



Nutrient Cycles (deacy and the carbon cycle)



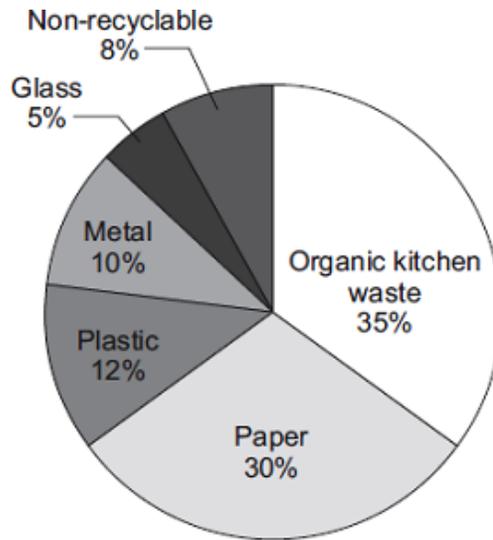
67 minutes



67 marks

Q1. This question is about recycling.

The pie chart shows the different types of waste from an average household in England.



- (a) In 2010, councils in England collected 23 million tonnes of waste from households. Most of the waste was put into landfill sites. Councils pay to use landfill sites.

Organic kitchen waste can be put onto compost heaps.

Calculate the mass of organic kitchen waste from households that could have been put onto compost heaps in 2010.

.....
.....

Answer = million tonnes

(2)

- (b) Some householders put organic kitchen waste onto their compost heaps.

- (i) Suggest **one** advantage of this to the council.

.....
.....

(1)

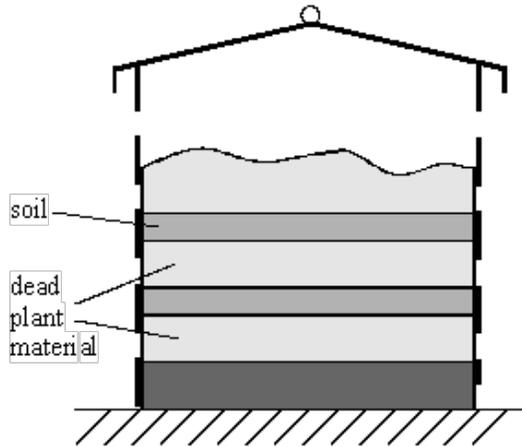
- (ii) Suggest **one** advantage of this to the householder.

.....
.....

(1)

(Total 4 marks)

Q2. The drawing shows a section through a well-designed compost heap.



(a) Suggest why soil is put in with the dead plant material.

.....
.....
.....

(2)

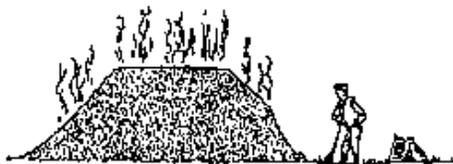
(b) Explain why the compost heap is designed with holes in the sides.

.....
.....
.....

(2)

(Total 4 marks)

Q3.



A farmer had too much manure to spread on his fields. He thought he would turn it into compost which had no smell.

(a) What makes the manure decay?

.....

(1)

(b) Write down **two** conditions which will help the manure to decay faster.

1.

2.

(2)

(Total 3 marks)

Q4. In compost heaps, dead plants are broken down by microbes.
This breakdown is much slower:

- when the weather is cold
- when the weather is dry
- when the heap is squashed down so that no air can circulate.

(a) What **three** conditions inside compost heaps are needed for microbes to work **quickly**?

1

2

3

(3)

(b) Why is the breakdown of dead plants important for living plants?

.....

.....

(1)

(Total 4 marks)

##

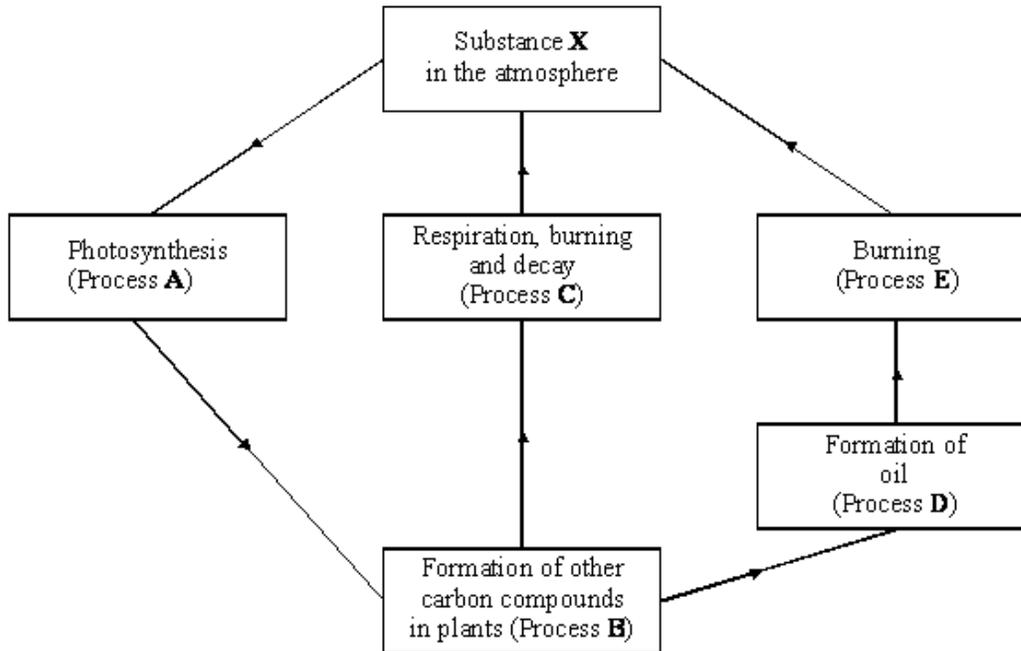
(a) Use words from the box to complete the sentences about the water cycle.

boils	condenses	evaporates	freezes	
melts	rain	sea	Sun	wind

Water from the surface of the Heat from the speeds up this process and so does the Water vapour in the atmosphere cools down and to form billions of tiny water droplets. Some of the droplets join together and fall as

(6)

(b) The diagram shows some processes in the carbon cycle.



(i) What is the name of substance **X**?

.....

(1)

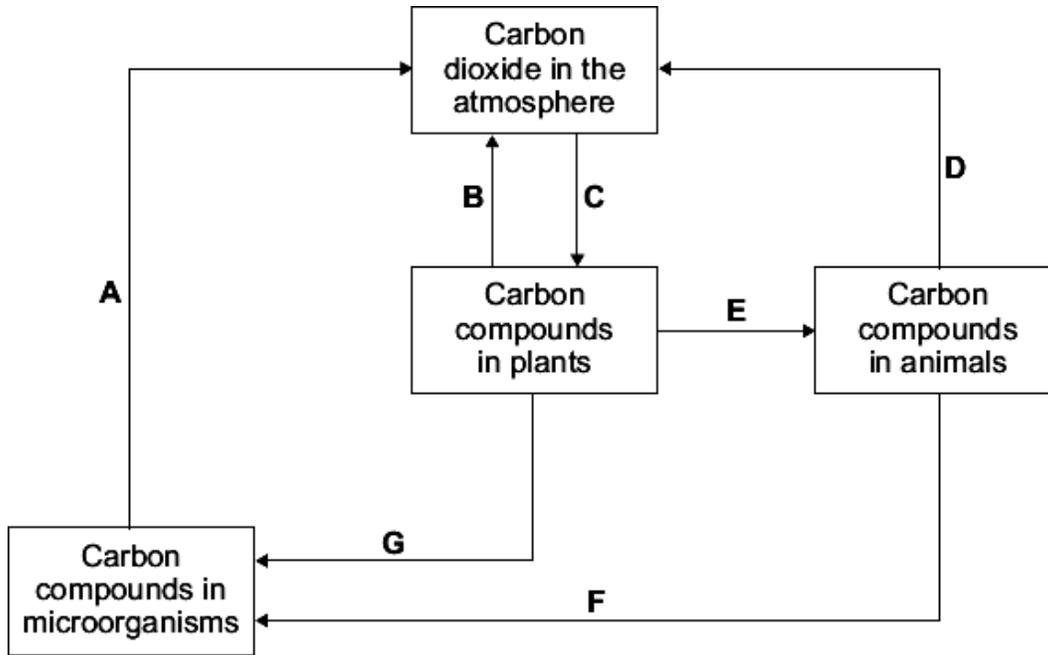
(ii) Which process, **A**, **B**, **C**, **D** or **E**, takes the **longest** and approximately how long does it take?

.....

(2)

(Total 9 marks)

Q6. The diagram shows part of the carbon cycle.



(a) Letter **A** represents respiration.

Which **two** other letters represent respiration?

and

(1)

(b) Other than carbon dioxide name **two** carbon compounds found in plants.

1

2

(2)

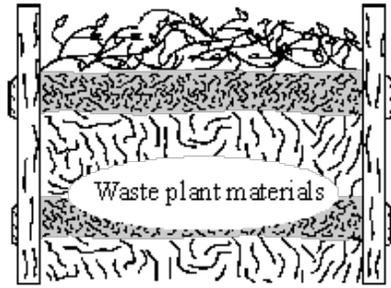
(c) Gardeners use compost heaps to decay dead plants. Decayed compost is then spread onto the soil in a garden.

Explain why gardeners spread decayed compost onto the soil.

.....

(2)
 (Total 5 marks)

Q7. Compost heaps are used to recycle waste plant materials.



Complete the sentences by choosing the correct words from the box.

cool	decay	dry	grow
moist	respire	warm	

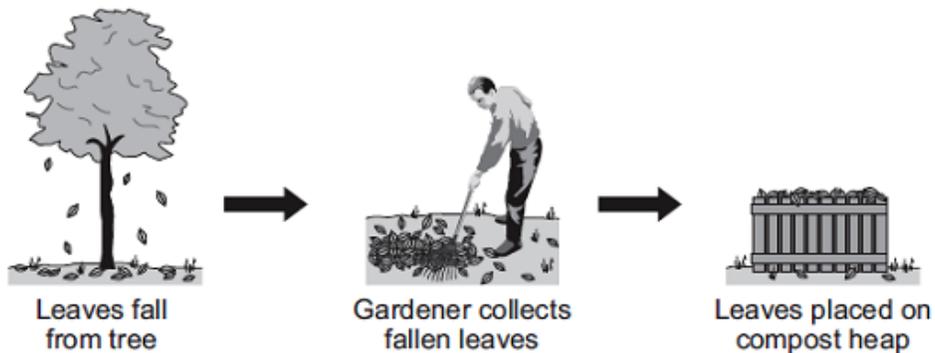
The waste plant materials because they are broken down by microorganisms.

The waste plant materials are broken down faster when the conditions are and

This process releases substances that can be used by other plants to

(Total 4 marks)

Q8. Gardeners often collect fallen leaves in autumn and place them on compost heaps.



(a) Over the next year the leaves decay.

Which living things cause decay?

.....

(1)

(b) The leaves decay more quickly in summer than in winter.

Give **one** reason why.

.....
.....

(1)

(c) The compost heap has holes in its sides to let gases enter.

Which gas is needed for decay?

Tick (✓) **one** box.

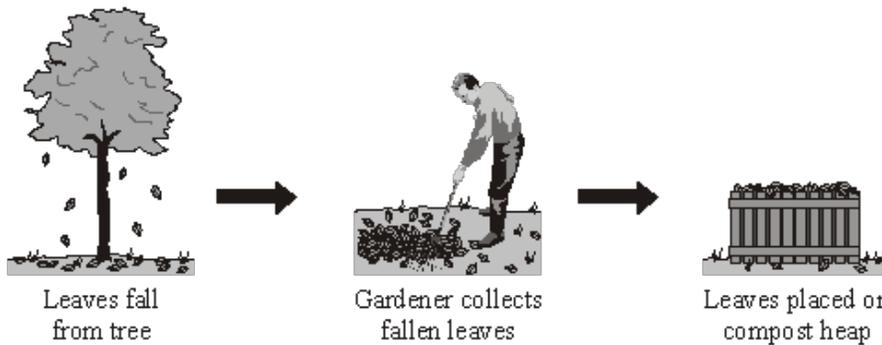
Carbon dioxide

Nitrogen

Oxygen

(1)
(Total 3 marks)

Q9. Gardeners often collect fallen leaves in autumn and place them on compost heaps.



(a) Over the next year the leaves decay.

Which living things cause leaves to decay?

.....

(1)

(b) The leaves decay more quickly in summer than in winter.

Give **one** reason why.

.....
.....

(1)

(c) The compost heap has holes in its sides to allow gases to enter.

Which gas is needed for decay?

Put a tick (✓) in the box next to your choice.

Carbon dioxide

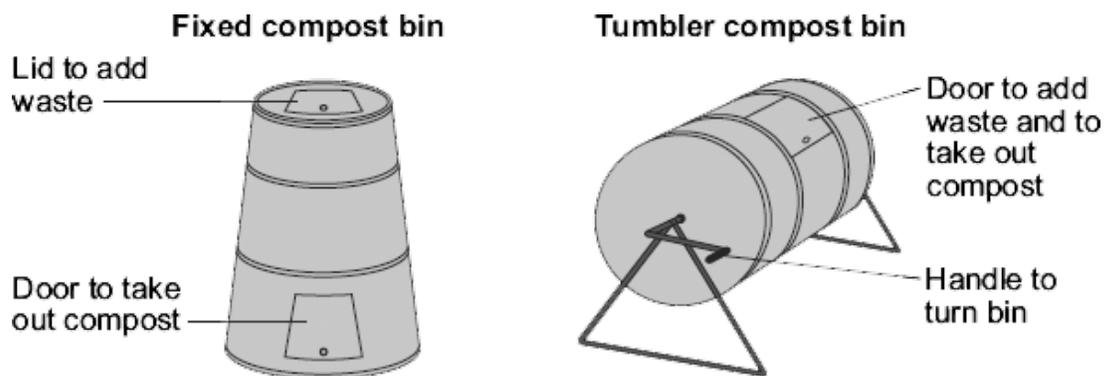
Nitrogen

Oxygen

(1)
(Total 3 marks)

Q10. Garden waste can be recycled.
One way of recycling garden waste is to use a compost bin.

The diagram shows two types of compost bin.
Each bin can contain the same amount of waste.



Information about the compost bins is given below.

Fixed compost bin

- Compost can be taken out after two years.
- The bin costs about £40.
- The bin takes up an area of 1 m².

Tumbler compost bin

- The bin is turned twice a day using the handle.
- Six weeks later compost can be taken out.
- The bin costs about £80.
- The bin takes up an area of 2 m².

(a) A gardener is buying a compost bin.

(i) Give **one** advantage to the gardener of buying a tumbler compost bin and not a fixed compost bin.

.....
.....

(1)

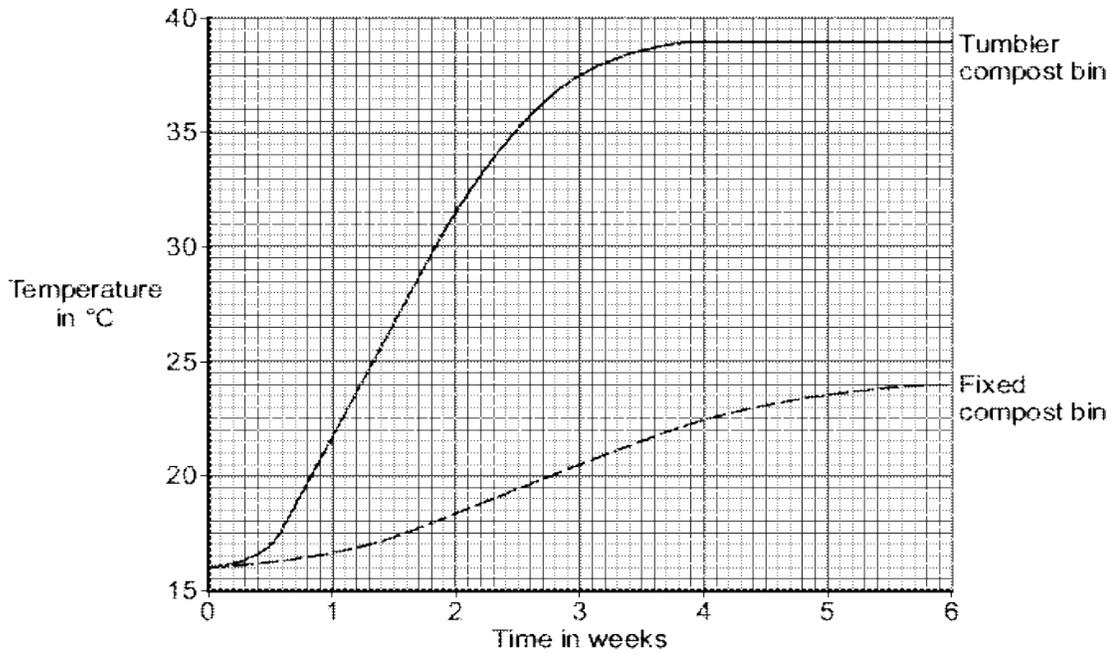
(ii) Give **two** advantages to the gardener of buying a fixed compost bin and not a tumbler compost bin.

1

2

(2)

- (b) The same amounts of waste were added to the two types of bin.
The graph shows the temperature in the bins in the first six weeks after the waste was added.



- (i) Give **two** differences between the results for the tumbler compost bin and the fixed compost bin.

1

.....

2

.....

(2)

- (ii) Complete the sentences.

The waste is converted into compost by organisms
called

The conversion of waste into compost works best in warm, moist
and conditions.

(2)

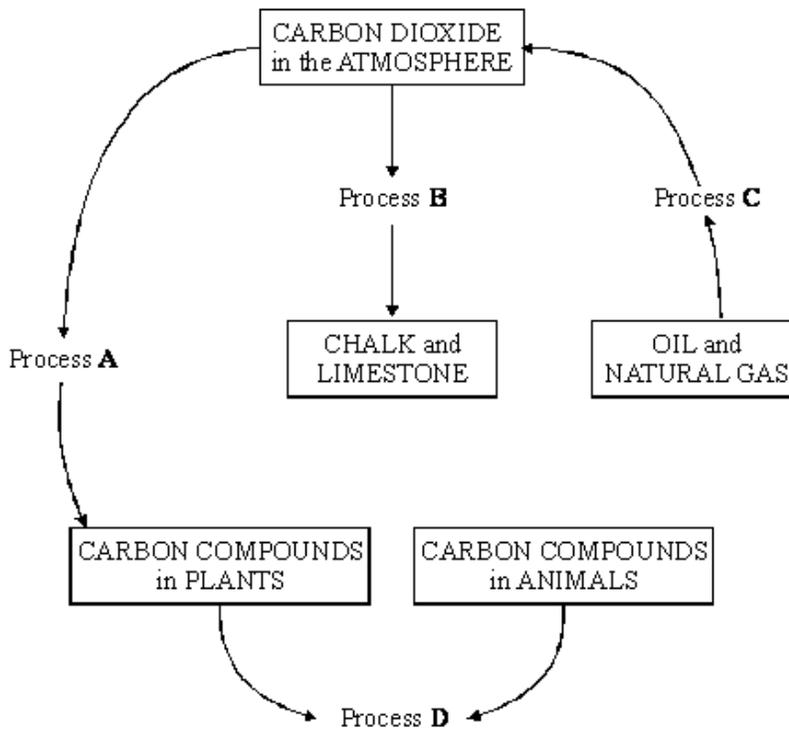
(iii) There was a big difference in the final temperatures in the two bins.

Suggest an explanation for this temperature difference.

.....
.....
.....

(2)
(Total 9 marks)

Q11. The diagram shows part of the carbon cycle.



What are the processes shown as **A**, **B**, **C** and **D**?

- (i) Process **A** is
- (ii) Process **B** is
- (iii) Process **C** is
- (iv) Process **D** is

(Total 4 marks)

Q12. The amount of carbon dioxide in the atmosphere is increasing.

The table shows the estimated mass of carbon dioxide exchanged with the atmosphere in one year.

	Mass of carbon dioxide exchanged with the atmosphere in millions of tonnes	
	Passed out into the atmosphere	Taken in from the atmosphere
Plants	30	64
Animals	10	0
Microorganisms	24	0
Combustion	6	0

(a) (i) Calculate the total mass of carbon dioxide passed out into the atmosphere in one year.

Show clearly how you work out your answer.

.....

Answer million tonnes

(2)

(ii) Calculate the increase in the mass of carbon dioxide in the atmosphere in one year.

You should use your answer to part (a)(i) in your calculation.

Show clearly how you work out your answer.

.....

Answer million tonnes

(2)

(b) Draw a ring around the correct answer to complete the sentence.

Plants use carbon dioxide in the process of

- | |
|-----------------|
| decomposition. |
| photosynthesis. |
| respiration. |

(1)

(Total 5 marks)

Q13. In a woodland, bluebells grow well every year.

Bluebells growing well in woodland



Mick Garratt [CC-BY-SA-2.0], via Wikimedia Commons

Each year the dead flowers and leaves of the bluebells and leaves from the trees fall onto the ground.

The bluebells do not run out of mineral ions.

Explain why the bluebells do **not** run out of mineral ions.

The words in the box may help you.

roots	dead leaves	mineral ions
	microorganisms	decay

.....

.....

.....

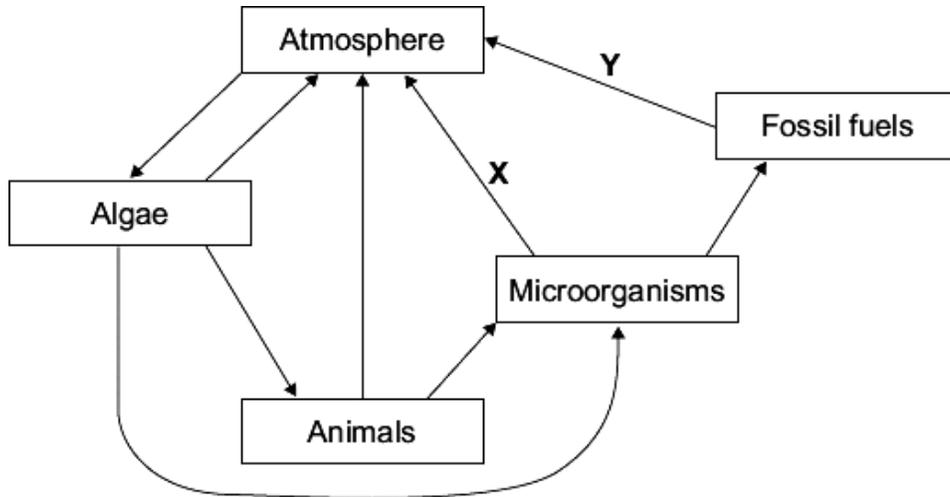
.....

.....

.....

(3)
(Total 3 marks)

Q14. The diagram shows part of a carbon cycle in a habitat.



(a) Name the processes shown by arrows **X** and **Y**.

X

Y

(2)

(b) Describe the part played by algae in this carbon cycle.

.....

(3)

(c) In tropical rainforests process **X** is much faster than in most other habitats.

Suggest why.

.....

(2)
 (Total 7 marks)

M1.	(a) 8.05 / 8.1 / 8 <i>correct answer with or without working gains 2 marks</i> <i>allow 1 mark for 8.0 or 8.10</i> <i>allow 35/100 x 23 (million) for 1 mark if no answer or incorrect answer</i> <i>allow 1 mark for 805 or 8 050 000</i>	2	
	(b) (i) any one from: <ul style="list-style-type: none">• less landfill sites used• less cost (of landfill sites) / saves money• less effort / cost to collect <i>allow less to collect</i>	1	
	(ii) compost can be used on garden <i>allow idea of compost can be used to help plant growth or compost provides minerals / named or compost improves the soil</i>	1	[4]
M2.	(a) soil contains the microbes which will decay the dead material <i>for 1 mark each</i>	2	
	(b) lets in air/oxygen oxygen speeds up decay process <i>for 1 mark each</i>	2	[4]
M3.	(a) microbes/worms/bacteria/fungi/moulds/ micro-organisms/decomposers (not germs/bugs/slugs/organisms - ignore these) <i>any one for 1 mark</i>	1	
	(b) idea warm/hot/heat (not sun) oxygen/air moist/water/wet/rain (not 'turn the compost' unless qualified) If no answer given in (a), one e.g. could be credited in (b) <i>any two in any order for 1 mark each</i>	2	[3]

- M4.** (a)
- warmth / heat / hot / not cold if refer to weather or
 - moisture / water conditions outside the compost heap, *do not allow*
 - air / oxygen (*allow idea that not squashed down*)
in any order for 1 mark each
- 3
- (b) *idea that nutrients / minerals / nitrates are recycled / fertilise the soil (do not allow food / goodness)*
for 1 mark
- 1
- [4]**

- M5.** (a) evaporates
- 1
- sea
- 1
- sun
- accept sun*
- 1
- wind
- 1
- condenses
- 1
- rain
- 1
- (b) (i) carbon dioxide
- accept CO₂ provided it is correct in every detail*
- 1
- (ii) (process) D
- 1
- millions of years
- a million years upwards*
- 1
- [9]**

- M6.** (a) B and D
- both required in any order*
- 1

(b) any **two** from:

*do **not** accept compounds restricted to animals*

- carbohydrate / named example
*allow **2** marks for 2 named examples*
*do **not** allow a general name and a named example for **2** marks*
*(eg award **1** mark only for carbohydrate and starch)*
- protein / enzyme
*allow **2** marks for 2 named examples*
- amino acid
- hormone / named plant hormone
- lipid / fat / oil / wax
- chlorophyll
- DNA
- vitamin(s)

2

(c) contains minerals / salts / ions / nutrients / named

ignore 'food'

*do **not** allow vitamins / glucose / energy etc*

1

(needed by plants) for health / better growth

for / help plant growth is insufficient

ignore moisture retention / soil structure

ignore more plants

*allow examples linked to mineral eg contains magnesium to make chlorophyll for **2** marks*

1

[5]

M7. decay

1

warm (*)

1

moist (*)

1

grow

() these words can be either order*

1

[4]

- M8.** (a) microorganisms / microbes / bacteria / fungi / decomposers
*allow named example **or** mould*
ignore germs / worms / other detritivores 1
- (b) (weather / it is) warm(er) / hot(ter)
accept optimum conditions for enzymes
allow cold(er) in winter
ignore wet(ter) / light(er) / sun
*do **not** accept heat dries the leaves out* 1
- (c) oxygen
no mark if more than one box is ticked 1
- [3]**

- M9.** (a) microorganisms / bacteria / fungi / microbes
*allow named example **or** mould*
ignore decomposers unqualified / germs / maggots / worms 1
- (b) it is warm(er) / hot / increased heat / increased temperature
ignore 'sun is hot' unqualified 1
- (c) oxygen 1
- [3]**

- M10.** (a) (i) (compost produced) quicker / faster / takes less time
it = tumbler bin
*answers should be comparative eg **only** 6 weeks = 1 mark*
6 weeks = 0 marks 1
- (ii) any **two** from:
- takes less space
 - cheaper (to buy)
 - don't need to turn / rotate it
it = fixed bin
references to space and cost should be comparative
*do **not** accept unqualified data* 2

- (b) (i) any **two** from:
- faster rise (in tumbler)
 - higher (in tumbler) **or** 2 correct number readings
 - levels off (in tumbler) **or** continues to rise in fixed
it = tumbler bin
ignore eg faster compost
- 2
- (ii) microorganisms / microbes / decomposers
allow bacteria / fungi / detritus feeders / worms / other named
examples of detritus feeders / mould
- 1
- aerobic
allow air(y)
allow oxygen(ated)
- 1
- (iii) faster respiration / decay / **or** microorganisms / microbes / decomposers work
 faster (in tumbler)
allow converse
allow bacteria / fungi / mould
- 1
- so more heat produced (in tumbler)
ignore heat produced by friction
- OR**
- more air / more oxygen(ation) (in tumbler) (1)
- so more respiration / faster decay / bacteria work faster (in tumbler) (1)
- 1

[9]

M11.	(i) photosynthesis	1	
	(ii) chemical reaction(s) or calcification <i>allow fossilisation</i>	1	
	(iii) burning or combustion <i>allow oxidation</i>	1	
	(iv) feeding or nutrition or eating or consuming <i>allow digestion</i> <i>allow a description e.g. plants are eaten by animals</i>	1	[4]

M12.	(a) (i) 70 <i>award 2 marks for correct answer irrespective of working</i> <i>allow 1 mark for 30 + 10 + 24 + 6 (with wrong answer or no answer),</i> <i>do not award this sum if other figure(s) are included in the addition</i>	2	
	(ii) 6 <i>award 2 marks for correct answer irrespective of working</i> <i>award 2 marks for correct answer to (a)(i) – 64 (ecf)</i> <i>award 1 mark either for 70 – 64 or answer to (a)(i) – 64 with no</i> <i>answer or incorrect answer</i>	2	
	(b) photosynthesis.	1	[5]

M13. any **three** from:

ignore references to carbon cycle

accept digested / decomposed / broken down / rotted for decay throughout

ignore eating

- dead leaves / flowers / bluebells are decayed
- idea that microorganisms do the decaying
accept microbes / bacteria / fungi / mould / decomposers for microorganisms
- minerals / ions / nutrients / named released (by decay / microorganisms)
not mineral ions unqualified
- (released) into soil **or** minerals / ions / nutrients taken up / in by (bluebell) roots (next year)
look for idea that minerals / ions / nutrients are in soil (eg released into soil or taken up from soil)

3

[3]

M14. (a) **X** respiration

correct order only

allow decay / decomposition / rotting

ignore breakdown / disintegrate

1

Y combustion / burning

1

(b) any **three** from:

- photosynthesise / absorb carbon dioxide
*accept are producers **or** produce / make biomass / glucose / other named*
*do **not** accept photosynthesis releases CO₂*
- release carbon dioxide / respire
- eaten by animals
- fed on / decayed by microorganisms
ignore eaten by microorganisms

3

(c) any **two** from:

(in tropical rainforest conditions are)

- warm(er) / hot
- damp / moist / wet / humid
ignore rain
- a lot of microorganisms
- a lot of material to decay
allow warm(er) so enzymes work faster for 2 marks

2

[7]

