



**Chapter 17 Organising an  
Ecosystem**

Name: \_\_\_\_\_

Class: \_\_\_\_\_

Date: \_\_\_\_\_

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Time: **41 minutes**

Marks: **41 marks**

Comments:

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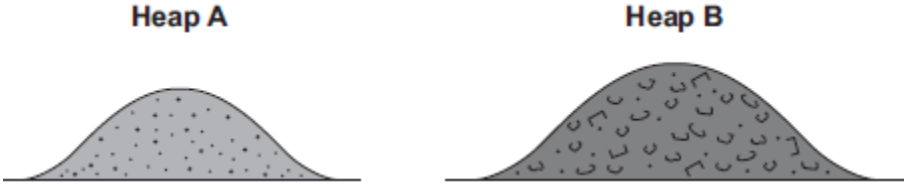
1

A gardener investigates if turning over the waste in a compost heap makes the waste decay more quickly.

The gardener:

- makes two separate heaps of garden waste, heap **A** and heap **B**
- turns over the material in heap **A** every 2 weeks
- does **not** turn over the material in heap **B**
- estimates the amount of decay in the two heaps after 6 months.

The diagram shows the two heaps of garden waste at the beginning of the investigation.



(a) Suggest **two** factors, other than time, the gardener should control to make the investigation fair.

1.....

.....

2.....

.....

(2)

(b) Name **one** type of living thing that causes decay.

.....

(1)

(c) The gardener's results are shown in the table.

Compost heap	Estimated amount of decay
<b>A</b>	A lot
<b>B</b>	Very little

(i) Why does turning over the material in heap **A** make the material decay more quickly?

.....  
.....

(1)

(ii) The gardener puts decayed material around his plants to help them grow.

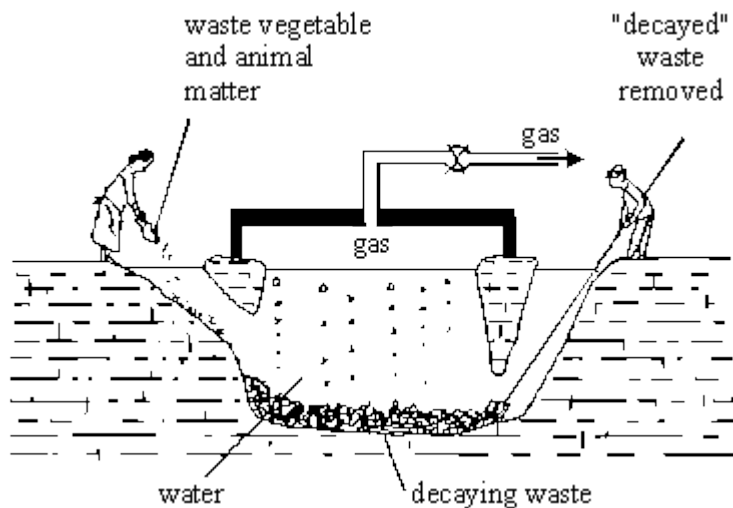
Suggest why the plants in a woodland grow well each year **without** material from compost heaps being added.

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

(2)

(Total 6 marks)

2



The diagram shows how the gas from decaying plant and animal waste can be collected.

(a) (i) Name the gas collected from the decaying waste.

.....

(1)

(ii) What can the gas be used for?

.....

(1)

(b) The decayed waste produces compost.

What can the compost be used for?

.....

**(1)**

**(Total 3 marks)**

3

The photographs show four different species of bird.

Great tit



© JensGade/iStock

Blue tit



© Marcobarone/iStock

Coal tit



© MikeLane45/iStock

Long-tailed tit



© Andrew Howe/iStock

The table gives information about the four species of bird in winter.

Bird species	Mean body mass in grams	Mean energy needed in kJ per day	Mean percentage of day spent feeding
Great tit	21	84.2	75
Blue tit	12	62.4	81
Coal tit	9	49.5	88
Lond-tailed tit	7	42.0	92

(a) (i) Calculate the energy needed per day per gram of body mass for the blue tit.

.....

.....

.....

Answer = ..... kJ per day per gram of body mass

(2)

(ii) Describe the trend for energy needed per day per gram of body mass for the four species of bird.

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

(1)

(iii) Suggest an explanation for the trend you have described in part (a)(ii).

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

(2)

(b) Describe and explain the trend shown by the data for the time spent feeding in winter for the birds.

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

(2)

(Total 7 marks)

4

Some students investigated the effect of pH on the growth of one species of bacterium.

They transferred samples of bacteria from a culture of this species to each of eight flasks. Each flask contained a solution of nutrients but at a different pH.

After 24 hours, the students measured the amount of bacterial growth.

(a) It was important that the flasks in which the bacteria grew were not contaminated with other microorganisms.

Describe **two** precautions the students should have taken to prevent this contamination.

1 .....

.....

2 .....

.....

(2)

- (b) To see the effect of pH on the growth of the bacteria, other conditions should be kept constant.

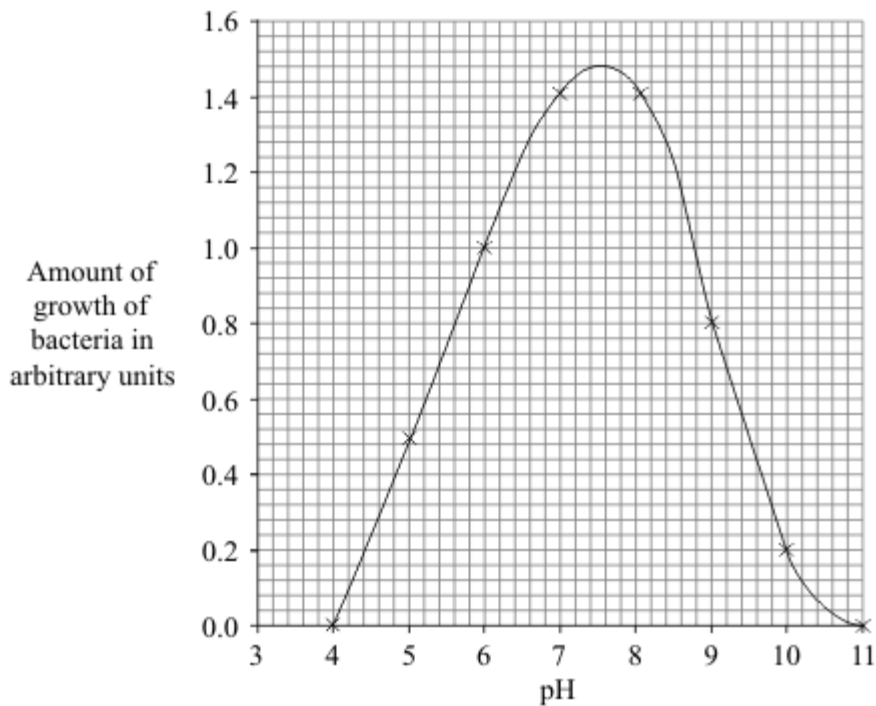
Suggest **two** conditions which should have been kept constant for all eight flasks.

1 .....

2 .....

(2)

- (c) The graph shows the results of the investigation.



The students wanted to find the best pH for the growth of this species of bacterium.

- (i) Use the graph to estimate the pH at which the bacteria would grow best.

pH .....

(1)

- (ii) What could the students do to find a more accurate value for the best pH for growth of the bacteria?

.....

.....

(1)

(Total 6 marks)

5

Microorganisms can decay potatoes.

(a) Microorganisms obtain carbohydrates from the potato to use inside their cells.

Describe how.

.....

.....

.....

.....

(2)

(b) A group of students investigated decay in potatoes.

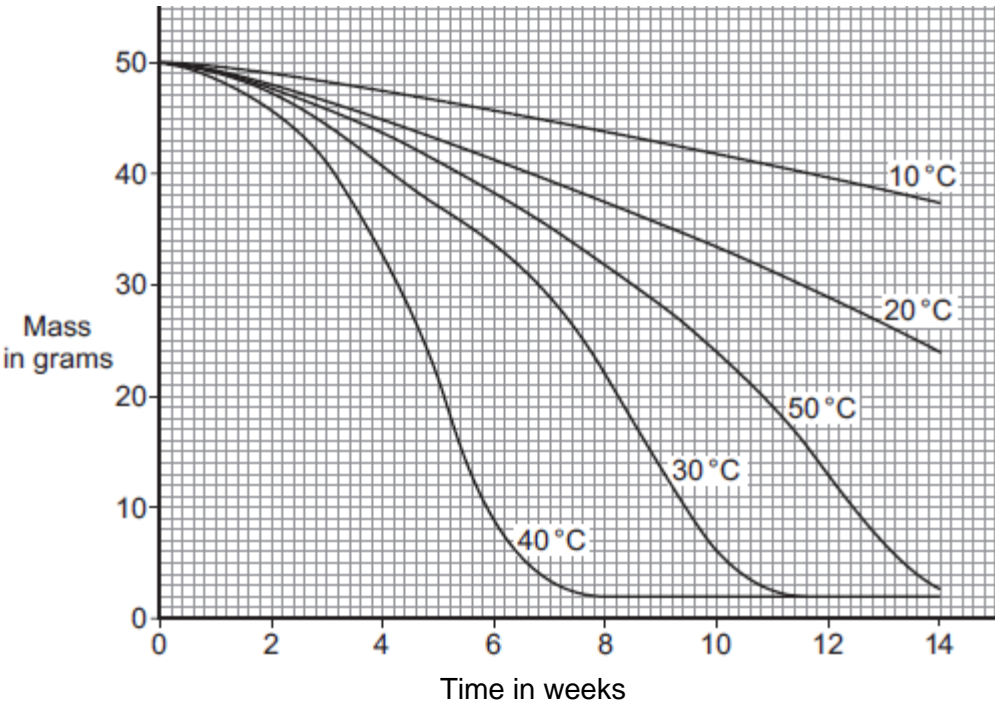
The students made the hypothesis:

**'The higher the temperature the faster the potato will decay.'**

The students:

- cut five 50 g cubes of potato and put each one in a Petri dish
- kept each dish at a different temperature for 14 weeks
- measured the mass of each potato cube every week and recorded the mass.

The results are shown in the graph.





(i) The potato cubes decreased in mass over the 14 weeks.

Explain why.

.....

.....

.....

.....

.....

.....

**(3)**

(ii) Do the students' results support their hypothesis?

Explain your answer.

.....

.....

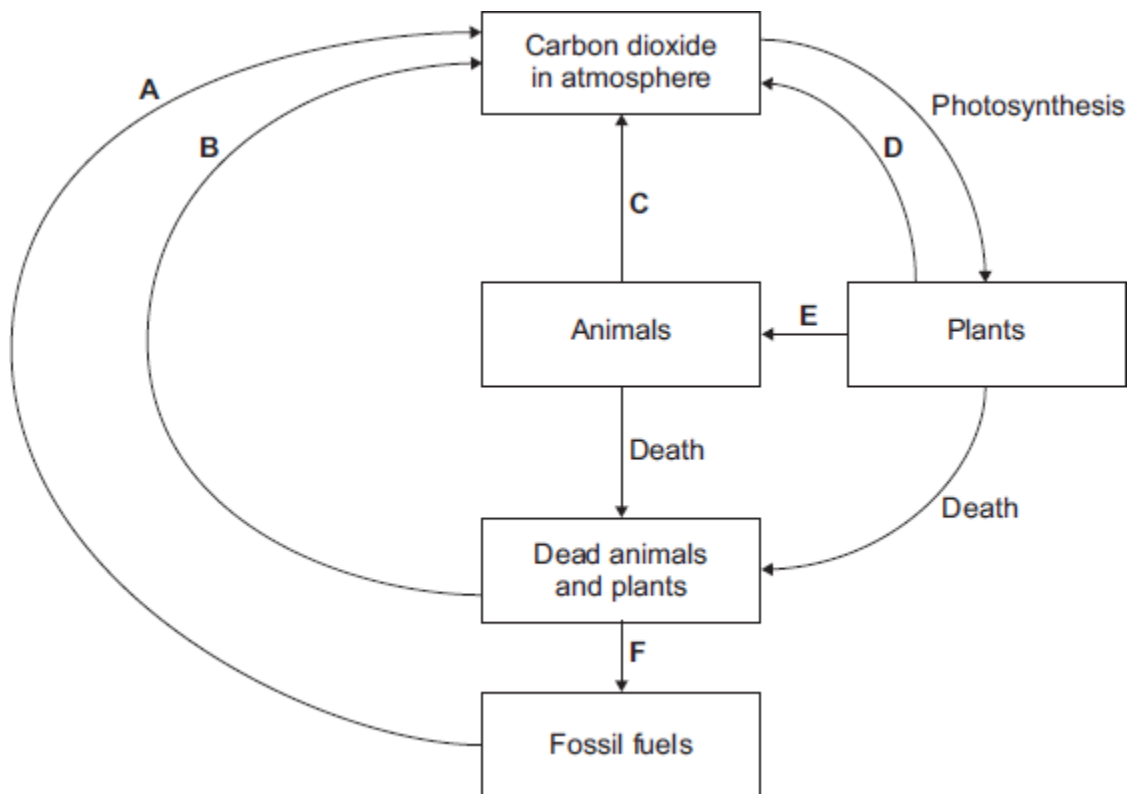
.....

.....

**(2)**

**(Total 7 marks)**

**6** (a) The diagram shows the carbon cycle.



(i) The concentration of carbon dioxide in the atmosphere has increased over the last 100 years.

Give **two** human activities that might have caused this increase.

1 .....

2 .....

(2)

(ii) Give the letters of **two** arrows in the diagram which show respiration.

and

(2)

(iii) Give the letter of **one** arrow which shows decay.

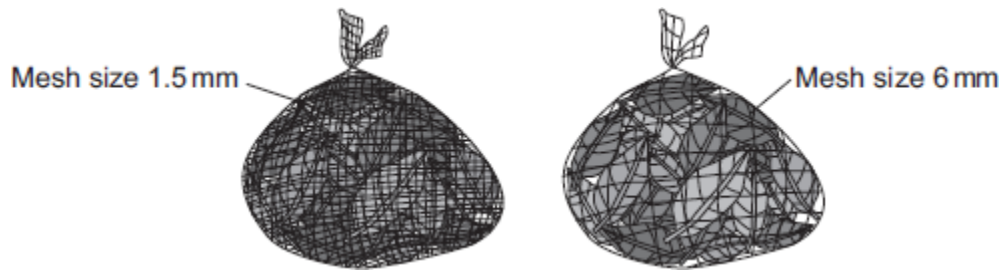
(1)

(b) Scientists investigated the breakdown of dead leaves.

The scientists:

- placed dried leaves in mesh bags. Half of the bags had a mesh size of 1.5 mm; the others had a mesh size of 6 mm.

**Mesh bags containing leaves**

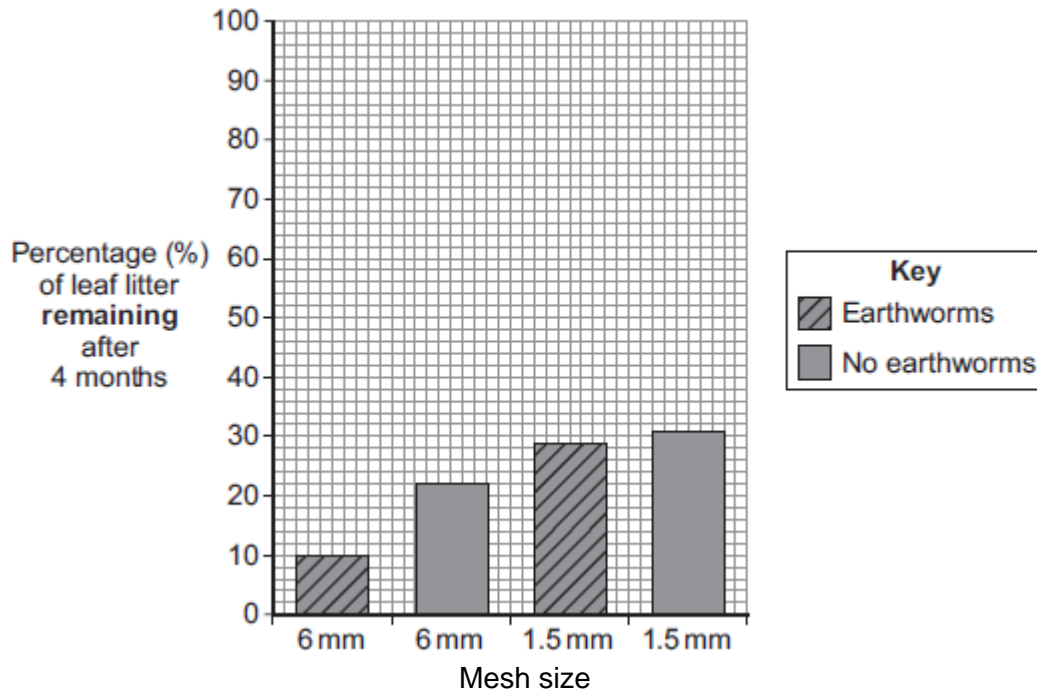


The scientists then:

- weighed the dried leaves in each bag at the start of the investigation
- placed the bags of leaves on soil: some of the bags were placed in areas where there **were earthworms** in the soil; the other bags were placed in areas where there were **no earthworms**
- left the bags for four months
- collected the bags, dried the leaves and weighed them again.

Most earthworms are between 3 mm and 6 mm in diameter.

The bar graph shows the scientists' results.



(i) The percentage of leaf litter at the start of the investigation was 100% in each bag.

What percentage of the leaf litter was broken down in the 6 mm mesh bags . . .

with earthworms ..... %

without earthworms? ..... %

- (ii) What effect do earthworms have on the amount of leaves broken down in the 6 mm mesh bags?

Use your answer to part **(b) (i)** to show how you arrive at your answer.

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

**(1)**

- (iii) When there were earthworms in the soil, the results for the 6 mm mesh bags were different from the results for the 1.5 mm mesh bags.

Explain why.

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

**(2)**

- (iv) Other organisms, smaller than earthworms, cause most of the breakdown of the leaves.

Explain how the results show this.

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

**(2)**

**(Total 12 marks)**

## Mark schemes

- 1** (a) any **two** from:
- amount of waste on each heap  
*allow size of heap*
  - (type of) materials on each heap  
*if neither marking points one or two awarded, allow 1 mark for same waste*
  - put heaps in same (environmental) conditions.  
*e.g. keep at same (outside) temperature*  
*allow put in same place*
- 2
- (b) microorganisms / microbes / bacteria / fungi / decomposers  
*ignore detritivores / examples (such as worms, maggots, insects)*  
*ignore pathogens / germs*  
*do **not** allow viruses*
- 1
- (c) (i) oxygen / air added (when turning over)  
*allow idea that decay will be aerobic*  
*allow bacteria / microorganisms need oxygen / air*  
*allow (microorganisms) respire faster*
- 1
- (ii) any **two** from:
- dead leaves / fruit / plants (fall off / onto the ground)
  - (fallen dead leaves / fruit / plants) decay
  - minerals / ions / nutrients are recycled / released.  
*ignore references to carbon dioxide*  
*allow animal waste **or** dead animals*
- 2
- 2** (a) (i) methane/biogas/natural gas  
*(accept formula) for 1 mark*
- 1
- (ii) cooking/heating/burning/fuel/vehicle fuel/lighting  
*for 1 mark*
- 1
- (b) *idea that it is a soil improver/fertiliser/provides nutrients or makes soil richer*  
*or improves plant growth/makes plants grow better*  
*(not "plants" alone/gardens/spreading on land)*  
*for 1 mark*
- 1
- [6]**
- [3]**

3

(a) (i) 5.2

*award 2 marks for correct answer, irrespective of working or lack of it*

*award 1 mark for  $62.4 \div 12$  only with incorrect or no answer*

2

(ii) the smaller the (mass of the) bird the more energy is needed (per gram of body mass)

*allow converse*

*ignore figures*

1

(iii) smaller bird has larger surface area : volume / mass ratio

*allow converse*

1

so heat / energy lost more quickly

*allow lose more heat / energy*

*if (a)(ii) describes a trend of more energy with increasing body mass*

*allow **one** mark for idea of more energy needed for flight*

1

(b) larger birds spend less time feeding

*accept converse*

*allow the less energy they need per day the longer they spend feeding*

1

since they need less food per gram of body mass (to satisfy energy needs)

1

[7]

4

(a) any **two** from:

- sterilise / kill microorganisms

*ignore 'cleaning' / 'disinfect'*

*ignore 'germs'*

- method of sterilisation eg apparatus / media sterilised in oven / autoclave

*allow pressure cooker / boiling water*

- pass flask mouth / pipette tip / loop / test tube mouth through flame

- work near a flame

- minimise opening of flask / test tube **or** hold non-vertical

*allow idea of sealing / covering **or** prevent entry of air*

2

(b) any **two** from:

- temperature  
*ignore references to time / type of bacterium*
- concentration / amount of nutrients / ions
- type of nutrient
- volume / amount of solution
- amount of bacteria added
- agitation **or** amount of oxygen

2

(c) (i) 7.5

*accept in range 7.4 – 7.6*

1

(ii) use more pH values around / close to pH 7.5 / between 7 and 8

1

**[6]**

**5**

(a) any **two** from:

- (microorganisms) produce enzyme / amylase / carbohydrase
- to break down / digest starch / carbohydrate (in potato)
- into sugars / glucose
- which diffuse back into microorganism

*accept decomposer / fungus / bacterium / cell*

2

(b) (i) (microorganisms)

*(accept bacteria / fungi / decomposers)*

digest the potato (starch)

*allow breakdown / feed on / consume / decompose*

*do **not** accept eat*

1

use starch / glucose / carbohydrate for respiration

1

which releases carbon dioxide / CO<sub>2</sub> (into the atmosphere)

1

(ii) up to 40 °C the potato took less time to decay / the rate is faster

*ignore yes / no*

*answers must be comparative*

1

but at 50 °C it took longer / the rate is slower

**or**

at 50 °C / a high(er) temperature the enzymes have denatured

*accept at a higher temperature / above 40 °C*

1

[7]

6

(a) (i) any **two** from:

- burning (fossil) fuels / one named example  
*allow combustion / driving cars*  
*accept breathing*
- deforestation / described  
*do not allow power stations unqualified*
- destruction of peat bogs

2

(ii) any **two** from:

B, C, D

*in any order*

2

(iii) B

1

(b) (i) with worms: 90

1

without worms: 78

1

(ii) increase

1

(iii) 6 mm mesh is large enough to let (more / bigger) worms in

*allow converse for 1.5 mm mesh*

1

worms entering increased breakdown

or ate more leaves

1



(iv) breakdown occurs with 1.5 mm mesh (which is smaller than worms)

1

breakdown with no worms  $\approx 70\%$  /  $\approx 30\%$  remaining

*allow a lot / most breakdown without worms*

*accept approximate figures*

1

[12]