

Name: _____

Class teacher: _____

Combined Science

Biology - Paper 1

CB5 Health, disease and development of medicine

Revision booklet

The World Health Organisation (WHO) describes health as a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity.

The presence of one disease can lead to a higher susceptibility to other diseases.

Damage to immune system

Makes it easier for other pathogens to cause disease.

Damage to body defences

Barriers and defences are damaged. Pathogens can enter the body.

Damage to organ systems

Organ systems don't work as effectively leading to other diseases.

Communicable and non-communicable diseases

Communicable

Caused by pathogens. They can be passed from person to person.

Non-communicable

Caused by a fault in genes or by the way we live (lifestyle)

Detection and identification of plant diseases (bio HT only)

Detection	Reference using gardening manual or website, laboratory test for pathogens, diagnostic testing.
<i>Stunted growth</i>	
<i>Spots on leaves</i>	
<i>Area of decay</i>	
<i>growths</i>	
<i>Malformed stem/leaves</i>	
<i>Discolouration</i>	
<i>Presence of pests</i>	

Health

CB5 HEALTH DISEASE AND MEDICINE part 1

Pathogens may infect plants or animals and can be spread by direct contact, water or air

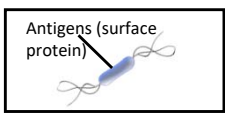
Pathogen	Disease	Symptoms	Method of transmission	Control of spread
Bacteria	<i>cholera</i>	Causes diarrhoea.	Contaminated water	Vaccination, water treatment to remove bacteria.
Bacteria	<i>tuberculosis</i>	Causes lung damage.	Air borne water droplets from coughing.	Isolation of infected person, vaccination.
Fungi	<i>Chalara ash dieback</i>	Leaf loss and bark lesions.	Spores in the air.	Remove/destroy infected trees.
Protists	<i>Malaria</i>	Recurrent fever. Damage to blood and liver.	By an animal vector (mosquitoes).	Prevent breeding of mosquitoes. Use of nets to prevent bites.
Bacteria	<i>Stomach ulcers (Bio only)</i>	Pain in abdomen, damage to stomach lining.	Oral transmission.	60% already carry the bacteria.
Virus	<i>Ebola (Bio only)</i>	Internal bleeding and fever.	Contact with bodily fluids of an infected person.	Isolation of infected person. Vaccination.
Virus	<i>HIV</i>	Initially flu like systems, serious damage to immune system.	Sexual contact and exchange of body fluids.	Anti-retroviral drugs and use of condoms.
Bacteria	<i>Chlamydia</i>	Unusual discharge from genitals or anus, pain when urinating.	Unprotected sex.	Using condoms during sex.

Bacteria may produce toxins that damage tissues and make us feel ill

Viruses	Bacteria (prokaryotes)	Protists (eukaryotes)	Fungi (eukaryotes)
<i>e.g. cold, influenza, measles, HIV, tobacco mosaic virus</i>	<i>e.g. tuberculosis (TB), Salmonella, Gonorrhoea</i>	<i>e.g. dysentery, sleeping sickness, malaria</i>	<i>e.g. athlete's foot, thrush, rose black spot</i>
DNA or RNA surrounded by a protein coat	No membrane bound organelles (no chloroplasts, mitochondria or nucleus). Cell wall. Single celled	Membrane bound organelles. Usually single celled.	Membrane bound organelles, cell wall made of chitin. Single celled or multi-cellular

Pathogens are microorganisms that cause infectious disease

Pathogens
Communicable diseases



Specific immune system	a. Exposure to pathogen	Pathogens are identified by white blood cells by the different proteins on their surfaces ANTIGENS .
	b. Antigens trigger an immune response	Trigger causes the production of antibodies.
	c. Production of memory lymphocytes	Antigens also trigger the production of memory lymphocytes (a type of white blood cell). These cells can produce the specific antibody for a pathogen.
	d. Secondary response	Memory lymphocytes can produce specific antibodies much more quickly if the same pathogen returns.

Antibiotics	e.g. penicillin	Used to treat bacterial infection by inhibiting cells processes in the bacterium but not the host organism (human) cells. They do not work on viruses.
--------------------	------------------------	--

CB5 HEALTH DISEASE AND MEDICINE part 2

Immunisation

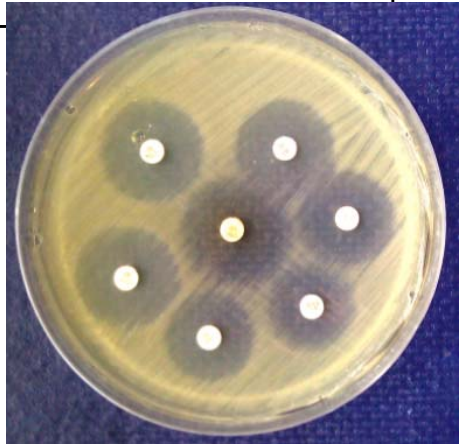
Vaccines are used to immunise a large proportion of the population (herd immunity) to prevent the spread of a pathogen

Vaccination	Small amount of dead or inactive form of the pathogen	1st infection by pathogen	White blood cells detect pathogens in the vaccine. Antibodies are released into the blood.
		Re-infection by the same pathogen	White blood cells detect pathogens. Antibodies are made much faster and in larger amounts.






Calculate cross sectional area

πr^2

Measure the diameter of the clear area where bacteria has not grown. Half the diameter of the clear area to find the radius.



Non-specific immune systems

Immune system	The human body has several chemical and physical ways of providing protection from pathogens		Nose	Nasal hairs, sticky mucus and cilia prevent pathogens entering through the nostrils.
			Trachea and bronchus (respiratory system)	Lined with mucus to trap dust and pathogens. Cilia move the mucus upwards to be swallowed.
			Stomach acid	Stomach acid (pH1) kills most ingested pathogens.
			Skin	Hard to penetrate waterproof barrier. Glands secrete oil which kill microbes.
			Lysozymes in tears	Breaks down the cell wall of some bacteria.

Vaccination (Biology only)	Disadvantages	A very small number of people (eg 1 in 900000 for MMR) a person may have a bad reaction to a vaccine and therefore cannot be immunised.
	Advantages	Almost everyone can be immunised (herd immunity) which protects those people who cannot have vaccines. Spread of a pathogen in a population is prevented.

Aseptic technique

Aseptic technique		
Autoclave	Sterile inoculating loops	Covered petri dishes and culture vials
Sterile growth medium and agar plates are sterilized by subjecting them to high pressure steam.	Sterilized before transferring microorganisms so that sample isn't contaminated.	Covered to avoid contamination by other microorganisms in the air.

Healthy weight can be calculate using waist:hip ratio and the equation for BMI.

$$BMI = \frac{mass (kg)}{(height (m))^2}$$

Lifestyle factors and their effects on non-communicable disease	Disease	lifestyle factors
	Obesity and malnutrition	Lack of exercise and consuming too many/too few calories through an unbalanced diet. Schools meals are balanced to combat this in young people.
	Liver disease	Large amounts of alcohol taken over a long period of time can lead to liver disease e.g. cirrhosis. The NHS spends over £500 million a year treating liver disease.
	Cardiovascular disease	Smoking leads to damage and blocking of arteries supplying the heart with oxygenated blood. WHO estimates that 6 million people die globally as a result of smoking related illnesses.

Non-communicable diseases are caused by the interaction of a number of factors	Disease	Diet, obesity, smoking, drinking alcohol, lack of exercise, genetics.
	Cardiovascular disease	
	Cancer	
	Lung disease	
	Liver disease	
	Malnutrition	

Non-communicable diseases

Evaluating different treatments for cardiovascular disease (CVD)

Drugs (including antibiotics) have to be tested and trialed before to check they are safe and effective

Discovery of new drugs

EDEXCEL GCSE HEALTH DISEASE AND MEDICINE part 3

Treating CVD

Life long medication	Surgical procedures	Lifestyle changes
Medicines to reduce blood pressure and cholesterol. Statins for lowering cholesterol carry a small risk of developing diabetes.	A stent can be surgically inserted into blocked blood vessel. Blocked blood vessels can be bypassed with inserted blood vessels. This treatment requires life long medication.	Giving up smoking, drinking excess alcohol and taking more exercise can reduce the risk of CVD. Some patients may not stick to lifestyle changes.

New drugs are extensively tested for:	Efficacy	Make sure the drug works
	Toxicity	Check that the drug is not poisonous
	Dose	The most suitable amount to take

Preclinical trials - using cells, tissues and live animals - must be carried out before the drug can be tested on humans.

Clinical trials use healthy volunteers and patients



Double blind trial. patients and scientists do not know who receives the new drug or placebo until the end of the trial. This avoids bias.

A placebo can look identical to the new drug but contain no active ingredients

Stage 1	Stage 2	Stage 3	Stage 4
Healthy volunteers try small dose of the drug to check it is safe record any side effects	A small number of patients try the drug at a low dose to see if it works	A larger number of patients; different doses are trialled to find the optimum dose	A double blind trial will occur. The patients are divided into groups. Some will be given the drug and some a placebo.

CB5 Health, Disease and the Development of Medicines

A communicable disease is one which

Give 2 examples

-
-

A non-communicable disease is one which

Give 2 examples

-
-

Suggest 3 treatments for cardiovascular disease, giving an advantage and a disadvantage of each;

- Adv:
Dis. adv.
- Adv:
Dis. adv.
- Adv:
Dis. adv.

A pathogen is _____

-
-
-
-

What is the definition of 'health' according to the World Health Organisation?

Having one disease can _____ the change of an organism contracting another disease.

Suggest 3 reasons for this;

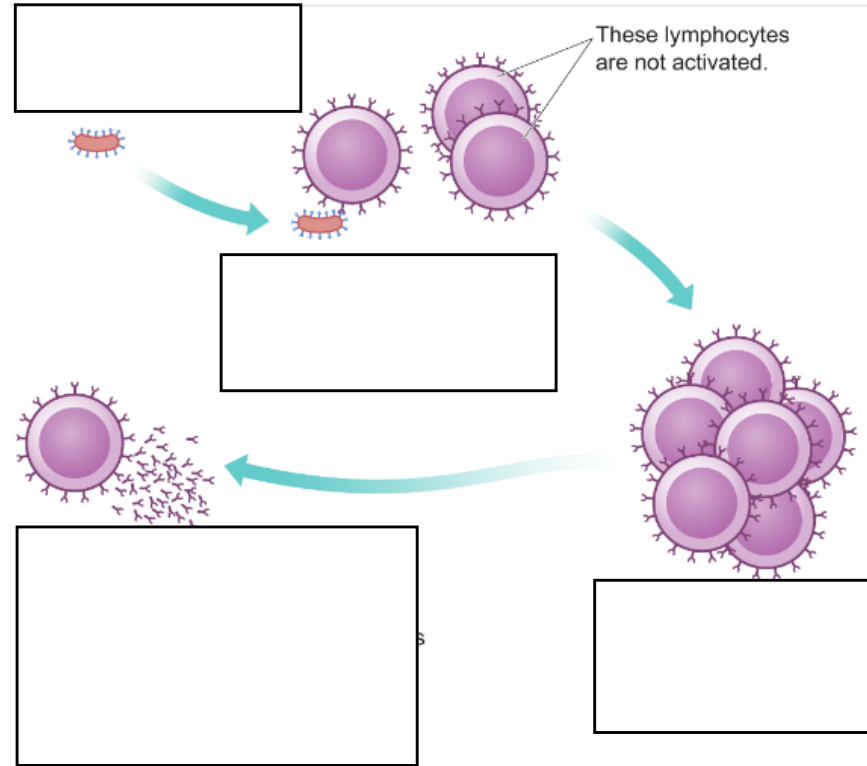
- _____

- _____

- _____

Disease	Pathogen	Effects	How is it spread?	How can the spread be reduced?
Cholera				
Tuberculosis				
Chalara Ash Dieback				
Malaria				
HIV				
Chlamydia				

Where can pathogens enter the body (list as many as you can)



How can immunisations be used to protect against diseases?

What physical defences does the body have against pathogens?

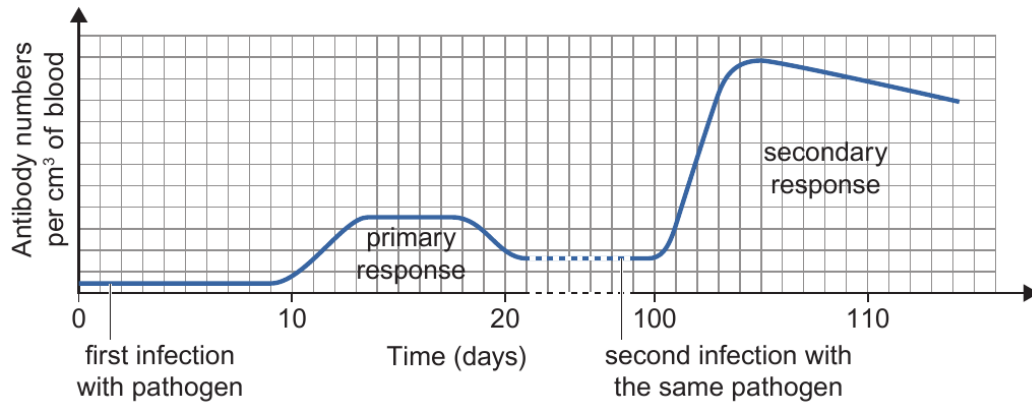
-
-

What chemical defences does the body have against pathogens

-
-

What type of pathogens are antibiotics used to fight?

Why is it dangerous to take antibiotics when they're not needed?



Explain the shape of this graph. _____

Add detail to describe the 4 stages of drug development.

- Discovery
- Pre-clinical
- Small clinical
- Large clinical

Write the formula for calculating BMI

Why may waist:hip ratio be a better predictor of cardiovascular disease?

CB5 Health, disease and development of medicine exam questions (38 marks)

Foundation questions

Q1.

BMI and waist : hip ratio can be used to find out if a person is obese.

Figure 9 shows some data for two males.

male	BMI	waist : hip ratio
A	27.3	0.85
B	?	0.81

Figure 9

BMI is calculated using the equation:

$$\text{BMI} = \frac{\text{mass in kilograms}}{(\text{height in metres})^2}$$

(i) Male B has a mass of 72 kg and a height of 1.81 m.

Calculate the BMI of male B.

Give the answer to 3 significant figures.

(3)

BMI

(ii) Figure 10 shows the interpretation of BMI values.

BMI range	interpretation
below 18.5	underweight
18.5 – 24.9	normal
25.0 – 29.9	overweight
30.0 and above	obese

Figure 10

Males with a waist : hip ratio above 0.90 are defined as abdominally obese.

Explain what the BMI and waist : hip ratio for male A shows about his weight distribution.

(2)

.....

.....

.....

.....

.....

Q2.

The human immune system helps defend the body against disease.

Bacteria and other microorganisms can cause infectious diseases.

Use the words in the box to complete the passage about treating infectious diseases.

(3)

antigens	painkillers	toxins	viruses
antibiotics	stimulants	pathogens	

Bacteria and other microorganisms that cause infectious diseases are called

Drugs called can be used to treat infectious diseases caused by bacteria. These drugs do not work against infectious diseases caused by

Q3.

Chlamydia is caused by a pathogen.

(i) Chlamydia is transmitted by

(1)

- A insect vectors
- B sneezing
- C sexual intercourse
- D contaminated food

(ii) The type of pathogen that causes chlamydia is a

(1)

- A bacterium
- B fungus
- C protist
- D virus

Q4.

The human immune system helps defend the body against disease.

In 1796, the work of Edward Jenner led to the development of a vaccine used to immunise people against a disease called smallpox.

Describe how the body responds to immunisation.

(3)

.....

.....

.....

.....

.....

.....

(Total for question = 3 marks)

Q5.

In 2014, nearly 155 000 people died from cardiovascular disease in the UK.

Coronary heart disease is a type of cardiovascular disease.

Figure 5 shows the number of deaths worldwide in 2002 for coronary heart disease for different age groups.

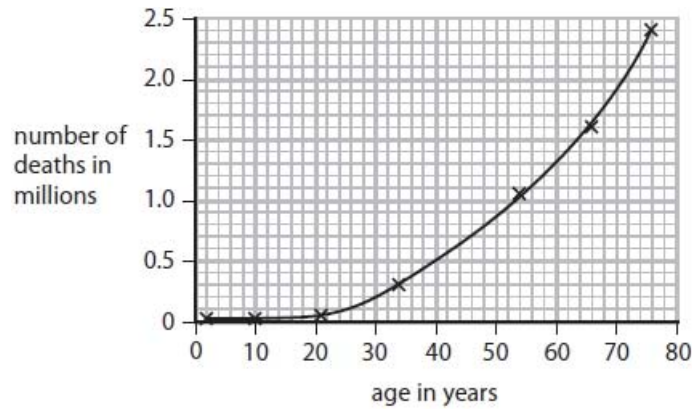


Figure 5

Describe the relationship between coronary heart disease and age.

(2)

.....

.....

.....

.....

Q6.

In 2014, nearly 155 000 people died from cardiovascular disease in the UK.

Figure 7 shows the use of a stent to treat cardiovascular disease.

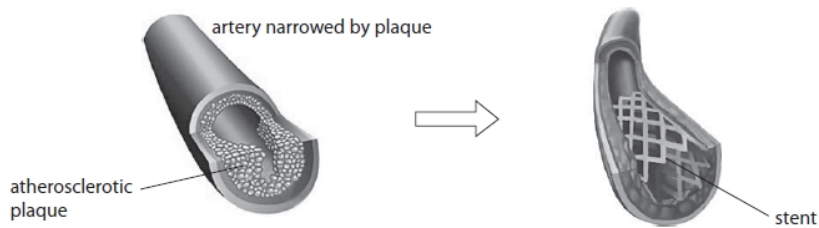


Figure 7

Explain how a stent works to treat cardiovascular disease.

(3)

.....

.....

.....

.....

.....

.....

Q7.

In 2014, nearly 155 000 people died from cardiovascular disease in the UK.

Give the reason why cardiovascular disease is a non-communicable disease.

(1)

.....
.....
.....

Q8.

Obesity increases the risk of a person developing cardiovascular disease.

Losing weight can reduce the risk of this disease occurring.

Explain why exercise can cause weight loss.

(2)

.....
.....
.....
.....

Q9.

Dieting can reduce the effects of cardiovascular disease.

(i) Which statement gives a reason why dieting can be used to reduce weight in obese people?

(1)

- A** Dieting increases metabolism and growth rate
- B** Dieting reduces energy consumption
- C** Dieting decreases metabolism
- D** Dieting increases energy consumption

(ii) A scientist is planning to test a new diet for weight loss.

She selects 40 obese people to take part in the test.

All the obese people are between 20 and 30 years of age.

State **two** other factors the scientist should control when selecting the people.

(2)

.....
.....
.....
.....

(iii) Devise a plan the scientist could use to test the effectiveness of the new diet using the 40 obese people.

(3)

.....
.....
.....
.....
.....
.....

Q10.

HIV is diagnosed by blood tests.

State **two** safety precautions that need to be taken when handling blood samples.

(2)

1

.....

2

.....

Higher questions

Q11.

The ratio of waist-to-hip measurements can be used to determine the risk of a person developing cardiovascular disease.

Calculate the waist-to-hip ratio for a person with a waist measurement of 830 mm and a hip measurement of 0.99 m.

Give your answer to 2 decimal places.

(2)

Answer =

Q12.

Most cases of scarlet fever occur in children.

Adults have usually developed immunity to a toxin that the Streptococcus bacteria produce during infection.

Explain how an adult develops immunity to the toxin.

(3)

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Q13.

Colistin is an antibiotic used to treat infections in the bloodstream.

Some bacteria are resistant to Colistin.

Explain how these bacteria have become resistant to Colistin.

(4)

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(Total for question = 4 marks)

Mark Scheme

Q1.

Question Number	Answer	Additional guidance	Mark
(i)	substitution (1) $72 \div 1.81^2$ evaluation (1) $= 21.977 / 21.98 / 22$ 3 s.f. (1) 22.0	accept $72 \div 3.2761$ award 2 marks for correct evaluation award full marks for correct numerical answer without working accept 21.9 for 2 marks	(3) AO 1 1

Question Number	Answer	Additional guidance	Mark
(ii)	<ul style="list-style-type: none"> the BMI shows male A is overweight but his waist:hip ratio {shows he is not abdominally obese / is below 0.9/is healthy} (1) male A's weight distribution is not around the {vital organs/abdomen} (1) 	accept male A's weight is distributed evenly over the body accept more weight on the hips than the waist accept mass for weight	(2) AO 3 2a AO 3 2b

Q2.

Question number	Answer	Mark
	<ul style="list-style-type: none"> pathogens (1) antibiotics (1) viruses (1) 	(3)

Q3.

Question	Answer	Mark
(i)	C sexual intercourse i The only correct answer is C <i>A is not correct because insect vectors do not transmit Chlamydia</i> <i>B is not correct because Chlamydia is not transmitted by sneezing</i> <i>D is not correct because Chlamydia is not transmitted by contaminated food</i>	(1) Comp AO1 1

Question	Answer	Mark
(ii)	<p>A bacterium</p> <p>ii The only correct answer is A</p> <p><i>B is not correct because Chlamydia is not caused by a fungus</i></p> <p><i>C is not correct because Chlamydia is not caused by a protist</i></p> <p><i>D is not correct because Chlamydia is not caused by a virus</i></p>	<p>(1)</p> <p>AO1 1</p>

Q4.

Question number	Answer	Mark
	<p>An answer that combines knowledge (1 mark) and understanding (2 marks) to provide a logical description:</p> <ul style="list-style-type: none"> white blood cells (1) produce antibodies (1) memory lymphocytes/cells produced (that provide immunity) (1) 	(3)

Q5.

Question number	Answer	Additional guidance	Mark
	<p>An answer that combines points of interpretation to provide a logical description:</p> <ul style="list-style-type: none"> number of deaths increase with age after the age of 21 (1) valid interpretation of data/information from graph(1) 	Allow increase after age between 20 and 23	(2)

Q6.

Question number	Answer	Mark
	<p>An explanation that combines identification - application of knowledge (1 mark) and reasoning/justification - application of understanding (2 marks):</p> <ul style="list-style-type: none"> stent inserted into blood vessel and is expanded (1) stent opens /widens blood vessel (1) greater blood flow (through blood vessel) (1) more oxygen delivered to body organ (1) 	(3)

Q7.

Question number	Answer	Mark
	cannot be transferred from one person to another	(1)

Question Number	Answer	Additional guidance	Mark
	An explanation linking: <ul style="list-style-type: none"> exercise {requires energy/ uses respiration} (1) {obtained from/reducing} fat (1) 	accept burns calories accept sweating causes water loss for 1 mark	(2) AO 1 1

Q9.

Question number	Answer	Mark
(i)	B	(1)

Question number	Answer	Mark
(ii)	Any two of the following points: <ul style="list-style-type: none"> similar BMI (1) same gender profile (1) similar amount (and type) of exercise (1) 	(2)

Question number	Answer	Mark
(iii)	An answer that combines the following points to provide a plan: <ul style="list-style-type: none"> weigh the 40 obese people (1) half follow the new diet and half keep their normal diet (1) after a fixed time period re-weigh the 40 people (1) 	(3)

Q10.

Question Number	Answer	Additional guidance	Mark
	Any two from: <ul style="list-style-type: none"> wear gloves/ goggles/cover wounds/cover cuts (1) clean up spills/use tongs to handle sample (tubes) (1) store samples in sealed containers (1) dispose of samples safely (1) 	accept store in fridge/cooler accept burn/incinerate/sterilise(1)	(2) AO 2 1

Q11.

Question number	Answer	Additional guidance	Mark
	<ul style="list-style-type: none"> 830 mm = 0.83 m (1) 0.83/0.99 = 0.8383... = 0.84 to two d.p. (1) OR <ul style="list-style-type: none"> 0.99 m = 990 mm (1) 830/990 = 0.8383... = 0.84 to two d.p. (1) <ul style="list-style-type: none"> Answer must be given to 2 decimal places 	award full marks for correct numerical answer without working	(2)

Q12

Question Number	Answer	Additional guidance	Mark
	<p>An answer linking three of the following:</p> <ul style="list-style-type: none"> • exposure to the {toxin/antigen/pathogen/bacteria} (1) • stimulates an immune response (1) • production of {(B)lymphocytes /antibodies} (1) • production of memory lymphocytes (1) 	<p>accept immunised /vaccinated</p> <p>accept antitoxins</p>	<p>(3)</p> <p>AO 2 1</p>

Q13.

Question number	Answer	Additional guidance	Mark
	<p>An explanation linking four of the following:</p> <ul style="list-style-type: none"> • people do not finish their course (of Colistin) (1) • natural selection /evolution (occurs) (1) • some bacteria have a mutation/ (genetic) variation (1) • (these) resistant bacteria survive /resistant bacteria reproduce (1) 	<p>accept overuse / repeated exposure (to the antibiotic)</p> <p>accept they have evolved</p> <p>accept some bacteria have a {gene/allele} for resistance</p> <p>accept the non-resistant bacteria die / the fittest bacteria survive</p> <p>ignore immune bacteria</p>	<p>(4)</p> <p>AO2 1</p>