Write your name here

Surname	Other names

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

Centre Number	Candidate Number

Biology

Paper 1: Biology 1

Higher Tier

Additional Sample Assessment Material for first teaching September 2016

Time: 1 hour 45 minutes

Paper Reference
1BI0/1H

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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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 There are four blood groups: A, B, AB and O.

(a) The alleles for these blood groups are I^A, I^B, I^O

(i) The possible genotypes for blood group B are

(1)

☒ **A** $I^A I^B$ and $I^B I^O$

☒ **B** $I^B I^B$ and $I^A I^B$

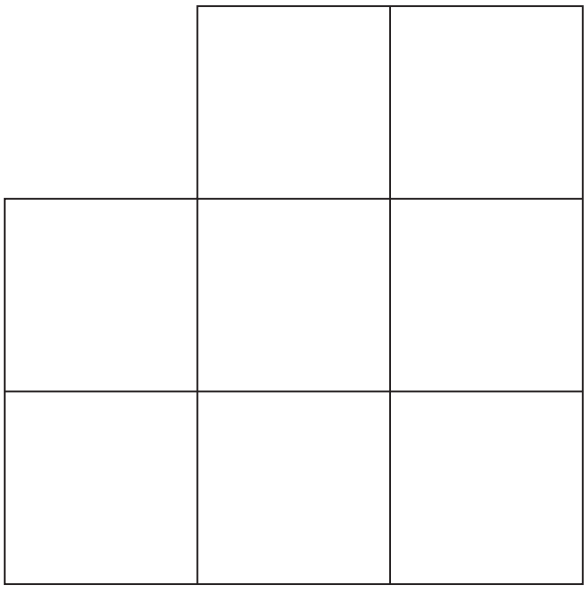
☒ **C** $I^O I^O$ and $I^B I^O$

☒ **D** $I^B I^B$ and $I^B I^O$

(ii) Two parents produce offspring that can only have blood group AB.

Complete the Punnett square to show this inheritance.

(2)



(b) Explain how a father who is blood group A and a mother who is blood group B can have a child that has blood group O.

(2)

(c) Explain why males are more likely than females to have a sex-linked genetic disorder such as haemophilia.

(3)

(Total for Question 1 = 8 marks)

2 In 2014, nearly 155 000 people died from cardiovascular disease in the UK.

(a) Give the reason why cardiovascular disease is a non-communicable disease.

(1)

.....

.....

(b) Drugs have been developed to treat people with cardiovascular disease.

Developing drugs involves many stages.
One stage involves testing the drugs on other mammals before testing them on humans.

Give **one** disadvantage of using other mammals for drug testing.

(1)

.....

.....

(c) Figure 1 shows information about the BMI and the lifestyle of two males, P and Q, who have the same height and age.

male	BMI	physical exercise in hours per week	percentage of total daily intake of nutrients (%)		
			carbohydrate	protein	fat
P	24	7	50	20	30
Q	29	2	50	15	35

Figure 1

(i) Which measurements are used to calculate BMI?

(1)

☒ **A** waist and hip

☒ **B** hip and mass

☒ **C** height and mass

☒ **D** waist and height

(ii) Explain which male has a greater risk of developing cardiovascular disease.

(3)

(d) Figure 2 shows the use of a stent to treat cardiovascular disease.

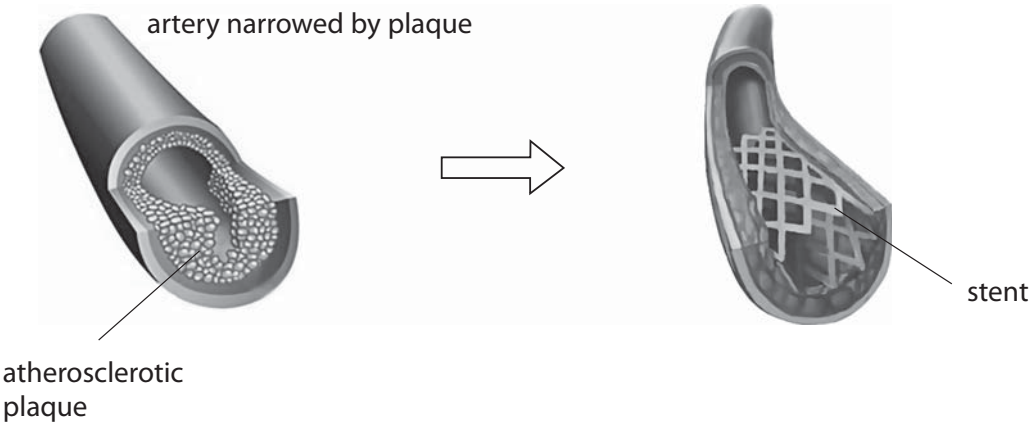


Figure 2

Explain how a stent works to treat cardiovascular disease.

(3)

(Total for Question 2 = 9 marks)

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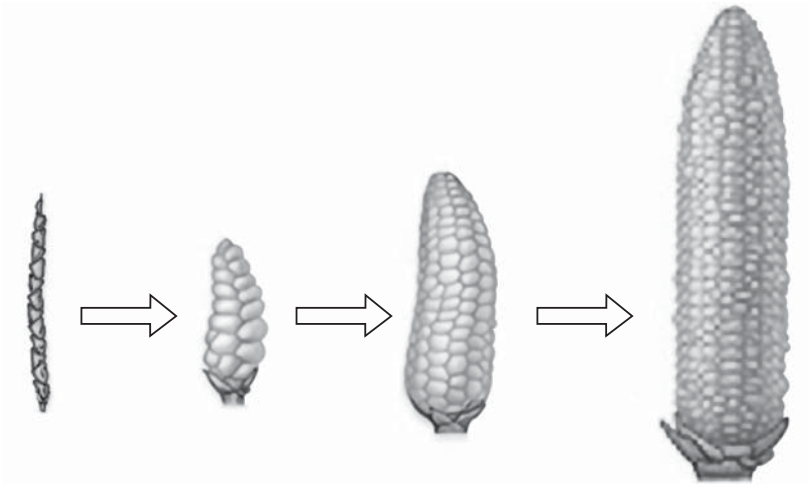
3 Corn is one of the world's most important crop plants.

Native Americans grew an early form of corn called teosinte.
Modern corn has been developed by selective breeding of teosinte plants.

Figure 3 shows some stages in the development of modern corn.



teosinte modern corn

Figure 3

(a) Give reasons why native Americans selectively bred teosinte.

(2)

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(b) Describe how selective breeding has produced modern corn.

(3)

(c) Genetic engineering can also be used to produce a new variety of modern corn.

Describe how the genome of this new variety of corn is different from the genome of corn that has not been genetically engineered.

(2)

(d) Explain why restriction enzymes are used in the process of genetic engineering.

(2)

(Total for Question 3 = 9 marks)

4 Short-sightedness, also known as myopia, is a common eye defect.

Figure 4 shows a section through the human eye with light rays from a distant object.

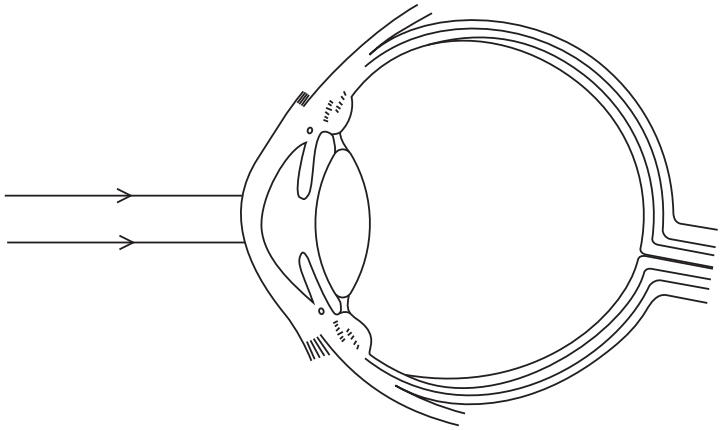

Figure 4

(a) (i) Complete the diagram to show the light rays for this individual who is short-sighted.

(2)

(ii) Explain how laser technology can be used to correct short-sightedness.

(2)

.....

.....

.....

.....

(iii) Which structure controls the amount of light entering the eye?

(1)

☒ **A** cornea

☒ **B** iris

☒ **C** retina

☒ **D** lens

(b) In an investigation, scientists asked three volunteers to look at a computer screen which changes from red to green.

Each volunteer was given a drink containing an amount of caffeine.

The volunteers hit a button with their index finger each time the screen changed colour.

Their reaction times were measured.

The results are shown in Figure 5.

	reaction time in seconds			
volunteer	**repeat 1**	**repeat 2**	**repeat 3**	**mean**
volunteer 1 – 100 mg caffeine	0.45	0.52	0.50	0.49
volunteer 2 – 300 mg caffeine	0.22	0.16	0.24	0.21
volunteer 3 – 600 mg caffeine	0.19	0.19	0.22	0.20

Figure 5

(i) Describe the effect of concentration of caffeine on the reaction times of these volunteers.

(2)

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.....

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(ii) Give **two** ways in which the scientists could improve this investigation.

(2)

1 .....

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2 .....

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(Total for Question 4 = 9 marks)

5 (a) Figure 6 shows a photomicrograph of onion cells.

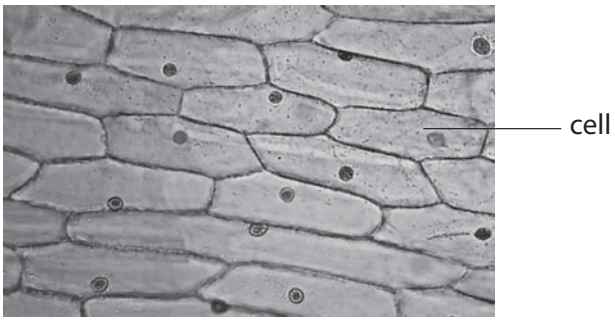

Figure 6

(i) The width of the labelled cell in Figure 6 is 6 mm. The cell has been magnified 750 times.

Calculate the actual width of this cell in mm.

Give your answer in standard form.

(3)

..... mm

(ii) The most appropriate unit of measurement to record the length of a cell under a light microscope is a

(1)

☒ **A** centimetre

☒ **B** micrometre

☒ **C** nanometre

☒ **D** picometre

(b) Give the name of the phase of the cell cycle during which DNA replication takes place.

(1)

.....

(c) During prophase of mitosis, the

(1)

☒ **A** cell elongates

☒ **B** cell halves in size

☒ **C** cytoplasm divides

☒ **D** nuclear membrane breaks down

(d) Figure 7 shows a plant cell in anaphase of mitosis.

Figure 7

Describe what occurs during anaphase of mitosis.

(3)

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(Total for Question 5 = 9 marks)

6 Some students investigated the effect of sucrose concentration on the change in mass of beetroot chips.
A beetroot chip was weighed, immersed in water for 30 minutes and then reweighed.
This was repeated using five more beetroot chips and five different concentrations of sucrose solution.
The results are shown in Figure 8.

chip	concentration of sucrose solution mol per dm^{-3}	starting mass of beetroot chip in grams	end mass of beetroot chip in grams
1	0.0 (water)	2.56	3.89
2	0.2	2.47	2.88
3	0.4	1.99	2.00
4	0.6	2.30	2.12
5	0.8	2.15	1.84
6	1.0	2.22	1.62

Figure 8

(a) (i) Calculate the percentage change in mass for chip 5.

Give your answer to an appropriate number of decimal places.

(3)

..... %

(ii) Explain the difference in the changes in mass of chip 5 and chip 2.

(3)

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*(b) A student set up an experiment to investigate osmosis as shown in Figure 9.

The student used visking tubing which is a partially permeable membrane.

The student put 25 cm^3 of 20% sucrose solution into visking tube 1 and 25 cm^3 of distilled water into visking tube 2.

Both tubes were placed in a 5% sucrose solution and left for 1 hour.

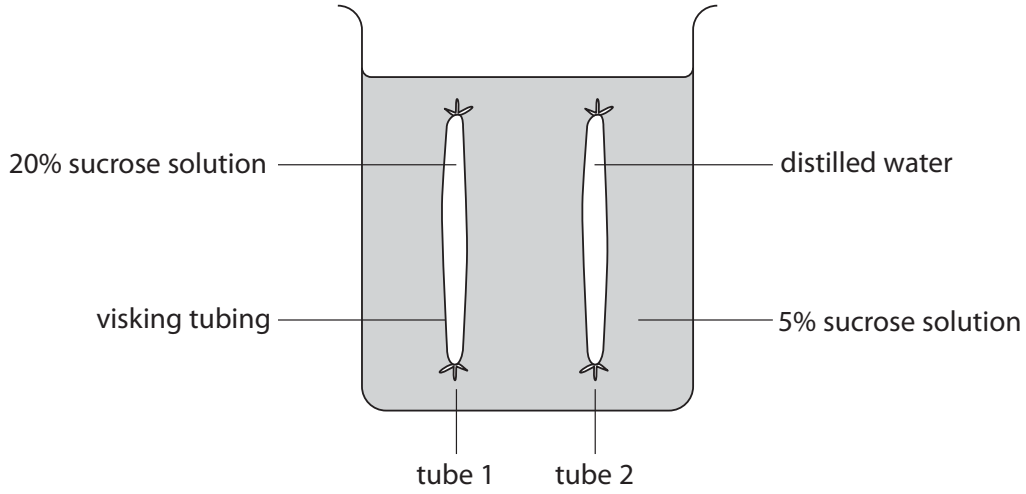

Figure 9

Explain how and why tube 1 and tube 2 would look different after one hour.

(6)

(Total for Question 6 = 12 marks)

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7 The enzyme proteinase K is used to extract DNA from skin cells.

(a) (i) Explain why proteinase K is used to extract DNA from skin cells.

(2)

(ii) Describe the safety precautions that should be used when handling human tissue in a laboratory.

(3)

(iii) Proteinase K is usually stored at 4 °C.

Figure 10 shows the effect of storage temperature on the activity of proteinase K.

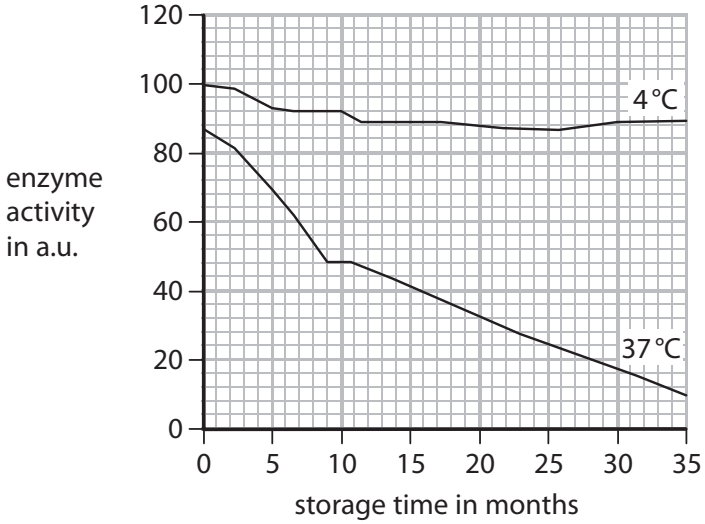

Figure 10

Explain how the activity of proteinase K changes when stored at 37 °C.

(2)

(b) Proteinase K is produced during protein synthesis.

Describe how the gene coding for proteinase K is transcribed to produce a strand of mRNA.

(3)

(Total for Question 7 = 10 marks)

8 Catalase is an enzyme.

Catalase breaks down hydrogen peroxide into oxygen and water.

(a) The effect of pH on the activity of catalase was investigated. The volume of oxygen produced in one minute at each pH was recorded.

The results can be seen in Figure 11.

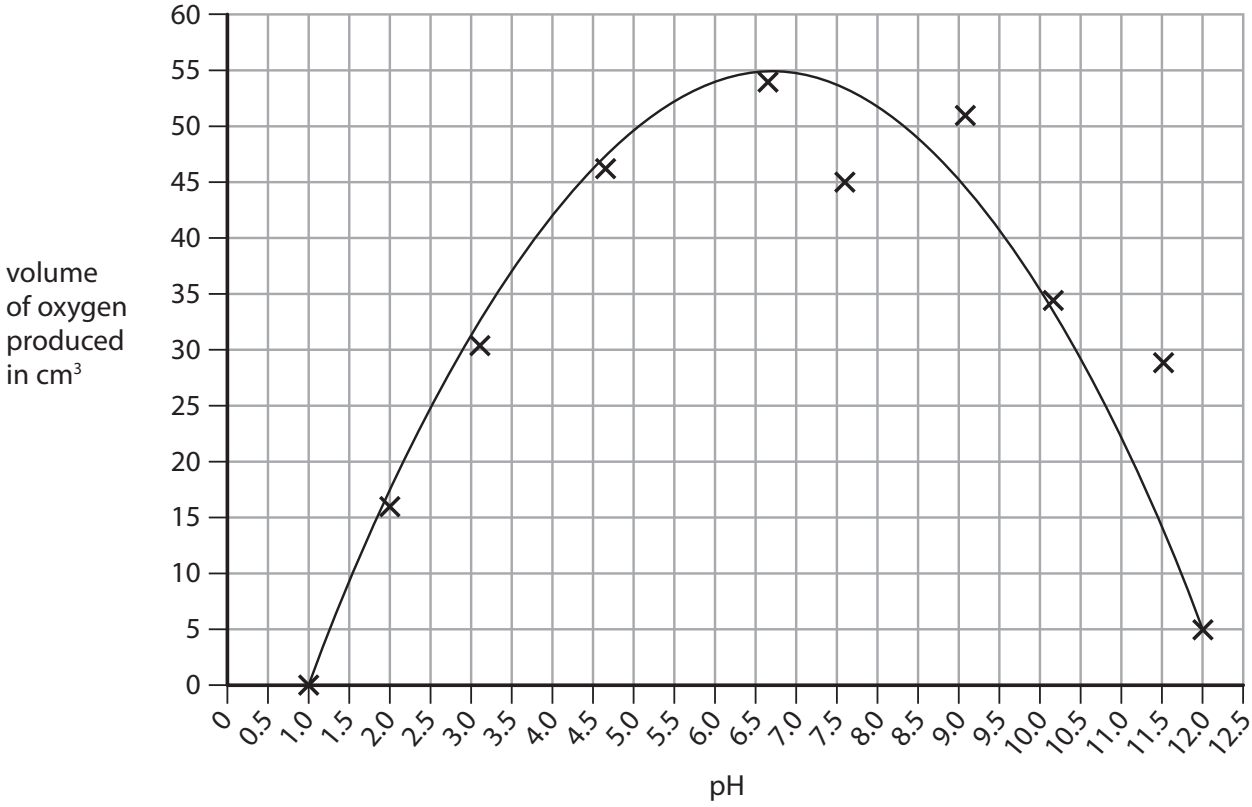

Figure 11

(i) Describe the effect of pH on the activity of catalase.

(2)

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.....

.....

(ii) Explain why the volume of oxygen produced changes above pH 7.

(3)

(iii) The investigation was improved.

State **two** variables that should be controlled in the improved method.

(2)

1 .....

2 .....

(b) The results for the improved method are shown in Figure 12.

	volume of oxygen produced in cm^3				
pH	**repeat 1**	**repeat 2**	**repeat 3**	**repeat 4**	**mean**
1	1.2	1.6	1.4	1.8	1.5
4	37.7	48.3	38.1	39.9	38.6
7	53.0	51.2	52.8	61.0	
10	29.0	28.5	29.6	28.7	29.3
12	5.2	1.8	1.0	1.4	1.4

Figure 12

(i) Calculate the most appropriate mean volume of oxygen produced at pH 7.

(2)

..... cm^3

(ii) Describe how the method could be developed to find the optimum pH for catalase activity.

(2)

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(Total for Question 8 = 11 marks)

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9 (a) A student was provided with one Petri dish containing sterile agar jelly.

She transferred a culture of bacterium **A** onto the Petri dish.

(i) Describe how the student would distribute the bacteria over the surface of the agar jelly.

(3)

(ii) The student then placed three paper discs, each with a 5 mm diameter, onto the agar jelly.

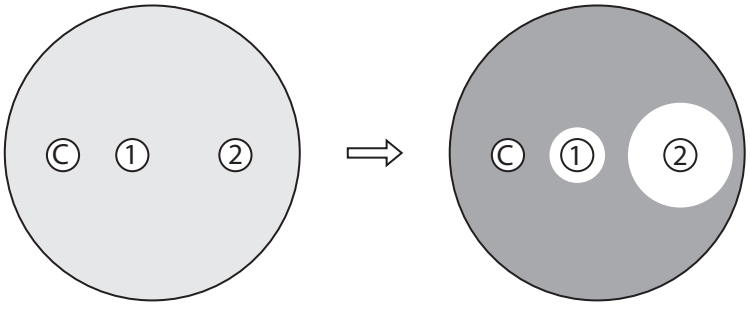
Disc C contained sterile water.

Disc 1 contained the antibiotic tetracycline.

Disc 2 contained the antibiotic penicillin.

The Petri dishes were incubated for 48 hours.

Figure 13 shows the Petri dishes before and after incubation.



before incubation after incubation

Figure 13

Describe the effect of the two antibiotics on bacterium **A**.

(2)

(iii) Disc 1 has a zone of inhibition with a diameter of 7 mm.

Disc 2 has a zone of inhibition with a diameter of 18 mm.

Calculate the area of the zone of inhibition for disc 2.

(2)

..... mm^2

*(b) Antibiotics have no effect on the lifecycle of viruses.

Describe the lifecycle of a lytic virus.

(6)

(Total for Question 9 = 13 marks)

10 (a) The bonds joining the two strands of a DNA molecule together are

(1)

- ☒ **A** weak peptide bonds
- ☒ **B** strong peptide bonds
- ☒ **C** weak hydrogen bonds
- ☒ **D** strong hydrogen bonds

(b) (i) Figure 14 shows the percentages of bases for three organisms.

organism	percentage of each base in DNA (%)			
	adenine	thymine	cytosine	guanine
Human	30.8	30.8	19.2	19.2
Beetle	28.4	28.4		
Ebola virus	23.7	17.0	26.2	27.0

Figure 14

Calculate the percentage of cytosine for the beetle.

(2)

.....%

(ii) Explain why the information given about the Ebola virus indicates that this virus does not have a typical DNA structure.

(3)

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(c) Figure 15 shows a Petri dish containing *E. coli* bacteria. The bacteria have been genetically modified to contain a phosphorescent gene so they glow in the dark.

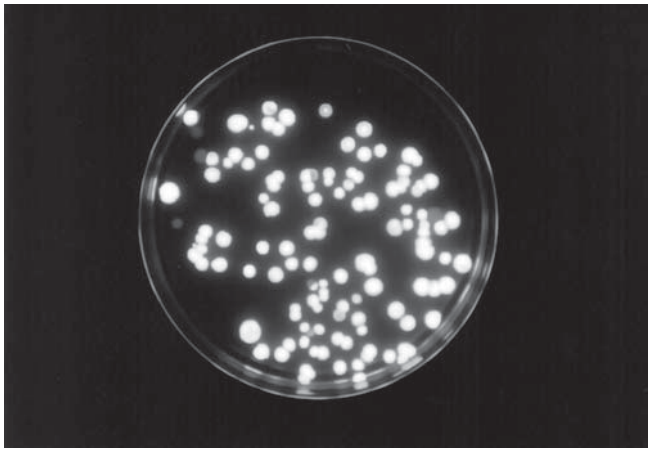

Figure 15

Explain how a bacterial cell can be genetically modified to glow in the dark.

(4)

(Total for Question 10 = 10 marks)

TOTAL FOR PAPER = 100 MARKS

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