

Selecting Table

1. Warfarin is a drug that reduces the risk of blood clots.
Alleles for two genes, 1 and 2, affect how quickly Warfarin is metabolised.

Alleles for gene 1 can be G or A.

Alleles for gene 2 can be C_1 , C_2 or C_3 .

The table shows the recommended Warfarin dose for patients with each genotype.

Gene 1 genotypes	Warfarin dose (mg/day)					
	Gene 2 genotypes					
	C_1C_1	C_1C_2	C_1C_3	C_2C_2	C_2C_3	C_3C_3
GG	6.0	6.0	3.5	3.5	3.5	1.2
GA	6.0	3.5	3.5	3.5	1.2	0.8
AA	3.5	3.5	1.2	1.2	1.2	0.5

2. Applications of fungicides to crops can be based on disease forecasts.

The table shows the ranges of temperature, humidity, rainfall, and light intensity that would increase the likelihood of some fungal diseases.

Which fungal disease would be most likely to occur with a temperature of 20 °C, humidity of 60%, rainfall of 9 mm, and light intensity of 6.0 units?

Fungal disease	Temperature (°C)	Humidity (%)	Rainfall (mm)	Light intensity (units)
A	10–19	35–60	5–9	3.9–6.5
B	14–29	61–85	0–2	6.1–6.4
C	16–32	45–83	8–10	5.3–6.3
D	11–25	42–95	7–23	2.5–3.1

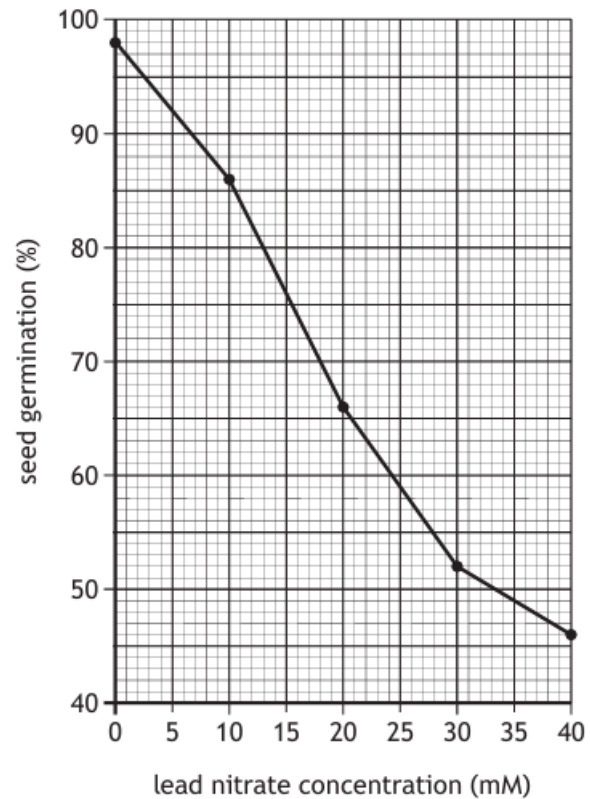
A patient is known to have the GA genotype for gene 1 and is homozygous for the C_3 allele.

What is the recommended Warfarin dose for this patient?

- A 0.8 mg/day
- B 1.2 mg/day
- C 3.5 mg/day
- D 6.0 mg/day

Selecting Graph

3. The graph shows the effect of lead nitrate concentration on seed germination of common wheat (*Triticum aestivum*).



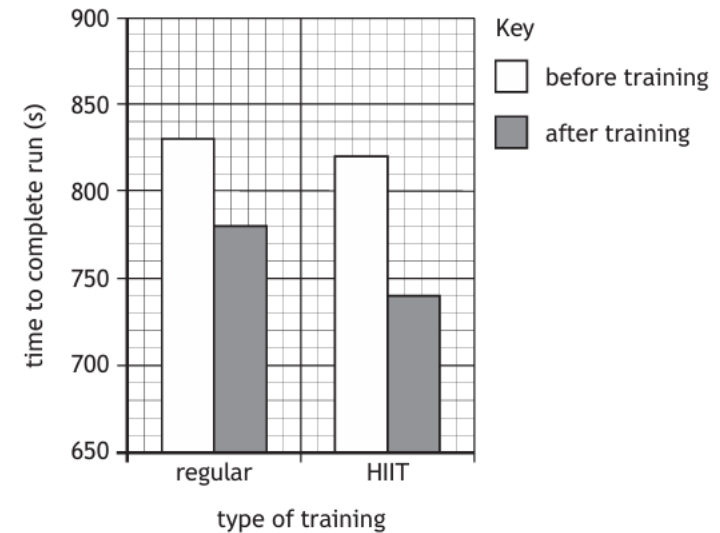
Identify the lead nitrate concentration (mM) in which seed germination was 50% of the control.

- A 18
- B 20
- C 33
- D 35

4

Two athletes took part in different training programmes. One undertook regular training sessions while the other undertook high intensity interval training (HIIT) sessions.

The graph shows the time taken to complete a run before and after each training programme.

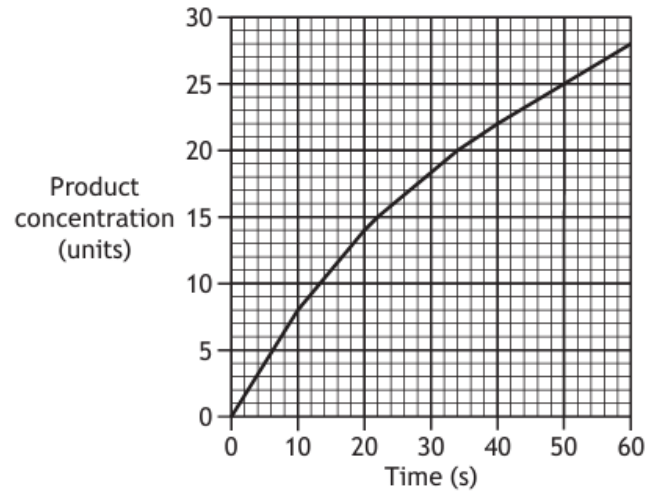


The improvement in performance as a result of HIIT training compared to regular training is

- A 30 s
- B 40 s
- C 50 s
- D 80 s.

Selecting Graph

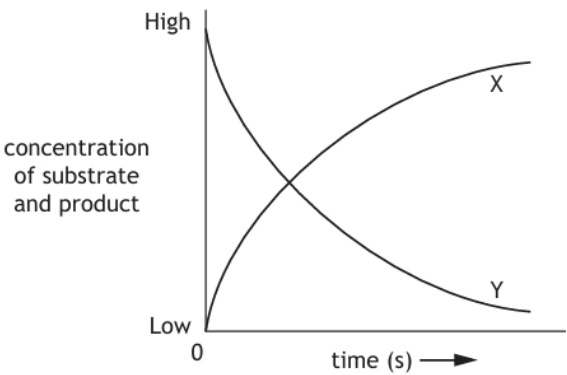
The graph shows how the concentration of product changes during an enzyme-controlled reaction.



How long does it take the product concentration to reach 50% of its final concentration?

- A 20 s
- B 22 s
- C 25 s
- D 28 s

The graph below shows the changes to the concentrations of substrate and product during an enzyme-controlled reaction.



Which line in the table below identifies the substrate, product and the change in the rate of the reaction during the process?

	Substrate	Product	Rate of reaction
A	X	Y	increasing
B	X	Y	decreasing
C	Y	X	increasing
D	Y	X	decreasing

Selecting Graph

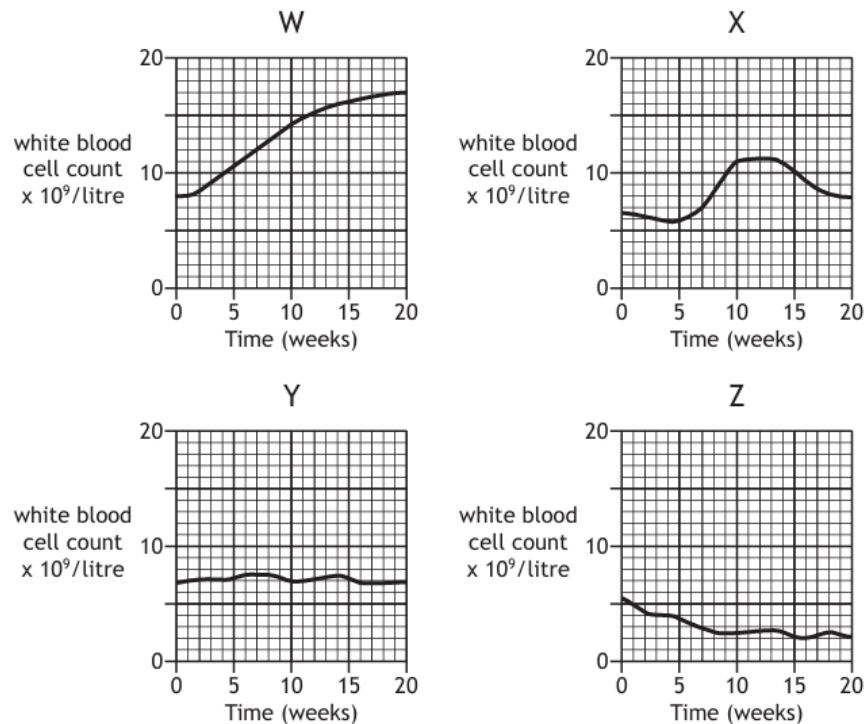
Blood tests to measure the number of white blood cells (leucocytes) are often used to indicate infection and/or illness.

Leucopenia, due to starvation or malnutrition, is indicated by white blood cell numbers dropping below $4 \times 10^9/\text{litre}$.

Leucocytosis, due to fever or tissue damage, is indicated by white blood cell numbers temporarily increasing to $11 \times 10^9/\text{litre}$.

Leukaemia, due to DNA damage and cell division, is indicated by white blood cell numbers permanently increasing.

The following graphs show the white blood cell count of four patients over 20 weeks.

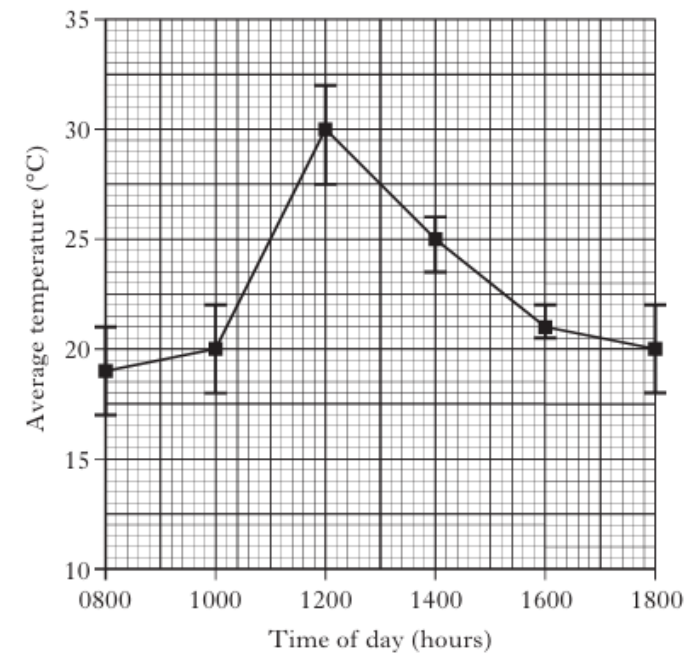


From the graphs, identify the patients.

	Leukaemia	Leucocytosis	Leucopenia
A	Y	X	Z
B	Z	W	Y
C	W	X	Z
D	W	Y	X

18. The body temperature of the lizard *Liolaemus occipitalis* varies with its environmental temperature.

In an investigation the body temperature of a group of 10 lizards was recorded every two hours from 0800 hours until 1800 hours. The results are shown in the graph below in which the error bars show the range of body temperatures in the group at each time of day.



The greatest difference in body temperatures recorded during the investigation is

- A 5°C
- B 10°C
- C 11°C
- D 15°C .

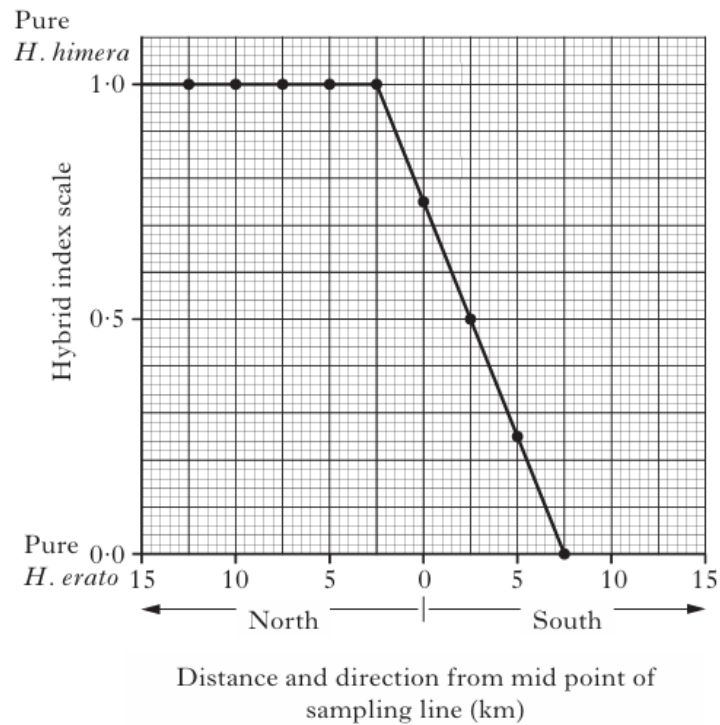
Selecting Graph

In Ecuador, populations of two species of butterfly, *Heliconius erato* and *Heliconius himera*, overlap and form a zone in which hybrid individuals are found.

Butterflies were collected from sites along a line extending north and south from a central point close to the middle of the hybrid zone. Each butterfly was scored on a scale from 0.0 – 1.0.

A score of 0.0 is pure *H. erato* and a score of 1.0 is pure *H. himera*. Values in-between are hybrids.

The results are shown in the graph below.



How wide is the zone in which hybrids were found?

- A 5.0 km
- B 7.5 km
- C 10.0 km
- D 12.5 km

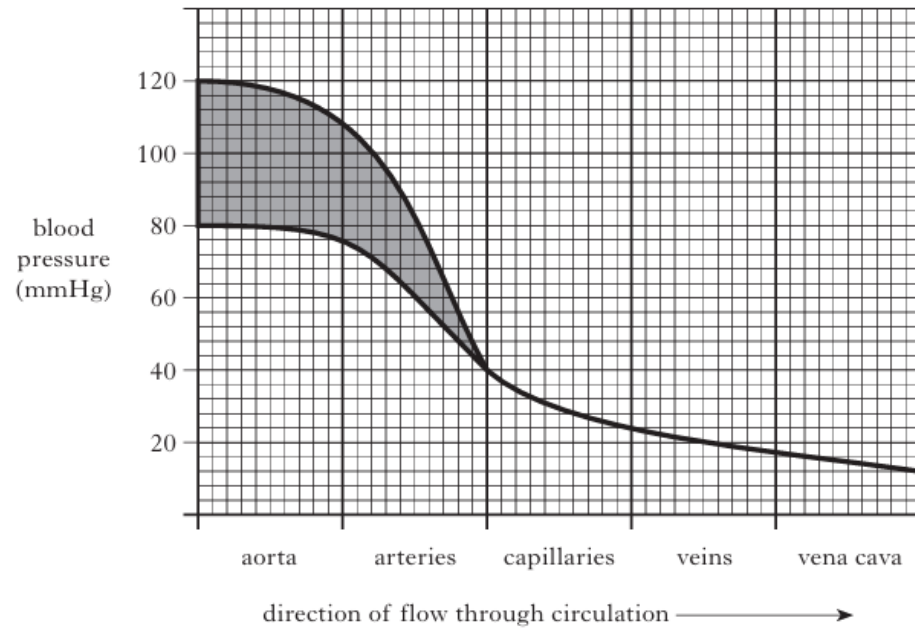
6. Which line in the table below shows correctly the distance and direction of a site at which hybrids with a score of 0.25 would be expected?

	Distance (km)	Direction
A	2.5	south
B	5.0	south
C	1.0	north
D	7.5	north

Selecting Graph

The difference between systolic and diastolic blood pressure is often referred to as pulse pressure.

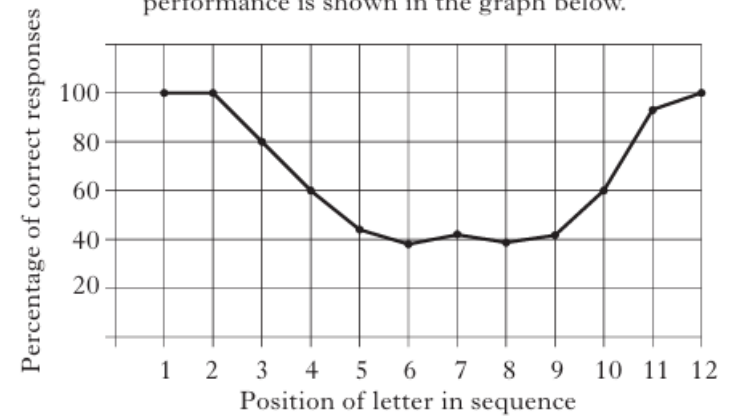
The graph below shows the changes in blood pressure as blood flows through the circulatory system of an individual.



The maximum pulse pressure shown in the graph is

- A 40 mmHg
- B 80 mmHg
- C 100 mmHg
- D 120 mmHg.

22. Students were asked to recall twelve letters of the alphabet in any order, after hearing the list of letters read out slowly. An analysis of their performance is shown in the graph below.



On how many occasions was a letter recalled by more than 50% of the students?

- A 4
- B 5
- C 6
- D 7

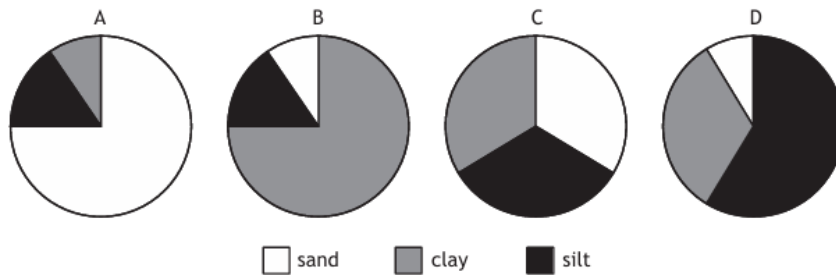
Selecting Graph

16. Soil type is dependent on the composition of its components which in turn affects the productivity of plants growing in it.

The table below shows the percentage of each component present in four different soils.

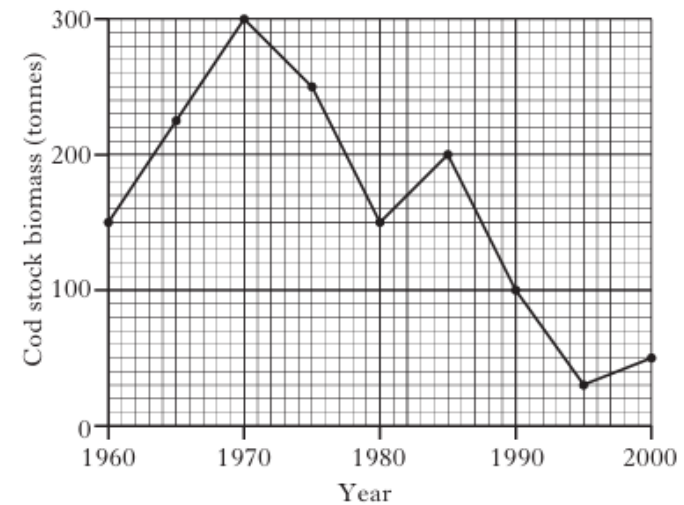
Soil type	Component (%)		
	clay	silt	sand
sandy clay loam	20–30	0–30	50–80
clay loam	20–35	20–60	20–50
sandy silt loam	0–20	40–80	20–50
silty clay loam	20–35	45–80	0–20

Which of the following charts represents a clay loam?



29. Cod is an important fish species which is caught for human food.

The graph below shows changes in the estimated biomass of cod stocks in a region of the North Sea between 1960 and 2000.



Which line in the table correctly shows the overall decrease in estimated cod biomass in this region in the ten year periods shown?

	Ten year period	Decrease in estimated cod biomass in the region (tonnes)
A	1960 and 1970	150
B	1970 and 1980	100
C	1980 and 1990	100
D	1990 and 2000	50

Selecting Graph

14. Nicotine is a chemical which may affect ante-natal development.

The diagram shows the stages of development when major and minor malformations of organs may occur if there is exposure to nicotine.

Key – major malformation
 minor malformation

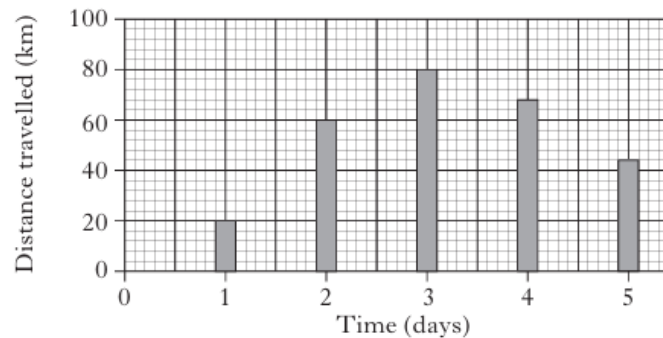
	Stage of development (weeks after fertilisation)														
	Ball of cells		Embryo (organ formation)						Fetus (organ growth and development)						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
brain															
ear															
limbs															
genitalia															

For how many weeks during pregnancy is there a possibility of major malformations to organs during development?

- A 6
- B 7
- C 9
- D 13

13. The buff-breasted pipit is a bird which migrates into parts of the USA each spring.

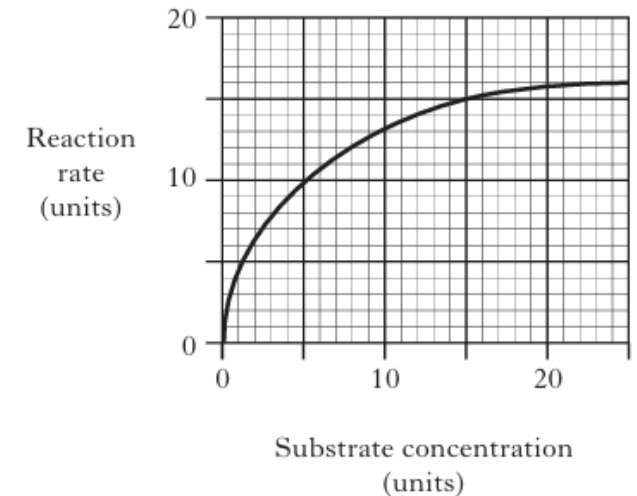
The chart below shows the average distance travelled by the birds in the first five days of their migration.



The greatest distance travelled by the pipit is on days

- A 1 and 2
- B 2 and 3
- C 3 and 4
- D 4 and 5.

14. The graph below shows the effect of substrate concentration on the rate of an enzyme-catalysed reaction.

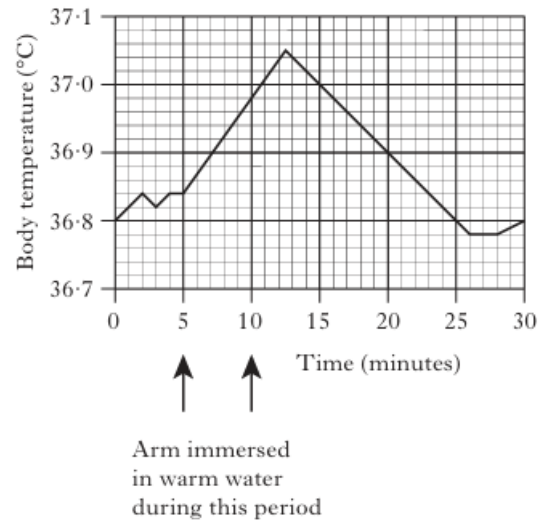


At which substrate concentration is the reaction rate equal to 75% of the maximum rate?

- A 5 units
- B 8 units
- C 12 units
- D 15 units

Selecting Graph

22. The graph below records the body temperature of a woman during an investigation in which her arm was immersed in warm water for 5 minutes.

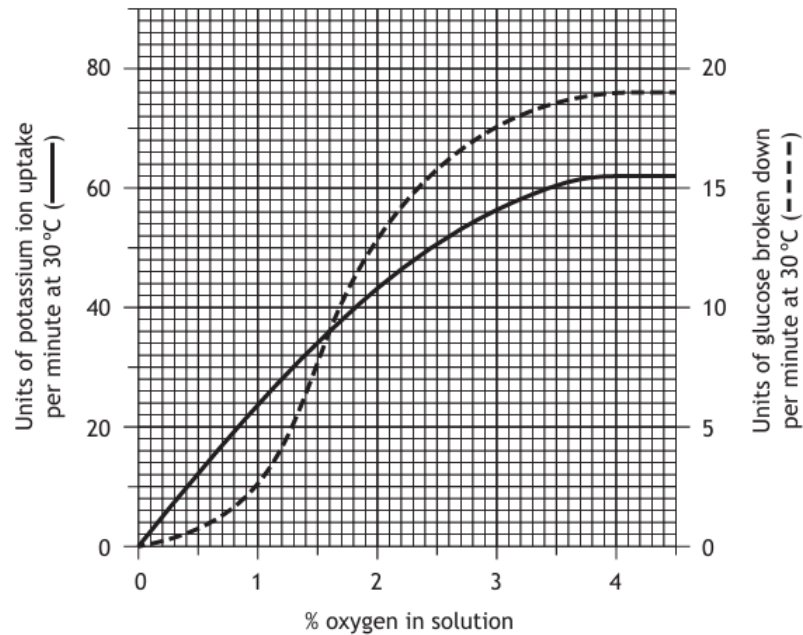


By how much did the temperature of her body vary during the 30 minutes of the investigation?

- A 2.7 °C
- B 0.27 °C
- C 2.5 °C
- D 0.25 °C

Selecting—Double Graph Y axis

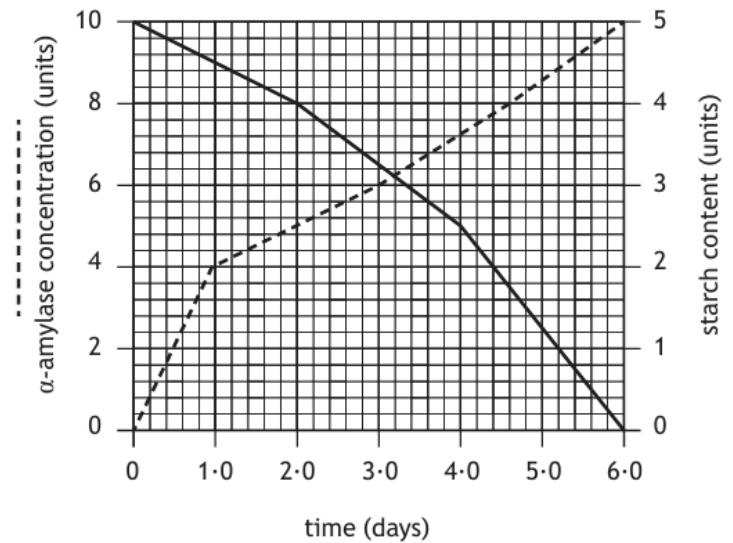
The graph below shows the rate of potassium uptake and glucose breakdown by muscle tissue in solutions of different oxygen concentrations.



How much glucose is broken down per minute when the oxygen concentration is 1%?

- A 2.5 units
- B 6 units
- C 10 units
- D 24 units

The graph shows changes in the α -amylase concentration and the starch content of a barley grain during early growth and development.

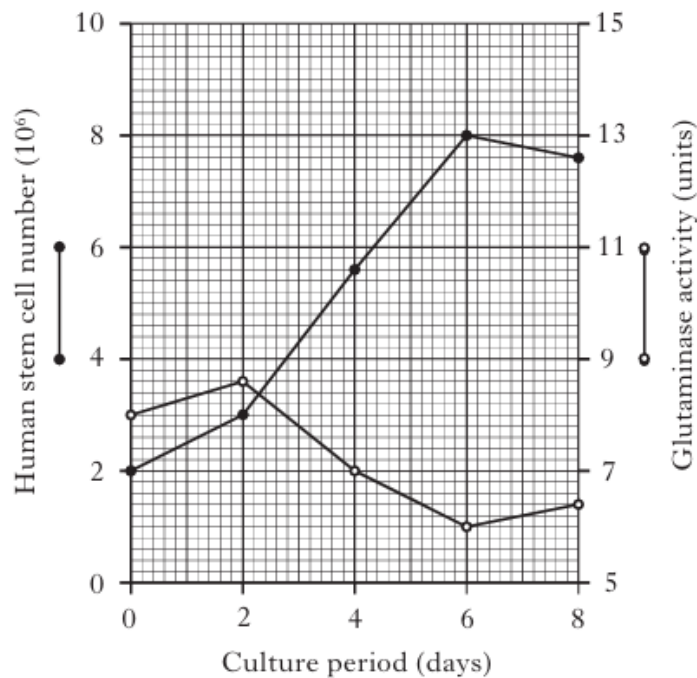


Identify the time by which the starch content of the barley grains had decreased by 50%.

- A 2.0 days
- B 3.2 days
- C 4.0 days
- D 6.0 days

Selecting—Double Graph Y axis

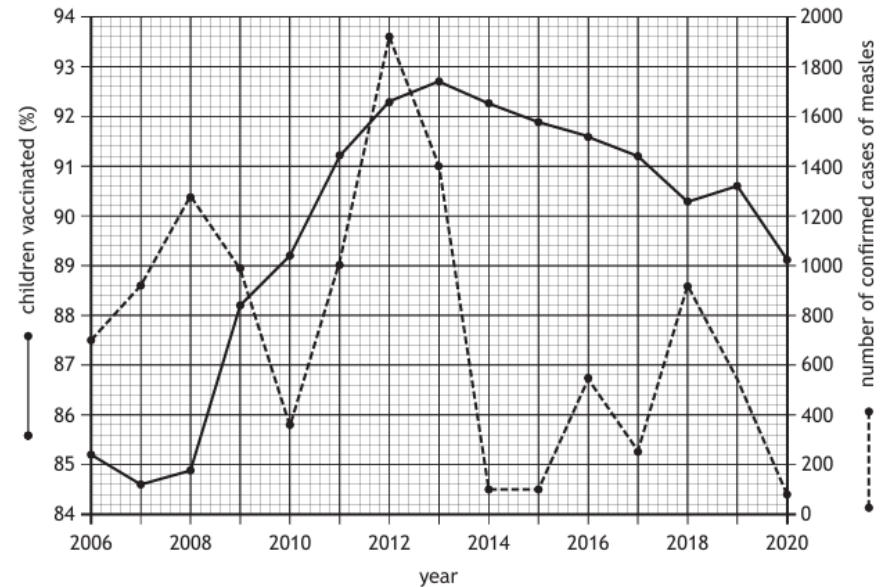
3. The graph below shows the changes in number of human stem cells in a culture. The activity of the enzyme glutaminase present in the cells over an eight day period is also shown.



How many units of glutaminase activity were recorded when the cell number was 50% of its maximum over the eight day period?

- A 3
- B 4
- C 8
- D 9

6. The graph shows the percentage of children vaccinated against measles and the number of confirmed cases of measles in children in a region of the UK between 2006 and 2020.



Identify the number of confirmed cases of measles one year after the highest percentage of children were vaccinated.

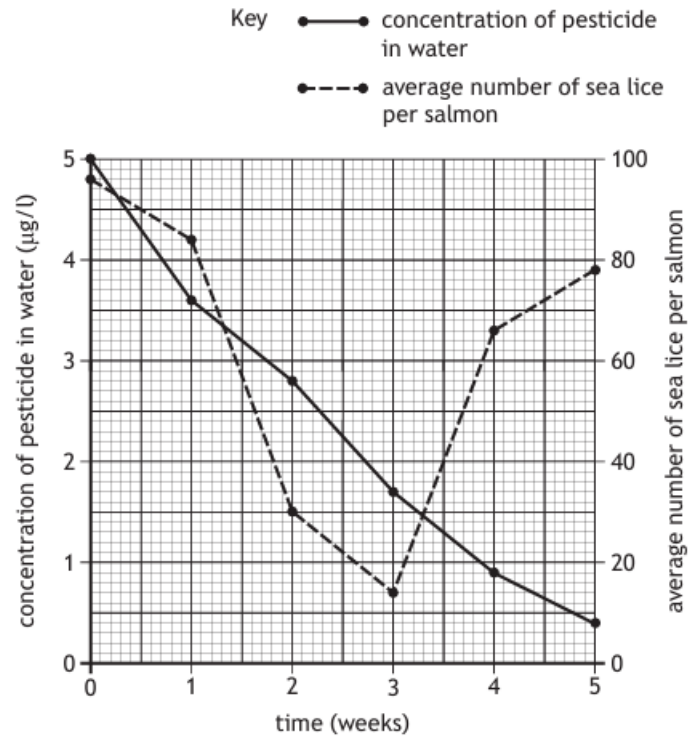
- A 84.5
- B 92.7
- C 100.0
- D 1720.0

Selecting—Double Graph Y axis

22. Farmed salmon are often infested with sea lice. The sea lice can be controlled by adding a pesticide to the water.

The concentration of pesticide in the water and the average number of sea lice per salmon were monitored over a 5-week period.

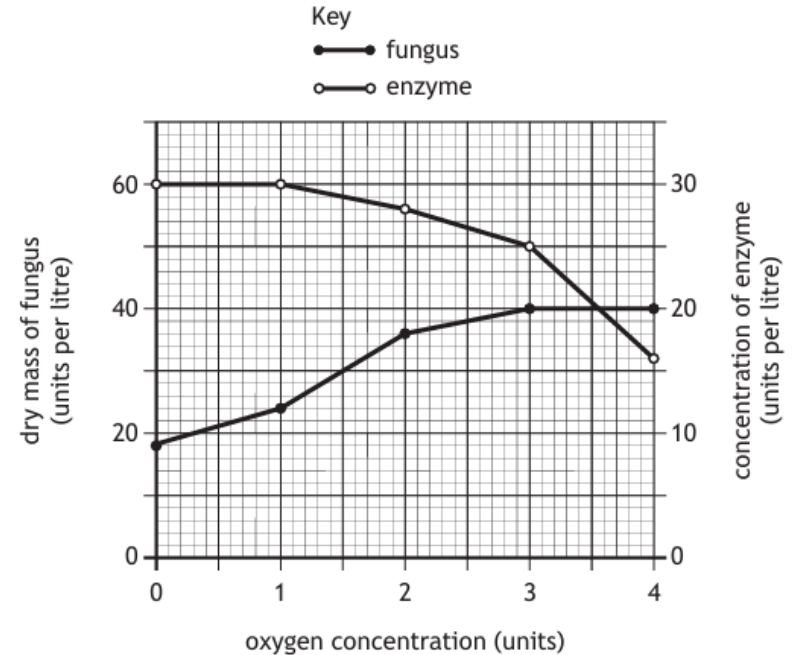
The results are shown in the graph.



What was the average number of sea lice per salmon when the concentration of pesticide was $1.7 \mu\text{g/l}$?

- A 0.7
- B 14.0
- C 17.0
- D 34.0

Fungi were cultured in a fermenter to produce an enzyme that was released into the culture medium. The graph shows the effect of oxygen concentration on the dry mass of the fungus and the concentration of enzyme in the medium after 48 hours growth.



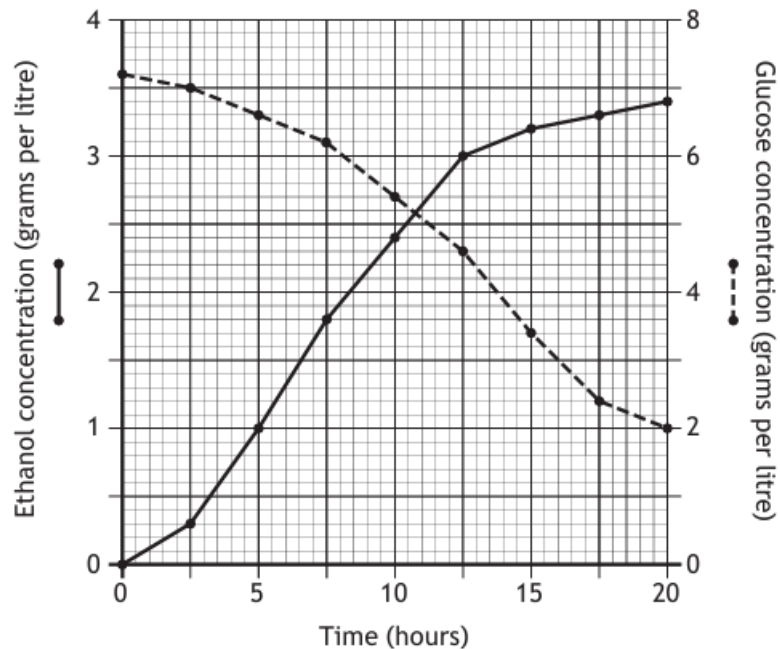
The concentration of enzyme when the dry mass of fungus was 36 units per litre was

- A 18 units per litre
- B 28 units per litre
- C 48 units per litre
- D 56 units per litre.

Selecting—Double Graph Y axis

In an investigation into fermentation, yeast was grown in a flask of glucose solution for 20 hours at 20 °C.

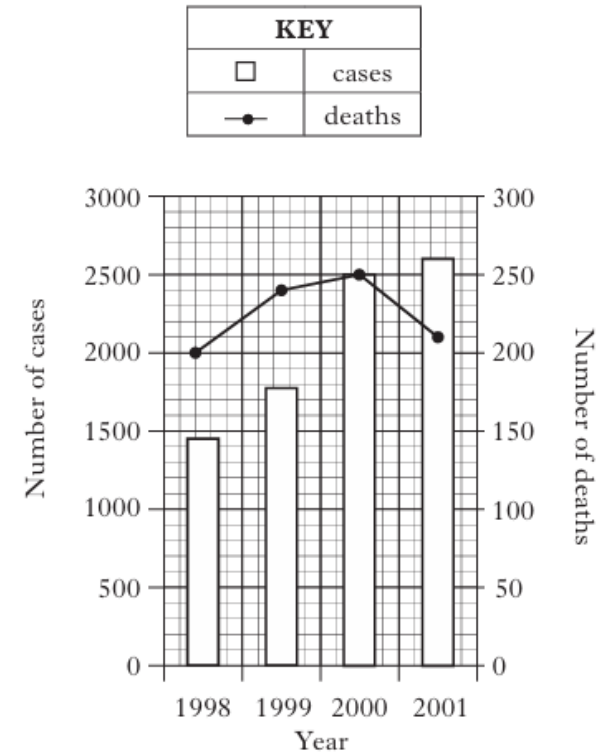
The graph shows the concentrations of ethanol and glucose in the flask over the period of the investigation.



What was the glucose concentration when the ethanol concentration was 3.3 grams per litre?

- A 1.2 grams per litre
- B 2.2 grams per litre
- C 2.4 grams per litre
- D 6.6 grams per litre

26. The graph below shows the number of cases of meningitis and deaths due to meningitis in the UK from 1998 to 2001.



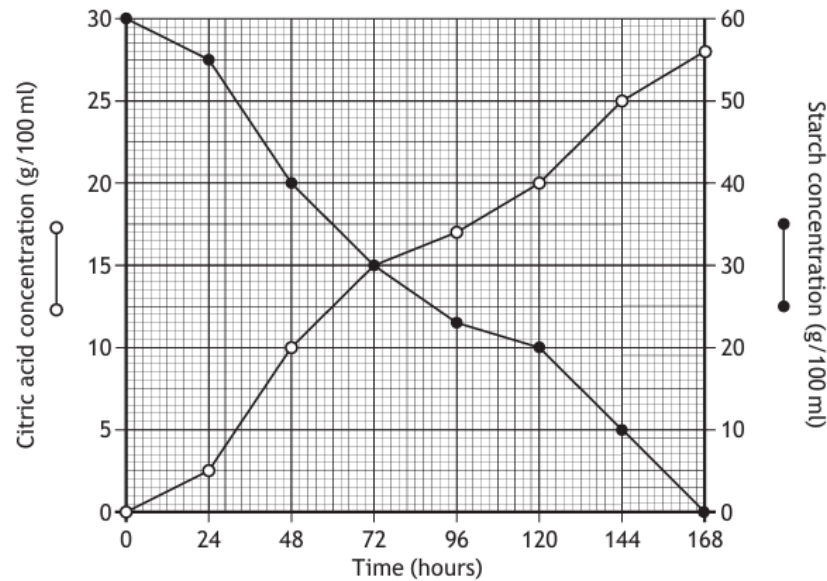
In which year was the number of deaths from meningitis less than 10% of the number of cases?

- A 1998
- B 1999
- C 2000
- D 2001

Selecting—Double Graph Y axis

The fungus *Aspergillus niger* is grown in large fermenters to produce citric acid using starch as a substrate.

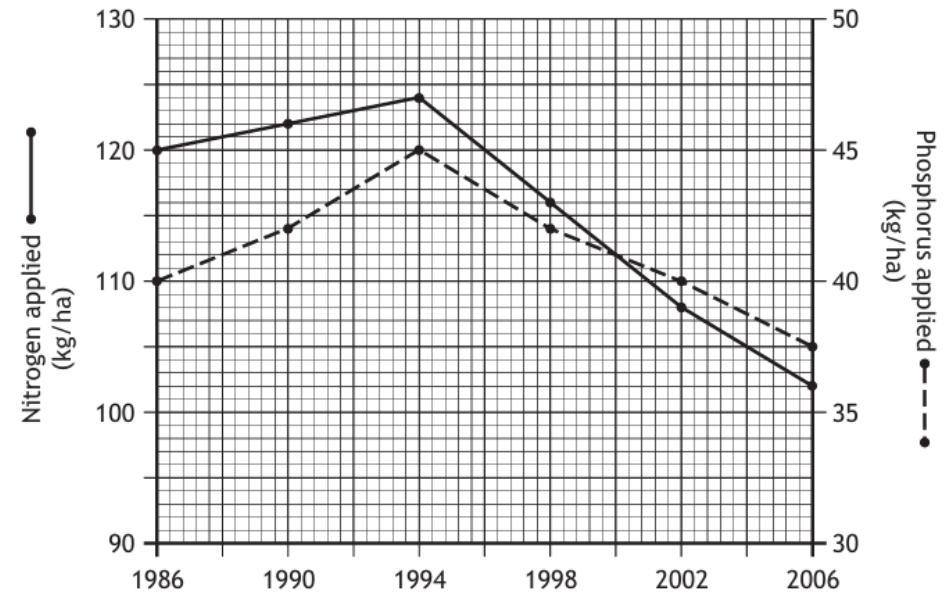
The graph shows the changes in the citric acid and starch concentrations in a fermenter over 168 hours.



The citric acid concentration equals the starch concentration at

- A 0 hours
- B 48 hours
- C 72 hours
- D 120 hours.

The graph below shows the levels of nitrogen and phosphorus applied to crops in an area of Scotland between 1986 and 2006.

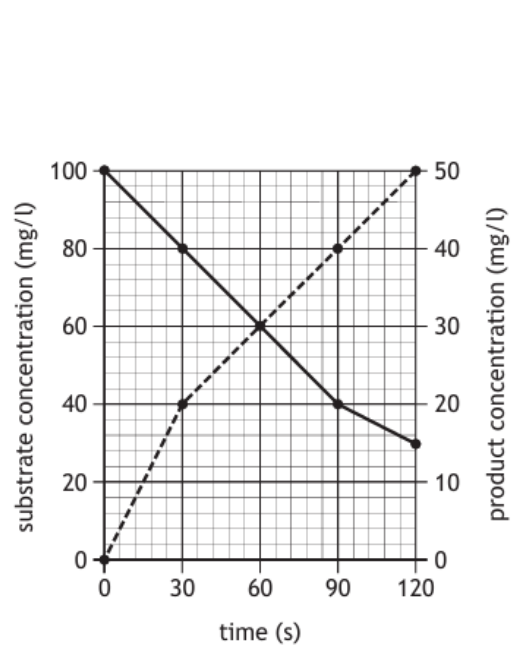


In which year was there the smallest difference between the levels of nitrogen and phosphorus applied?

- A 1998
- B 2000
- C 2002
- D 2006

Selecting—Double Graph Y axis

The graph shows the substrate and product concentrations during a reaction in a metabolic pathway.



At which time is the product concentration exactly 50% of the substrate concentration?

- A 30 seconds
- B 60 seconds
- C 75 seconds
- D 90 seconds

Selecting—Double Graph Answers

Table

- 1. A
- 2. C

Graph

- 1. D
- 2. A
- 3. A
- 4. D
- 5. C
- 6. D
- 7. C
- 8. B
- 9. A
- 10. D
- 11. C
- 12. D
- 13. B
- 14. C
- 15. B
- 16. B

Double Graph

- 1. A
- 2. C
- 3. C
- 4. C
- 5. B
- 6. B
- 7. C
- 8.
- 9. D
- 10. D
- 11. B