

Please write clearly in block capitals.

Centre number

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Candidate number

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Surname

Forename(s)

Candidate signature

GCSE COMBINED SCIENCE: SYNERGY

F

Foundation Tier

Paper 1 Life and environmental sciences

Tuesday 14 May 2019

Afternoon

Time allowed: 1 hour 45 minutes

Materials

For this paper you must have:

- a ruler
- a protractor
- a scientific calculator
- the periodic table (enclosed)
- the Physics Equations Sheet (enclosed).

Instructions

- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. Cross through any work you do not want to be marked.
- In all calculations, show clearly how you work out your answer.

Information

- The maximum mark for this paper is 100.
- The marks for questions are shown in brackets.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.

| For Examiner's Use | |
|--------------------|------|
| Question | Mark |
| 1 | |
| 2 | |
| 3 | |
| 4 | |
| 5 | |
| 6 | |
| 7 | |
| 8 | |
| 9 | |
| TOTAL | |



Answer **all** questions in the spaces provided.

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0 1

The heart pumps blood around the body.

0 1 . 1

Which structures prevent blood flowing the wrong way in the heart?

[1 mark]

0 1 . 2

Which blood vessels take blood away from the heart?

[1 mark]

Tick (✓) **one** box.

Arteries

Capillaries

Veins



0 1 . 3

In the legs, blood in the arteries is different from blood in the veins.

What are **two** differences between blood in the arteries and blood in the veins in the legs?

[2 marks]

Tick (✓) **two** boxes.

Blood in arteries has less carbon dioxide

Blood in arteries has less oxygen

Blood in arteries has less nitrogen

Blood in arteries has more carbon dioxide

Blood in arteries has more oxygen

Blood in arteries has more nitrogen

Heart rate is the number of times the heart contracts each minute.

0 1 . 4

People who exercise regularly have stronger heart muscle than people who do not exercise.

Resting heart rate is measured when the person is at rest.

How would long-term regular exercise affect resting heart rate?

[1 mark]

Tick (✓) **one** box.

Resting heart rate would decrease

Resting heart rate would increase

Resting heart rate would stay the same

Question 1 continues on the next page

Turn over ►



A student wore a heart monitor which measured his heart rate all the time.

The heart monitor recorded his lowest heart rate each day for five days.

Table 1 shows the results.

Table 1

| Day | Lowest heart rate in beats per minute |
|-------------|--|
| 1 | 62 |
| 2 | 72 |
| 3 | 77 |
| 4 | 59 |
| 5 | 65 |
| Mean | X |

0 1 . 5 Calculate mean value **X** in **Table 1**.

[1 mark]

X = _____ beats per minute

0 1 . 6 Suggest **one** possible reason for the higher heart rate on day 3.

[1 mark]



0 1 . 7

Another student had a mean heart rate of 82 beats per minute in one day.

Calculate their total number of heart beats on that day.

[3 marks]

Number of heart beats = _____

10

Turn over for the next question

Turn over ►



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ANSWER IN THE SPACES PROVIDED**



0 2

In chemistry, the word 'pure' has a specific meaning.

0 2 . 1

Which is a pure substance in chemistry?

[1 mark]Tick (✓) **one** box.

Air

Carbon

Iodine solution

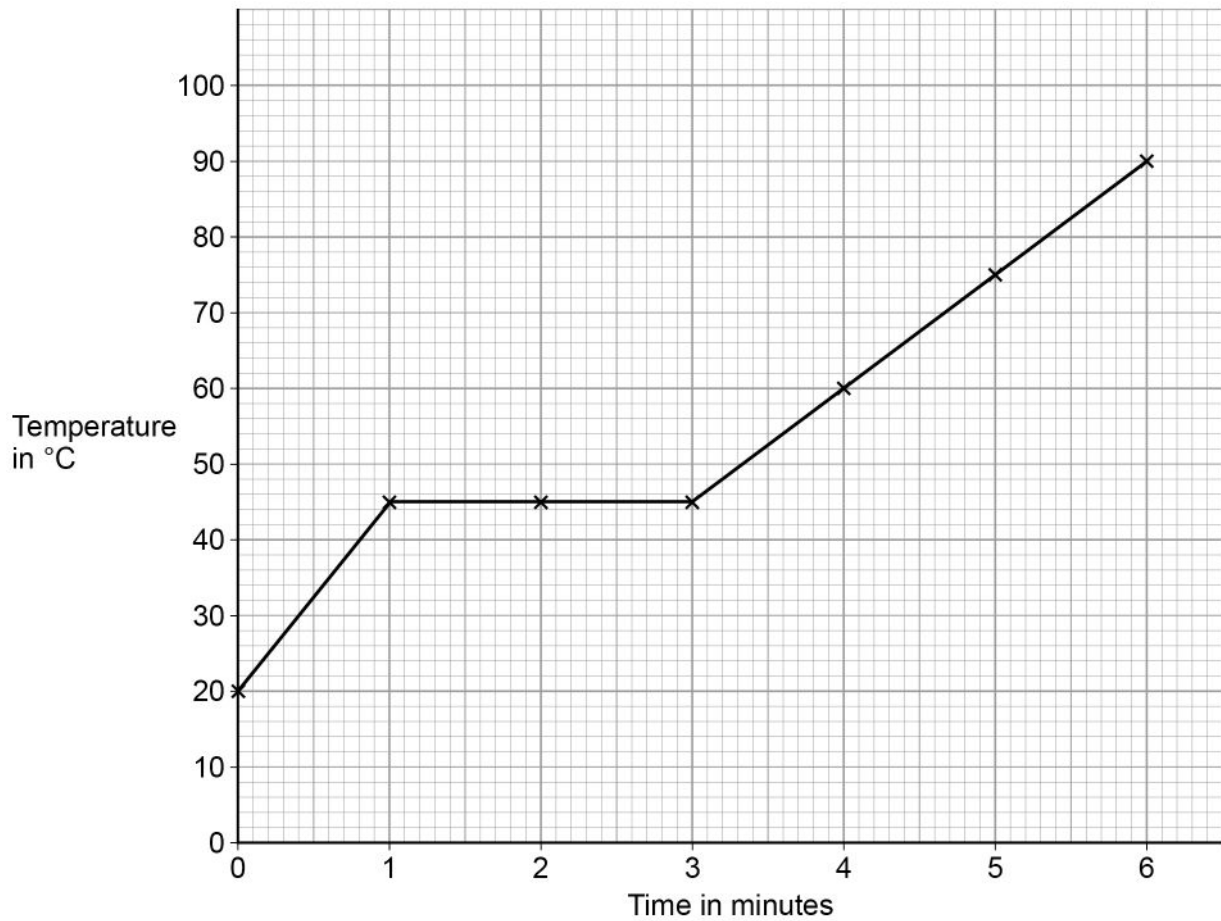
Question 2 continues on the next page**Turn over ►**

A student heated two solid substances.

The student recorded the temperature every minute.

Figure 1 shows the results for substance **A**.

Figure 1



0 2 . 2 Describe how the temperature of substance **A** changes with time.

Include data from **Figure 1** in your answer.

[3 marks]



0 2 . 3 Give the melting point of substance **A**.

[1 mark]

Melting point = _____ °C

Table 2 shows the results for Substance **B**.

Table 2

| Time in minutes | Temperature in °C |
|-----------------|-------------------|
| 0 | 20 |
| 1 | 38 |
| 2 | 56 |
| 3 | 56 |
| 4 | 68 |
| 5 | 80 |
| 6 | 92 |

0 2 . 4 Complete **Figure 1**.

You should:

- plot the data for substance **B** from **Table 2**
- join the data points for substance **B** with straight lines.

[3 marks]

8

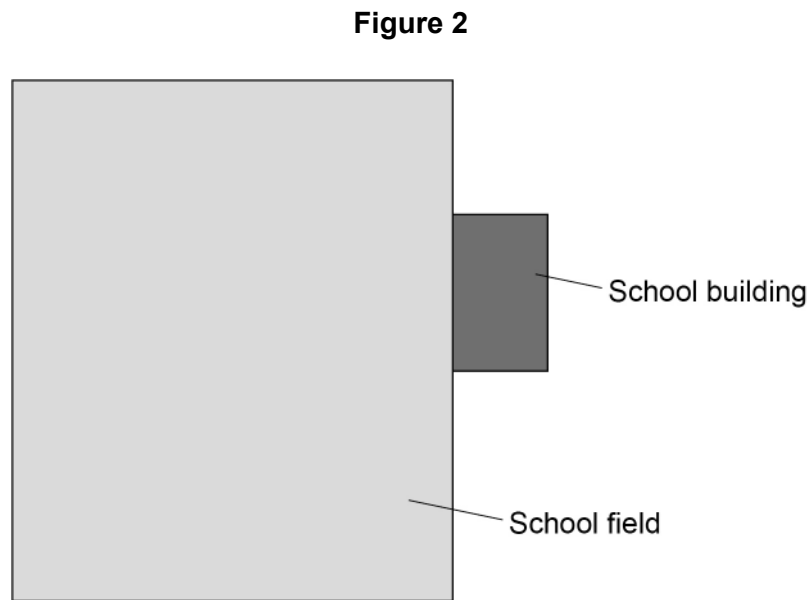
Turn over ►



0 3

Students investigated plants in a school field.

Figure 2 is a diagram of the school building and school field.



0 3 . 1

Draw **one** line from each word to the correct description.

[2 marks]

Word

Description

Abundance

How tall the plants grow

How many plants have flowers

Distribution

Number of plants in an area

Where plants are found in an area



Students investigated the distribution of plants on the school field at different distances from the school building.

0 3 . 2 What is the independent variable in this investigation?

[1 mark]

Tick (✓) **one** box.

Area of the school field

Distance from the school building

Number of plants

The students used a transect.

0 3 . 3 Draw **one** line on **Figure 2** to show where the transect could be placed.

[1 mark]

Question 3 continues on the next page

Turn over ►



0 3 . 4

Figure 3 shows the equipment the students used.

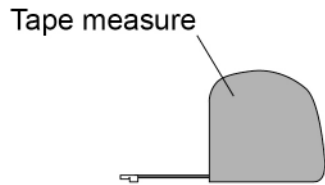
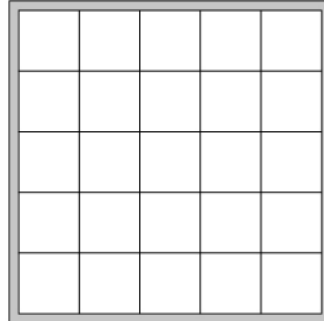


Figure 3



Not to scale

Describe a method to investigate the distribution of plants on the school field at different distances from the school building.

[4 marks]



0 3 . 5 There was a tree in one corner of a field.

Suggest why fewer plants would grow under the tree than in the middle of the field.

[1 mark]

0 3 . 6 Give **two** factors that affect the distribution of plants in a field.

Do **not** refer to any factors you used in your answer to Question **03.5**.

[2 marks]

1 _____

2 _____

11

Turn over for the next question

Turn over ►



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| | |
|---|---|
| 0 | 4 |
|---|---|

Hormones control parts of the reproductive system.

| | | | |
|---|---|---|---|
| 0 | 4 | . | 1 |
|---|---|---|---|

Complete the sentences.

Choose answers from the box.

[2 marks]

| | | | | |
|---------|---------|-----------|----------|--------------|
| amylase | insulin | oestrogen | protease | testosterone |
|---------|---------|-----------|----------|--------------|

The main reproductive hormone in males is _____.

The main reproductive hormone in females is _____.

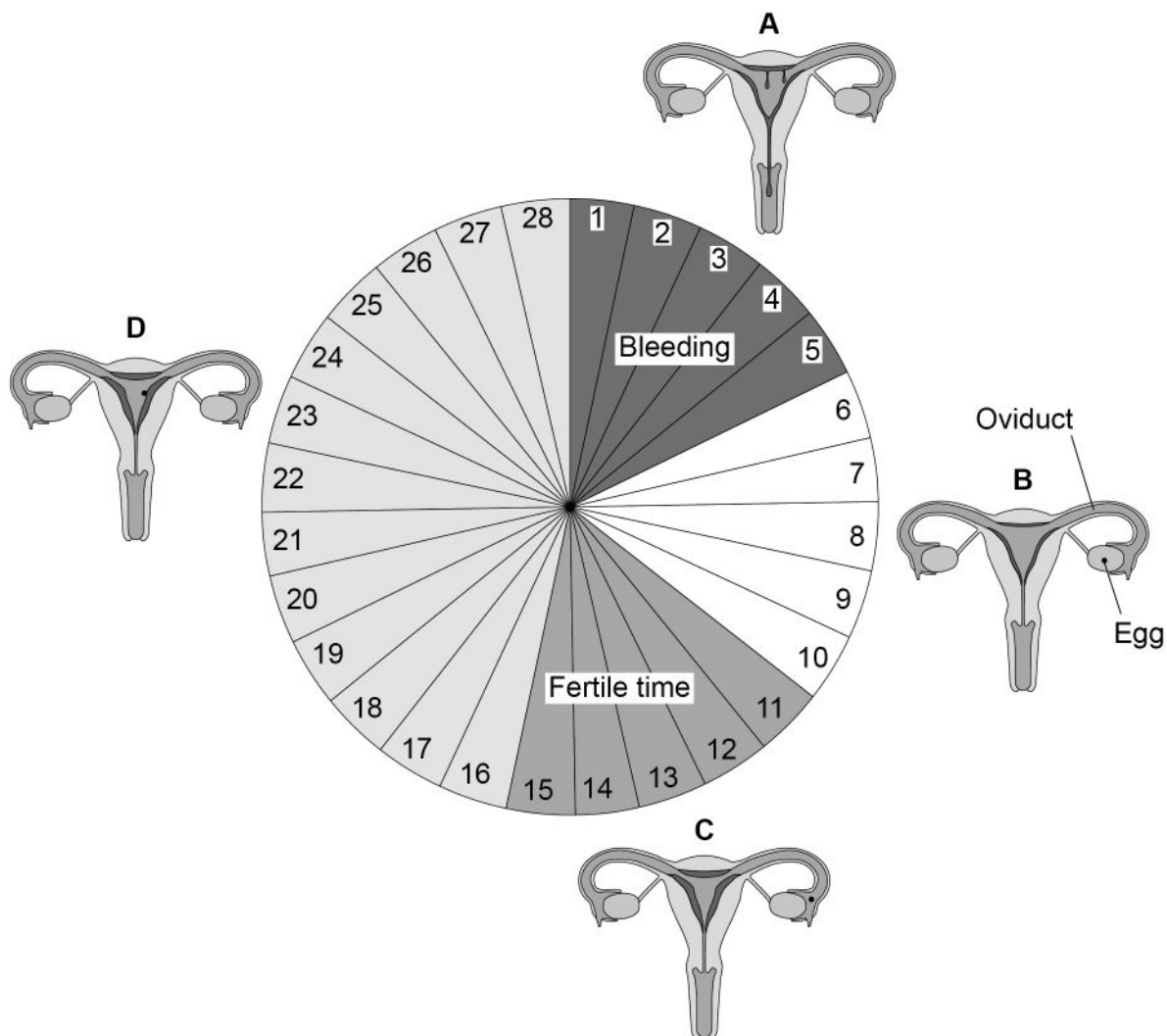
Question 4 continues on the next page

Turn over ►



Figure 4 shows the stages of the menstrual cycle and the approximate time each stage takes in days.

Figure 4



0 4 . 2

Calculate the percentage of days in the cycle when bleeding occurs.

Use Figure 4.

[2 marks]

Percentage = _____ %



0 4 . 3

Suggest why the number of days of bleeding shown in **Figure 4** is only an estimate.

[1 mark]

0 4 . 4

What is happening during stage **B**?

[1 mark]

Tick (✓) **one** box.

The egg is being fertilised

The egg is maturing

The uterus lining is breaking down

0 4 . 5

Towards the end of stage **C** an egg is released.

Which organ is the egg released from?

[1 mark]

0 4 . 6

Name the hormone that stimulates the release of an egg.

[1 mark]

Question 4 continues on the next page

Turn over ►



0 4 . 7

Explain how surgery to cut and block the oviducts is an effective form of contraception.

[2 marks]

0 4 . 8

Give **one** method of contraception.

Do **not** refer to the method given in Question **04.7**.

[1 mark]

| |
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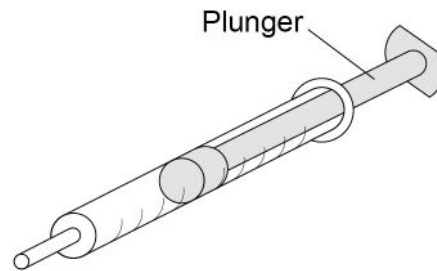
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0 5

Figure 5 shows a syringe containing air.

Figure 5



The gas particles in the syringe are moving.

0 5 . 1

What happens to the average kinetic energy of the gas particles if the temperature decreases?

[1 mark]

Tick (✓) **one** box.

The average kinetic energy decreases

The average kinetic energy increases

The average kinetic energy stays the same

0 5 . 2

What happens to the average speed of the gas particles if the temperature decreases?

[1 mark]

Tick (✓) **one** box.

The average speed decreases

The average speed increases

The average speed stays the same



0 5 . 3 The syringe plunger is pulled outwards.

Why does air move into the syringe as the plunger is pulled outwards?

[1 mark]

Tick (✓) **one** box.

gas pressure outside the syringe = gas pressure inside the syringe

gas pressure outside the syringe < gas pressure inside the syringe

gas pressure outside the syringe > gas pressure inside the syringe

Question 5 continues on the next page

Turn over ►



0 5 . 4 Write down the equation that links density, mass and volume.

[1 mark]

The mass of air in the syringe is 0.031 g

0 5 . 5 Which mass is the same as 0.031 g?

[1 mark]

Tick (✓) **one** box.

- 0.000031 kg
- 0.00031 kg
- 3.1 kg
- 31 kg

0 5 . 6 The volume of the air in the syringe is 0.000025 m^3

Calculate the density of the air inside the syringe.

Give your answer to 2 significant figures.

[3 marks]

Density = _____ kg/m^3



0 5 . 7 A helium balloon is released and rises through the air.

What does this show about the density of the helium in the balloon compared with the density of the surrounding air?

[1 mark]

Tick (✓) **one** box.

The density of helium is the same as the density of air

The density of helium is less than the density of air

The density of helium is more than the density of air

0 5 . 8 Describe how the water displacement method could be used to determine the density of a small stone.

[3 marks]

12

Turn over for the next question

Turn over ►



0 6

This question is about seawater.

0 6

1

How is fresh water obtained from seawater?

[1 mark]Tick (✓) **one** box.

Desalination

Filtration

Sedimentation

Sterilisation

Figure 6 shows a map of the world.**Figure 6**

0 6 . 2 The seawater at location **X** is warmer than the seawater at location **Z**.

Why would the salt concentration at location **X** be greater than the salt concentration at location **Z**?

[1 mark]

Tick (✓) **one** box.

Increased condensation at location **X**

Increased evaporation at location **X**

Increased rainfall at location **X**

0 6 . 3 Location **X** is in the middle of the ocean.

Location **Y** is near a large city.

Suggest why seawater near a large city has more dissolved solids than seawater in the middle of the ocean.

[1 mark]

Question 6 continues on the next page

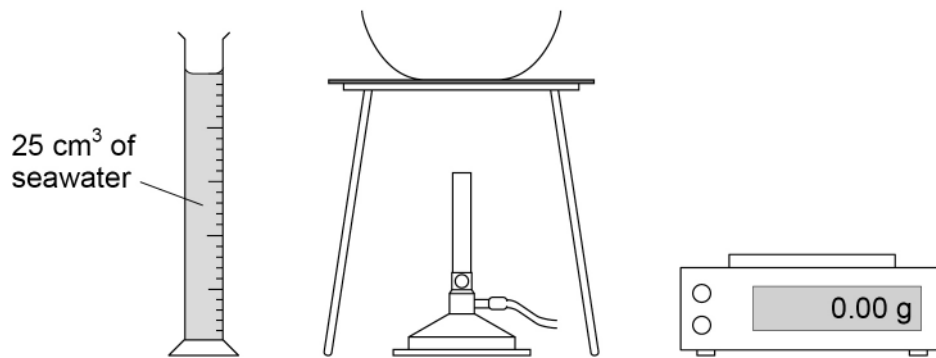
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0 6 . 4 Students separated the dissolved solids from a sample of seawater.

Figure 7 shows some of the equipment used.

Figure 7



Describe a method to measure the mass of dissolved solids in a 25 cm³ sample of seawater.

[5 marks]



0 7

Bacteria and viruses can cause communicable diseases.

0 7 . 1

Bacterial cells are different from animal cells.

Which structure is found in bacterial cells and **not** in animal cells?**[1 mark]**Tick (✓) **one** box.

Cell membrane

Mitochondrion

Nucleus

Plasmid

0 7 . 2

Which scientific process uses part of bacterial cells?

[1 mark]Tick (✓) **one** box.

Breeding programmes

Genetic engineering

Selective breeding

Stem cell treatment

Question 7 continues on the next page**Turn over ►**

0 7 . 3 Table 3 lists four communicable diseases.

Which diseases are caused by a bacterium and which are caused by a virus?

Put **one** tick in each row.

One row has been completed for you.

[2 marks]

Table 3

| Disease | Caused by a bacterium | Caused by a virus |
|------------|-----------------------|-------------------|
| Measles | | ✓ |
| Gonorrhoea | | |
| AIDS | | |
| Salmonella | | |

0 7 . 4 A virus causes measles.

Give **three** symptoms of measles.

[3 marks]

- 1 _____
- 2 _____
- 3 _____

0 7 . 5 Bacteria can be killed with antibiotics.

Give **one** problem linked to the overuse of antibiotics.

[1 mark]

- _____
- _____



| | | | |
|---|---|---|---|
| 0 | 7 | . | 6 |
|---|---|---|---|

A fungus causes an infection called athlete's foot.

- The fungus infects the skin.
- The fungus grows in moist, warm conditions.

Describe how athlete's foot can be transmitted from one person to another person.

[2 marks]

| | | | |
|---|---|---|---|
| 0 | 7 | . | 7 |
|---|---|---|---|

Bacteria and viruses can enter the body through the nose and mouth.

Describe how mucus and cilia in the trachea prevent most of these pathogens from reaching the lungs.

[2 marks]

Mucus _____

Cilia _____

| |
|----|
| 12 |
|----|

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Turn over ►



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0 8Grey wolves (*Canis lupus*) can be found in the USA.**0 8 . 1**

Give the genus name of the grey wolf.

[1 mark]

0 8 . 2

Describe how biological classification systems have changed over time.

[4 marks]

0 8 . 3

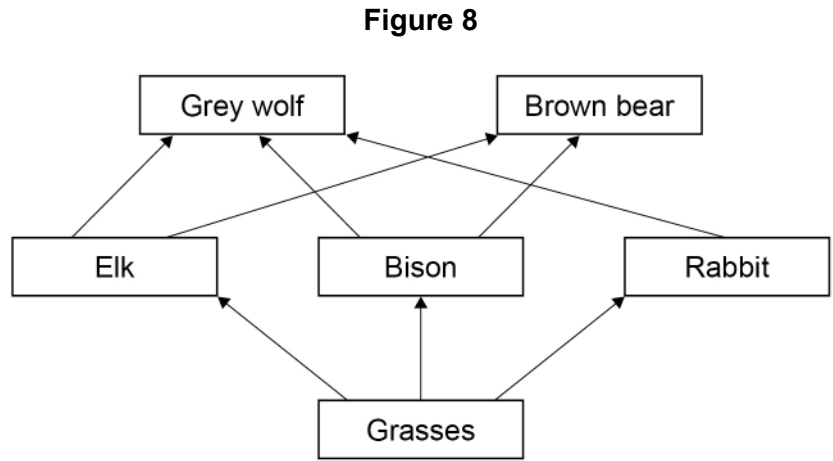
Population and community are terms used to describe the organisms in an area.

Describe the difference between the terms population and community.

[2 marks]

Question 8 continues on the next page**Turn over ►**

Figure 8 shows part of a food web.



0 8 . 4

Look at **Figure 8**.

Explain how killing all the grey wolves could affect the populations of the other organisms.

[6 marks]



In Yellowstone Park in the USA, grey wolves were hunted and killed until there were none left by 1926.

Grey wolves were reintroduced to Yellowstone Park in 1995.

The wolves came from several family groups in different parts of Canada.

0 8 . 5 Why should scientists select animals from more than one area for reintroduction programmes?

[1 mark]

Tick (✓) **one** box.

To reduce the effect of inbreeding

To choose similar characteristics

To reduce genetic diversity

Question 8 continues on the next page

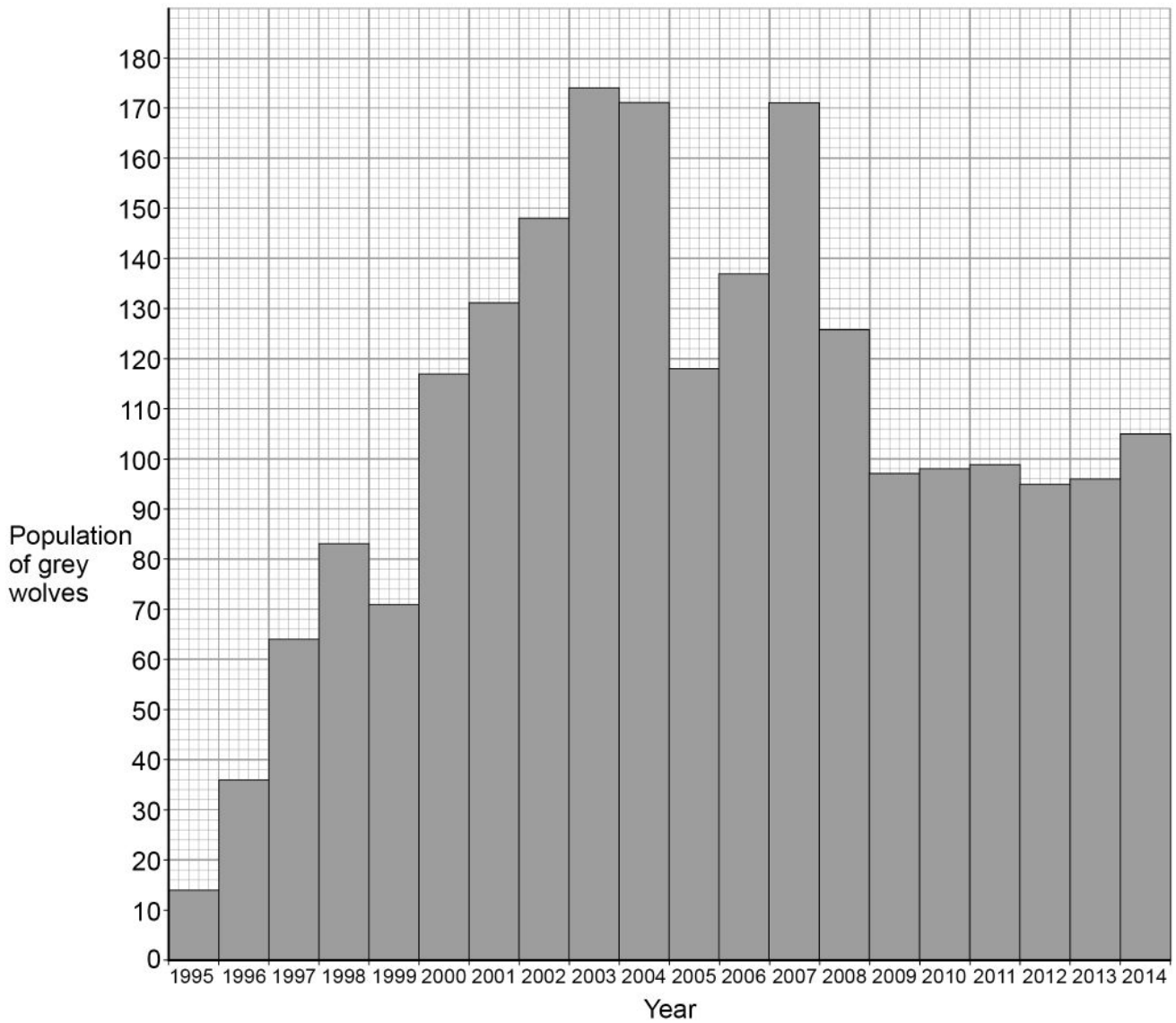
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Figure 9 shows the change in the population of grey wolves in Yellowstone Park since 1995.

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Figure 9



0 8 . 6

The wolf population in 2014 was greater than the wolf population in 1995.

Calculate how many times greater.

[1 mark]

Number of times greater = _____

0 8 . 7

Scientists now believe the population of wolves in Yellowstone Park is **not** likely to decrease to zero.

Describe how the data since 2009 support this belief.

[1 mark]

16

Turn over for the next question

Turn over ►



0 9

Polonium is an element with 33 isotopes.

0 9 . 1

What is the difference between isotopes of the same element?

[1 mark]Tick (✓) **one** box.

The number of electrons

The number of neutrons

The number of protons

0 9 . 2An isotope of polonium is ${}_{84}^{210}\text{Po}$ (polonium-210).

Polonium-210 emits alpha radiation.

Alpha particles can be represented by the symbol ${}^4_2\text{He}$

An alpha particle consists of sub-atomic particles.

What are these sub-atomic particles?

[2 marks]Tick (✓) **two** boxes.

Electrons

Gamma rays

Neutrons

Protons

X-rays



09.3

Complete the nuclear equation to show the radioactive decay of polonium-210

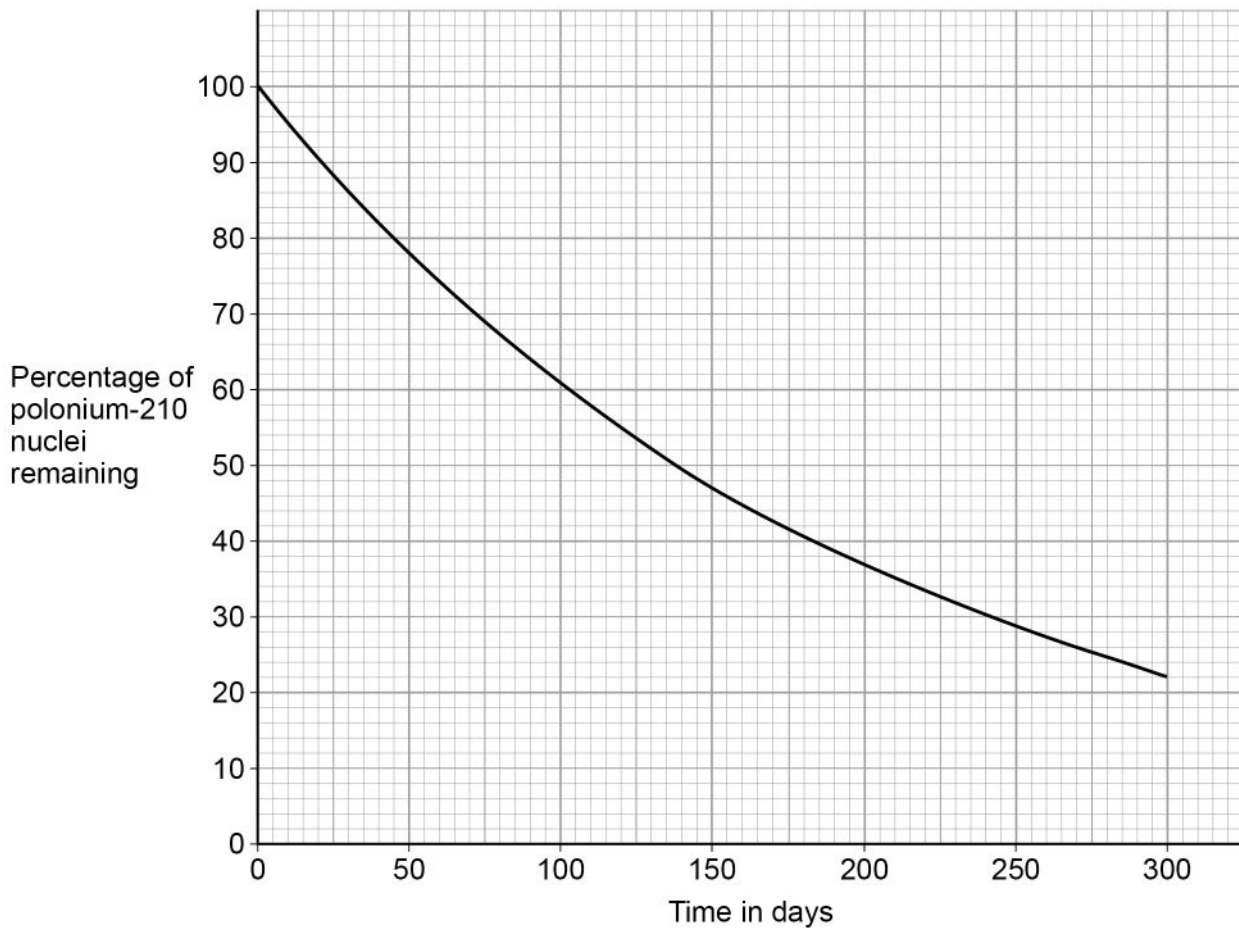
Use the periodic table to help you.

[3 marks]**Question 9 continues on the next page****Turn over ►**

0 9 . 4 A sample of polonium-210 decays.

Figure 10 shows how the percentage of polonium-210 nuclei remaining varies with time.

Figure 10



Determine the half-life of polonium-210

[1 mark]

Half-life = _____ days



0 9 . 5 Another isotope of polonium, polonium-206, has a half-life of 8.8 days.

A 5.0 mg sample of polonium-206 was left to decay.

Calculate what mass of polonium-206 remained after 44 days.

[2 marks]

Mass of polonium-206 after 44 days = _____ mg

0 9 . 6 If polonium-210 were to enter the body, the alpha radiation it emits would cause harm.

Explain why alpha radiation emitted inside the body is harmful.

[2 marks]

0 9 . 7 Isotopes that emit alpha radiation can be transported safely in a glass bottle.

Suggest why.

[1 mark]

12

END OF QUESTIONS



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