Write your name here

Surname

Other names

**Pearson Edexcel
Level 3 GCE**

Centre Number

Candidate Number

Biology B

**Advanced
Paper 1: Advanced Biochemistry,
Microbiology and Genetics**

Sample Assessment Material for first teaching September 2015
Time: 1 hour 45 minutes

Paper Reference

9BI0/01

You may need a ruler, pencil and a calculator.

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.
- Show your working in any calculation questions and include units in your
  answer where appropriate.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*
- You may use a scientific calculator.
- 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.

Information

- The total mark for this paper is 90.
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*

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 ▶

S47568A
©2015 Pearson Education Ltd.

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   The photograph below shows an electron micrograph (EM) image of a chloroplast.

————K
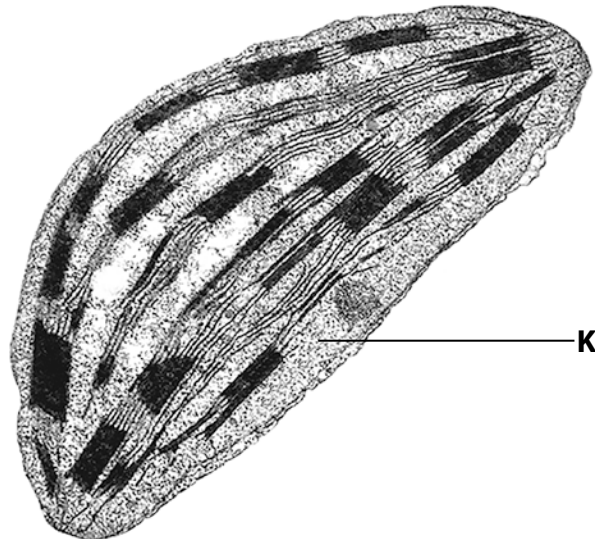
© Chloroplast, TEM Dr Jeremy Burgess/Science Photo Library

(a) Which of the following is correct for the part labelled **K**?

(1)

		Name	Reaction that takes place
☒	**A**	granum	light-dependent
☒	**B**	granum	light-independent
☒	**C**	stroma	light-dependent
☒	**D**	stroma	light-independent

(b) Describe the role of membranes inside the chloroplast.

(3)

....

....

....

....

....

....

....

....

(Total for Question 1 = 4 marks)

2 Retinitis pigmentosa is a genetic eye disease that affects rod cells. The disease results in night blindness and sight defects.

Induced pluripotent stem cells (iPS cells) are being used by scientists studying this disease.

(a) Which of the following is correct for a pluripotent cell?

(1)

		Is obtained from	Can differentiate into
☒	**A**	early embryo	any cell type
☒	**B**	early embryo	limited cell types
☒	**C**	late embryo	any cell type
☒	**D**	late embryo	limited cell types

(b) Describe how iPS cells can be produced.

(3)

....

....

....

....

....

....

(c) Describe how iPS cells could be used to cure retinitis pigmentosa.

(2)

....

....

....

....

(Total for Question 2 = 6 marks)

3 The classification of viruses is based on their structure and the type of nucleic acid that they contain.

(a) Which of the following is a reason why the influenza virus is classified as a retrovirus?

(1)

☒ **A** it has a capsid

☒ **B** it has an envelope

☒ **C** it contains RNA

☒ **D** it contains DNA

(b) Which of the following methods would be best for preventing the transmission of influenza through a population?

(1)

☒ **A** take paracetamol

☒ **B** wear a face mask

☒ **C** use insect repellent

☒ **D** take antibiotics

(c) Explain how the influenza virus has a pathogenic effect.

(4)

....

....

....

....

....

....

....

....

(Total for Question 3 = 6 marks)

4   The photograph below shows cells dividing by mitosis.
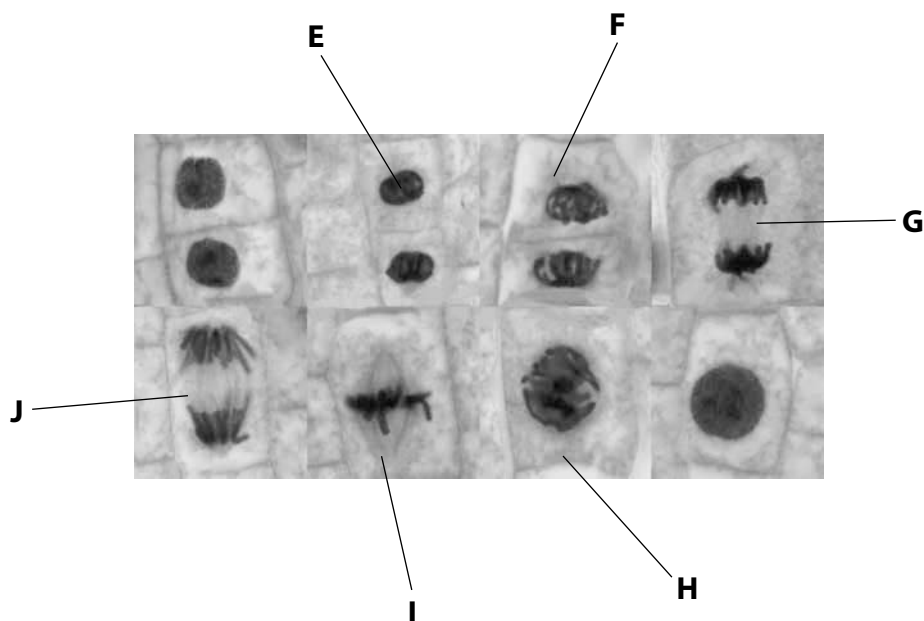
© Steve Gschmeissner / Science Photo Library

(a) The actual length of cell **J** is 23.5 μm.

   (i)   Calculate the magnification of this photograph.

   (3)

Answer ....

(ii) Describe what has happened in cell **J**.

(4)

....

....

....

....

....

....

....

....

(b) (i) Which sequence of letters represent the cells in order of their appearance in the phases of mitosis?

(1)

☒ **A** E, F, G H, I, J

☒ **B** G F, H I, J, E

☒ **C** H I, J, G F, E

☒ **D** J, I, H G F, E

(ii) Give a reason why there are differences in the appearance of cells **E** and **G**.

(1)

....

....

(Total for Question 4 = 9 marks)

BLANK PAGE

5 The diagram below shows a stage of the process of respiration in the cytoplasm of muscle cells.

```
┌─────────────────────────┐
│      monosaccharide      │
└─────────────────────────┘
             │
      ┌──────────┐
      │  Step 1  │
      └──────────┘
             │
             ▼
┌─────────────────────────┐
│   intermediate molecules │
└─────────────────────────┘
             │
      ┌──────────┐
      │  Step 2  │
      └──────────┘
             │
             ▼
┌─────────────────────────┐
│         pyruvate         │
└─────────────────────────┘
```
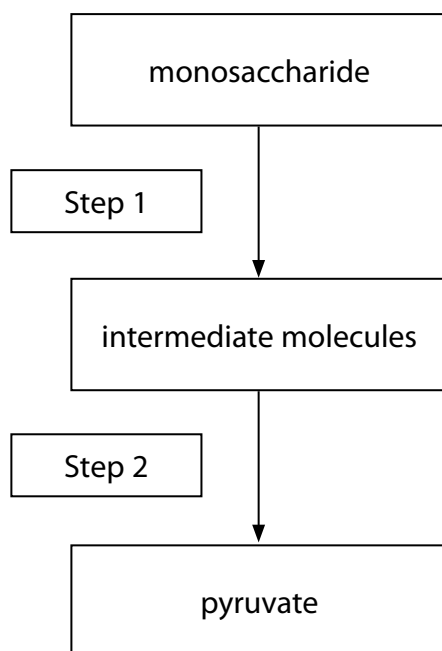
(a) What is the name of this stage?

(1)

- ☒ **A** Calvin cycle
- ☒ **B** glycogenolysis
- ☒ **C** glycolysis
- ☒ **D** Krebs cycle

(b) Which other products are formed during this stage?

(1)

- ☒ **A** ADP and carbon dioxide
- ☒ **B** ADP and oxidised coenzyme
- ☒ **C** ATP and carbon dioxide
- ☒ **D** ATP and reduced coenzyme

(c) What occurs in the first reaction of step 1?

(1)

- ☒ **A** condensation
- ☒ **B** hydrolysis
- ☒ **C** phosphorylation
- ☒ **D** photophosphorylation

(d) Describe what happens to the pyruvate when the muscle is supplied with oxygen.

(4)

....

....

....

....

....

....

....

(Total for Question 5 = 7 marks)

6 (a) Describe the action of bactericidal and bacteriostatic antibiotics.

(2)

....

....

....

....

(b) The resistance of one type of bacteria to a range of different antibiotics was investigated.

A lawn of bacteria was prepared by spreading a suspension of the bacteria over the surface of agar. Paper discs that had been soaked previously in different antibiotics were placed on top of the bacteria. The antibiotics were all the same concentration. The culture was incubated for 48 hours.

The diagram below shows the appearance of the culture after incubation.
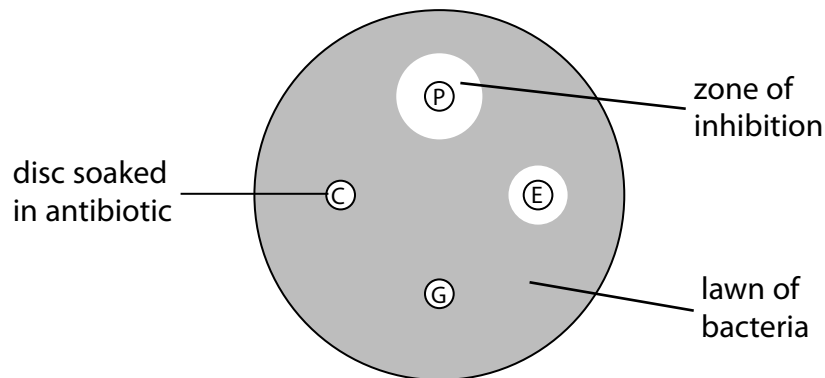
Key:

C = chloramphenicol

E = erythromycin

G = gentamycin

P = penicillin

Explain why these results indicate that the bacteria must be Gram positive.

(3)

....

....

....

....

....

....

(c) Plasmids with genes for resistance to antibiotics are widely used in gene technology. These plasmids are used to create recombinant bacteria.

Explain how culturing could be used to obtain recombinant bacteria.

(5)

....

....

....

....

....

....

....

....

....

....

....

(Total for Question 6 = 10 marks)

7 The order of bases in a section of DNA codes for a sequence of amino acids in a protein.

(a) Draw a diagram to show the structure of an amino acid.

(2)

(b) The diagram below shows the order of bases in a section of DNA that codes for part of a polypeptide chain.

A	A	T	C	G	C	C	G	G	A	T	A	T	G	G	C	A	A

leucine	alanine	alanine	tyrosine	threonine	valine

(i) Give the sequence of bases in the mRNA that codes for the amino acid leucine.

(1)

....

....

(ii) Explain how this length of DNA will code for this sequence of amino acids.

(3)

....

....

....

....

....

....

(iii) Discuss the possible consequences for this sequence of amino acids if a point mutation occurred in this section of DNA.

(6)

....

....

....

....

....

....

....

....

....

....

....

....

(Total for Question 7 = 12 marks)

8 A broth culture for growing bacteria was set up.
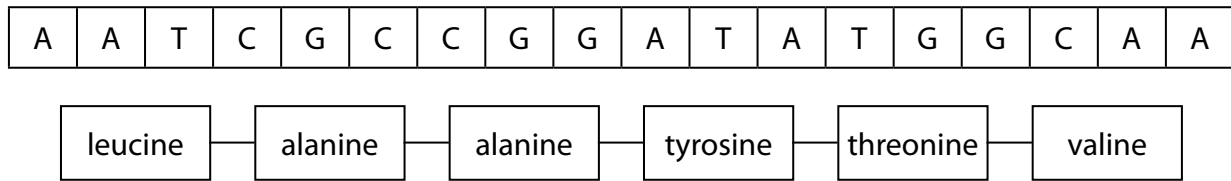
Dilution plating was used to determine the number of live bacteria in the culture over a period of 24 hours.

The graph below shows the number of live bacteria in the culture during this 24-hour period.
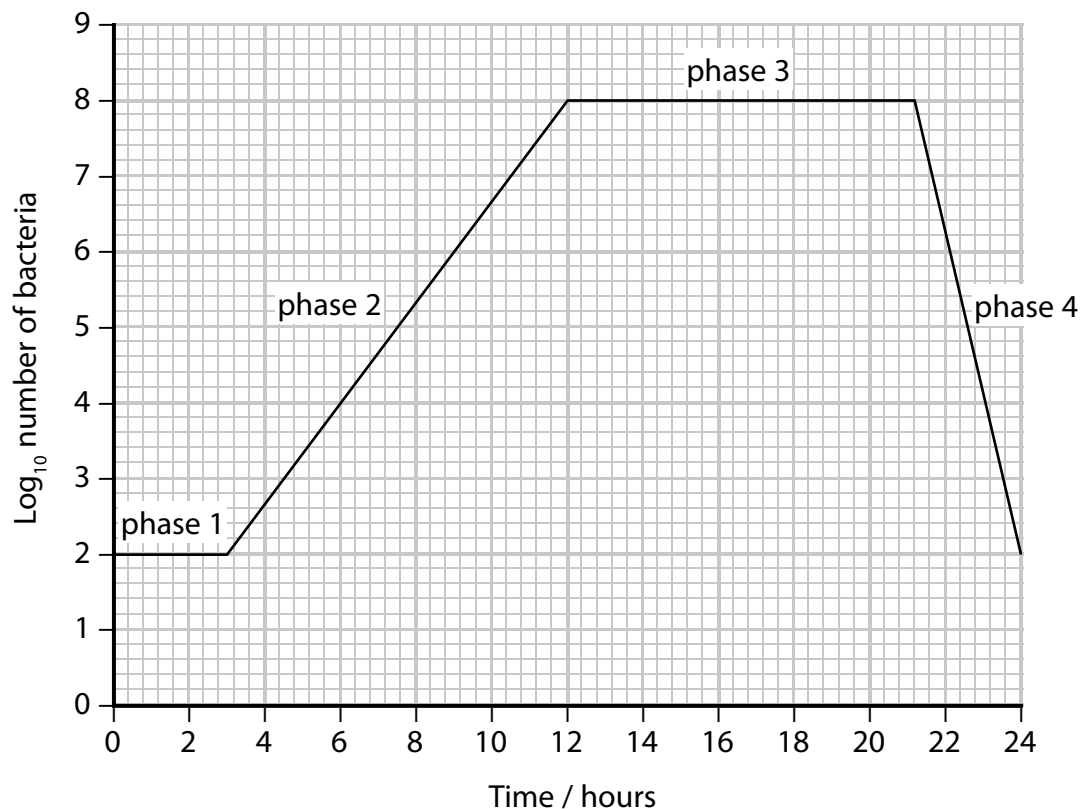
(a) Which is the correct order of the phases 1 to 4 shown on the graph?

(1)

☒ **A** lag, log, death, stationary

☒ **B** lag, log, stationary, death

☒ **C** log, lag, death, stationary

☒ **D** log, lag, stationary, death

(b) Evaluate the use of dilution plating and optical methods for determining the number of bacterial cells in a culture.

(6)

....

....

....

....

....

....

....

....

....

....

....

....

....

(c) Calculate the growth rate constant (k) for phase 2 of this culture, using the formula:

$$k = \frac{\log_{10} N_t - \log_{10} N_0}{0.301 \times t}$$

(4)

Answer ....
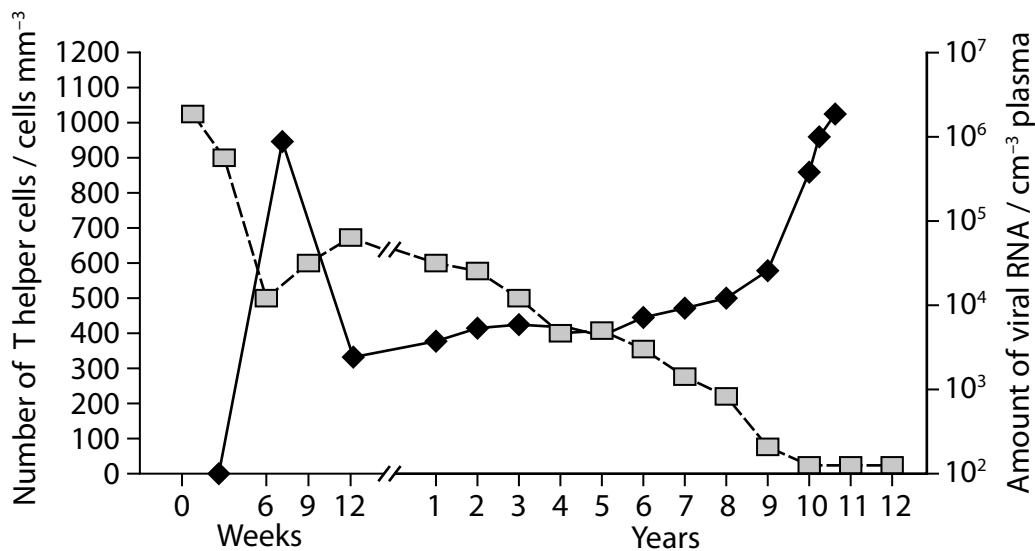
(Total for Question 8 = 11 marks)

BLANK PAGE

Turn over for question 9

9 The Human Immunodeficiency Virus (HIV) causes an infection called Acquired Immune Deficiency Syndrome (AIDS).

The virus attacks T helper cells in the body and eventually leads to death, usually as a result of opportunistic infections.

The graph below shows changes in the T helper cell count and in the amount of viral RNA in a person during a period from initial HIV infection to death.

(a) Calculate the percentage change in viral RNA from week two to week six

(2)

Answer ....

(b) Analyse the data to explain the changes in the T helper cell count from initial HIV infection until death.

(5)

(c) The HIV virus contains an enzyme called reverse transcriptase. This enzyme uses the viral RNA as a template to synthesise a single strand of complementary DNA in the host cell.

(i) A sequence of bases in a section of RNA from HIV is UCCCCAGCG

Which of the following shows the correct sequence of bases in the single strand of complementary DNA made using reverse transcriptase?

(1)

☒ **A** UCCCCAGCG

☒ **B** AGGGGTCGC

☒ **C** AGGGGUCG

☒ **D** TCCCCTCGC

(ii) Describe how other enzymes convert the complementary single strand of DNA into a double strand of DNA in the host cell.

(2)

....

....

....

....

(d) There are drugs that can be taken to reduce the reproduction of HIV.

Explain why a patient is usually given several different drugs at the same time.

(2)

....

....

....

....

**(Total for Question 9 = 12 marks)**

10 An investigation was carried out into the effect of carbon dioxide concentration on photosynthesis.

Cells of a unicellular alga were suspended in a solution containing 1.0% carbon dioxide. After 250 seconds the carbon dioxide was changed to 0.003% CO_2.

The cells were illuminated with a bright light and some were removed at regular time intervals. The concentrations of ribulose bisphosphate (RuBP) and glycerate 3-phosphate (GP) in the cells were measured.

The graph below shows the results of the investigation.
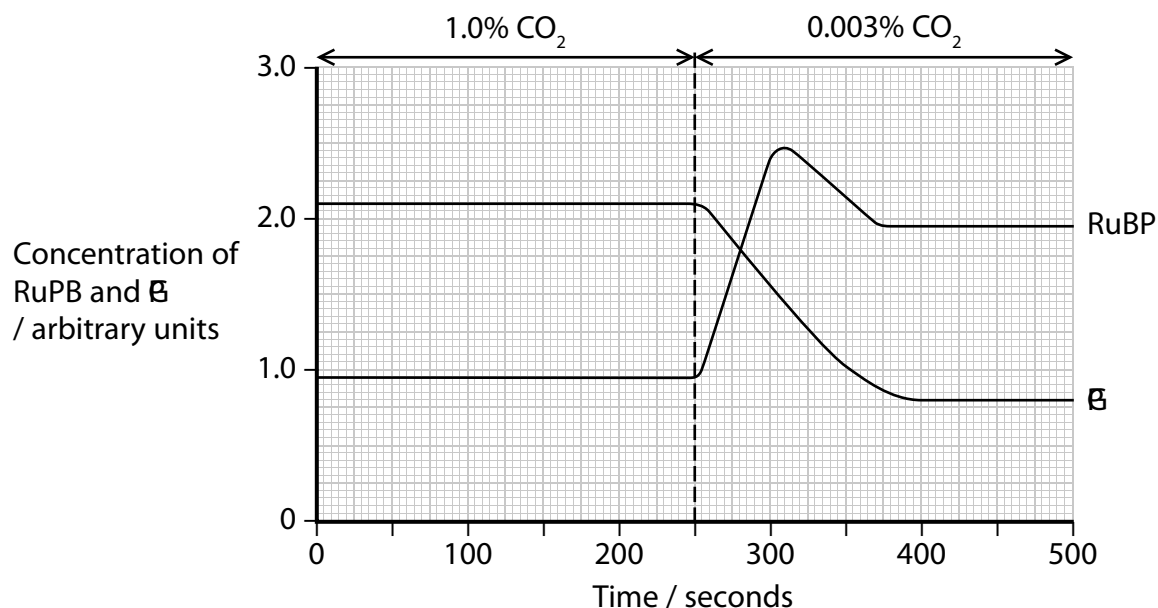
(a) Explain why the cells were illuminated at a high light intensity during this investigation.

(3)

....

....

....

....

....

....

(b) (i) Analyse the data to explain the effect of carbon dioxide concentrations on the production of RuBP.

(4)

....

....

....

....

....

....

....

....

(ii) Analyse the data to explain the effect of carbon dioxide concentrations on the rate of production of GP.

(3)

....

....

....

....

....

(c) This investigation was carried out at 25℃.

Explain the effect of lowering the temperature on the concentration of RuBP for the first 250 seconds of this investigation.

(3)

....

....

....

....

....

....

....

(Total for Question 10 = 13 marks)

TOTAL FOR PAPER = 90 MARKS