C4.2 Transfers of energy and matter

What the Cell · DP Biology · worksheet · SL statements C4.2.1–22

Name _____ **Date** _____ **Total** _____ / 52

About 55 minutes, or one section at a time. You will need a calculator. The number of marks shows how many separate points to make.

Section A: Recall

10 marks

1 **Distinguish** between open and closed systems. C4.2.1 **[2]**

2 **State** the main source of energy for most ecosystems. C4.2.2 **[1]**

3 **Name** one chemoautotroph. C4.2.7 **[1]**

4 **List** three sources of energy for decomposers. C4.2.5 **[2]**

5 **State** the units used for primary production. C4.2.15 **[1]**

6 **List** three fuels whose combustion releases carbon dioxide. C4.2.19 **[3]**

Section B: Understanding

18 marks

7 **Explain** why energy cannot be recycled, whereas matter can. C4.2.13, C4.2.22 **[3]**

8 **Compare and contrast** photoautotrophs and chemoautotrophs. C4.2.6, C4.2.7 **[3]**

Photoautotrophs	Chemoautotrophs

9 **Explain** why there are rarely more than four or five trophic levels. C4.2.12, C4.2.14 [3]

10 **Explain** why secondary production is lower than primary production. C4.2.16 [3]

11 **Explain** how an ecosystem can change from a carbon sink to a carbon source. C4.2.18 [3]

12 **Outline** the interdependence of aerobic respiration and photosynthesis. C4.2.21 [3]

Section C: Working with data

16 marks

Data in question 13 are invented for practice. Question 14 follows the real pattern at Mauna Loa, with rounded figures.

13 C4.2.10–12

Energy gained per year in a pond was measured, in kJ m^{-2} yr^{-1}.

Group	Energy
Algae	40000
Water fleas	5000
Small fish	450
Heron	30

a **Draw** a pyramid of energy for this pond, with labels. **[3]**

b **Calculate** the percentage of energy passed from algae to water fleas. **[1]**

c **Suggest** two reasons why not all energy reached the small fish. **[2]**

d **State** the trophic level of small fish. **[1]**

14 C4.2.20

Year	1960	1980	2000	2020
Yearly mean carbon dioxide / ppm	317	339	370	414

a **Calculate** the mean rate of rise, in ppm per year, between 1960 and 2020. **[2]**

b **Describe** how the rate of rise changes. **[1]**

c **Explain** the long-term rise. **[2]**

d Each year, carbon dioxide also rises and falls by about 6 ppm. **Explain** this pattern. **[4]**

Section D: Longer answer

8 marks

15 **Draw** a labelled carbon cycle, and **explain** how burning fossil fuels affects it. C4.2.17, C4.2.19 **[8]**