PEARSON EDEXCEL A-LEVEL BIOLOGY B · 9BI0

BIOLOGY



EXAM QUESTION PACK

TOPIC 6: MICROBIOLOGY AND PATHOGENS

ANTIBIOTIC RESISTANCE

SCORE	PERCENTAGE
/32	%

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Q1.

Bacteria are becoming increasingly resistant to antibiotics.

Controlling the spread of antibiotic resistance is necessary.

In an investigation, *E.coli* bacteria were isolated from animals reared for food and from some wild animals.

The mean percentage of the *E.coli* isolated from each type of animal that were resistant to different types of antibiotics was determined.

The table shows the results of this investigation, where n is the number of each type of animal.

Antibiotic	Mean percentage of resistant *E.coli* isolated from animals reared for food (%)			Mean percentage of resistant *E.coli* isolated from wild animals (%)	
	Broiler chicken n = 45	Village chicken n = 45	Cattle n = 12	Bat n = 13	Rodent n = 35
Ampicillin	50.00	8.89	8.33	0.00	8.57
Cephalothin	14.29	8.89	8.33	20.00	14.58
Chloramphenicol	46.43	0.00	0.00	0.00	0.00
Neomycin	50.00	2.22	25.00	0.00	5.71
Tetracycline	95.86	55.56	25.00	0.00	2.86

(i) Calculate the ratio of tetracycline-resistant *E.coli* in all the chickens to tetracycline-resistant *E.coli* in cattle.

(2)

Answer .....

(ii) There was a total of 2×10^8 *E.coli* isolated from cattle and 6×10^9 *E.coli* isolated from rodents.

Calculate how many more *E.coli* are resistant to cephalothin in rodents than in cattle.

(2)

Answer .....

(iii) Antibiotics can be added to animal feed.

It is thought this use of antibiotics has contributed to the spread of antibiotic resistance.

Evaluate the extent to which the results of this investigation support this idea.

(4)

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(Total for question = 8 marks)

Q2.

Bacteria are becoming increasingly resistant to antibiotics.

Controlling the spread of antibiotic resistance is necessary.

One method of controlling the spread of antibiotic resistance is to avoid unnecessary prescriptions of antibiotics.

The table shows some illnesses and whether a prescription for antibiotics is recommended.

Illness	Antibiotic prescription
Bronchitis	may be recommended
Ear infection	may be recommended
Influenza	not recommended
Fluid in the ear	not recommended
Strep throat	recommended
Urinary tract infection	recommended

Explain why these recommendations could reduce the spread of antibiotic resistance.

(2)

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(Total for question = 2 marks)

Q3.

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)

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(Total for question = 2 marks)

Q4.

Salmonella can cause severe vomiting and diarrhoea.

Public health laboratories use the Salmonella Rapid Culture technique to confirm a *Salmonella* infection.

This can accurately identify *Salmonella* as purple stained colonies within 48 hours.

Previous methods for the identification of *Salmonella* infections took four days.



Explain the advantages of using this technique in public health laboratories.

(3)

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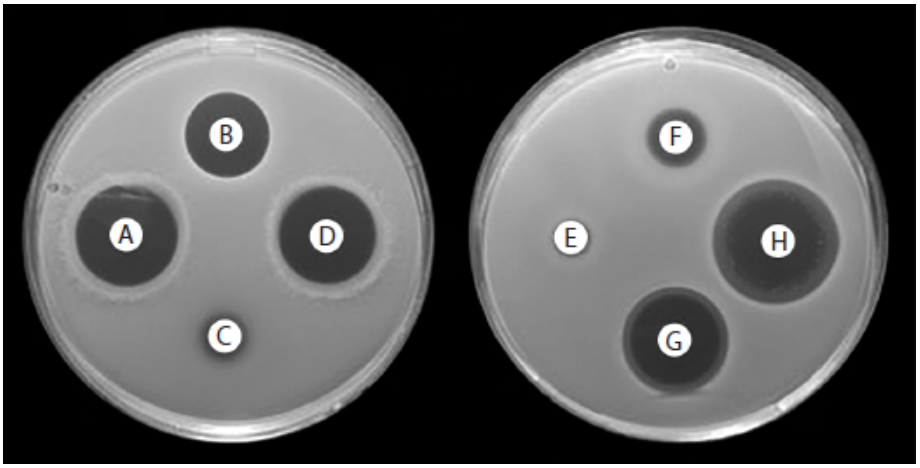
Q5.

A student read that more than half of raw chickens on sale in supermarkets are contaminated with bacteria from the genus *Campylobacter*.

Some species of *Campylobacter* cause food poisoning in humans.

The student carried out an experiment to test the effectiveness of various antibiotics against *Campylobacter*.

The photograph shows the student's agar plates at the end of the experiment.



The white circles labelled A–H are filter paper discs. These discs were soaked in different antibiotics then placed on the surface of the agar.

The student concluded that fresh chickens should be sprayed with antibiotic H before being packaged for sale in supermarkets.

Evaluate the student's conclusion.

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Q6.

Antibiotics have been developed to control bacterial infections.

(a) Name **one** bacterium which causes symptoms of infection by producing exotoxins.

(1)

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(b) Explain how an antibiotic has a bacteriostatic effect on bacteria.

(2)

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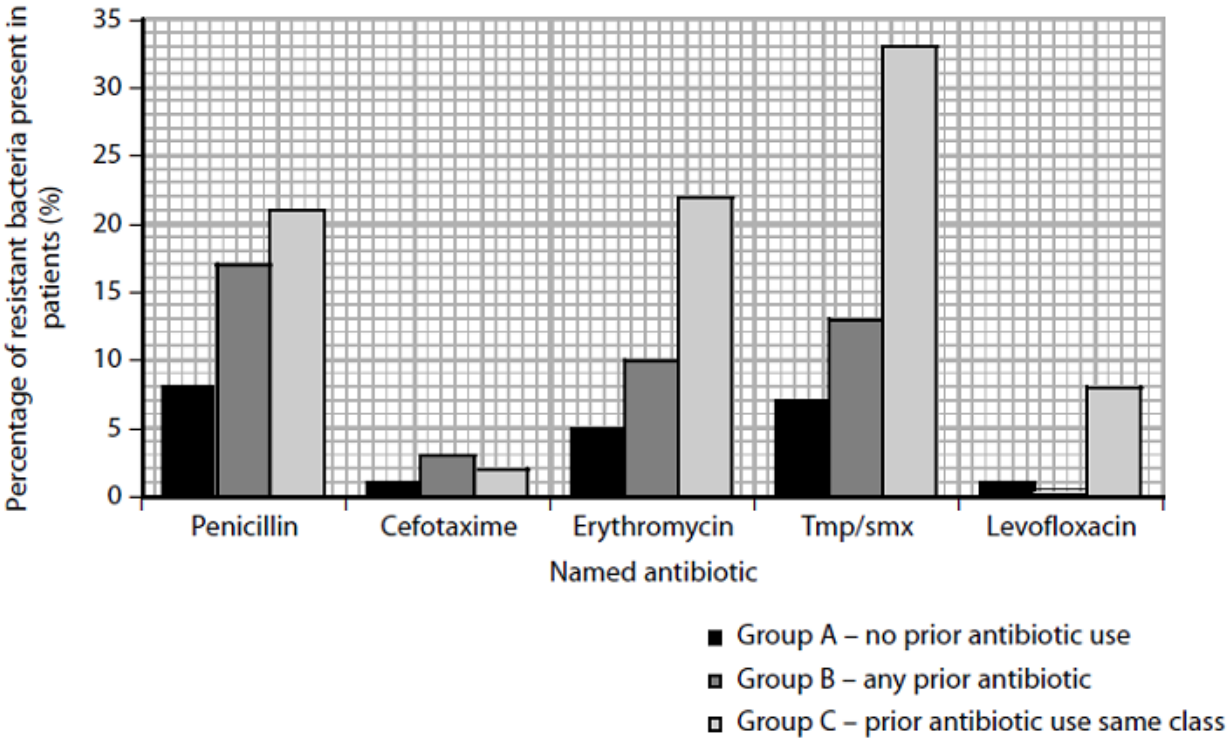
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*(c) Bacterial resistance to common antibiotics is an increasingly serious problem facing doctors treating a wide range of infections.

The graph below shows the percentage of resistant bacteria in patients being treated with antibiotics for *Streptococcus pneumoniae* infections.

Group A had never been given antibiotics.
Group B had been previously treated with other antibiotics.
Group C had been previously treated with the named antibiotic.



Analyse the data and use your knowledge of antibiotic resistance to evaluate the claim that soon doctors will be unable to treat most common bacterial infections with antibiotics.

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(Total for question = 12 marks)

Q7.

Antibiotics are widely used to treat infections.

Some antibiotics are bactericidal.

The table shows information about five antibiotics.

Antibiotic	Year discovered	Time for first resistant strain of bacteria to be detected / years	Number of different types of each antibiotic that exist today
Penicillin	1928	1	>18
Tetracycline	1945	3	>16
Vancomycin	1953	27	1
Linezolid	1978	1	1
Daptomycin	1985	2	1

Analyse the data to comment on the number of types of each antibiotic that exist today.

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(Total for question = 5 marks)