

GCSE Combined Science: Trilogy

Worksheet: Levels of organisation

TIME 35 min	TOTAL 32 marks	CALCULATOR Allowed	DIFFICULTY Easy, Medium
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Topics: Levels of organisation

NAME	CLASS	DATE
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- Use black ink or black ball-point pen. Pencil should only be used for drawing.
- Answer all questions in the spaces provided.
- In all calculations, show clearly how you work out your answer.
- The marks for questions are shown in brackets.

0 1

A food chain in a woodland is shown.

oak leaves → caterpillar → blue tit → sparrowhawk

0 1 . 1

Which organism in the food chain is the producer?

[1 mark]

0 1 . 2

Producers make glucose. Name the process they use.

[1 mark]

0 1 . 3

Which organism is a secondary consumer?

Tick (✓) **one** box.

Oak leaves

☐

Caterpillar

☐

Blue tit

☐

Sparrowhawk

☐

[1 mark]

0 1 . 4

The sparrowhawk is a predator.

What is a predator?

.....

.....

[1 mark]

0 1 . 5

Explain why all food chains begin with a producer.

.....

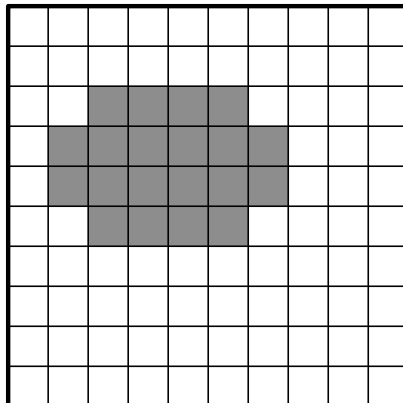
.....

[1 mark]

0 2

A student placed a quadrat divided into 100 small squares on a patch of grass. Figure 1 shows the quadrat. The shaded squares show where the grass was growing.

Figure 1



0 2 . 1

Each small square is 1% of the area of the quadrat.
Estimate the percentage cover of grass in the quadrat.

.....

.....

.....

Percentage cover = %

[1 mark]

0 2 . 2

Suggest why ecologists measure the percentage cover of plants such as grass, rather than counting the number of plants.

.....

.....

[1 mark]

0 3

A student is investigating how the percentage cover of a moss species changes with distance from the edge of a wood, along a line (transect) running from the trees into an open field.

0 3 . 1

Write a hypothesis for this investigation, including scientific reasoning to justify your prediction.

.....

.....

.....

.....

[2 marks]

0 3 . 2

Identify the independent and dependent variables. Give **one** variable that should be controlled, and explain why.

.....

.....

.....

.....

.....

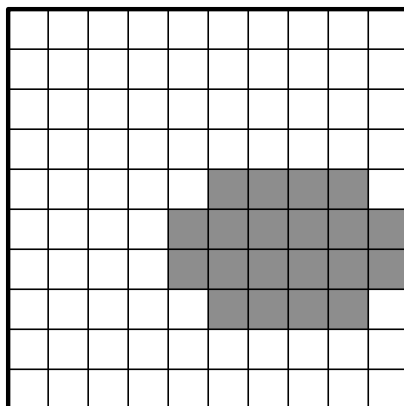
.....

[3 marks]

0 4

A student placed a quadrat divided into 100 small squares on a patch of bracken. Figure 2 shows the quadrat. The shaded squares show where the bracken was growing.

Figure 2



0 4 . 1

Each small square is 1% of the area of the quadrat.
Estimate the percentage cover of bracken in the quadrat.

.....

.....

.....

Percentage cover = %

[1 mark]

0 4 . 2

Suggest why ecologists measure the percentage cover of plants such as bracken, rather than counting the number of plants.

.....

.....

[1 mark]

0 5

In the Southern Ocean:

- phytoplankton are single-celled algae
- krill are small animals that eat phytoplankton
- Adélie penguins eat krill
- leopard seals eat Adélie penguins.

0 5 . 1

Use the information to write a food chain.

.....

.....

[1 mark]

0 5 . 2

Name the producer in this food chain, and explain why it is called a producer.

.....

.....

.....

.....

[2 marks]

0 5 . 3

Which organism in this food chain is the secondary consumer?

.....

.....

.....

[1 mark]

0 5 . 4

Give the name of **one** predator in this food chain and the name of its prey.

.....

.....

[1 mark]

0 5 . 5

Warmer seas have reduced the amount of sea ice, and krill numbers have fallen.
Suggest how this could affect the numbers of Adélie penguins and leopard seals.

.....

.....

.....

.....

[2 marks]

0 6

A student estimated the population of daisies in a school field. The field measures 50 m by 40 m.
The student placed ten quadrats, each with an area of 0.25 m², at random positions in the field and counted the daisies in each quadrat. Table 1 shows the results.

Table 1

Quadrat	1	2	3	4	5	6	7	8	9	10
Number of daisies	4	0	5	2	4	1	6	4	3	1

0 6 . 1

What is the mode of the number of daisies per quadrat?

.....

.....

.....

[1 mark]

0 6 . 2

What is the median number of daisies per quadrat?

.....

.....

.....

[1 mark]

0 6 . 3

Calculate the mean number of daisies per quadrat.

.....

.....

.....

Mean =

[1 mark]

0 6 . 4

Estimate the total number of daisies in the field.

.....

.....

.....

.....

Number of daisies =

[3 marks]

0 6 . 5

Explain why the student placed the quadrats at random positions.

.....

.....

[1 mark]

.....

0 7

A student used a transect to investigate the distribution of glasswort with distance from the edge of the sea, across a salt marsh. Every 10 m the student measured the salt concentration of the soil water and estimated the percentage cover of glasswort in a quadrat. Table 2 shows the results.

Table 2

Distance from the sea in m	Salt concentration of soil water in g/dm ³	Percentage cover of glasswort
0	30	88
10	26	79
20	21	65
30	19	47
40	16	27
50	12	5

0 7 . 1

Describe the relationship between the salt concentration of the soil water and the percentage cover of glasswort.

.....

.....

[1 mark]

0 7 . 2

Calculate the percentage decrease in the percentage cover of glasswort between 0 m and 50 m.

Give your answer to 3 significant figures.

.....

.....

.....

.....

Percentage decrease = %

[2 marks]

0 7 . 3

Give **one** other abiotic factor that the student could measure at each quadrat.

[1 mark]

END OF QUESTIONS

Original practice questions written to match the specification. Not produced by, affiliated with or endorsed by AQA.

Mark scheme

GCSE Combined Science: Trilogy · Worksheet: Levels of organisation · 32 marks

Question 1 (5 marks)

01.1 [1 mark]

Answer: Oak leaves (oak tree)

- oak leaves / oak tree (1)
-

01.2 [1 mark]

Answer: Photosynthesis

- photosynthesis (1)
-

01.3 [1 mark]

Correct: Blue tit

01.4 [1 mark]

- an animal / consumer that kills and eats other animals (1)
-

01.5 [1 mark]

- producers make their own food / synthesise molecules (by photosynthesis), so they are the source of biomass for all other organisms (1)
-
-

Question 2 (2 marks)

02.1 [1 mark]

Answer: 20%

- 20 (%) (1)
-

02.2 [1 mark]

- the plants grow in patches / it is difficult to tell where one plant ends and the next begins, so individual plants cannot easily be counted (1)
-

Question 3 (5 marks)

03.1 [2 marks]

- a suitable hypothesis, e.g. 'moss cover will decrease as distance from the woodland edge increases' (1)
- with reasoning, e.g. because light intensity increases and the soil becomes drier further from the trees, and mosses grow best in shaded, moist conditions (1)

03.2 [3 marks]

- independent variable: distance from the woodland edge (1)
- dependent variable: percentage cover of the moss species (1)
- control, e.g. the size of the quadrat used, or the time of day/year the readings are taken — these must be kept the same because a different quadrat size, or sampling at very different times, could change the recorded percentage cover for reasons unconnected to distance (1)

Question 4 (2 marks)

04.1 [1 mark]

Answer: 20%

- 20 (%) (1)

04.2 [1 mark]

- the plants grow in patches / it is difficult to tell where one plant ends and the next begins, so individual plants cannot easily be counted (1)
-

Question 5 (7 marks)

05.1 [1 mark]

Answer: phytoplankton → krill → Adélie penguin → leopard seal

- phytoplankton → krill → Adélie penguin → leopard seal (1)

Notes: The arrows must point from the organism that is eaten to the organism that eats it.

05.2 [2 marks]

- phytoplankton (1)
 - it makes its own food / synthesises molecules (glucose) by photosynthesis (1)
-

05.3 [1 mark]

Answer: Adélie penguin

- Adélie penguin (1)
-

05.4 [1 mark]

- leopard seal (predator) and Adélie penguin (prey) / Adélie penguin (predator) and krill (prey) (1)
-

05.5 [2 marks]

- fewer penguins, because they have less food (1)
 - fewer leopard seals, because there are fewer penguins for them to eat (1)
-

Question 6 (7 marks)

06.1 [1 mark]

Answer: 4

- 4 (1)
-

06.2 [1 mark]

Answer: 3.5

- 3.5 (1)
-

06.3 [1 mark]

Answer: 3.0

- 3 / 3.0 (1)
-

06.4 [3 marks]

Answer: 24 000

- area of field = $50 \times 40 = 2000 \text{ m}^2$ (1)
- daisies per $\text{m}^2 = 3.0 \div 0.25 = 12$ / number of quadrats that would fit in the field = $2000 \div 0.25 = 8000$ (1)
- 24 000 (1)

Notes: An answer of 24 000 scores 3 marks. Allow ECF from an incorrect mean. 6000 (quadrat area not taken into account) scores 1 mark.

06.5 [1 mark]

- to avoid bias / so that the sample is representative of the whole field (1)
-

Question 7 (4 marks)

07.1 [1 mark]

- as the salt concentration of the soil water decreases, the percentage cover of glasswort decreases / positive correlation (1)

07.2 [2 marks]

Answer: 94.3%

- $(88 - 5) \div 88 \times 100$ (1)
- 94.3 (%) (1)

Notes: An answer of 94.32 (not given to 3 significant figures) scores 1 mark.

07.3 [1 mark]

- soil moisture (1)
- soil pH (1)
- wind speed (1)
- light intensity (1)

Any 1 of the points above.
