Write your name here

Surname	Other names

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

Centre Number	Candidate Number

Biology

Paper 1

Foundation Tier

Sample Assessment Materials for first teaching September 2016	Paper Reference
Time: 1 hour 45 minutes	**1BI0/1F**

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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S 5 0 0 4 1 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 Eye colour is controlled by genes.

The allele for brown eyes, B, is dominant to the allele for blue eyes, b.

(a) A female with blue eyes and a male with brown eyes are about to have a child.

Complete the Punnett square to determine the phenotype of the child.

(2)

		man	
		B	B
woman	b		
	b		

Phenotype of child .....

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(b) A scientist recorded the eye colour of 30 people.

The results are shown in Figure 1.

blue	green	blue	brown	brown	brown	hazel	blue	
brown	hazel	blue	blue	hazel	green	brown	brown	
blue	green	brown	brown	blue	hazel	blue	brown	brown
brown	blue	brown	brown	brown				

Figure 1

(i) Complete the tally chart, in Figure 2, for this data.

(2)

eye colour			
blue	brown	green	hazel
total.....	total.....	total.....	total.....

Figure 2

(ii) Give another appropriate method of displaying this information.

(1)

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A section of one allele for eye colour has the following DNA sequence:

ATGGCTAAGTA

(c) (i) Which sequence is the complementary DNA strand?

(1)

- ☒ **A** ATGGCTAAGTA
- ☒ **B** CGTTAGCCTGC
- ☒ **C** TACCGATTCAT
- ☒ **D** GCAATGGACG

(ii) Give **one** way in which a second allele for eye colour might be different.

(1)

.....

.....

Figure 3 outlines a method that can be used to extract DNA from fruit.

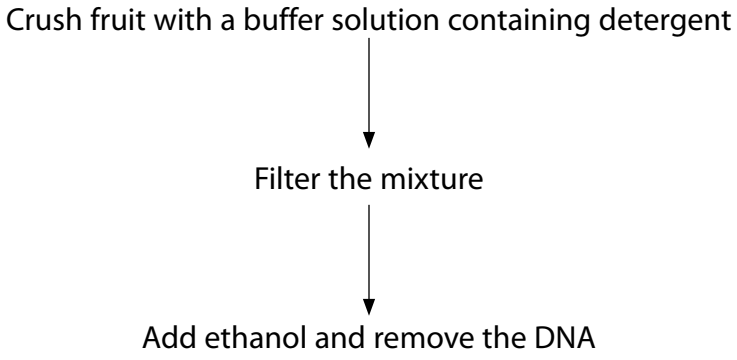

Figure 3

(d) (i) Give a reason for filtering the mixture.

(1)

.....

.....

(ii) What is the role of the ethanol?

(1)

- ☒ **A** denature the enzymes
- ☒ **B** disrupt cell membranes
- ☒ **C** supercoil the DNA
- ☒ **D** to precipitate the DNA

(Total for Question 1 = 9 marks)

2 Antibiotics can be used to treat Chlamydia, which is a sexually transmitted infection.

(a) What type of pathogen causes Chlamydia?

(1)

☒ **A** bacteria

☒ **B** fungus

☒ **C** protist

☒ **D** virus

Figure 4 shows the number of new cases of Chlamydia diagnosed each year, in a region of the UK, between 2000 and 2008.

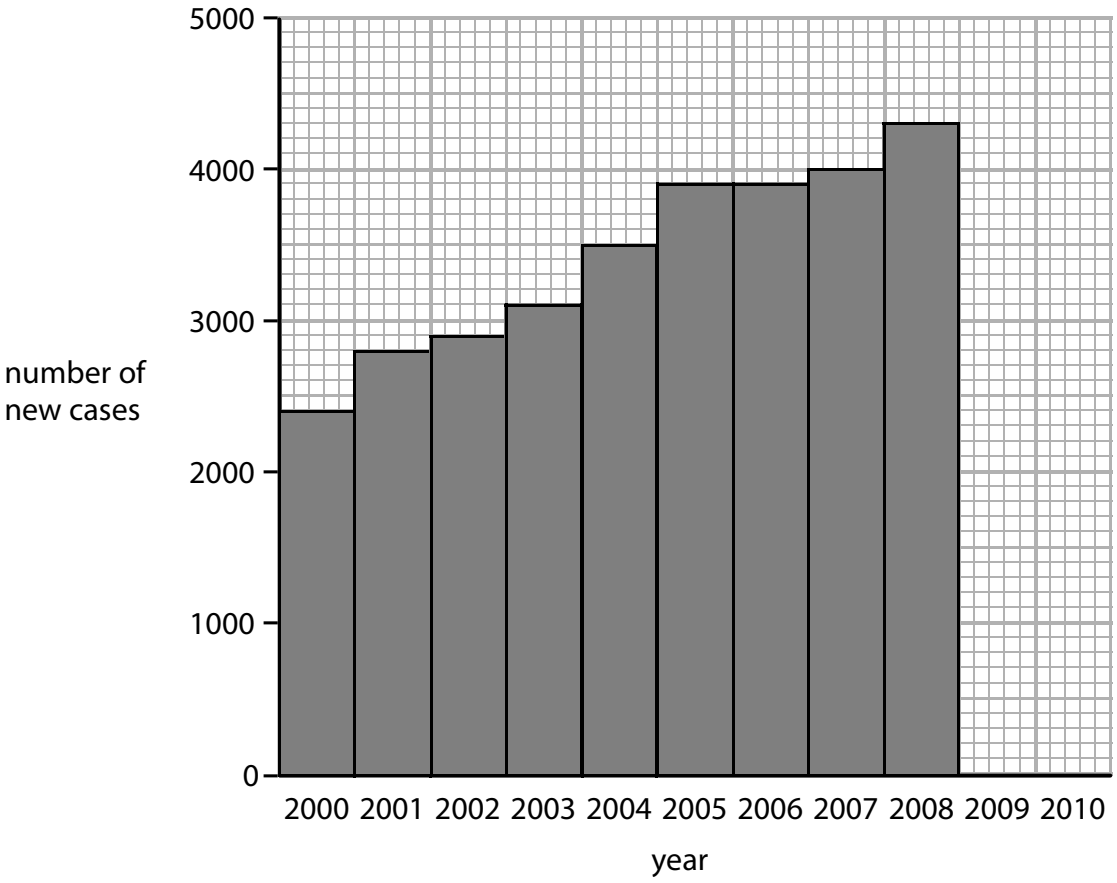

Figure 4

(b) (i) In 2009 there were 4800 new cases diagnosed.

In 2010 there were 4100 new cases diagnosed.

Plot this data on the graph in Figure 4.

(1)

(ii) Describe the trend in cases between 2000 and 2010.

(2)

People infected with Chlamydia are more likely to be infected with the STI Gonorrhoea.

(iii) Explain how people become infected with both Chlamydia and Gonorrhoea.

(2)

HIV is a sexually transmitted infection.

(c) Explain how infection with HIV can lead to AIDS.

(2)

(Total for Question 2 = 8 marks)

3 The sugar molecule glucose can be detected by a chemical test.

(a) Use words from the box to complete the sentences.

(2)

blue-black	iodine	brick red
Biuret	lilac	Benedict's

The ..... reagent is added to a tube containing a solution of glucose.

The tube is heated and the colour changes to a ..... colour.

Sugary drinks have been linked to tooth decay.

Tooth decay occurs when the enamel on teeth is dissolved.

A scientist investigates the effect of five different drinks on artificial tooth enamel.

She places 10 g of artificial tooth enamel into 100 ml of each drink. These are left for seven days.

The percentage change of mass for each sample of enamel is calculated.

Figure 5 shows the results.

drink	cola	milk	lemonade	squash	milkshake
percentage change of mass (%)	–3.4	0.0	–2.8	–0.6	–1.6

Figure 5

(b) (i) Which drink is most likely to cause tooth decay?

(1)

- ☒ **A** cola
- ☒ **B** lemonade
- ☒ **C** milkshake
- ☒ **D** squash

(ii) Explain why it might be better to drink milk rather than a milkshake.

Use data from Figure 5.

(2)

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The scientist is concerned that the conclusions from this experiment might **not** show the real effect of sugary drinks on teeth.

(iii) Give **two** ways in which the scientist could improve the investigation.

(2)

1 .....

.....

2 .....

.....

The sugar content of drinks is not the only dietary factor that can affect health.

(iv) Give **one** other dietary factor that a person should consider when choosing a drink.

(1)

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(Total for Question 3 = 8 marks)

4 Figure 6 shows a diagram of a cell.

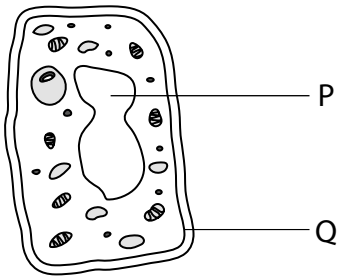

Figure 6

(a) (i) Which row of the table identifies both structure P and structure Q?

(1)

		structure P	structure Q
☒	**A**	nucleus	cell membrane
☒	**B**	nucleus	cell wall
☒	**C**	vacuole	cell membrane
☒	**D**	vacuole	cell wall

(ii) Plant cells have a cell wall and a large vacuole.

Draw one straight line from each structure to its function.

(2)

structure	**function**
	where respiration occurs
cell wall	contains cellulose to provide support
	where photosynthesis occurs
large vacuole	controls the cell
	stores cell sap

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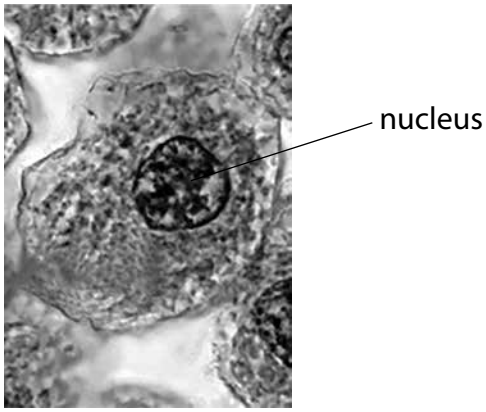
Figure 7 shows an image of an animal cell taken using a microscope with a 10× eyepiece lens and a 40× objective lens.



(Source: © Ed Reschke/Getty Images)

Figure 7

(b) (i) The total magnification of the animal cell is

(1)

- ☒ **A** ×50
- ☒ **B** ×140
- ☒ **C** ×400
- ☒ **D** ×4000

(ii) The diameter of the cell is 15 μm.

Use Figure 7 to estimate the diameter of the cell nucleus.

(1)

diameter of nucleus = ... μm

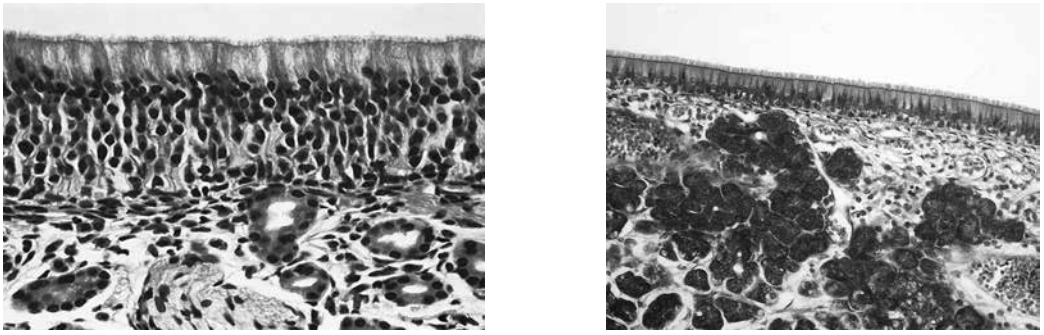
(iii) Give the measurement of 15 μm in mm.

(1)

..... mm

The development of electron microscopes has increased our understanding of cells and their features.

Figure 8 shows two images of ciliated epithelium, one taken using a light microscope and one using an electron microscope.



Light microscope

Electron microscope

(Science photolibrary Epithelium C022/2228 ©Steve Gschmeissner/Science Photolibrary

Figure 8

(c) Explain how the electron microscope image helps us to understand more about ciliated epithelium.

(3)

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(Total for Question 4 = 9 marks)

5 Cell division processes are used to produce body cells and gametes.

The nucleus of a daffodil cell has 46 chromosomes.

(a) (i) State the number of chromosomes in each pollen grain from this daffodil.

(1)

.....

.....

(ii) Humans share 35% of their DNA with a daffodil.

The human genome contains 6600 million bases.

Calculate the number of bases that are the same as a daffodil.

(2)

number of bases = ... million

(b) Figure 9 shows the development of a human embryo from a fertilised egg.

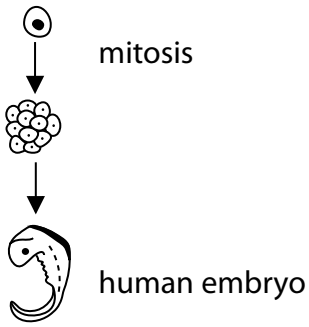

Figure 9

(i) Explain how many cells are produced from one fertilised egg, after two cell divisions by mitosis.

(2)

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(ii) Which process occurs causing the divided cells to become specialised?

(1)

- ☒ **A** meiosis
- ☒ **B** cloning
- ☒ **C** differentiation
- ☒ **D** cytokinesis

A student wanted to observe dividing cells under a microscope.

The student squashed the root tip of an onion plant on a microscope slide.

(c) (i) Describe how the student should use a light microscope to view the squashed root tip.

(3)

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(ii) Even though the slide was at the correct magnification, the student could not see the chromosomes in the dividing cells.

State what could be done to the slide to make the chromosomes more visible.

(1)

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(Total for Question 5 = 10 marks)

6 Figure 10 shows the human eye.

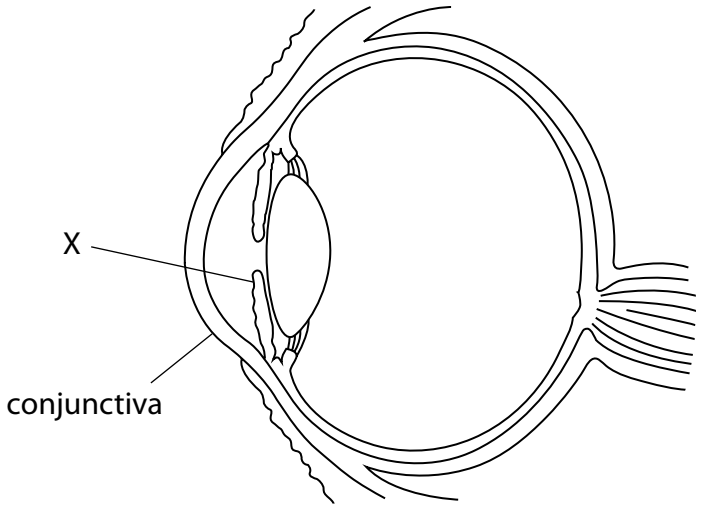

Figure 10

(a) (i) What is the part labelled X?

(1)

- ☒ **A** cornea
- ☒ **B** pupil
- ☒ **C** lens
- ☒ **D** iris

The conjunctiva is a membrane that covers the eyeball and inner surface of the eyelid.

(ii) Describe how the conjunctiva helps protects the eye from infection.

(2)

Cataracts are caused by cloudy patches that develop on the lens. The chance of being affected by cataracts is related to age.

Figure 11 shows the percentage of people affected by cataracts in different age categories.

age category / years	percentage chance of being affected by cataracts (%)
0–14	3.8
15–44	6.5
45–59	30.7
> 60	59.0

Figure 11

(b) (i) Explain one conclusion that can be made about the occurrence of cataracts, using the data above.

(2)

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In a survey of one of the age categories, 80 people out of 256 showed signs of developing cataracts.

(ii) Calculate which age category the 256 people are most likely to be taken from.

(2)

Age category .....

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The retina is a light receptor consisting of rod and cone cells.

(c) Describe how the information detected by the retina is transmitted to the brain.

(2)

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(Total for Question 6 = 9 marks)

7 Figure 12 shows the times when *Homo sapiens* and some of their ancestral species are thought to have lived.

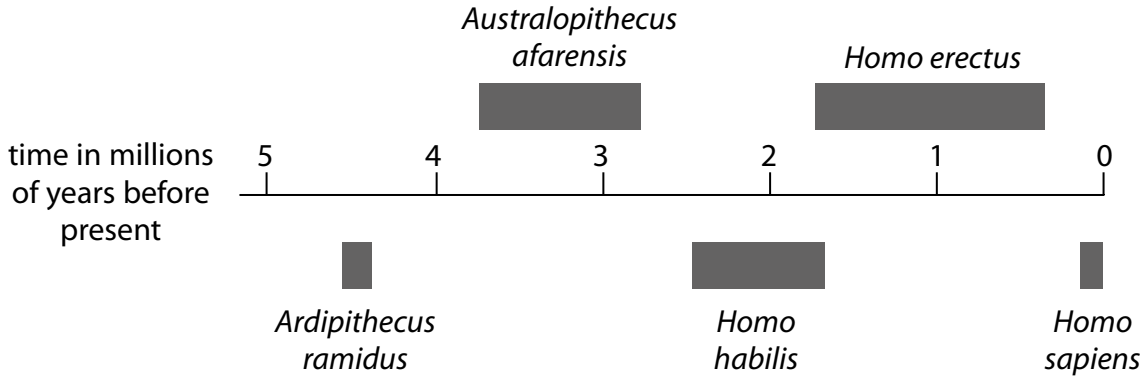

Figure 12

(a) Fossil remains of *Ardipithecus ramidus* were discovered in Ethiopia.

(i) Calculate the number of years *Ardipithecus ramidus* is thought to have inhabited the Earth.

(2)

Answer .....

(ii) Describe the evidence that scientists might have used to show that *Ardipithecus ramidus* inhabited the Earth earlier than *Homo habilis.*

(2)

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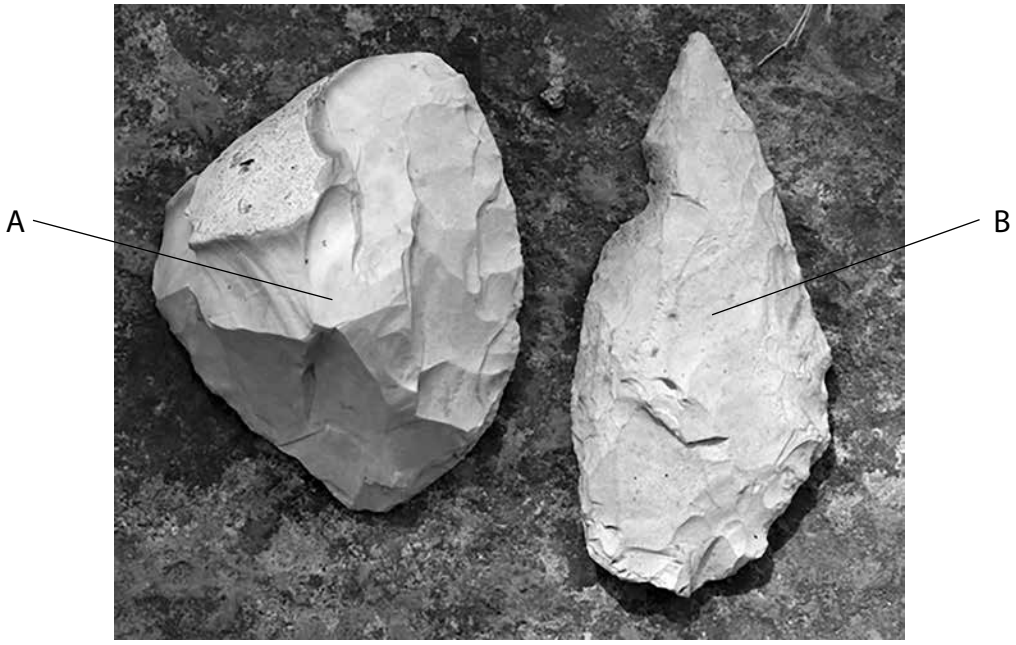
(iii) Suggest an explanation for the extinction of *Homo habilis*.

(2)

(iv) Figure 13 shows two stone tools, one used by *Homo habilis* and one used by *Homo erectus*.



(Source: Frederic Surmely/look at sciences/Science Photo Library)

Figure 13

Explain which stone tool was most likely to be used by *Homo erectus*.

Use information from Figure 12 and Figure 13.

(2)

(b) The population of humans on Earth has increased significantly, leading to food shortages.

The growth of drought-resistant crop plants could lead to an increase in food supply.

Describe how drought-resistant crop plants can be produced.

(3)

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(Total for Question 7 = 11 marks)

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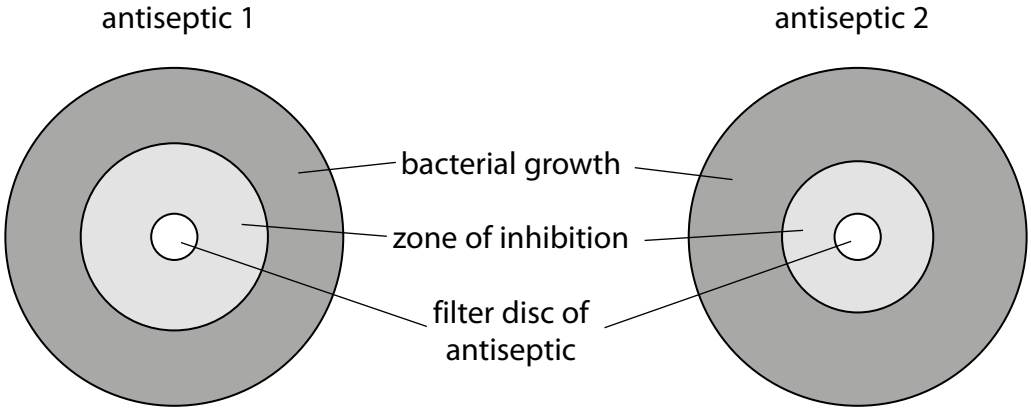
8 *Streptococcus pyogenes* is a bacterium that causes communicable infections.

(a) Scientists tested the ability of two antiseptics to kill *Streptococcus pyogenes* bacteria.

They spread *Streptococcus pyogenes* bacteria on two agar jelly plates and placed a small disc of filter paper containing antiseptic in the centre of each dish.

Figure 14 shows the results of the test after 24 hours of incubation.



antiseptic 1 zone of inhibition	
radius (mm)	12
area (mm^2)	452

Figure 14

(i) Calculate the area of the zone of inhibition for antiseptic 2.

Give the answer to 3 significant figures.

($\pi = 3.14$)

(3)

zone of inhibition for antiseptic 2 = ... mm^2

(ii) Give the antiseptic that is the most effective.

(1)

.....

.....

(iii) Both plates were incubated for 24 hours.

State **two** other variables the scientist would need to control during the test.

(2)

1 .....

.....

2 .....

.....

(b) The wire loop used to spread bacteria on an agar plate was heated in a Bunsen burner flame before being used.

(i) Explain why this aseptic precaution was used.

(2)

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.....

.....

.....

(ii) State **one** additional aseptic technique which would have been used for this investigation.

(1)

.....

.....

(c) Garlic is a plant that produces antiseptic chemicals.

Explain **one** benefit to garlic plants of producing antiseptic chemicals.

(2)

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(Total for Question 8 = 11 marks)

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9 The ratio of waist-to-hip measurements can be used to determine the risk of a person developing cardiovascular disease.

(a) Calculate the waist-to-hip ratio for a person with a waist measurement of 830 mm and a hip measurement of 0.99 m.

Give your answer to two decimal places.

(2)

Answer = ...

(b) Dieting can reduce the effects of cardiovascular disease.

A scientist is planning to test a new diet for weight loss.

She selects 40 obese people to take part in the test.

All the obese people are between 20 and 30 years of age.

(i) State **two** other factors the scientist should control when selecting the people.

(2)

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(ii) Devise a plan the scientist could use to test the effectiveness of the new diet using the 40 obese people.

(3)

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Smoking is a lifestyle factor that can cause many diseases.

Figure 15 shows the trends in smoking between 1960 and 2010 for men and women.

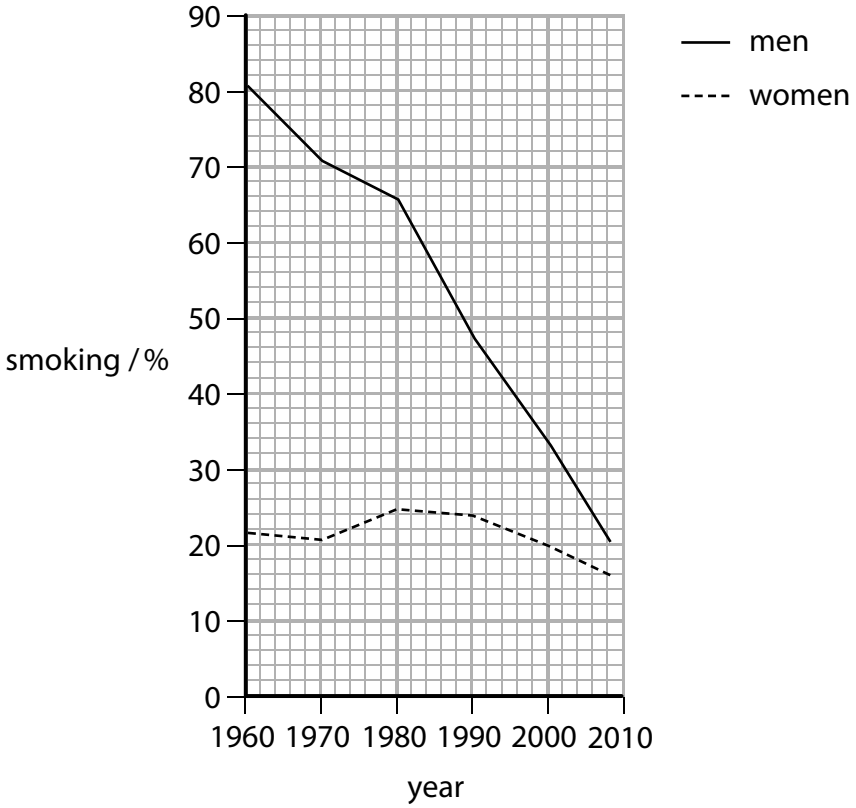

Figure 15

*(c) Explain how the changes in the trends for smoking may affect the occurrence of cardiovascular disease.

(6)

(Total for Question 9 = 13 marks)

10 Gregor Mendel investigated the genetics of peas.

He did not know about genes but showed that inherited characteristics can be dominant or recessive.

(a) Explain how Mendel used homozygous tall and homozygous short pea plants to show that the tall allele is dominant to the short allele.

(2)

.....

.....

.....

.....

*(b) Figure 16 shows a drosophila fruit fly.

(Source: Science Photo Library)

Figure 16

The brown body colour of a drosophila fruit fly is dominant to black body colour and is not sex-linked.

Explain how Gregor Mendel could have used a brown drosophila fruit fly and a black drosophila fruit fly to show that brown body colour is dominant to black body colour.

(6)

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(c) Figure 17 shows a strawberry plant that has produced several runners and new strawberry plantlets are growing at the end of each runner. This is an example of asexual reproduction.

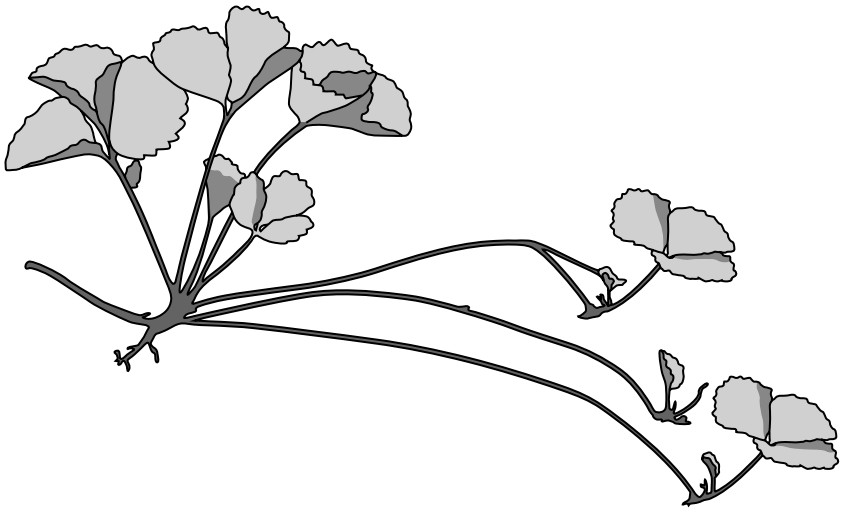

Figure 17

(i) Explain why asexual reproduction in strawberries is beneficial to strawberry farmers.

(2)

Strawberry fruits, containing seeds, are produced after a flower is fertilised.

(ii) Explain why seed production is an advantage to the strawberry plant.

(2)

(Total for Question 10 = 12 marks)

TOTAL FOR PAPER = 100 MARKS

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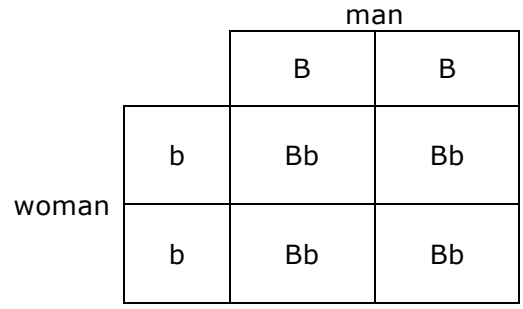
Paper 1 Foundation

Question number	Answer	Mark
1(a)	A completed Punnett square, including: • offspring alleles correct (1)  • phenotype of child: brown eyes (1)	**(2)**

Question number	Answer	Additional guidance	Mark
1(b)(i)	• All four columns correct (tally and total) (2) • One or two correct columns (1)	blue: 9 brown: 14 green: 3 hazel: 4	**(2)**

Question number	Answer	Mark
1(b)(ii)	Could be displayed as a bar chart/pie chart	**(1)**

Question number	Answer	Mark
1(c)(i)	C	**(1)**

Question number	Answer	Additional guidance	Mark
1(c)(ii)	Any one from: • mutation in the base sequence (1) • different base sequence (1) • different sequence length (1)	different amino acid sequence	**(1)**

Question number	Answer	Mark
1(d)(i)	To remove insoluble material	**(1)**

Question number	Answer	Mark
1(d)(ii)	D	**(1)**

Question number	Answer	Mark
2(a)	A	(1)

Question number	Answer	Mark
2(b)(i)	2009 bar plotted at 4800 and 2010 bar plotted at 4100	(1)

Question number	Answer	Additional guidance	Mark
2(b)(ii)	An answer that combines points of interpretation/evaluation to provide a logical description: • overall trend increases until 2009 (1) • decrease in the number of cases in 2010/correct manipulation of the data (1)	e.g. in 2010 it decreased by 700 cases (1)	(2)

Question number	Answer	Mark
2(b)(iii)	An explanation that combines identification – understanding (1 mark) and reasoning/justification – understanding (1 mark): • Chlamydia and Gonorrhoea are STI infections spread by the same mechanism (1) • individuals aren't using a barrier contraception method (1)	(2)

Question number	Answer	Mark
2(c)	An explanation that combines identification – knowledge (1 mark) and reasoning/justification – understanding (1 mark): • HIV destroys {white blood cells/cells of the immune system} (1) • therefore a reduced immune response makes the individual more susceptible to other communicable diseases (1)	(2)

Question number	Answer	Mark
3(a)	• Benedict's (1) • brick red (1) Answers must be in the correct order	(2)

Question number	Answer	Mark
3(b)(i)	A	(1)

Question number	Answer	Mark
3(b)(ii)	An explanation that combines identification via a judgement (1 mark) to reach a conclusion via justification/reasoning (1 mark): • milk does not change the mass of the enamel/milkshake reduces the mass of the enamel (1) • so therefore milk causes less tooth decay (1)	**(2)**

Question number	Answer	Mark
3(b)(iii)	Any two of the following points: • use real teeth (1) • clean the teeth (1) • expose the teeth for shorter time periods repeatedly (1)	**(2)**

Question number	Answer	Additional guidance	Mark
3(b)(iv)	Any one from: • energy content • fat content • vitamin and mineral content • caffeine level • alcohol content	accept other dietary factors	**(1)**

Question number	Answer	Mark
4(a)(i)	C	(1)

Question number	Answer	Mark
4(a)(ii)	One mark for each correct line cell wall → contains cellulose to provide support large vacuole → stores cell sap where respiration occurs where photosynthesis occurs controls the cell	(2)

Question number	Answer	Mark
4(b)(i)	C	(1)

Question number	Answer	Additional guidance	Mark
4(b)(ii)	5 (μm) ± 1.5	approximately a third of the diameter of the cell	(1)

Question number	Answer	Mark
4(b)(iii)	0.015 (mm)	(1)

Question number	Answer	Mark
4(c)	An explanation that combines identification – application of knowledge (1 mark) and reasoning/justification – application of understanding (2 marks): • higher magnification can be used (1) • so the cilia are more visible (1) • and the sub-cellular structures are visible (1)	**(3)**

Question number	Answer	Mark
5(a)(i)	23 (chromosomes)	**(1)**

Question number	Answer	Additional guidance	Mark
5(a)(ii)	6600 million ÷ 100 (1) × 35 = 2310 million (1)	award full marks for correct numerical answer without working	**(2)**

Question number	Answer	Mark
5(b)(i)	An explanation that combines identification – understanding (1 mark) and reasoning/justification – understanding (1 mark): • one cell produces two daughter cells for every division by mitosis (1) • two cell division steps produces four cells (1)	**(2)**

Question number	Answer	Mark
5(b)(ii)	C	**(1)**

Question number	Answer	Mark
5(c)(i)	An answer that combines knowledge (1 mark) and understanding (2 marks) to provide a logical description: • place the slide on the stage of the microscope and look through the eyepiece lens (1) Plus two from: • turning the focusing wheel/knob will obtain a clear image (when looking through the eyepiece lens) (1) • start by using the lowest objective lens magnification (1) • increase the magnification of the objective lens and refocus (1)	**(3)**

Question number	Answer	Mark
(c)(ii)	Use a stain (1)	(1)

Question number	Answer	Mark
6(a)(i)	D	(1)

Question number	Answer	Mark
6(a)(ii)	An answer that combines the following points of understanding to provide a logical description: • (the conjunctiva)forms a physical barrier between the inside of the eye and the environment (1) • and the lysozyme on the conjunctiva kills micro-organisms that enter the eye (1)	(2)

Question number	Answer	Mark
6(b)(i)	An explanation that combines identification via a judgement (1 mark) to reach a conclusion via justification/reasoning (1 mark): • occurrence of cataracts increases with age (1) • manipulation of the data, e.g. doubles between 45–59 and > 60 (1)	(2)

Question number	Answer	Mark
6(b)(ii)	$\frac{80}{256} \times 100 = 31\%$ (1) 45–59 category (1)	(2)

Question number	Answer	Mark
6(c)	An answer that combines knowledge (1 mark) and understanding (1 mark) to provide a logical description: • information is transmitted as an electrical signal (1) • and the signal travels down a sensory neurone from the receptor to the brain/signal travels along the optic nerve (1)	(2)

Question number	Answer	Mark
7(a)(i)	• 4.6 million – 4.4 million (1) • 0.2 million years/200 000 years (1)	(2)

Question number	Answer	Additional guidance	Mark
7(a)(ii)	An answer that combines knowledge (1 mark) and understanding (1 mark) to provide a logical description: • (scientists might look for) differences in the structural features of the fossil (1) • and *Ardipithecus ramidus* would be deeper in the rock layer than *Homo* {*habilis*/stone tools} (1)	e.g. *Ardipithecus ramidus* smaller cranial capacity	**(2)**

Question number	Answer	Additional guidance	Mark
7(a)(iii)	An explanation that combines identification – application of knowledge (1 mark) and reasoning/justification – application of understanding (1 mark): • likely to be out-competed by *Homo erectus* (1) • {for resources essential for survival/due to the presence of a new selection pressure} (1)	accept: named resources accept: named selection pressure, e.g. climate change, environmental change, disease	**(2)**

Question number	Answer	Additional guidance	Mark
7(a)(iv)	An explanation that combines identification via a judgement (1 mark) to reach a conclusion via justification/reasoning (1 mark): • stone tool B because it is more {sophisticated/worked} (1) • and *Homo erectus* lived more recently than *Homo habilis* (1)	accept: data quoted from the timeline	**(2)**

Question number	Answer	Mark
7(b)	An answer that combines the following points of application of knowledge and understanding to provide a logical description: • genetic variation means that some plants will be tolerant of drought conditions and these can be selected (1) • cross-pollinate these plants and grow the seeds under drought conditions (1) • select offspring and repeat over several generations (1)	**(3)**

Question number	Answer	Additional guidance	Mark
8(a)(i)	• radius 10 mm ± 1 mm (1) • area = πr^2 (1) • answer 314 (mm^2) (1) answer must be to 3 significant figures	if radius outside range but area calculated max 2 marks award full marks for correct numerical answer without working	**(3)**

Question number	Answer	Additional guidance	Mark
8(a)(ii)	antiseptic 1 (1)	ecf from (a)(i)	**(1)**

Question number	Answer	Mark
8(a)(iii)	Any two of the following points: • volume of antiseptic (1) • incubation temperature (1) • same type of agar (1) • amount of bacteria (1)	**(2)**

Question number	Answer	Mark
8(b)(i)	An explanation that combines identification – understanding (1 mark) and reasoning/justification – understanding (1 mark): • the Bunsen burner flame kills all microorganisms on the loop (1) • so only the desired bacteria are transferred to the loop/no unwanted microorganisms spread to the agar plate (1)	**(2)**

Question number	Answer	Mark
8(b)(ii)	Any one from: • keep the lids on the agar plates after growth (1) • use agar sterilised in an autoclave first (1) • work close to a Bunsen flame to create an uplift (1)	**(1)**

Question number	Answer	Mark
8(c)	An explanation that combines identification – application of knowledge (1 mark) and reasoning/justification – application of understanding (1 mark): • prevents damage to the plant (1) • because the chemicals produced by garlic kills pathogens/pests (1)	**(2)**

Question number	Answer	Additional guidance	Mark
9(a)	• 830 mm = 0.83 m (1) • 0.83/0.99 = 0.8383… = 0.84 to two d.p. (1) OR • 0.99 m = 990 mm (1) • 830/990 = 0.8383… = 0.84 to two d.p. (1) Answer must be given to 2 decimal places	award full marks for correct numerical answer without working	**(2)**

Question number	Answer	Mark
9(b)(i)	Any two of the following points: • similar BMI (1) • same gender profile (1) • similar amount (and type) of exercise (1)	**(2)**

Question number	Answer	Mark
9(b)(ii)	An answer that combines the following points to provide a plan: • weigh the 40 obese people (1) • half follow the new diet and half keep their normal diet (1) • after a fixed time period re-weigh the 40 people (1)	**(3)**

Question number	Indicative content	Mark
***9(c)**	Answers will be credited according to candidate's deployment of knowledge and understanding of the material in relation to the qualities and skills outlined in the generic mark scheme. The indicative content below is not prescriptive and candidates are not required to include all the material which is indicated as relevant. Additional content included in the response must be scientific and relevant. **AO2 (3 marks) and AO3 (3 marks)** AO3: Interpretation and evaluation from the graph • the trend is downwards • women are less likely to smoke than men • the trend for men is decreasing more steeply than for women • the decreasing trend in smoking should lead to a decrease in the occurrence of cardiovascular disease • the decrease of cardiovascular disease in men would be greater than in women AO2: Link between reducing smoking and cardiovascular disease: • less damage to alveoli so reduced effect on surface area of lungs • less fatty deposits build up in arteries so less chance of a heart attack or stroke • effect of nicotine raising heart rate and blood pressure is reduced • the risk of blood clotting is reduced so lower chance of heart attack or stroke	**(6)**

Level	Mark	Descriptor
	0	No awardable content
Level 1	1–2	• Interpretation and evaluation of the information attempted but will be limited with a focus on mainly just one variable. Demonstrates limited synthesis of understanding. (AO3) • The explanation attempts to link and apply knowledge and understanding of scientific ideas, flawed or simplistic connections made between elements in the context of the question. (AO2)
Level 2	3–4	• Interpretation and evaluation of the information on both variables, synthesising mostly relevant understanding. (AO3) • The explanation is mostly supported through linkage and application of knowledge and understanding of scientific ideas, some logical connections made between elements in the context of the question. (AO2)
Level 3	5–6	• Interpretation and evaluation of the information, demonstrating throughout the skills of synthesising relevant understanding. (AO3) • The explanation is supported throughout by linkage and application of knowledge and understanding of scientific ideas, logical connections made between elements in the context of the question. (AO2)

Question number	Answer	Mark
10(a)	An explanation that combines identification – understanding (1 mark) and reasoning/justification – understanding (1 mark): • Mendel crossed homozygous tall and homozygous short pea plants and produced all tall offspring (1) • therefore all the offspring had a heterozygous genotype, with one tall and one short allele showing that the tall allele is dominant (1)	**(2)**

Question number	Indicative content	Mark
***10(b)**	Answers will be credited according to candidate's deployment of knowledge and understanding of the material in relation to the qualities and skills outlined in the generic mark scheme. The indicative content below is not prescriptive and candidates are not required to include all the material which is indicated as relevant. Additional content included in the response must be scientific and relevant. **AO2 (6 marks)** • cross the brown fruit fly and black fruit fly • identify the phenotype of the offspring • all the phenotype will be brown body • remove the parent flies • cross brown offspring • identify the phenotypes of the 2nd generation offspring • $\frac{1}{4}$ will be black body and $\frac{3}{4}$ will be brown body • the results would show the same ratio as Mendel's pea plant crosses	**(6)**

Level	Mark	Descriptor
	0	No awardable content
Level 1	1–2	• The explanation attempts to link and apply knowledge and understanding of scientific enquiry, techniques and procedures, flawed or simplistic connections made between elements in the context of the question. (AO2) • Lines of reasoning are unsupported or unclear. (AO2)
Level 2	3–4	• The explanation is mostly supported through linkage and application of knowledge and understanding of scientific enquiry, techniques and procedures, some logical connections made between elements in the context of the question. (AO2) • Lines of reasoning mostly supported through the application of relevant evidence. (AO2)
Level 3	5–6	• The explanation is supported throughout by linkage and application of knowledge and understanding of scientific enquiry, techniques and procedures, logical connections made between elements in the context of the question. (AO2) • Lines of reasoning are supported by sustained application of relevant evidence. (AO2)

Question number	Answer	Mark
10(c)(i)	An explanation that combines identification – application of knowledge (1 mark) and reasoning/justification – application of understanding (1 mark): • asexual reproduction is a rapid reproduction technique allowing the production of more plants • as there is no requirement for cross pollination/higher crop yield/increased profit)	**(2)**

Question number	Answer	Mark
10(c)(ii)	An explanation that combines identification – application of knowledge (1 mark) and reasoning/justification – application of understanding (1 mark): • introduces variation into the population • which allows for natural selection of fitter plants/increased chance of the population surviving	**(2)**