Please check the examination details below before entering your candidate information

| Candidate surname | Other names |
|---|---|
| | |

**Pearson Edexcel**
**Level 1/Level 2 GCSE (9–1)**

Centre Number | | | | | |

Candidate Number | | | | |

# Tuesday 14 May 2019

Afternoon (Time: 1 hour 45 minutes)

Paper Reference **1BI0/1F**

# Biology

## Paper 1

**Foundation Tier**

**You must have:**
Calculator, ruler

Total Marks

## Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided – *there may be more space than you need.*
- Calculators may be used.
- Any diagrams may NOT be accurately drawn, unless otherwise indicated.
- You must **show all your working out** with **your answer clearly identified** at the **end of your solution**.

## Information

- The total mark for this paper is 100.
- The marks for **each** question are shown in brackets – *use this as a guide as to how much time to spend on each question.*
- In questions marked with an **asterisk** (*), marks will be awarded for your ability to structure your answer logically showing how the points that you make are related or follow on from each other where appropriate.

## Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.

*Turn over* ▶

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P 5 6 3 9 0 A 0 1 3 2

Pearson

**Answer ALL questions. Write your answers in the spaces provided.**

**Some questions must be answered with a cross in a box ☒.**
**If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.**

**1** (a) Figure 1 shows a pea plant with flowers.

**Figure 1**

(i) Name the type of reproduction involving flowers.

**(1)**

Sexual

(ii) What is the advantage of reproduction involving flowers?

**(1)**

☒ **A** all the offspring are identical

☒ **B** there is variation in the offspring

☒ **C** there is no fertilisation

☒ **D** all the offspring grow faster

(b) The seeds produced by this pea plant can be round or wrinkled.

The allele for round seeds (R) is dominant to the allele for wrinkled seeds (r).

(i) A homozygous dominant round seeded plant was crossed with a homozygous recessive wrinkled seeded plant.

Complete the Punnett square to show the genotypes of the offspring.

**(1)**

| | r | r |
|---|---|---|
| R | Rr | Rr |
| R | Rr | Rr |

(ii) State the percentage of the offspring that will produce round seeds.

**(1)**

percentage = 100 %

(iii) Which scientist discovered the basis of genetic inheritance by crossing pea plants?

**(1)**

- ☒ **A** Charles Darwin
- ☒ **B** Alfred Wallace
- ☒ **C** Louis Leakey
- ☒ **D** Gregor Mendel

(c) The blood group of a person is determined by their genotype.

Describe how a person inherits the blood group AB.

**(2)**

Inherit A from one parent

Inherit B from the other parent

**(Total for Question 1 = 7 marks)**

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**2** (a) A student investigated mitosis in the root tip of a garlic plant.

(i) Explain why the student used the tip of the root.

**(2)**

• (the root tip) contains {meristem / dividing} cells

• for growth

(ii) The student squashed the root tip on a microscope slide to spread out the cells.

The slide was placed on the stage of a microscope.

Describe how to use the microscope to obtain a clear image of the cells.

**(2)**

• switch the lamp on

• start with the lowest objective lens / look through the eyepiece lens

• use the (focusing) wheel to obtain a clear image

(iii) The student could not see the chromosomes inside the cells.

State what can be added to the root tip squash to make the chromosomes visible.

**(1)**

Use a strain

(b) Figure 2 shows a root cell in a stage of mitosis.

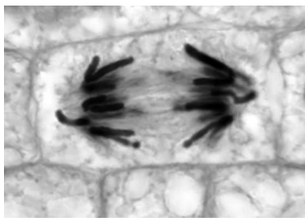


**Figure 2**

(i) Which stage of mitosis is shown in Figure 2?

**(1)**

- ☒ **A** prophase
- ☒ **B** metaphase
- ☒ **C** anaphase
- ☒ **D** telophase

(ii) Describe what is happening in Figure 2.

**(3)**

• spindle (fibres)

• are pulling the chromosomes

• to either side of the cell / poles

**(Total for Question 2 = 9 marks)**

**3** (a) Chlamydia is caused by a pathogen.

(i) Chlamydia is transmitted by

**(1)**

☒ **A** insect vectors

☒ **B** sneezing

☒ **C** sexual intercourse

☒ **D** contaminated food

(ii) The type of pathogen that causes chlamydia is a

**(1)**

☒ **A** bacterium

☒ **B** fungus

☒ **C** protist

☒ **D** virus

(b) Figure 3 shows the number of cases of chlamydia in the United Kingdom per 100 000 people between 1996 and 2013.

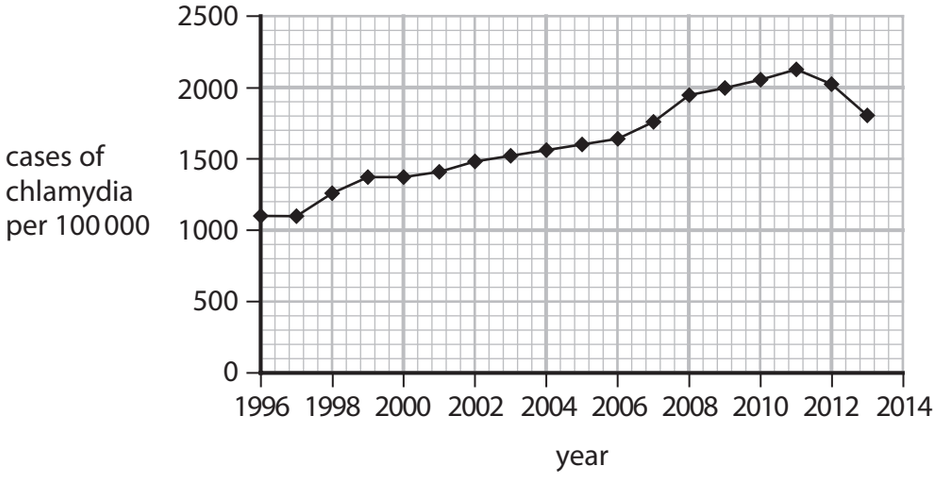



**Figure 3**

(i) Describe the trend in the number of cases of chlamydia between 1996 and 2013.

**(2)**

• number of cases increases
• and then decreases
• correct reference to data from graph

(ii) State the number of cases of chlamydia per 100 000 in 2013.

**(1)**

graph reading 1800

(iii) The population of the United Kingdom in 2013 was 64 000 000.

Calculate the number of people with chlamydia in 2013.

**(2)**

64 000 000 ÷ 100 000 = 640

**(Total for Question 3 = 7 marks)**

**4** (a) Figure 4 shows the structures in a leaf.

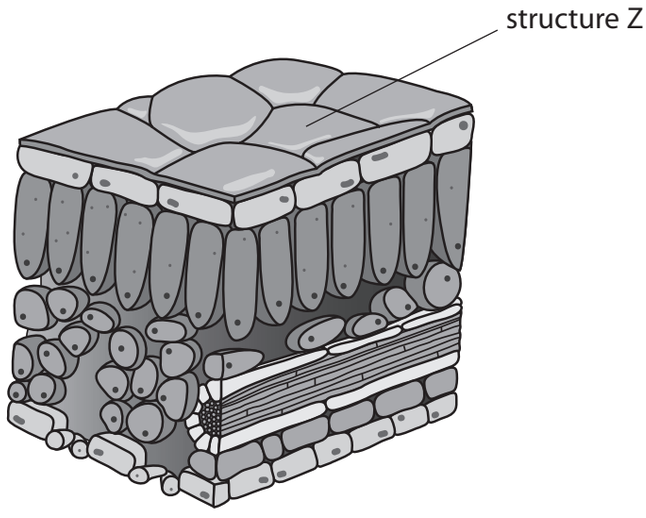



**Figure 4**

Explain how structure Z is involved in defence against pathogens.

**(2)**

• waxy cuticle / (physical) barrier
• to prevent entry to pathogens

(b) Chemicals can be extracted from plants.

Some of these chemicals can kill bacteria.

A scientist spread some bacteria on a nutrient agar plate as shown in Figure 5.

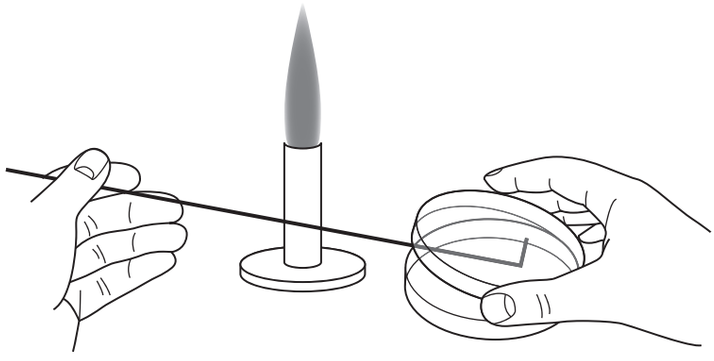


**Figure 5**

(i) What is being shown in Figure 5?

**(1)**

☒ **A** aseptic technique

☒ **B** cloning

☒ **C** genetic engineering

☒ **D** selective breeding

(ii) Explain why the scientist worked near to a Bunsen burner.

**(2)**

• Bunsen burner creates {a convection current/uplift}

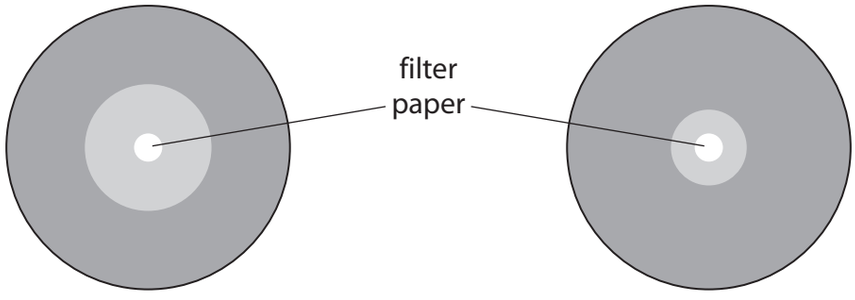
• prevents microorganisms in the air falling onto the agar plate / contamination

(c) A scientist spread bacteria onto the surface of two agar plates.

A filter paper disc was placed in the centre of each plate.

Each filter paper disc had been soaked in a different chemical extracted from plants.

The results are shown in Figure 6.




| chemical A | chemical B |
|---|---|
| radius of zone of inhibition = 12 mm | radius of zone of inhibition = 8 mm |

**Figure 6**

(i) The area of a circle is calculated using $\pi r^2$.

Calculate the area of the zone of inhibition for chemical A.

Use $\pi = 3.14$

**(2)**

3.14 x 12 x 12 (1) ..... mm$^2$
452.16

(ii) The scientist concluded that chemical A was more effective than chemical B at killing bacteria.

Give **two** variables the scientist needed to control to make this conclusion valid.

**(2)**

1 • species / type of bacteria (on both plates)

2 • volume of chemical

(d) Some crop plants have been genetically engineered to produce toxic chemicals in their leaves.

Explain **one** advantage of producing these genetically modified crop plants.

**(2)**

• kills insects /pests / pathogens (which feed on the crops)

• less damage to the crops / increased crop yield

• no need to use insecticides / pesticides

**(Total for Question 4 =11 marks)**

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**5** (a) Figure 7 shows the activity of the enzymes pepsin and trypsin at different pH levels.

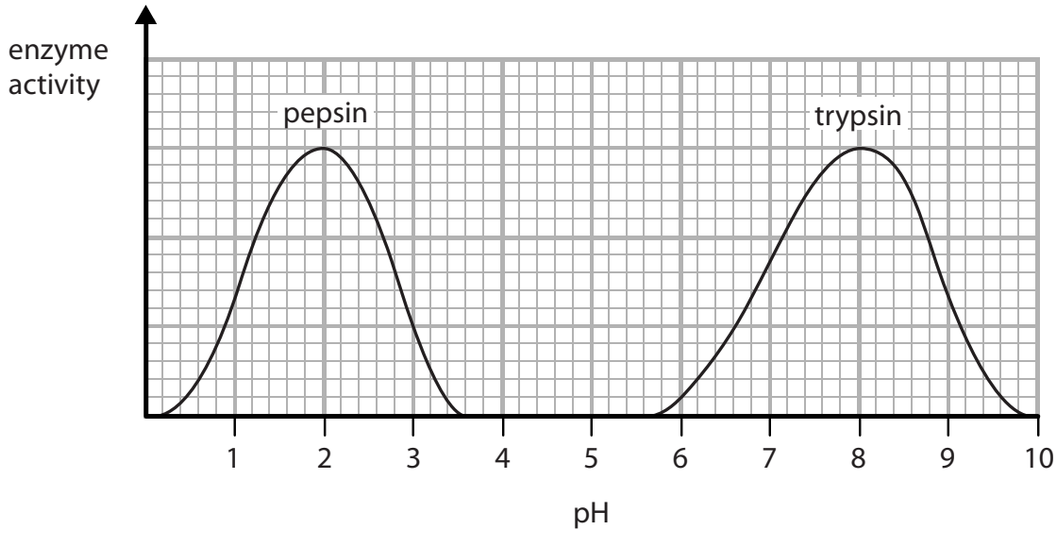


**Figure 7**

(i) Describe the trend in the graph for the enzyme **trypsin**.

Use data from the graph to support your answer.

**(4)**

• reference to enzyme activity
• (the enzyme activity) increases from pH 5.8 to pH 8
• optimum (activity) at pH 8

• (enzyme activity) decreases between pH 8 and pH 9.8

(ii) State the optimum pH for the enzyme **pepsin**.

**(1)**

2

(iii) Pepsin only works effectively in the stomach.

Describe the conditions in the stomach that allow pepsin to work effectively.

**(2)**

conditions in the stomach are pH 2 /acidic / low pH

• (The stomach secretes) hydrochloric acid

(b) At high pH values the active site of the enzyme pepsin changes shape.

When the active site of the enzyme changes shape, the enzyme is

**(1)**

☒ **A** specific

☒ **B** denatured

☒ **C** digested

☒ **D** dead

(c) State what is produced when proteins are digested.

**(1)**

Amino Acids

**(Total for Question 5 = 9 marks)**

**6** (a) A karyogram is a picture of the chromosomes found in the nucleus of a single cell.

Figure 8 shows a human karyogram.

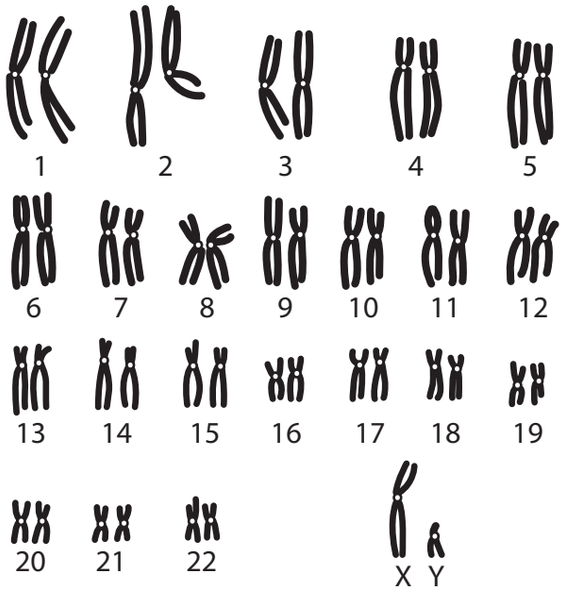


**Figure 8**

(i) State **two** reasons why this karyogram cannot be from a gamete (sex cell).

**(2)**

1 • this karyogram contains pairs of chromosomes / 46 chromosomes

2 • gametes only have 23 chromosome / chromosomes are not in pairs

(ii) State the gender shown by this karyogram.

**(1)**

Accept Boy

(iii) Complete the Punnett square to show how gender is inherited.

**(2)**

| | | male gametes | |
|---|---|---|---|
| | | X | Y |
| female gametes | X | XX | XY |
| | X | XX | XY |

(iv) State the probability that a child will be male.

**(1)**

0.5 / 50% / ½ / 1 in 2

(b) Figure 9 shows two sperm cells.

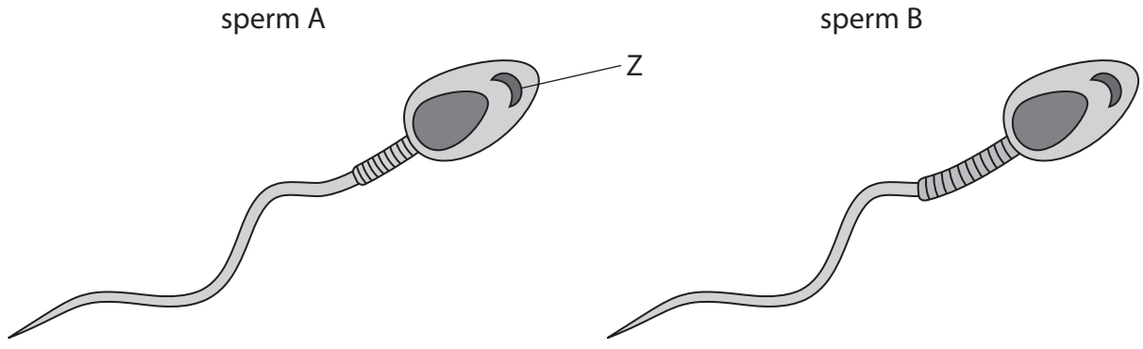


**Figure 9**

(i) Name structure Z.

**(1)**

Acrosome

(ii) Sperm B has a larger middle section than sperm A.

Explain why sperm B will be more likely to fertilise an egg than sperm A if they were both released at the same time.

**(3)**

• (middle section) contains mitochondria
• so has more mitochondria (in middle piece of sperm B)

• (sperm B can) release more energy / has a faster rate of respiration

**(Total for Question 6 = 10 marks)**

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**7** Starch is a nutrient in food.

Starch is a source of energy.

(a) Name the enzyme that breaks down starch.

**(1)**

Amylase

(b) Enzymes from different parts of the digestive system were used to investigate the breakdown of starch.

Figure 10 shows the apparatus used in this investigation.

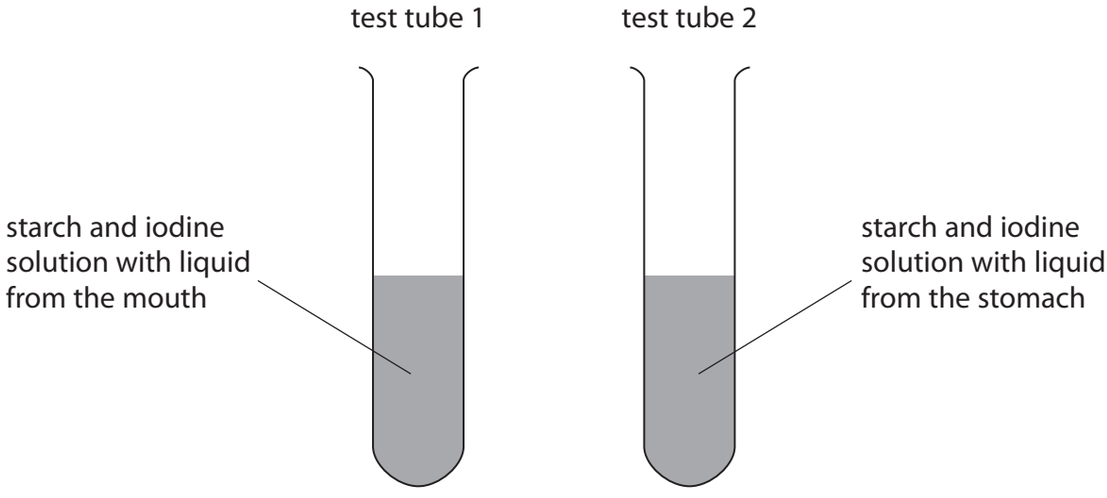


**Figure 10**

The colour of the contents of each test tube was recorded every two minutes for a total of ten minutes.

The results are shown in Figure 11.

| time in minutes | colour of the contents of each test tube | |
|---|---|---|
| | **test tube 1** starch and iodine solution with liquid from the mouth | **test tube 2** starch and iodine solution with liquid from the stomach |
| 0 | blue-black | blue-black |
| 2 | blue-black | blue-black |
| 4 | brown | blue-black |
| 6 | orange | blue-black |
| 8 | orange | blue-black |
| 10 | orange | blue-black |

**Figure 11**

(i) Give **one** reason why the contents of both test tubes were blue-black at the beginning of the investigation.

**(1)**

starch is present / iodine reacts with starch

(ii) Explain the results of this investigation after ten minutes.

**(3)**

• in test tube 1 starch has been broken down

• in test tube 2 starch has not been broken down

• because amylase is present in the mouth / no amylase in the stomach

*(c) The diagram shows equipment that can be used to measure the energy content of different foods.

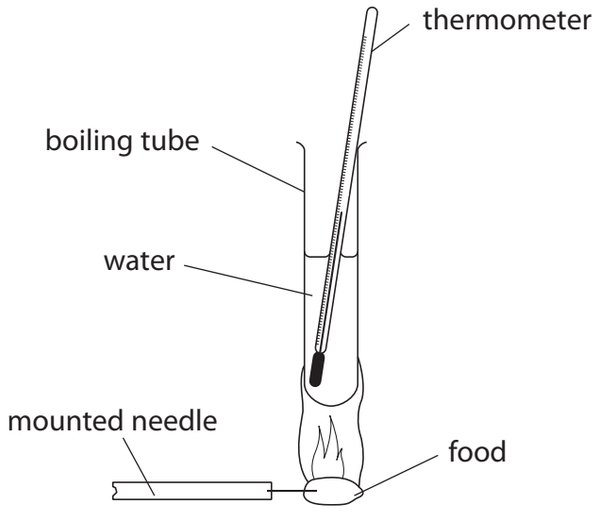


**Figure 12**

Devise a method to compare the energy content of two foods using this equipment.

Include details of how to control the variables.

**(6)**

AO3
Using the equipment
• add water to the boiling tube
• place food/named food on mounted needle
• take the starting temperature of the water
• ignite / burn the food
• take the temperature of the water when the food stops burning /record the highest temperature of the water
• repeat the test using the other food
AO2
Controlling variables
• mass of food measured with a balance
• volume of water measured with a measuring cylinder
• starting temperature of water measured with a thermometer
• distance of food from boiling tube measured with a ruler
• burning time measured with a stopwatch
• external temperature/draughts prevented by placing a screen around the apparatus

**(Total for Question 7 = 11 marks)**

**8** (a) James Watson and Francis Crick built a model that showed that DNA has a double helix structure.

(i) Which statement about DNA is correct?

**(1)**

☒ **A** each pair of bases is joined by hydrogen bonds

☒ **B** phosphate groups are joined by hydrogen bonds

☒ **C** nucleotides consist of a sugar and a phosphate group only

☒ **D** bases are joined to phosphate molecules

(ii) Figure 13 shows the percentage of each base in human DNA.

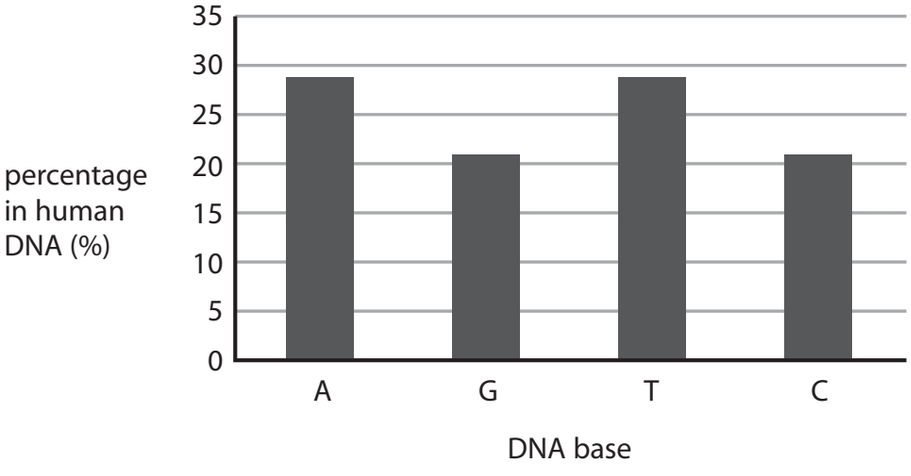


**Figure 13**

Describe how this data provides evidence for base pairing in DNA.

**(2)**

An answer that combines points of interpretation/evaluation to provide a logical description:
• amount of C and G is equal/amount of A and T is equal
• A pairs with T and C pairs with G

(b) A scientist obtained a mass of 0.0062 nanograms of DNA from a diploid human cell.

Calculate the mass of DNA the scientist should obtain from a haploid human cell.

Give your answer in picograms.

(1 nanogram = 1000 picograms)

**(2)**

3.1 picograms

(c) A student used the method shown in Figure 14 to compare the mass of DNA extracted from strawberry fruit cells and from kiwi fruit cells.

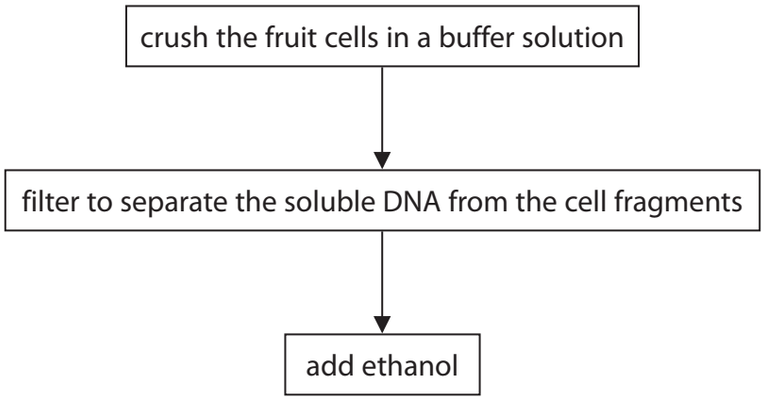


**Figure 14**

(i) State why ethanol is used.

**(1)**

To precipitate the DNA

(ii) State **two** variables the student needs to control when using this method to compare the mass of DNA from these two fruits.

**(2)**

1 • mass of fruit

2 • volume of buffer

(iii) The student repeated the experiment.

Give **one** reason why.

**(1)**

To obtain more data

(d) Mitosis and meiosis are processes that produce new cells.

Compare the outcomes of mitosis and meiosis.

**(3)**

• mitosis produces 2 cells and meiosis produces 4 cells

• mitosis produces genetically identical cells and meiosis produces genetically different cells

• mitosis produces diploid cells and meiosis produces haploid cells

**(Total for Question 8 = 12 marks)**

**9** (a) *Clostridium tetani* is a bacterium that can be found in soil.

It causes the infection tetanus.

Children are vaccinated against tetanus.

Explain why these children do not get tetanus if the bacteria enter their body through a cut in the skin.

**(3)**

• they are immune (to Clostridium tetani)

• because the vaccination contained an antigen / bacteria have antigens

• memory lymphocytes

(b) Colistin is an antibiotic used to treat infections in the bloodstream.

Some bacteria are resistant to Colistin.

Explain how these bacteria have become resistant to Colistin.

**(4)**

• people do not finish their course (of Colistin)

• natural selection /evolution (occurs)

• some bacteria have a mutation/ (genetic) variation

• (these) resistant bacteria survive /resistant bacteria reproduce

*(c) Figure 15 shows three stone tools found in different layers of rock.

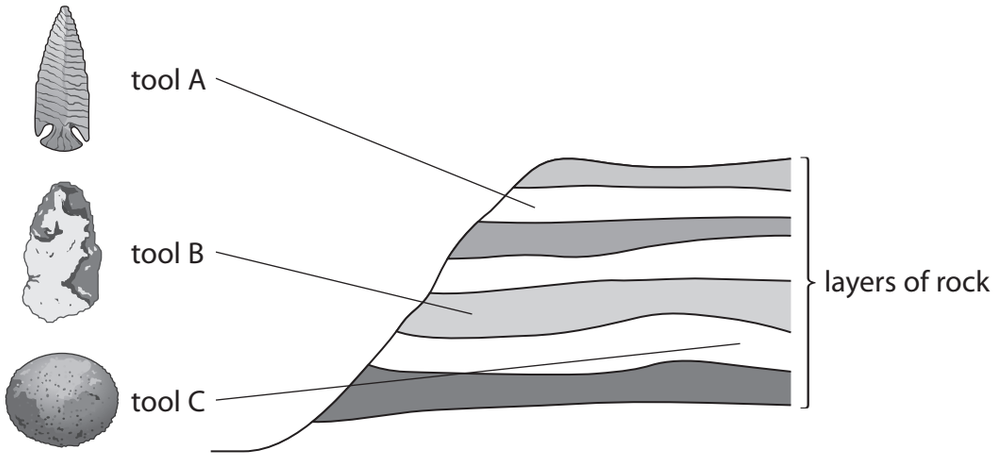


**Figure 15**

Explain how information from Figure 15 provides evidence for human evolution.

**(6)**

AO2 (6 marks)
Indicative content
Area 1 - Age of tools
• Younger rock layers towards top / older rock layers lower down
• C is older than B which is older than A
• Tools can be compared with other fossils from known time period
• Rocks can be dated, e.g. radiometric dating
Area 2 - Quality of tools
• A is the most sophisticated / most finely worked / more specialised / more refined / more symmetrical
• B shows some evidence of being worked / is rough
• C most basic / most simple / less sophisticated / unworked
Area 3 – Skills and intelligence
• tools show evidence of greater human manipulation / greater skill (between C and A)
• higher intelligence in more recent (species of) humans

**(Total for Question 9 = 13 marks)**

**10** (a) The effect of age on focusing distance was investigated.

Volunteers of different ages had their eyes tested.

Each volunteer was asked to read words from a book. The book was moved closer to their eyes.

When the words became out of focus, the distance was recorded.

Figure 16 shows the results.

| age of volunteers | distance (mm) | | | mean distance (mm) |
|---|---|---|---|---|
| | person 1 | person 2 | person 3 | |
| 40 | 256 | 261 | 257 | 258 |
| 45 | 282 | 275 | 280 | 279 |
| 50 | 292 | 301 | 297 | ? |
| 55 | 311 | 309 | 307 | 309 |

**Figure 16**

(i) Calculate the mean distance for the volunteers aged 50.

Give your answer to three significant figures.

**(3)**

297 mm

(ii) Give **one** conclusion that can be made from the data in Figure 16.

**(1)**

• as age increases focusing distance increases /ORA

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(iii) Give **two** improvements that are needed in this investigation before a valid conclusion can be made.

**(2)**

1 • use more people /repeat the test (with more people)

2 • use more ages

(b) Which part of the eye detects coloured light?

**(1)**

☒ **A** iris

☒ **B** lens

☒ **C** cones

☒ **D** cornea

(c) Figure 17 shows light rays entering the eye of a person with normal vision.

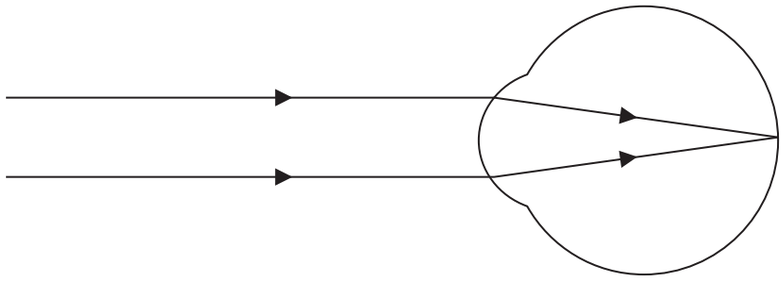

**Figure 17**

(i) Describe how light rays are focused to give normal vision.

**(2)**

• light rays {refracted / bent} {at the cornea /by the lens}

• (light rays) {converge / focus} on the retina / focal point is on the retina

(ii) Figure 18 shows light rays entering the eye of a person with an eye defect and two lenses that can be used to correct eye defects.

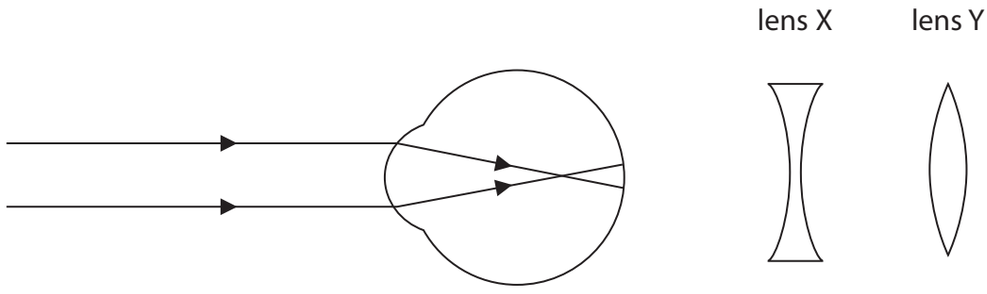


**Figure 18**

Explain which lens would correct the eye defect shown in Figure 18.

**(2)**

• lens X which is a {diverging/concave lens}

• {lens X/a diverging lens/a concave lens} will {diverge/spread} out the light rays

**(Total for Question 10 = 11 marks)**

**TOTAL FOR PAPER = 100 MARKS**

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