C1.2 Cell respiration: data-based questions

What the Cell · DP Biology · data-based questions

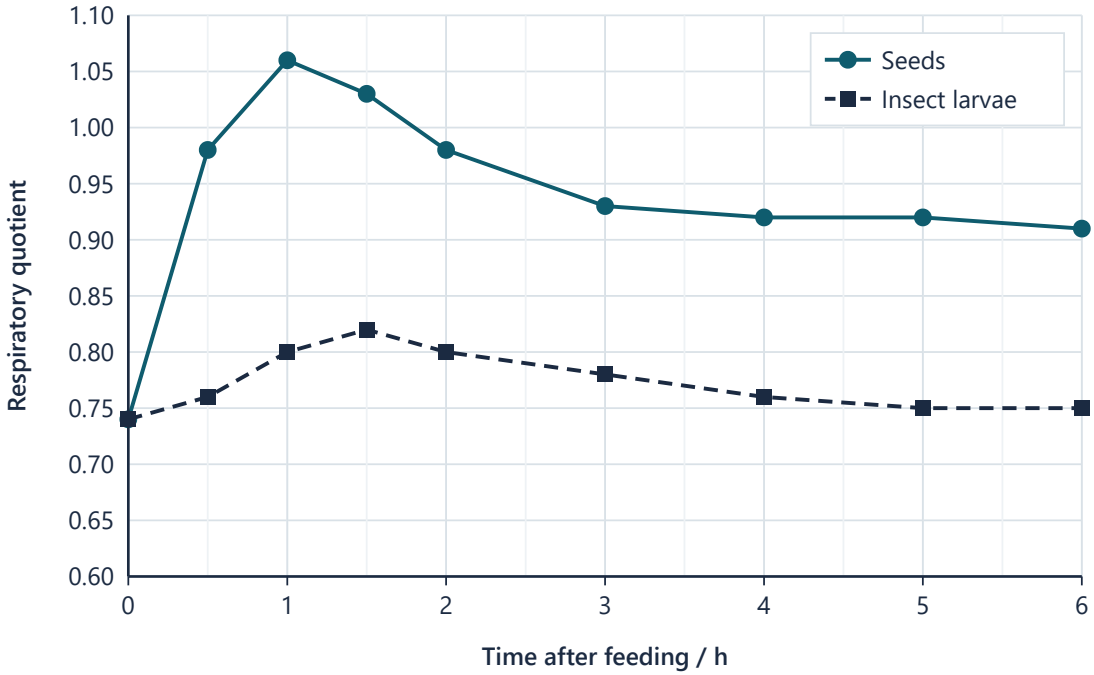
Name _____ **Date** _____ **Total** _____ / 23

Read the data carefully before you answer. The number of marks shows how many separate points to make. Show your working in calculations.

1 Respiratory quotient in finches

8 marks

The respiratory quotient (RQ) is the volume of carbon dioxide produced divided by the volume of oxygen used. Zebra finches were fasted overnight, then fed either seeds (mostly carbohydrate) or insect larvae (mostly lipid and protein). Their RQ was measured for six hours. Typical RQ values: carbohydrate 1.0, protein 0.8, lipid 0.7.



a **State** the RQ before feeding, and **deduce** the main respiratory substrate being used. **[2]**

b **Compare** the RQ of the two groups between 1 and 3 hours after feeding. **[2]**

c **Suggest** why the RQ of the seed-fed birds rises above 1.0. **[1]**

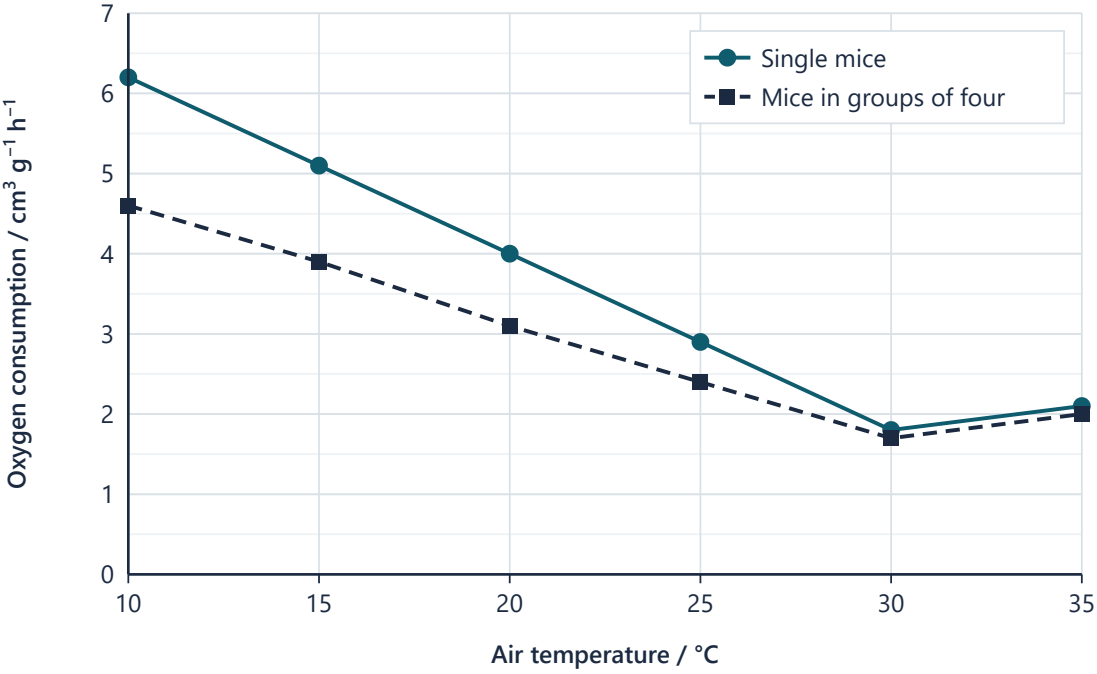
d A bird produced 3.8 cm^3 of carbon dioxide while using 4.2 cm^3 of oxygen. **Calculate** its RQ. **[1]**

e **Explain** why the RQ of the larva-fed birds stays lower than that of the seed-fed birds. **[2]**

2 Temperature and metabolic rate in mice

8 marks

Oxygen consumption of house mice was measured at different air temperatures. Mice were tested alone, or in groups of four that could huddle together.



a **State** the oxygen consumption of single mice at 15 °C. **[1]**

b **Calculate** how much lower, as a percentage, oxygen consumption is for grouped mice than single mice at 15 °C. **[2]**

c **Outline** the relationship between air temperature and oxygen consumption from 10 to 30 °C. **[1]**

d **Explain** why oxygen consumption can be used as a measure of metabolic rate. **[2]**

e **Suggest** why mice in groups use less oxygen in cold air. **[1]**

f **Suggest** why oxygen consumption rises again at 35 °C. **[1]**

3 Mitochondrial myopathy

7 marks

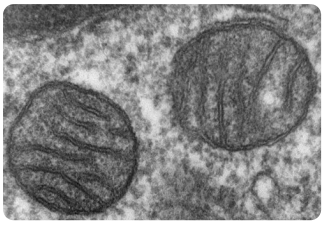
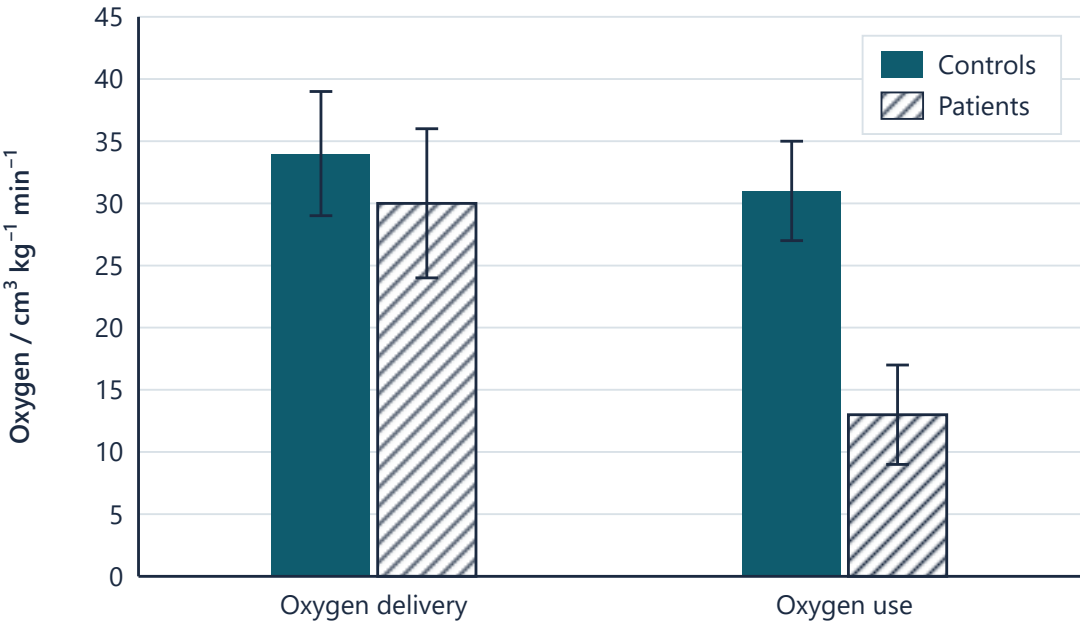


Photo: Louisa Howard, Public domain, Wikimedia Commons.

Mitochondrial myopathy is a group of disorders in which the electron transport chain does not work properly. Thirty patients and thirty healthy people (controls) cycled to exhaustion. Oxygen delivery to the muscles (from blood flow) and oxygen use by the muscle cells were measured at peak exercise. Error bars show ± 1 SD.



a **Calculate** the percentage difference in oxygen use by the patients compared with the controls. **[2]**

b **Compare** oxygen delivery and oxygen use in the patients. **[2]**

c **Explain** why patients become tired at low levels of exercise. **[2]**

d **Suggest** why oxygen delivery is similar in both groups. **[1]**

What the Cell. Original questions written for this course, with data based on published patterns.