# D4.2 Stability and change: data-based questions

What the Cell · DP Biology · data-based questions

**Name** _____ **Date** _____ **Total** _____ / 24

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

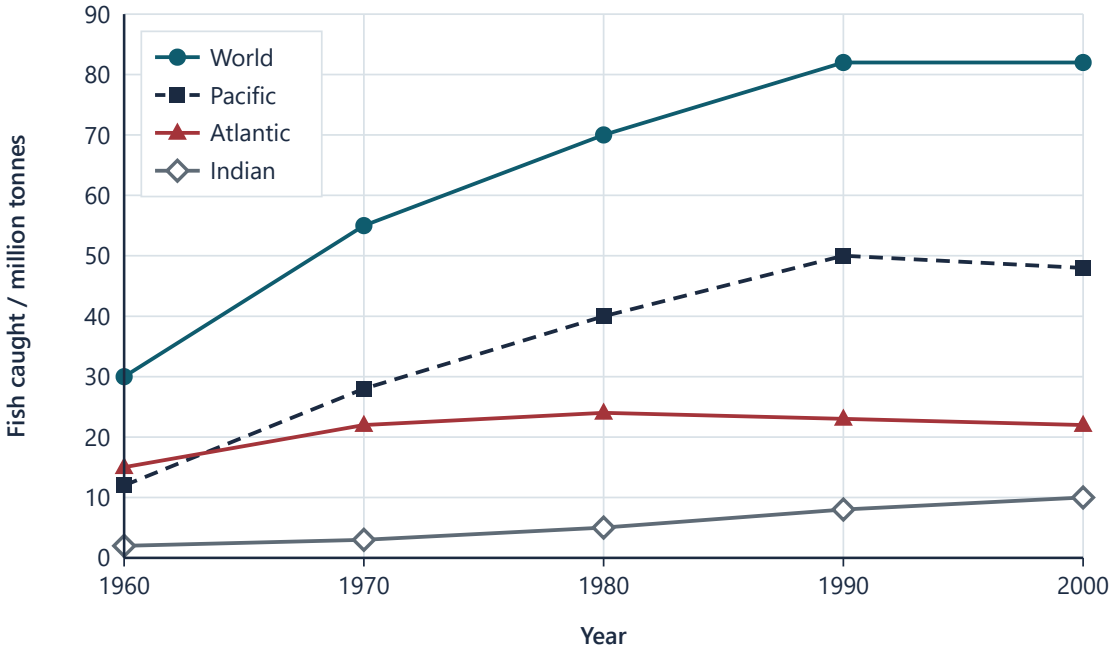
## 1 Fish catches

6 marks



Image: Zserghei, Public domain, Wikimedia Commons.

The Food and Agriculture Organization (FAO) records the mass of fish caught from the sea each year. The graph shows catches from three oceans and the whole world.




a **Calculate** the percentage increase in world catch from 1960 to 2000. **[1]**

b **Compare** the catches from the Atlantic and the Pacific. **[2]**

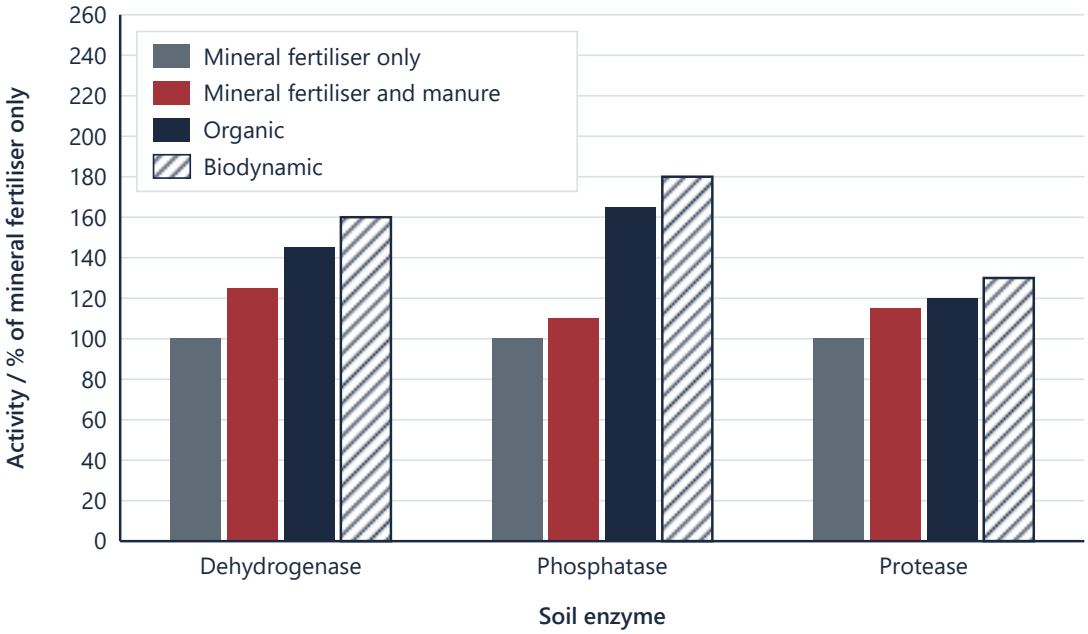
c Fishing fleets grew larger throughout this period. **Suggest** why the world catch stopped increasing after 1990. **[2]**

d **State** one other type of data needed to decide whether a fish population is being overfished. **[1]**

## 2 Farming methods and soil life

6 marks

A 21-year trial in Switzerland compared four farming methods. The activity of three soil enzymes, made by soil microorganisms, was measured as a percentage of the activity in soil given mineral fertiliser only.




a **Identify** the enzyme most affected by the farming method. **[1]**

b **Identify** the enzyme least affected by the farming method. **[1]**

c **List** the farming methods in order of dehydrogenase activity, from lowest to highest. **[1]**

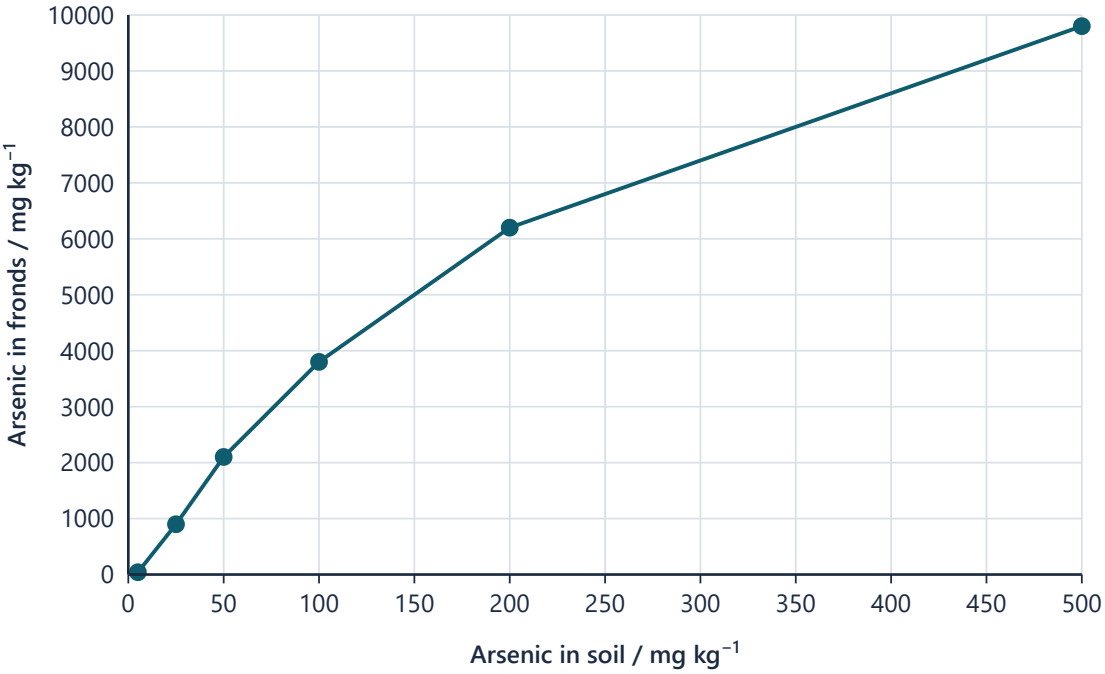
d **Suggest** why soil enzyme activity is higher with organic methods. **[2]**

e **State** one reason why high soil enzyme activity helps farming to be sustainable. **[1]**

## 3 A fern that removes arsenic

6 marks

Chinese brake fern (*Pteris vittata*) can take up large amounts of arsenic, a poison. Ferns were grown for 20 weeks in soils with different arsenic concentrations, and arsenic in the fronds (leaves) was measured.




a The bioconcentration factor is arsenic in fronds divided by arsenic in soil. **Calculate** it for soil with 100 mg kg$^{-1}$ arsenic. **[1]**

b **Describe** the relationship between arsenic in the soil and in the fronds. **[2]**

c **Suggest** how this fern could be used to clean up polluted land. **[2]**

d **Suggest** one problem with this method. **[1]**

## 4 Air pollution and tree growth

6 marks

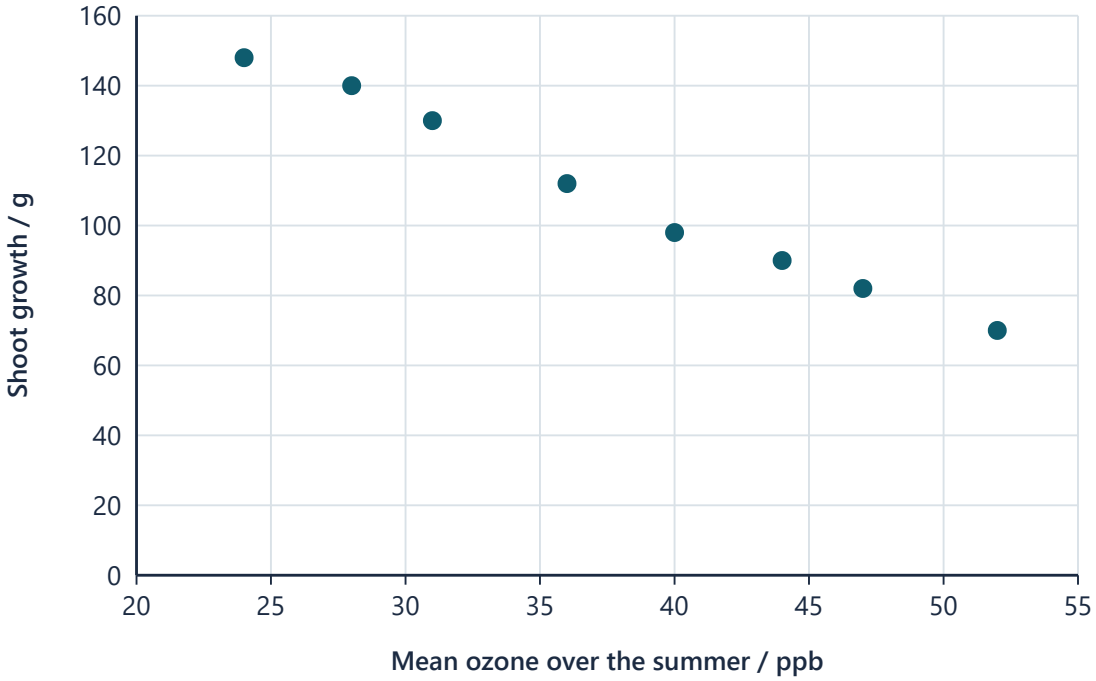
Air pollution was measured in New York City and in nearby rural areas over one summer.

| | City | Rural |
|---|---|---|
| **pH of rain** | 4.2 | 4.5 |
| **Nitrogen dioxide / ppb** | 32 | 9 |
| **Sulfur dioxide / ppb** | 6 | 2 |
| **Ozone / ppb** | 28 | 44 |

a **Compare** the acidity of rain in the city and in rural areas. **[1]**

b **Compare** the air pollution in the city and in rural areas. [2]

Cottonwood saplings were grown at eight sites in and around the city, and their shoot growth was measured.




c **Describe** the relationship between ozone and shoot growth. [1]

d Cottonwood grew about twice as fast in the city as in rural areas. **Suggest** a hypothesis to explain this, using all the data. [2]