OCR GCSE 21ST CENTURY BIOLOGY B · J257

BIOLOGY



EXAM QUESTION PACK

B2.6 HOW CAN WE TREAT DISEASE? (HIGHER)

SCORE	PERCENTAGE
/47	%

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1. New medicines, including vaccines, have to be tested before being made widely available.

Preclinical and clinical tests are used to assess the safety and effectiveness of new medicines.

For each test, complete the table by putting a tick (✓), in **one** box next to the test to indicate if it assesses **safety**, **effectiveness** or **both**.

For each test, one example has been done for you.

Preclinical tests	Safety	Effectiveness	Both
Cultured human cells			✓
Whole animals			

Clinical tests	Safety	Effectiveness	Both
Healthy volunteers			
Humans with the disease			✓

[2]

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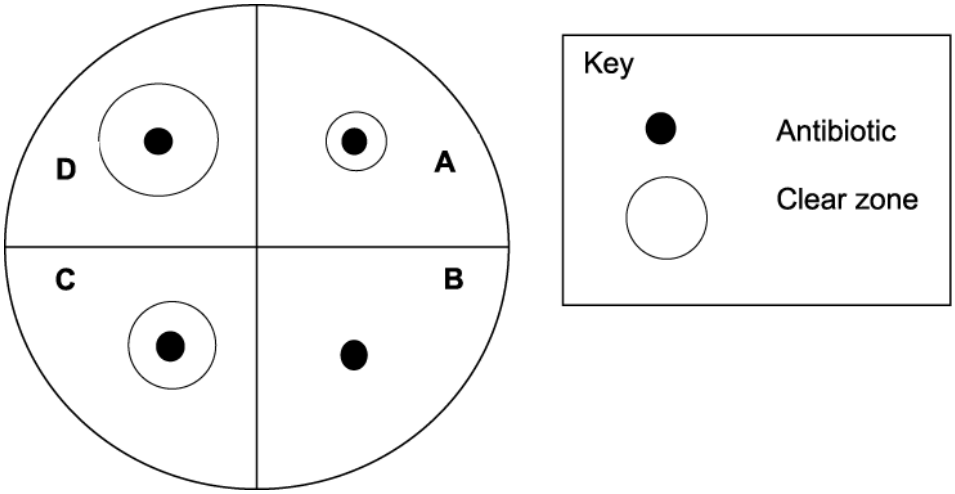
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2. Jack has a bacterial infection caused by *Streptococcus pneumonia*.

A doctor takes a sample from Jack to work out which antibiotic will kill the bacteria.

The diagram below shows the effectiveness of four different antibiotics when grown on agar jelly.

The clear zone for each antibiotic is shown on the diagram.The clear zone is the area of the bacteria that has been killed by the antibiotic.The table shows the areas of the clear zones.



Antibiotic	Clear zone (mm^2)
A	50.24
B	0.00
C	94.99
D	

(i) Using the formula πr^2 calculate the clear zone for antibiotic **D**.
Show your working.
$\pi = 3.14$

Clear zone = mm^2 **[2]**

(ii) Jack's doctor must decide which antibiotic to prescribe him.
Use the information provided at the start of this question to decide which of the following conclusions can be

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made.

Put a tick (✓) in the box next to the correct conclusion.

Antibiotic **A** works best. ☐

Jack should be given antibiotic **A**. ☐

Antibiotic **B** has the least effect. ☐

Jack should not be given antibiotic **B**. ☐

Antibiotic **C** works best. ☐

Jack should be given antibiotic **C**. ☐

All antibiotics worked equally well. ☐

Jack can be given any antibiotic. ☐

[1]

(iii) The control for this test could have been a disc which did not contain any antibiotic.

State a reason for using a control in this experiment.

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[1]

3. Swelling of the aorta is called an aneurysm. An aneurysm is repaired by inserting a plastic tube called a stent into the aorta.

In 1990, the risk of death from this operation was 5.7%.

Explain the difference between **perceived** and **calculated** risk when patients decide whether or not to have the operation.

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[2]

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4. Scientists have developed a drug that could be used to treat Ebola.

The drug was tested in a human trial.

(i) In a human trial, different treatments are given to different groups of people.

- Some groups are treated with the new drug.
- Some groups are treated with a different drug or a placebo.

Put a tick (✓) in the correct box next to each statement to show whether it is **true** or **false**.

	True	False
A placebo contains a very small amount of the new drug.	☐	☐
The safety and effectiveness of the drug are tested using a group of people who have the disease.	☐	☐
One of the groups treated with the drug is a group of healthy people.	☐	☐
In an 'open-label' trial, the doctor knows which treatment the patient receives, but the patient does not know.	☐	☐
In a 'blind' trial, neither the doctor nor the patient knows which treatment the patient receives.	☐	☐

[3]

(ii) Explain why it is important to test drugs in **long-term** human trials.

---

[2]

(iii) One woman infected with Ebola virus was not treated with drugs.

She was treated with blood taken from a man who had recovered from Ebola.

Suggest how this could help the woman to recover and suggest reasons why this treatment might not work.

The quality of written communication will be assessed in your answer.

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[6]

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5(a). Helen is investigating the effect of antibiotics on the growth of bacteria.

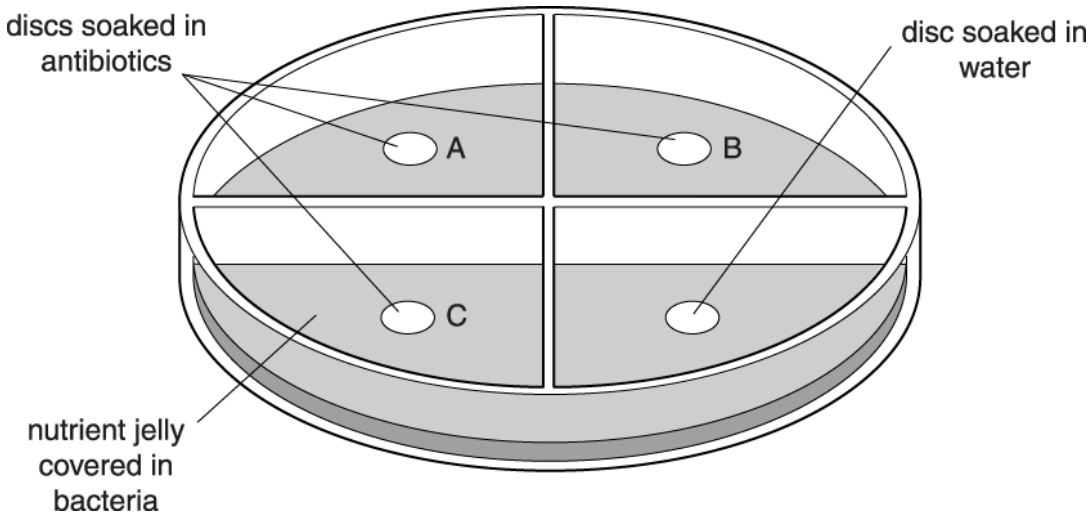
Bacteria are grown on nutrient jelly. This makes the jelly look cloudy.

Helen puts a small paper disc into each of three different antibiotic solutions, **A**, **B** and **C**.

She puts another paper disc into water.

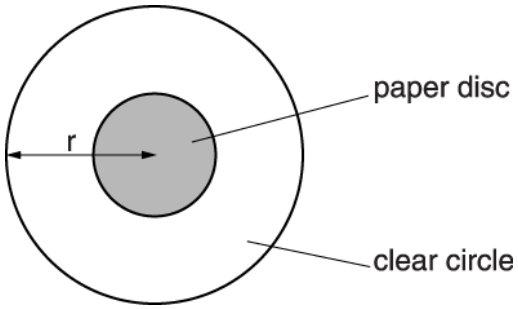
She then places all of the paper discs onto the nutrient jelly.

The diagram shows the apparatus she uses for her investigation.



After two days Helen sees clear circular areas around some of the paper discs.

Helen measures the radius (r) as shown in the diagram.



She then calculates the total area of the clear circle (including the paper disc) using the formula:
area = πr^2 (where $\pi = 3.14$).

Here are her results.

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	Radius in mm	Total area of the clear circle (including the paper disc) in mm^2
A	8	
B	14	615.44
C	3	28.26
water	3	28.26

Complete the table by calculating the total area of the clear circle (including the paper disc) for **A**.

Show your working below.

[2]

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(b). Describe Helen's results and explain the conclusions she can make from them.

The quality of written communication will be assessed in your answer.

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[6]

(c). Helen designed her experiment so that it was a fair test.

Explain what it meant by this and why it is important.

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[2]

(d). New drugs must be tested to make sure that they are safe and effective.

Explain how this is done.

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[2]

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6. Amir works in a laboratory. His job is to identify pathogens that cause plant diseases.

Amir has a sample of one species of bacteria from an infected plant.

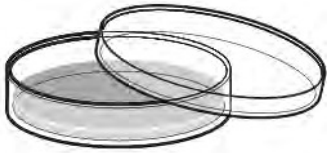
He wants to test the effectiveness of different antibiotics against this species of bacteria.

Amir must start by transferring bacteria from the sample bottle into four Petri dishes containing agar jelly.

He needs to set up four identical dishes of this species of bacteria.



glass bottle containing the sample of bacteria



Petri dish containing agar jelly

He intends to pour some of the liquid from the glass bottle into each Petri dish.

(i) Write down **two** ways he could improve his method and explain why each is an improvement.

Improvement 1 ----------

Explanation ----------

Improvement 2 ----------

Explanation ----------

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[4]

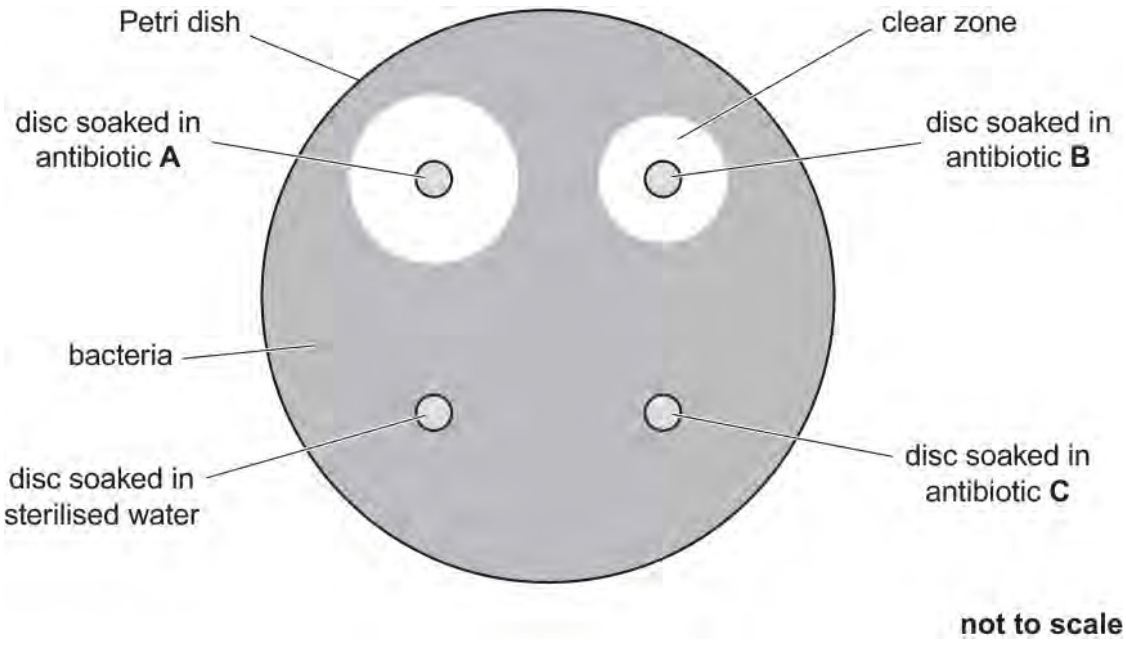
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After transferring bacteria from the sample to the four Petri dishes, Amir adds four different paper discs to each dish.

The paper discs have been soaked in different solutions.

Amir places the dishes in an incubator overnight.
The bacteria grow to cover the surface of the agar jelly.

The diagram shows what Amir sees on one of the dishes after it has been incubated.



(ii) The diameter of the clear zone around the disc soaked in antibiotic **A** is 23 mm.

Calculate the area of this clear zone.

Use the equation: area of clear zone = $3.14 \times r^2$.

Give your answer to **3**significant figures.

Area of clear zone = ... mm^2**[3]**

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(iii) **Table 4.1** shows Amir's results for all four dishes.

Disc soaked in	Area of clear zone (mm^2)			
	Petri dish 1	Petri dish 2	Petri dish 3	Petri dish 4
Antibiotic **A**		363	346	346
Antibiotic **B**	227	254	227	214
Antibiotic **C**	0	0	0	0
Sterilised water	0	0	0	0

Table 4.1

Suggest **two** possible explanations for the results for antibiotic **C**.

1 ----------

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2 ----------

---[2]

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7. New drugs and treatments have to go through rigorous clinical trials.

A clinical trial was conducted to see if using a particular combination of chemotherapy drugs increased survival rates for a type of cancer of the ovaries.

The two drug combinations being tested were:

- drugs 1 and 2
- drugs 3 and 4.

(i) The table shows some details of the clinical trial design.

Use your knowledge of clinical trials to justify each part of the design.

Design	Justification
Only women took part in the trial.	
All women who took part in the trial had ovarian cancer.	
A placebo was not used.	
An open trial was conducted.	

[4]

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The results of the trial are shown in the table.

	Group A (Drugs 1 and 2)	Group B (Drugs 3 and 4)
Number of women who took part in the trial.	305	314
Number of women who were still alive two years after treatment.	247	222
Most severe side effects.	• A drop in total blood cell number • Nerve damage • Joint pain	• Loss of appetite • Diarrhoea • Feeling or being sick • High temperature • Low white blood cell number

(ii) Use the information in the table to recommend which drug combination the doctors should use.

Justify your decision.

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[2]

(iii) Explain why scientists should communicate findings such as these to a range of audiences.

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[1]

END OF QUESTION PAPER

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