

Please check the examination details below before entering your candidate information

Candidate surname

Other names

**Pearson BTEC**  
**Level 3**  
**Nationals**  
**Certificate**

Centre Number

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Learner Registration Number

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**Tuesday 21 May 2019**

Afternoon (Time: 40 minutes)

Paper Reference **31617H/1B**

**Applied Science / Forensic and Criminal Investigation**

**Unit 1: Principles and Applications of Science I**

**Biology**

**SECTION A: STRUCTURES AND FUNCTIONS OF CELLS AND TISSUES**

**You must have:**

A calculator and a 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 learner registration number.
- Answer **all** questions.
- Answer the questions in the spaces provided  
– *there may be more space than you need.*

### Information

- The exam comprises three papers worth 30 marks each.  
Section A: Structures and Functions of Cells and Tissues (Biology).  
Section B: Periodicity and Properties of Elements (Chemistry).  
Section C: Waves in Communication (Physics).
- The total mark for this exam 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 ►

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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 human respiratory system contains ciliated epithelial cells.

Ciliated epithelial cells are eukaryotic.

(a) Which cell component is only found in eukaryotic cells?

(1)

- A capsule
- B cell membrane
- C nucleus
- D plasmid

(b) Table 1 compares squamous epithelial tissue and columnar epithelial tissue.

	squamous tissue	columnar tissue
location in the respiratory system	(i) .....	(ii) .....
description of the shape of the cells	(iii) .....	rectangular

Table 1

Identify the missing words in Table 1.

(1)

(i) .....

(1)

(ii) .....

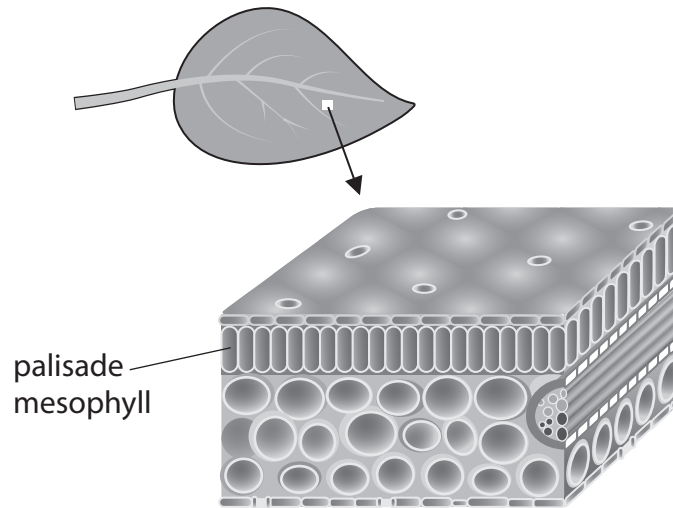
(1)

(iii) .....

(Total for Question 1 = 4 marks)



- 2 Figure 1 shows the structure of a leaf.  
The leaf is made of layers of cells.  
One layer is the palisade mesophyll layer.



**Figure 1**

The palisade mesophyll layer is a tissue.  
Sentence 1 gives an incomplete definition of a tissue.

A tissue is a group of similar, ..... X ..... cells that have a specific ..... Y .....

**Sentence 1**

(a) Give the correct words for X and Y to complete Sentence 1.

(2)

X.....

Y.....

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(b) A palisade mesophyll cell contains a vacuole.

Explain how the vacuole in a palisade mesophyll cell helps to increase the rate of photosynthesis.

(3)

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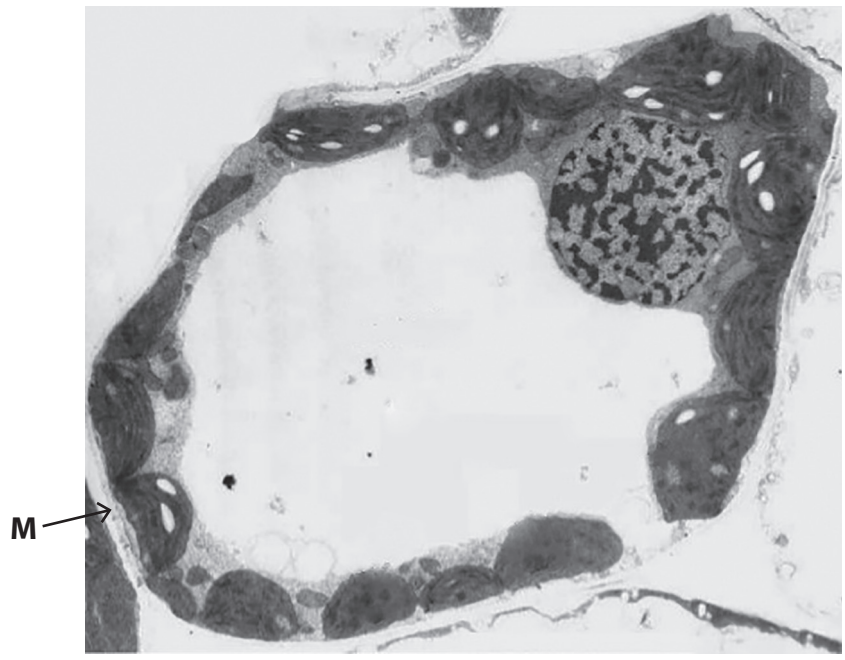
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(c) Figure 2 shows an electron micrograph of a cross section of a palisade mesophyll cell.



**Figure 2**

Identify the cell structure labelled M in Figure 2.

(1)

- A** amyloplast
- B** cell wall
- C** plasmodesmata
- D** tonoplast

**(Total for Question 2 = 6 marks)**



3 Figure 3 shows a synapse.

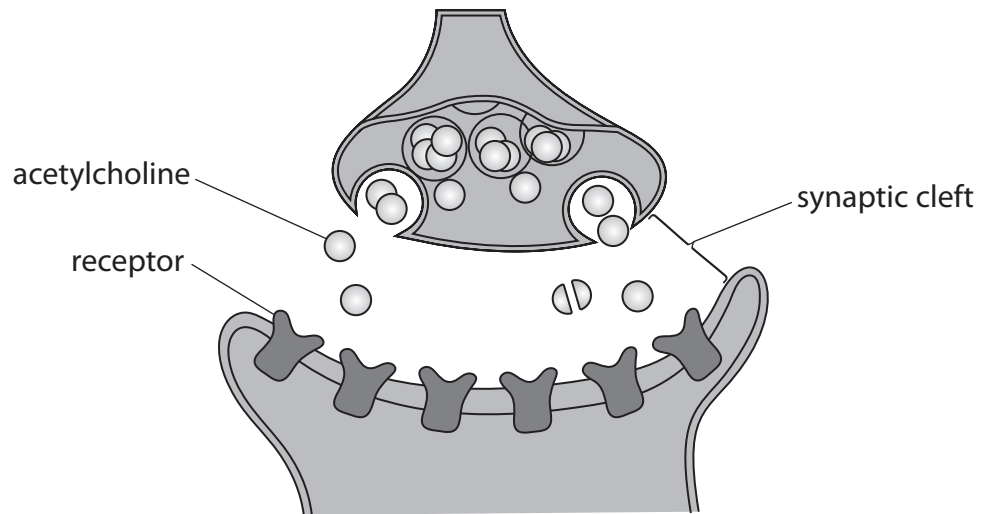


Figure 3

(a) Describe the function of a synapse.

(2)

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(b) (i) Identify the correct statement.

(1)

- A acetylcholine is an enzyme
- B acetylcholine is a hormone
- C acetylcholine is a neurotransmitter
- D acetylcholine is a vesicle

(ii) Explain what happens to acetylcholine after its function is complete.

(3)

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(c) Acetylcholine causes the release of hydrochloric acid in the stomach.

Nicotine is an agonist for acetylcholine.

Explain why nicotine causes higher levels of hydrochloric acid in the stomach.

(4)

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(Total for Question 3 = 10 marks)





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4 (a) 1500 Gram-positive bacteria are placed on nutrient agar gel in a Petri dish.

The number of Gram-positive bacteria doubles every 20 minutes when the bacteria divide.

The total number of bacteria can be calculated using the formula:

$$\text{total number of bacteria} = \text{bacteria at beginning} \times 2^n$$

n = number of divisions.

Calculate the total number of Gram-positive bacteria in the Petri dish after two hours.

Show your working.

(4)

total number of bacteria = .....

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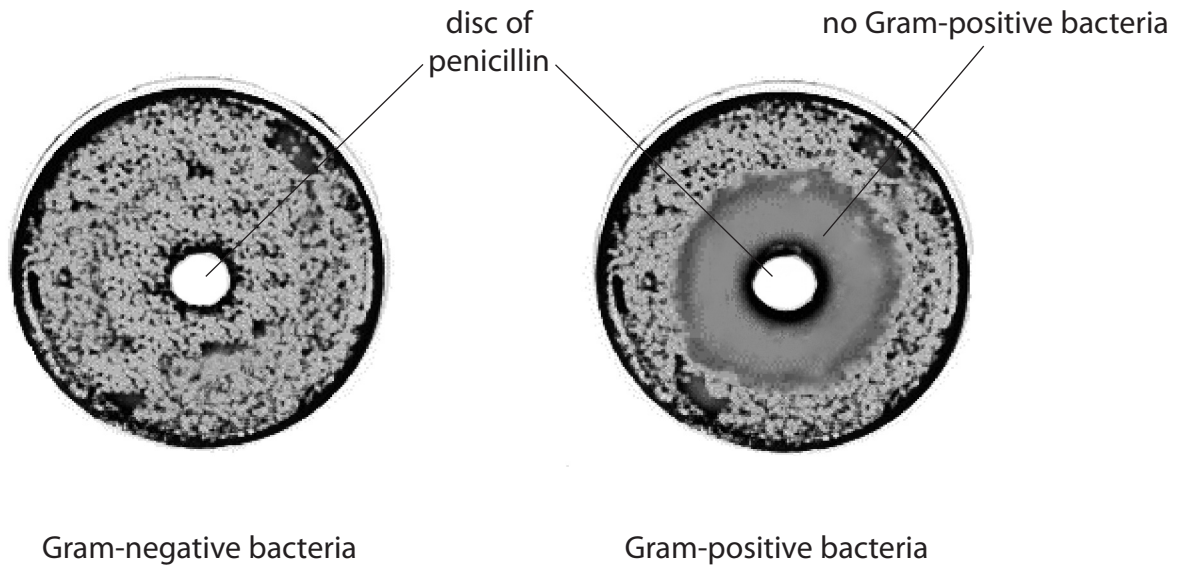


(b) Penicillin is an antibiotic used to treat Gram-positive bacterial infections.

Penicillin stops Gram-positive bacteria from dividing.

Figure 4 shows Gram-negative bacteria and Gram-positive bacteria growing on two separate nutrient agar plates.

There is a disc of penicillin in the centre of each agar plate.



**Figure 4**

Discuss why penicillin prevents the growth of Gram-positive bacteria but not Gram-negative bacteria.

Your answer should refer to the differences in the cell walls of the two types of bacteria.

(6)

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Handwriting practice area with horizontal dotted lines.

**(Total for Question 4 = 10 marks)**

**TOTAL FOR PAPER = 30 MARKS**



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