

GCSE Biology

Worksheet: Pyramids of biomass

TIME 35 min	TOTAL 32 marks	CALCULATOR Allowed	DIFFICULTY Easy, Medium
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Topics: Pyramids of biomass

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

Pyramids of biomass can be drawn for food chains.

0 1 . 1

Complete the sentences. Choose answers from the list.

1 · 3 · biomass · number · water

A pyramid of biomass shows the relative amount of at each trophic level of a food chain.

Trophic level is always at the bottom of the pyramid.

.....

.....

.....

.....

[2 marks]

Figure 1

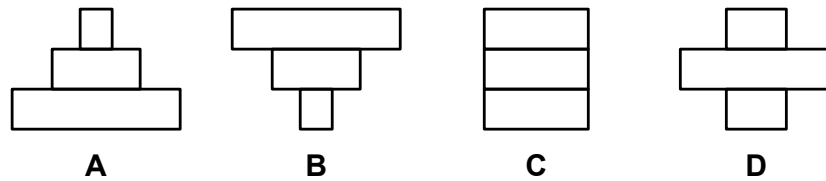


Figure 1 shows four shapes, A, B, C and D.

Which shape is most likely to be the pyramid of biomass for the food chain
grass → rabbit → fox?

Tick (✓) **one** box.

A

☐

B

☐

C

☐

D

☐

[1 mark]

Give the reason why the bars of a pyramid of biomass get narrower at higher trophic levels.

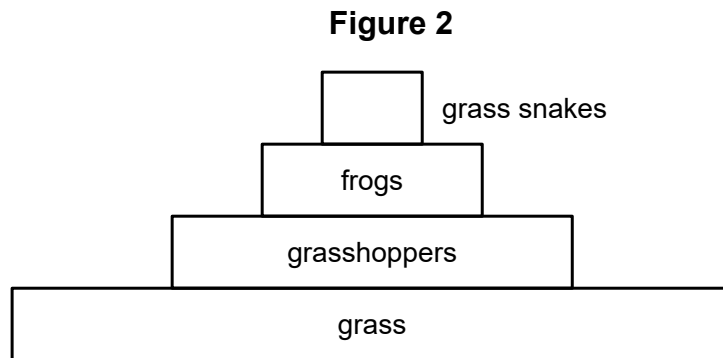
.....

.....

[1 mark]

0 2

Figure 2 shows a pyramid of biomass for a food chain.



0 2 . 1

Which organism in Figure 2 is the producer?

.....

.....

.....

[1 mark]

0 2 . 2

What does the width of each bar in a pyramid of biomass show?

.....

.....

[1 mark]

0 2 . 3

Why is each bar smaller than the bar below it?

Tick (✓) **one** box.

Biomass is lost between trophic levels

☐

Organisms at higher trophic levels are smaller

☐

There are more predators than prey

☐

Producers do not photosynthesise

☐

[1 mark]

0 2 . 4

At which trophic level are the grass snakes?

.....

.....

.....

[1 mark]

0 3

In a field, cattle eat grass. The dry biomass of the grass is 600 g/m^2 and the dry biomass of the cattle is 50 g/m^2 .

A student drew a pyramid of biomass for the grass and the cattle, using a scale of $1 \text{ cm} = 50 \text{ g/m}^2$.

0 3 . 1

Calculate the width of the bar for the grass.

.....

.....

.....

Width = cm

[1 mark]

0 3 . 2

Calculate the width of the bar for the cattle.

.....

.....

.....

Width = cm

[1 mark]

0 3 . 3

Give **one** reason why the biomass of the cattle is less than the biomass of the grass.

.....

.....

[1 mark]

0 4

Table 1 shows the dry biomass of the grass and of the sheep that eat the grass in a field.

Table 1

Trophic level	Organisms	Dry biomass in g/m ²
1	grass	460
2	sheep	23

0 4 . 1

Calculate the efficiency of biomass transfer from trophic level 1 to trophic level 2.

.....

.....

.....

.....

Efficiency = %

[2 marks]

0 4 . 2

A student draws a pyramid of biomass using a scale of 1 cm = 50 g/m². Calculate the width of the bar for trophic level 1.

.....

.....

.....

Width = cm

[1 mark]

.....

0 5

Table 2 shows the biomass at each trophic level in a food chain in a grassland.

Table 2

Trophic level	Biomass in g/m ²
producers	800
primary consumers	80
secondary consumers	7
tertiary consumers	0.6

0 5 . 1

Calculate the efficiency of biomass transfer from the primary consumers to the secondary consumers.

.....

.....

.....

.....

Efficiency = %

[2 marks]

0 5 . 2

A student wants to draw an accurate pyramid of biomass on a sheet of paper, with the producer bar 16 cm wide.

Calculate the width of the bar for the tertiary consumers, and comment on the result.

.....

.....

.....

.....

.....
[2 marks]

0 5 . 3

The biomass was measured in summer.

Suggest why the biomass of the primary consumers (insects) would be different in winter.

.....

.....

[1 mark]

0 5 . 4

Suggest why a pyramid of biomass is more useful than counting the number of organisms at each trophic level.

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.....

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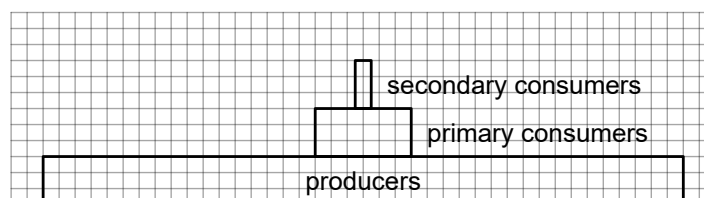
.....

[2 marks]

0 6

Figure 3 shows a pyramid of biomass for a food chain in a meadow, drawn on a grid. Each small square represents 10 g/m^2 of biomass.

Figure 3



0 6 . 1

Use Figure 3 to find the biomass of the primary consumers.

.....

.....

.....

Biomass = g/m^2

[1 mark]

0 6 . 2

Calculate the efficiency of biomass transfer from the producers to the primary consumers.

.....

.....

.....

.....

Efficiency = %

[2 marks]

0 6 . 3

The biomass of the tertiary consumers in this food chain is 1.5 g/m².
Calculate the efficiency of biomass transfer from the secondary consumers to the tertiary consumers.

.....

.....

.....

.....

Efficiency = %

[2 marks]

.....

0 7

Students want to construct a pyramid of biomass for this food chain in a meadow:

grass → grasshoppers → spiders

0 7 . 1

Describe how the students could collect and process the data needed to construct an accurate pyramid of biomass for this food chain, and how they should draw the pyramid.

.....

.....

.....

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.....

.....

[6 marks]

END OF QUESTIONS

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

Mark scheme

GCSE Biology · Worksheet: Pyramids of biomass · 32 marks

Question 1 (4 marks)

01.1 [2 marks]

Answer: biomass; 1

- biomass (1)
 - 1 (1)
-

01.2 [1 mark]

Correct: A

01.3 [1 mark]

- biomass is lost at each trophic level / only about 10% of the biomass is transferred to the level above (1)
-

Question 2 (4 marks)

02.1 [1 mark]

Answer: Grass

- grass (1)
-

02.2 [1 mark]

- the (relative) biomass / mass of living material at that trophic level (1)
-

02.3 [1 mark]

Correct: Biomass is lost between trophic levels

02.4 [1 mark]

Answer: Level 4 (tertiary consumers)

- 4 / tertiary consumers (1)
-

Question 3 (3 marks)

03.1 [1 mark]

Answer: 12 cm

- $600 \div 50 = 12 \text{ (cm)}$ (1)

03.2 [1 mark]

Answer: 1 cm

- $50 \div 50 = 1 \text{ (cm)}$ (1)

03.3 [1 mark]

- not all of the grass is eaten (1)
- some of the ingested material is egested as faeces (1)
- much of the absorbed material is used in respiration and lost as carbon dioxide and water (1)
- water and urea are lost in urine (1)

Any 1 of the points above.

Question 4 (3 marks)

04.1 [2 marks]

Answer: 5%

- $23 \div 460 \times 100 \text{ (1)}$
- 5 (%) (1)

04.2 [1 mark]

Answer: 9.2 cm

- $460 \div 50 = 9.2 \text{ (cm)}$ (1)
-

Question 5 (7 marks)

05.1 [2 marks]

Answer: 8.75%

- $7 \div 80 \times 100$ (1)
- 8.75 (%) (1)

Notes: Allow 8.8 or 9.

05.2 [2 marks]

Answer: 0.012 cm

- $0.6 \div 800 \times 16 = 0.012$ cm (1)
- this bar is far too narrow to draw / would look like a line (1)

05.3 [1 mark]

- many insects die / are dormant in winter, or there is less plant growth so less food, so the biomass would be lower (1)

05.4 [2 marks]

- organisms differ greatly in size (e.g. one tree and thousands of insects) (1)
- biomass shows the amount of living material available to the next trophic level (1)

Question 6 (5 marks)

06.1 [1 mark]

Answer: 60 g/m²

- 6 squares $\times 10 = 60$ (g/m²) (1)

06.2 [2 marks]

Answer: 15%

- producers = $40 \times 10 = 400$ g/m², so $60 \div 400 \times 100$ (1)
- 15 (%) (1)

Notes: Allow ECF from the previous part.

06.3 [2 marks]

Answer: 15%

- secondary consumers = $1 \times 10 = 10$ g/m², so $1.5 \div 10 \times 100$ (1)
 - 15 (%) (1)
-

Question 7 (6 marks)

07.1 [6 marks]

Levels of response

- **Level 3 (5–6)** A detailed, coherent answer. Relevant points are accurate, linked in a logical sequence and use correct scientific terms.
- **Level 2 (3–4)** Several relevant points with some linking, but the answer has gaps, errors or lacks detail.
- **Level 1 (1–2)** Simple statements making one or two relevant points, with little or no linking.
- **No marks (0)** Nothing relevant or worthy of credit.

Indicative content

- place several quadrats (e.g. 1 m²) at random positions in the meadow, so the sample is representative
- collect the grasshoppers and spiders from the area of each quadrat, e.g. with a sweep net or pooter, before cutting all the grass in the quadrat at ground level
- sort the organisms into the three trophic levels
- dry each sample in an oven at a low temperature (e.g. about 80 °C) and reweigh it until its mass stops changing (constant mass), to find the dry mass
- dry mass is used because the amount of water in organisms varies
- calculate the mean dry mass per m² for each trophic level
- draw a bar for each trophic level, to scale (bar width proportional to the biomass), with the producer (grass) at the bottom and the spiders at the top
- only small samples should be taken, because the organisms are killed when they are dried

Notes: Level 3 (5–6 marks): a coherent method covering random sampling from a measured area, finding the dry mass of each trophic level, and drawing the bars to scale in the correct order. Level 2 (3–4 marks): a workable method with some gaps, e.g. dry mass not mentioned or the drawing of the pyramid not described. Level 1 (1–2 marks): simple, isolated statements, e.g. 'weigh the organisms'.
