

GCSE Biology A (Gateway)

J247/04 Biology A B4-B6 and B7 (Higher Tier)

Question Set: 3

1

Erythromycin is an antibiotic drug.

(a) What is an antibiotic?

A chemical usually made by microbes that kill other microbes [2]

(b) It is important to get the dose of erythromycin right. Too much erythromycin can be harmful.

However, recently some strains of bacteria have developed resistance to low concentrations of erythromycin.

To see how effective erythromycin is, it is tested using bacteria grown on agar plates.

This method is used:

- A petri dish is used that has the bacteria growing evenly over the surface.
- A disc of filter paper is soaked in erythromycin.
- The disc is placed on the agar in the centre of the petri dish using sterile forceps.
- The dish is incubated at 37°C.

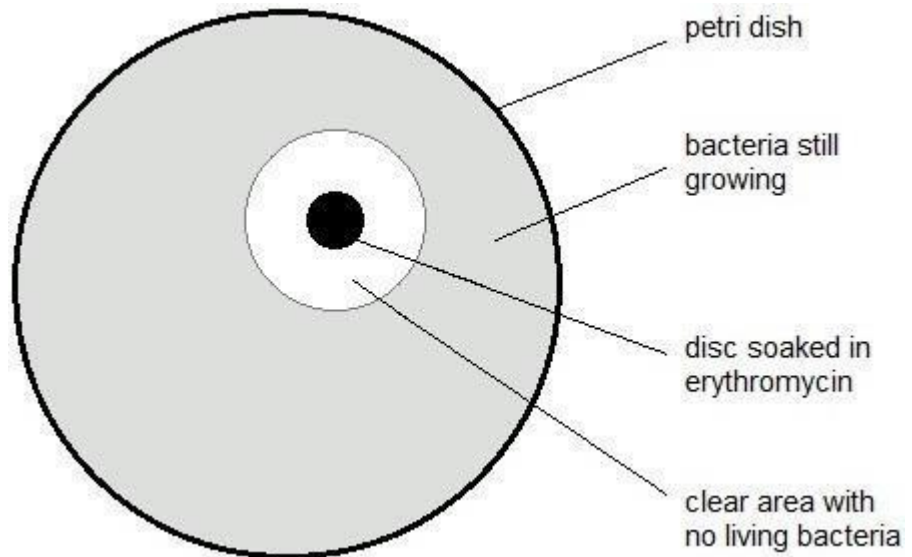
(i) Why did the scientists incubate the dish at 37°C rather than at higher or lower temperature? Any higher and the bacteria might be killed and any lower the bacteria would reproduce too slowly to gain results [2]

(ii) Why is the filter paper disc moved using sterile forceps?

To prevent contamination by other microbes

[1]

- (c) (i) The diagram shows the actual size of the dish after incubation.



This table is used to analyse the results of the experiment.

Area clear of bacteria including the area of the disc in mm ²	Level of resistance
less than 133	resistant
133 to 416	intermediate resistance
more than 416	not resistant

Diameter = 24 mm
 Radius = 12 mm
 $3.14 \times (12)^2 =$
 $\underline{452.16}$
 $= \underline{\underline{452.2 \text{ mm}^2}}$

Use the results of the experiment and the table to judge the level of resistance in this strain of bacteria.

(The area of a circle = πr^2 and $\pi = 3.14$.)

$452.2 > 416$ so its
 not resistant.

[3]

- (ii) Suggest any limitations to measuring the level of resistance with this method.

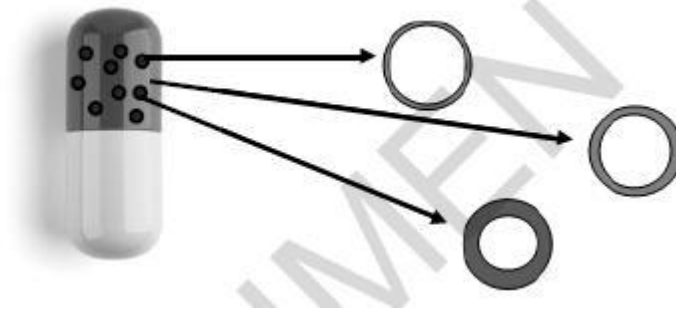
Only one plate is used so only gives limited information.

[2]

(d) Erythromycin is usually given to patients in a capsule.

The capsule has lots of small spheres containing the drug. The walls of the spheres are different thicknesses.

They are made of a carbohydrate polymer.



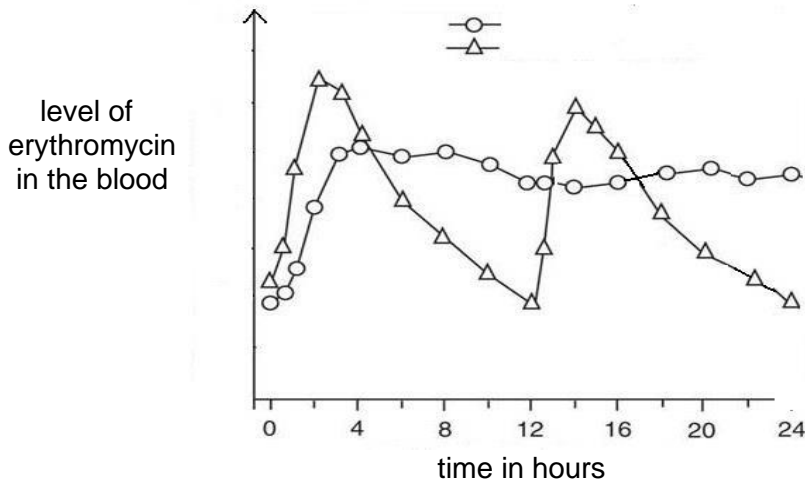
(i) Explain why the drug is released from the spheres in the small intestine.

The coat is digested by enzymes in the small intestine.

[2]

(ii)* The graph shows the levels of erythromycin in the blood when given using this capsule and in a normal tablet.

A coated capsule taken every 12 hours A normal tablet taken every 12 hours



Explain the shape of the two graphs and why it is better to give erythromycin in capsules.

The graph of the tablet increases in gradient very quickly and reaches its peak in 2 hours of starting each time it is given. For the following 10 hours the level of erythromycin decreases steadily in the blood. [6]
The graph of the capsule peaks within 4 hours and then the level of erythromycin stays steady for the remaining 8 hours.

For the tablet the dosage rose quickly because of its rapid absorption into the blood stream and the dosage falls fast because it is rapidly broken down. However for the capsule there is a staggered release of drug dosage because the wall of the capsule is thicker so takes longer to digest. So it is better to give erythromycin in capsules as the highest level of dosage from tablets may be toxic. Also the capsule is effective throughout the 12 hour duration but the tablet wears off quickly and so may not be able to kill all the bacteria.

Total Marks for Question Set 3: 18

OCR
Oxford Cambridge and RSA

Copyright Information

OCR is committed to seeking permission to reproduce all third-party content that it uses in its assessment materials. OCR has attempted to identify and contact all copyright holders whose work is used in this paper. To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced in the OCR Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download from our public website (www.ocr.org.uk) after the live examination series.

If OCR has unwittingly failed to correctly acknowledge or clear any third-party content in this assessment material, OCR will be happy to correct its mistake at the earliest possible opportunity.

For queries or further information please contact The OCR Copyright Team, The Triangle Building, Shaftesbury Road, Cambridge CB2 8EA.

OCR is part of the Cambridge Assessment Group; Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge