Answers

All exam-style questions and sample answers in this title were written by the authors.
In examinations, the way marks are awarded may be different.

Chapter 1

Practice question 1

a their mass **b** kilograms

Practice question 2

The numbers would be too small and not very accurate. She should use centimetres or millimetres instead.

Practice question 3

a cm^3 **b** mm **c** °C **d** s

Practice question 4

a g/cm^3 **b** m/s

Practice question 5

cm^3/s

Practice question 6

a 5×10^4 **b** 6.7×10^3 **c** 2.75×10^8

Practice question 7

a 208 **b** 925 000 **c** 100 600 000

Practice question 8

1.7×10^7

Practice question 9

a 3×10^{-3} **b** 6.08×10^{-5} **c** 4.108×10^{-8}

Practice question 10

a 0.0006 **b** 0.000 000 722 **c** 0.005 008

Practice question 11

1.05×10^{-4} m

Practice question 12

10^5	$10 \times 10 \times 10 \times 10 \times 10$	100 000	one hundred thousand
10^6	$10 \times 10 \times 10 \times 10 \times 10 \times 10$	1 000 000	one million

Practice question 13

a 10^3 **b** 10^9 **c** 10^7

Practice question 14

a 100 000 **b** 100 000 000 **c** 10 000 000 000

Practice question 15

10^{-3}	$1 \div (10 \times 10 \times 10)$	0.001	one thousandth
10^{-4}	$1 \div (10 \times 10 \times 10 \times 10)$	0.0001	ten thousandth

Practice question 16

a 10^{-2} **b** 10^{-10} **c** 10^{-7}

Practice question 17

a 0.1 **b** 0.0001 **c** 0.000 000 01

Practice question 18

a (given) **b** 1 kg **c** $1\,cm^3$ **d** 1 ms
e 1 nJ

Practice question 19

$0.000\,000\,01 = 10^{-8}$
10^{-9} m = 1 nm
so 10^{-8} m = 10 nm

Practice question 20

a $1 \times 1000 = 1000$ mm

b $\frac{14}{1000} = 0.014$ kg

c $\frac{1200}{1000} = 1.2$ mm

Practice question 21

$\frac{8}{1000} = 0.008$ mm

Further questions

1 a $\frac{80}{250} = 0.32\,mg/cm^3$

b i $\frac{(0.315 + 0.423 + 0.345 + 0.478 + 0.278)}{5} = 0.368$ s

ii $0.368 \times 1000 = 0.368$ ms

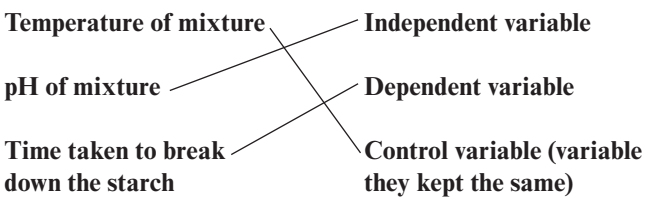
c cm^3 because the size of the number will not be too big or too small

d Caffeine increases reaction times.

2 1 l = 1 000 000 µl
9856 × 5 000 000 = 49 280 000 000 = 4.928×10^{10}

Chapter 2

Practice question 1



Practice question 2

a Independent: the year; Dependent: the number of measles cases
b Independent: concentration of salt solution; Dependent: change in mass
c Independent: light intensity of area; Dependent: the number of dandelion plants.

Practice question 3

a discrete **b** continuous **c** categorical
d discrete **e** continuous **f** categorical

Practice question 4

a Independent: volume of water; Dependent: height of seedling
b Both are continuous because they are measured and so can take any value within a range.

Practice question 5

C, a 25 cm^3 measuring cylinder, because it would give the most accurate measurement.

Practice question 6

a 20 cm
b 0.5 cm
c It has a higher resolution, of 1 mm.

Practice question 7

a 21 °C **b** 38 °C **c** −7 °C **d** 6 °C

Practice question 8

a 6.6 cm^3 **b** 21 cm^3 **c** 38 cm^3

Practice question 9

Put the measuring cylinder on a flat, level surface.
Put her eyes level with the meniscus.
Take the measurement from the bottom of the meniscus.

Practice question 10

a 2 **b** 3 **c** 4 **d** 1 **e** 4 **f** 5

Practice question 11

a 3
b Use scales that have a greater resolution, for example 0.01 kg.
c There would be a greater number of significant figures.

Practice question 12

a type of seeds
b They have not given the unit for temperature.
c 45 – 21 = 24°C

Practice question 13

Glucose concentration (g/cm^3)	Volume of oxygen used in 5 minutes (cm^3)			
	Reading 1	Reading 2	Reading 3	Mean
0.2				
0.4				
0.6				
0.8				

Practice question 14

41, 60, 90, 76

Practice question 15

5.5 g

Further question

a 25 cm^3, 10 cm^3, 50 cm^3
b

Concentration of hydrogen peroxide (vol.)	Volume of oxygen produced after 30 seconds (cm^3)			
	Reading 1	Reading 2	Reading 3	Mean
10				
15				
20				
25				
30				

c $\frac{(12.6 + 13.2 + 7.2)}{3} = 11\ cm^3$

Chapter 3

Practice question 1

Scale **B**

Practice question 2

a The axis will only go up to 50.
The highest number of plants is 82.
The bar for 82 plants will not fit on the chart.
b Have each large square as 20 (rather than 10).

Practice question 3

The *y*-axis drawn should:
- have large squares with a value of 2 (Number of girls)
- start at 0, and end at 10
- have tick lines drawn extending away from the large squares
- be labelled 'Number of girls'.

Practice question 4

a Year
b 7/Year 7

Practice question 5

The bar graph should have:
- two bars drawn of equal width
- the first bar labelled 'right', the second bar labelled 'left'
- bars of correct height
- a gap in between each bar
- a title on the *x*-axis 'Handedness'.

Practice question 6

The bar graph should have:
- five bars drawn of equal width
- the bars labelled correctly
- bars of correct height
- a gap in between each bar
- a title on the *x*-axis 'Number of siblings'.

Practice question 7

Length of middle finger/cm	Frequency
6.0–6.4	1
6.5–6.9	3
7.0–7.4	1
7.5–7.9	7
8.0–8.5	3

Practice question 8

a

Mass of tortoise/g	Frequency
100–114	
115–129	
130–144	
145–159	

b The zoo keeper chose it because it created four bars, which is neither too few nor too many.

Practice question 9

Length of leaf/mm	Frequency
50–54	3
55–59	2
60–64	3
65–69	2
70–74	6

Practice question 10

The histogram should have:
- bars of correct height
- no gaps in between the bars.

Practice question 11

The histogram should have:
- five bars drawn of equal width, one large square each
- the bars labelled correctly
- bars of correct height
- no gaps in between the bars
- a title on the *x*-axis 'Foot length/ mm'.

Practice question 12

The histogram should have:
- the *y*-axis labelled 'Frequency' with one large square for 2
- the *x*-axis labelled 'Resting heart rate/beats per minute' with one large square for each group
- six bars drawn of equal width
- the bars labelled correctly
- bars of correct height
- no gaps in between each bar.

Practice question 13

a **D** Concentration of carbon dioxide
b **i** Volume of oxygen produced in 1 minute
ii Concentration of carbon dioxide

Practice question 14

The axes are labelled incorrectly. Time is the independent variable and should be on the *x*-axis. Light intensity is the dependent variable and should be on the *y*-axis.

Practice question 15

The line graph should have:
- lines drawn with a ruler to show axes
- label of *y*-axis: Number of oxygen bubbles produced in one minute
- label of *x*-axis: Temperature/°C
- suitable scales chosen for each axis, e.g. one large square = 10 units
- both scales starting at 0
- tick marks and numbers added.

Practice question 16

The points plotted for 0.02, 0.04, 0.06, 0.08 are incorrect.

Practice question 17

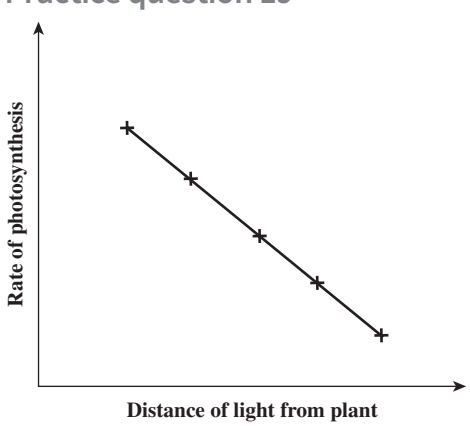
a The dots used to plot the points are too big.

b He should use smaller dots, so just the middle is on the correct coordinate/point *or* draw crosses, so just the middle is on the correct point. This will make it clear what the data points show to make it easier to interpret his results.

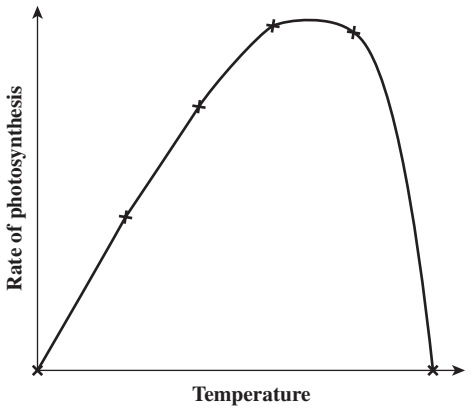
Practice question 18

The points plotted should be with small dots or crosses, where the middle of the cross or dot is at the correct point.

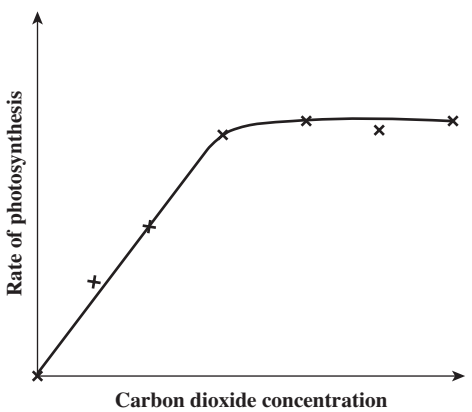
Practice question 19



Practice question 20



Practice question 21



Further question

The bar chart should have:
- *y*-axis with a suitable scale and correctly labelled
- bars plotted to correct height
- bars labelled and *x*-axis title given.

Chapter 4

Practice question 1

7%

Practice question 2

a 14 **b** 16 + 31 = 47

Practice question 3

D

Practice question 4

Negative correlation

Practice question 5

As the ethanol concentration increased the heart rate decreased.

Practice question 6

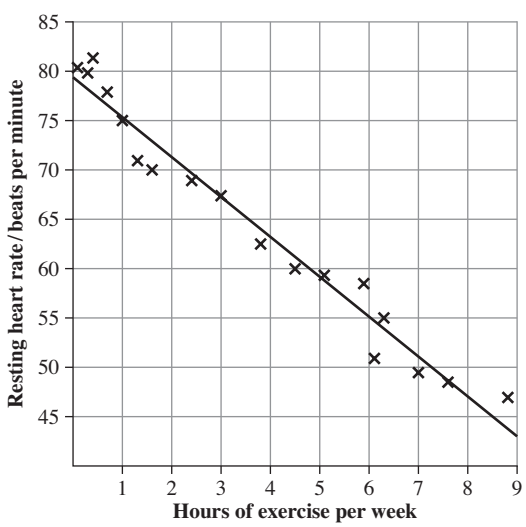
C

Practice question 7

The student drank the cola after 5 minutes. His heart rate then increased from around 68 to 88 beats per minute.

Practice question 8

a



b The correlation is very strong because the points are close to the best-fit line.

c The more hours of exercise a person does per week, the lower their resting heart rate.

Practice question 9

The graph shows that there is a link between smoking and developing CHD.

The higher the cigarette consumption, the higher the number of deaths from CHD.

Practice question 10

The graph shows a weak correlation showing that in countries where people eat a lot of saturated fat, there are fewer deaths from CHD.

However, there may be other factors that are not taken into account. For example, if people smoke less, are less stressed and take more exercise, the risk of developing CHD decreases. Also, it shows deaths from CHD, not how many people develop the disease. In some countries, health care may be better so CHD is better treated before it causes death.

The graph only shows death in men, the relationship might be different in women.

Practice question 11

3.6 billion

Practice question 12

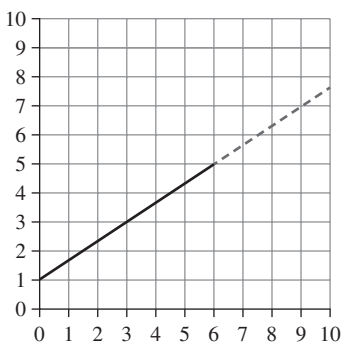
10 000

Practice question 13

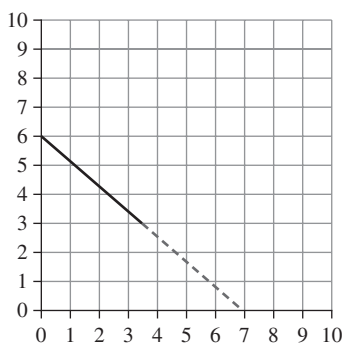
52

Practice question 14

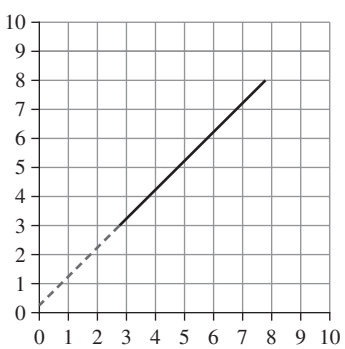
a



b

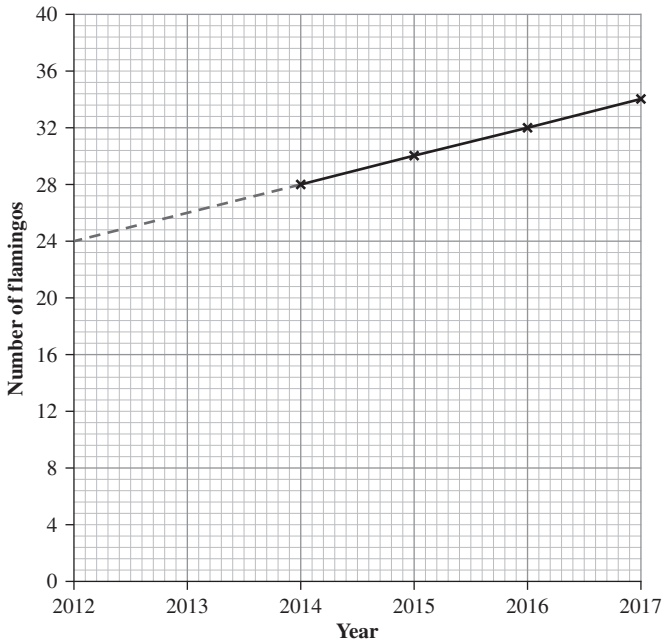


c



Practice question 15

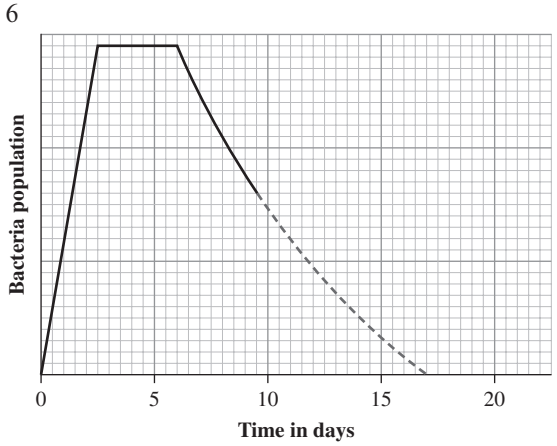
24



Practice question 16

a 6

b



Day 17

Further question

a 11 minutes
b 12 breaths per minute
c The breathing rate decreased. The student slowed down.

Chapter 5

Practice question 1

a 48 **b** 43.2 **c** 1140

Practice question 2

$\left(\frac{11}{20}\right) \times 100 = 55\%$

Practice question 3

a 11

b $\left(\frac{3}{12}\right) \times 100 = 25\%$

Practice question 4

$1928 - 954 = 974$

$\left(\frac{974}{1928}\right) \times 100 = 50.5\%$ increase

Practice question 5

a $6000 - 50\,000 = -44\,000$

$\left(\frac{-44\,000}{50\,000}\right) \times 100 = -88 = 88\%$

b $1200 - 6000 = -4800$

$\left(\frac{-4800}{6000}\right) \times 100 = -80 = 80\%$

c $240 - 1200 = -960$

$\left(\frac{-960}{1200}\right) \times 100 = -80 = 80\%$

Practice question 6

Scale: 1 cm: 10 µm
Diameter of red blood cell image = 2 cm
Diameter of real red blood cell = $2 \times 20 = 20$ µm

Practice question 7

Length of scale line = 1 cm
Diameter of image = 4.4 cm
Actual diameter 44 nm

Practice question 8

Height of image = 54 mm

$\frac{54}{2000} = 0.027$ mm

Practice question 9

$\frac{25}{20\,000} = 0.00125$ mm

$0.00125 \times 1000 = 1.25$ µm

Practice question 10

size of image = $10.2 \times 10 = 102\,\text{mm}$

$$\frac{102}{0.1} = \times\ 1020$$

Practice question 11

$$\text{magnification} = \frac{\text{size of the image}}{\text{real size}}$$

$1\,\text{mm} = 0.001\,\mu\text{m}$

$$\frac{34}{0.001} = \times\ 34\,000$$

Practice question 12

a 3 : 2 **b** 7 : 3

Practice question 13

a 2 : 1 **b** 1 : 4 **c** 3 : 1 **d** 1 : 3

Practice question 14

1 : 1

Practice question 15

a 50% **b** 100%

Practice question 16

There are 2 possible combinations out of 4 that result in XY (a boy)
This is a probability of 2 in 4, which is simplified to 1 in 2.

Further questions

1 a $\frac{40}{100} = 0.1\,\text{mm}$

b $0.1 \times 1000 = 100\,\mu\text{m}$

c $\frac{8}{40} = 0.2\,\mu\text{m}$

2 a $\frac{55}{100} = 0.55$
$0.55 \times 156 = 85.8\,\text{cm}^3$

b 5 000 000 : 250 000
$\frac{5\,000\,000}{250\,000} = 20$
20 : 1

Chapter 6

Practice question 1

a $25 \times 25 = 625\,\text{cm}^2$
b i 2 km **ii** $4\,000\,000\,\text{m}^2$

Practice question 2

$3.3 \times 2.2 = 7.26$
$(3.3 + 3.5) \times 2 = 13.6$
$7.26 + 13.6 = 20.86\,\text{m}^2$

Practice question 3

Area of quadrat = $0.5 \times 0.5 = 0.25\,\text{m}^2$
Area of land = $12.8 \times 5.2 = 66.56\,\text{m}^2$
$\frac{66.56}{0.25} = 266.24$

Practice question 4

$(1.2^2) \times 2 = 2.88$
$(5.5 \times 1.2) \times 4 = 26.4$
$2.88 + 26.4 = 29.28\,\text{cm}^2$

Practice question 5

$4.4^2 \times \pi = 60.8\,\text{cm}^2$

Practice question 6

$\frac{90}{10} = 9$
$9^2 \times \pi = 254\,\text{cm}^2$

Further question

a $\frac{50}{100} = 0.5$
$0.5^2 = 0.25\,\text{m}^2$

b around $5100\,\text{m}^2$
[Accept an answer between 4500 and $5500\,\text{m}^2$]

c $\frac{5100}{0.25} = 20\,400$ [use answer carried over from part b]
$20\,400 \times 1.7 = 34\,680$

Additional questions involving several maths skills

1 a Bar drawn with a height of 122

b 52 s

c $8.2 \times 10 = 82\,\text{mm}$
$\frac{82}{45} = 1.8\,\text{mm/s}$

d Measure the temperature of the water using a thermometer.

2 a 8000 mm

b Diameter of image = 18 mm
$\frac{18}{4000} = 0.0045$
$0.0045 \times 1000 = 4.5\,\mu\text{m}$

c $6 - 8 = -2$
$\left(\frac{-2}{8}\right) \times 100 = 25\%$ decrease