compounds transferred by) feeding
- respiration
- breaks down carbon compounds / carbohydrates
accept glucose
- releases carbon dioxide
- organisms die / produce wastes / *excrete*
- (which are) decomposed / decayed by microorganisms
allow broken down
allow bacteria / fungi / microbes / decomposers
- (which) release carbon dioxide

[6]

2

read 'the gas' or 'it' as carbon dioxide

(plants) photosynthesis

1

(plants) absorb carbon dioxide / CO₂ (from the air)

allow take in / use carbon dioxide / CO₂ (from the air)

1

(overall) more carbon dioxide / CO₂ is being released into the air than is being removed

*allow 470 (billion tonnes) released **but / and** 450 (billion tonnes) taken in*

1

(by) respiration (by all organisms / any named organism)

ignore breathing

ignore carbon

1

(and) combustion / burning

ignore carbon

1

(so) amount of carbon dioxide / CO₂ in air is increasing

allow 20 (billion tonnes) of carbon dioxide / CO₂ added to air each year

1

[6]

3	<p>(a) the birds now arrive earlier (in the UK) <i>must imply both species of birds</i></p> <p style="text-align: right;">1</p> <p>the Sand martin (now) arrives before the Barn swallow or the Barn swallow (now) arrives later than the Sand martin or arrival time of the two birds has reversed</p> <p style="text-align: right;">1</p> <p>(b) any two from:</p> <ul style="list-style-type: none"> • warmer in UK <u>earlier</u> (in year) or colder abroad <u>earlier</u> (in year) <i>allow too hot / cold abroad <u>earlier</u> (in year)</i> <i>ignore global warming</i> • insects / food appears <u>earlier</u> (in year in UK) or shortage of insects / food abroad <u>earlier</u> (in year) <i>accept feasible reference to competition for food</i> • new genes / mutation <i>allow evolution / natural selection</i> <i>ignore adapted</i> <i>ignore pollution</i> <p style="text-align: right;">2</p>	[4]
4	<p>reduces landfill <i>accept reduces pollution from burning wastes</i> <i>ignore less waste unqualified</i></p> <p style="text-align: right;">1</p> <p>scheme self-financing or produces compost / fertiliser which can be sold</p> <p style="text-align: right;">1</p> <p>produces nutrients / fertiliser / minerals (ions) for plants <i>allow returns / recycles nutrients into soil</i> <i>ignore helps plants grow</i></p> <p style="text-align: right;">1</p>	[3]

5	plants absorb CO ₂ for photosynthesis <i>ignore carbon</i>	1	
	all organisms / any named organism respire(s) and release(s) CO ₂ <i>ignore breathing</i> <i>ignore carbon</i>	1	
	any four from:		
	• carbon compounds / named compound made by plants		
	• plants eaten by animals		
	• dead organisms / faeces are decomposed / decayed <i>allow broken down</i>		
	• by bacteria / microorganisms		
	• dead plants and animals (may) form fossil fuels		
	• when (fossil) fuels are burnt they release CO ₂ into the air	4	[6]
6	(a) (sensor used by Group 2) had lower <u>resolution</u> <i>accept converse answers</i> <i>allow poor / worse <u>resolution</u></i> <i>allow (sensor used by Group 2) only measured to whole numbers</i> <i>ignore reference to sensitivity / precision / accuracy</i>	1	
	(b) microorganisms / bacteria (in water / from sewage) <i>ignore references to plants</i>	1	
	<u>used up</u> oxygen <i>must be linked to microorganisms</i>	1	
	during respiration	1	
	(c) freshwater louse <i>correct organism and reason needed for mark</i> <i>allow louse / lice</i>		
	number of organisms changes little	1	[5]

- 7 (a) microorganisms / bacteria / fungi
allow correct named organisms
allow detritus feeders / decomposers / worms 1
- break down / digest / feed on (dead organisms)
accept use carbohydrates / glucose
allow decomposes
ignore decay / rot 1
- (and release carbon dioxide when they) respire
*do **not** allow respiration if linked to leaves / dead organisms* 1
- (b) any **two** from:
- the higher the temperature the faster the rate of decay
allow faster / more carbon dioxide for faster rate of decay
 - the higher the oxygen concentration the faster the rate of decay
allow faster / more carbon dioxide for faster rate of decay
 - the rate increases faster (with increasing oxygen concentration) at 20 °C
 (than 15 °C) 2
- [5]

8 conclusion with relevant explanation:
for microorganisms allow microbes, bacteria or fungi

Conclusion

as temperature increases the rate of decay increases
may refer to A, B or both 1

Explanation

(because) microorganisms / enzymes are more active in warmer conditions
allow microorganisms reproduce quicker 1

Conclusion

(decay of) leaves from region B was affected more by temperature / increases more rapidly with temperature

accept description of this eg below 26-28°C leaves from region B decay slower (than from region A), but above 26-28°C leaves from region B decay faster (than from region A) 1

Explanation

(because) there were different types of microorganisms on the leaves

allow (leaves from) different species of beech tree

allow difference in water content of leaves

ignore different levels of oxygen

allow rate of decay of leaves from both regions the same at 26-28°C for 1 mark, if no other conclusions made

if incorrect / incomplete conclusion ignore explanation

1

[4]