Name: _____

Class: _____

Date: _____

Infection and Response part 5 AQA Triple Biology

Time: **64 minutes**

Marks: **64 marks**

Comments:

1. A child has a sore throat. The mother takes the child to the doctor. The doctor says that the child has a bacterial infection.

Explain how the infection makes the child ill.

_____

_____

_____

_____

(Total 2 marks)

2. (a) Explain, as fully as you can, how the body's white blood cells respond to infections.

_____

_____

_____

_____

_____

(4)

(b) Describe, in as much detail you can, how **one** method of immunisation protects us from a named disease.

Name of disease _____

How immunisation protects us from this disease.

_____

_____

_____

_____

_____

_____

(3)

(Total 7 marks)

3. (a) Explain how diseases caused by bacteria are usually treated by doctors.

_____

_____

(2)

(b) Explain, as fully as you can, how white blood cells protect us from disease.

(5)
(Total 7 marks)

4. (i) Give **two** ways in which white blood cells protect us from disease.

1. _____

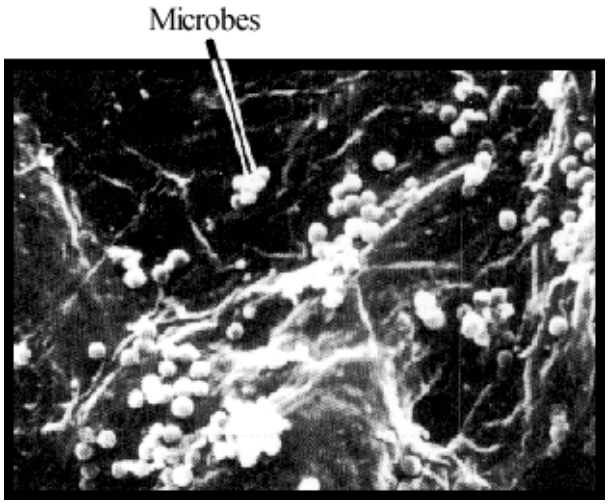
2. _____

(2)

(ii) Explain, as fully as you can, how immunisation protects us from disease.

(3)
(Total 5 marks)

5. The photograph below shows human skin highly magnified. Groups of microbes can be seen on the skin.



Give **two** ways in which the body protects itself from these microbes.

1. _____

_____

2. _____

_____

(Total 2 marks)

6. The influenza virus damages the cells lining the respiratory tract causing sore throats.

Coughing and sneezing spread the virus.

(a) Give the correct term for this method of spreading an infection.

_____

(1)

(b) In an immunisation programme such as that for MMR (Measles, Mumps and Rubella), suggest why it is essential for a large proportion of the child population to be vaccinated in order to protect the few individuals who are unable to be vaccinated.

_____

_____

(1)

(c) In some modern influenza vaccines the protein surface sub-units are separated from the virus coat and used for the vaccine. This stimulates an effective immune response in the same way as inactive pathogens.

(i) Explain how this immunity is produced in the body following vaccination, and how further illness from the same virus is prevented.

_____

_____

_____

_____

_____

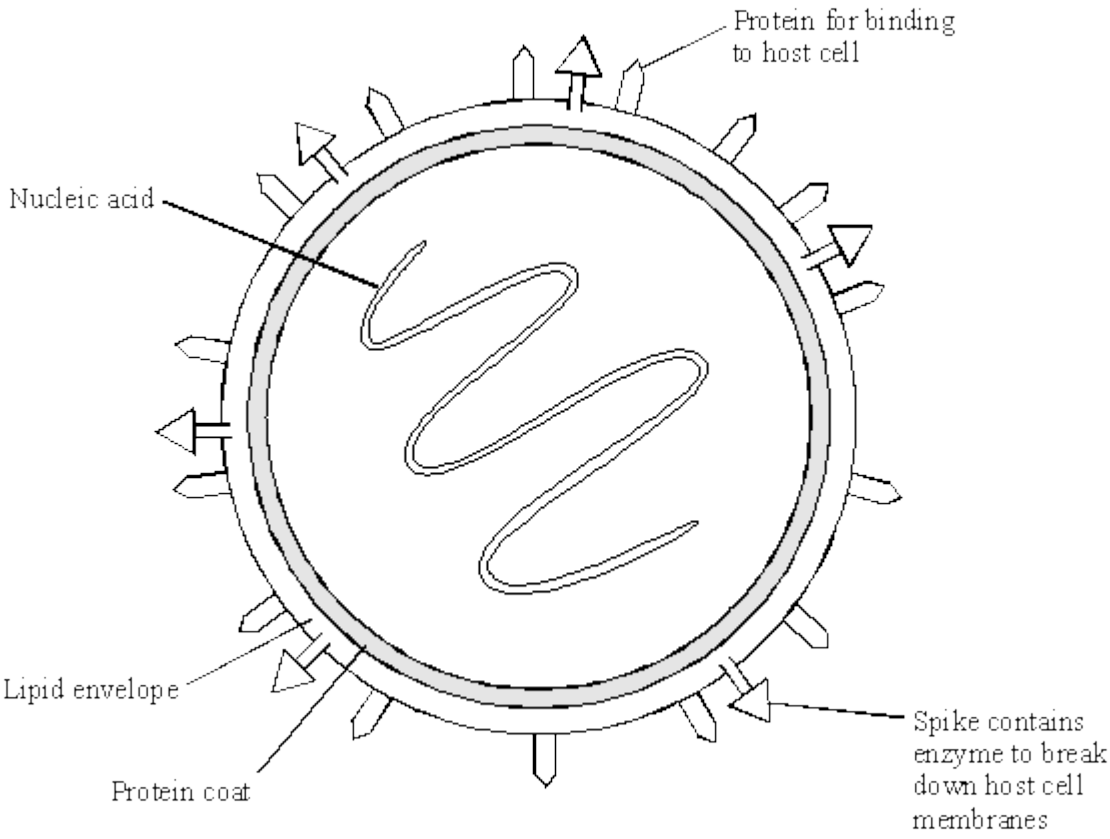
(4)

(ii) This type of immunity resulting from an influenza injection is described

as _____ immunity.

(1)

(d) The diagram shows the structure of an influenza virus.



Influenza epidemics can arise because the nucleic acid of the virus frequently changes. This results in changes in the virus structure and so a new strain of the virus is formed. A person who has had influenza or who has been vaccinated may not be immune to the new strain.

Explain why this is so, using the diagram of the influenza virus structure and your knowledge of immunity.

(3)

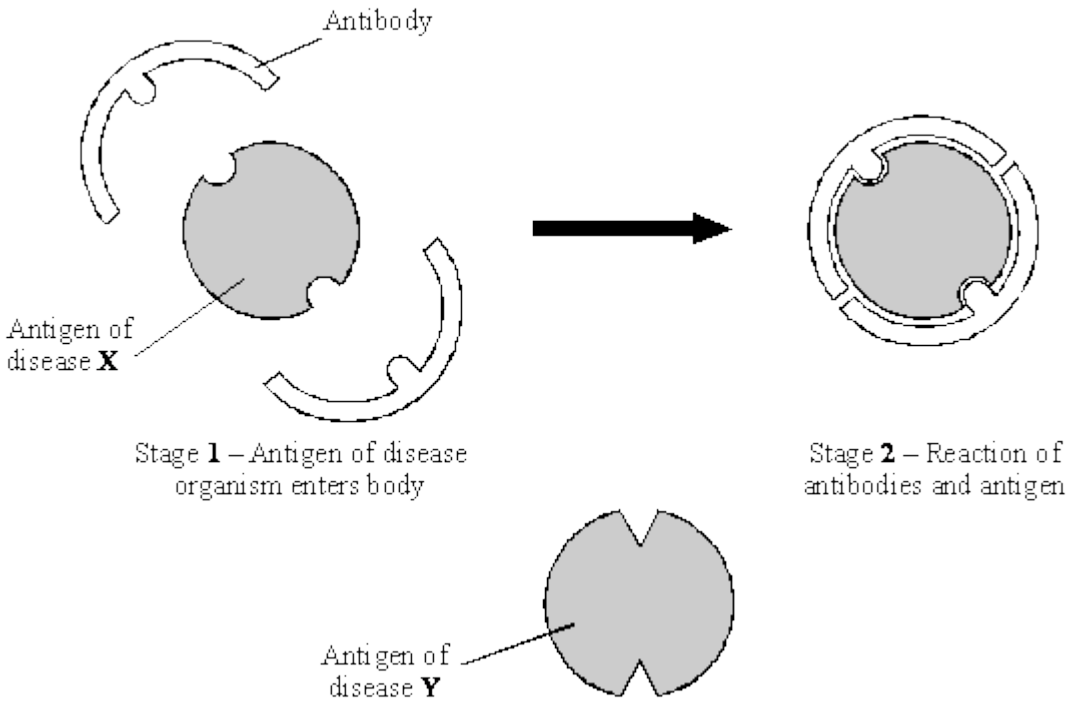
(Total 10 marks)

7. Penicillin is an antibiotic which stops bacteria from reproducing. It was used a lot in the past to treat bacterial infections in humans and other animals. In many hospitals there are now strains of penicillin resistant bacteria.

Explain how natural selection could have produced these strains of penicillin resistant bacteria.

(Total 5 marks)

8. (a) Antibodies help to defend the body against disease. The diagram represents the reaction of antibody and antigen for disease **X.**



Using the diagram to help you, suggest why the body's defence against disease **X** would not be effective against disease **Y**.

_____

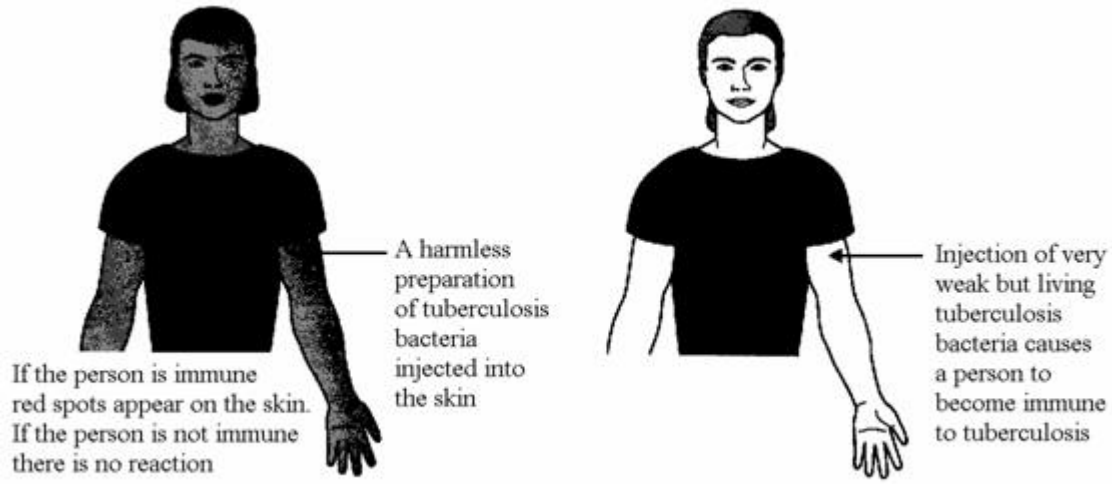
_____

_____

(2)

(b) Tuberculosis is a disease which is caused by a bacterium. The body is able to produce antibodies to destroy the bacteria which cause the disease. Some people are naturally immune. A person can be tested to find if they are immune.

Use information in the diagrams to help you answer the questions.



A Testing for immunity

B Immunisation

(i) Suggest the possible cause of the reaction when a person who is already immune is tested, as shown in diagram **A**.

_____

_____

_____

(2)

(ii) Explain why the injection of tuberculosis bacteria (diagram **B**) causes immunity but does not cause the disease.

_____

_____

_____

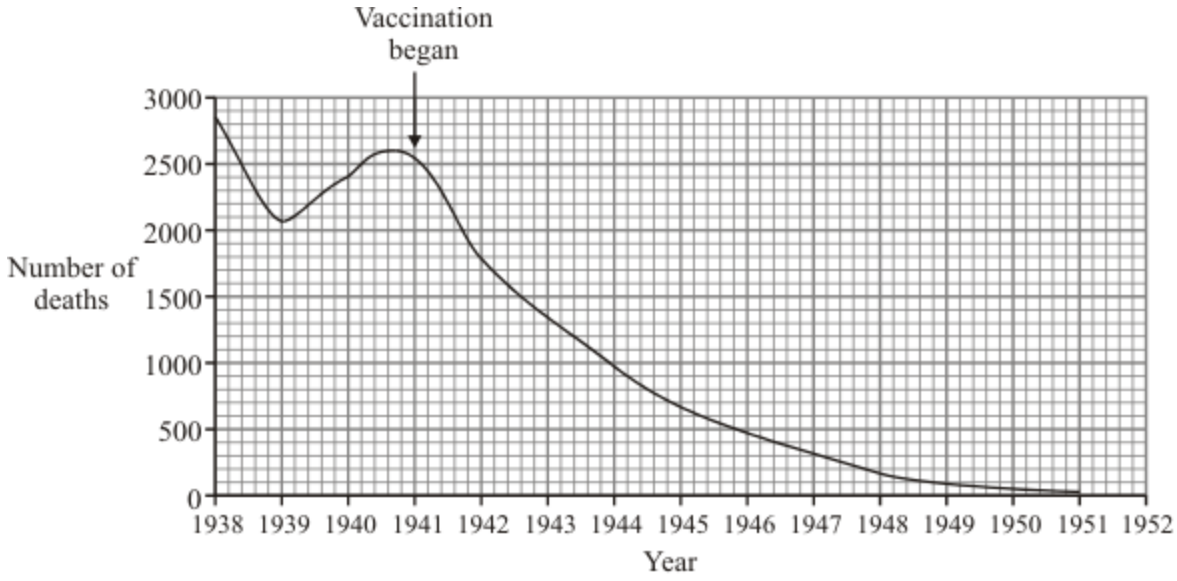
_____

_____

(3)

(Total 7 marks)

9. Diphtheria is a disease of the human breathing system. The graph shows the number of deaths from diphtheria in the United Kingdom between 1938 and 1951. Vaccination against diphtheria was begun in 1941.



(a) What evidence in the graph suggests that vaccination protects people from diphtheria?

_____

(1)

(b) Complete the passage by choosing the correct words from the box.

antibodies	**bacteria**	**platelets**
red blood cells	**white blood cells**	

During vaccination, harmless _____ are injected into the body.

This causes _____ to make _____ which help to protect the body against diphtheria.

(3)

(Total 4 marks)

10. Hepatitis B is a liver disease caused by a virus. The virus is found in body fluids such as blood, saliva and urine. Diagram **1** shows the structure of the virus in cross section.

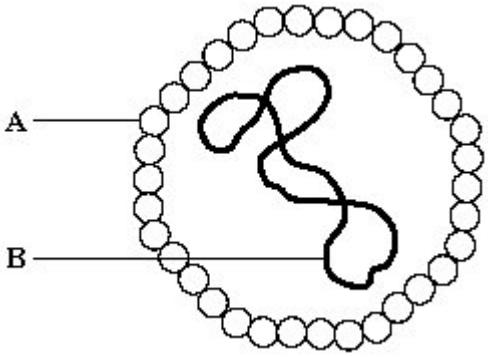
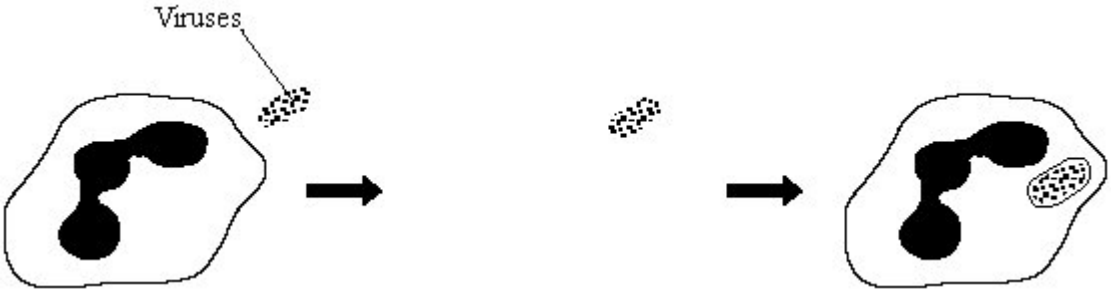


Diagram 1

(a) The human body has several natural defences against viruses. Some of these prevent viruses from entering the body. Others act once the viruses have entered.

(i) Diagram **2** shows a white blood cell attacking a group of viruses.

Complete diagram **2** by drawing the 2nd stage.



1st stage **2nd stage** **3rd Stage**

Diagram 2

(1)

(ii) What type of chemical is released by some white blood cells to attack viruses?

_____

(1)

(b) Hepatitis B is more likely to be spread among people who share needles when they inject drugs. Use information given at the beginning of this question to explain why this is so.

_____

_____

_____

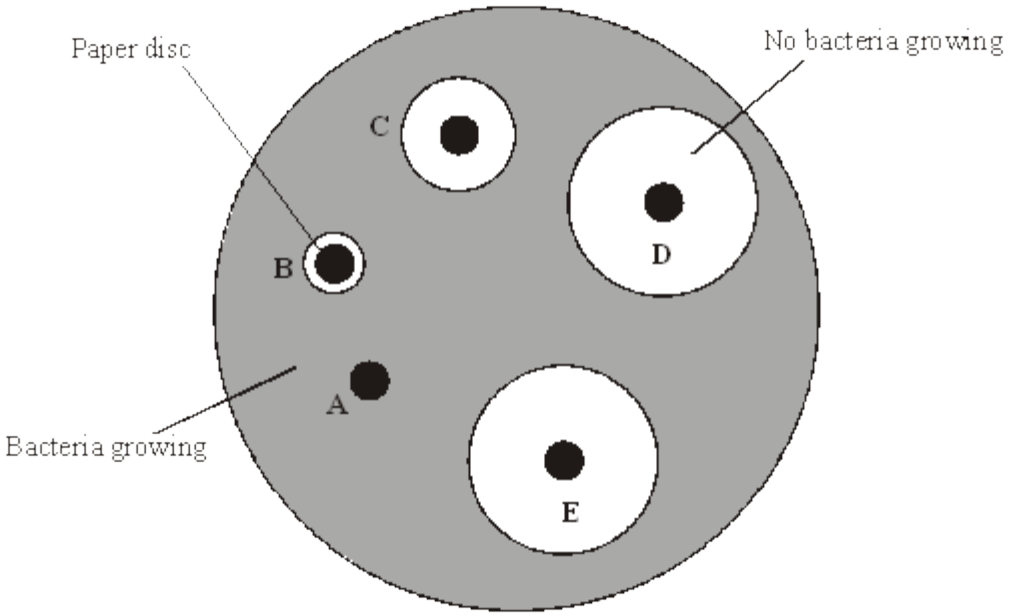
_____

(2)

(Total 4 marks)

11. An investigator placed paper discs containing different concentrations of an antibiotic onto a culture of bacteria in a petri dish.

After an incubation period of two days, the dish looked like this.



(a) Explain why there are areas around some of the paper discs where no bacteria are growing.

_____

_____

(2)

(b) The concentration of the antibiotic on the paper discs is given in the table, along with the diameter of the circles where no bacteria are growing.

Disc	Concentration of the antibiotic in units	Diameter of circle where no bacteria are growing, in mm
A	0	0
B	2	8
C	4	14
D	6	26
E	10	26

What effect does an increase in the concentration of the antibiotic have on the growth of the bacteria?

_____

_____

_____

(2)

(c) When students carry out this experiment, they need to take several safety precautions.

The precautions include:

- passing inoculating loops through a flame
- sealing the lid of the petri dish with tape
- incubating at a maximum temperature of 25 °C.

Explain why each of these precautions is necessary.

To gain full marks in this question you should write your ideas in good English. Put them into a sensible order and use the correct scientific word.

(5)

(d) Scientists are concerned that many bacteria are developing resistance to antibiotics.

Suggest **two** ways by which this problem could be limited.

(2)

(Total 11 marks)

1. bacteria reproduce rapidly / increase rapidly in numbers
produce poisons / toxins

each for 1 mark

[2]

2. (a) engulf bacteria
produce antibodies
produce antitoxins
effect of antibodies/antitoxins

for 1 mark each

4

(b) method must be related to disease
dead/weakened microbes (as appropriate)
stimulate antibody production
antibody production rapid if microbe enters again

for 1 mark each

3

[7]

3. (a) use antibiotics; or named one to kill bacteria; (not microbes)

each for 1 mark

2

(b) some ingest/digest bacteria (not microbes) OWTTE
some produce antibodies;
which destroy bacteria/viruses;
some produce antitoxins;
which counteract poisons released by bacteria

each for 1 mark

5

[7]

4. (i) 2 of:
ingest microbes;)allow higher level answers
produce antibodies;)allow cause and effect
produce antitoxins)eg antitoxins neutralise poisons = 2

each for 1 mark

2

(ii) injection of dead/weak microbes;
stimulates antibody production;
these can be produced again quickly on new infection
or remain for long time to 'combat' new infection

each for 1 mark

3

[5]

5. blood clots to seal cuts;
kills microbes which enter

each for 1 mark
(allow higher level answers)

[2]

6. (a) droplet infection **or** aerosol infection

*do **not** accept airborne*
accept airborne droplets

1

(b) so there is no large group which could catch the infection/pass on the infection

converse – if large numbers can't pass it on the virus is less likely to reach those few who are susceptible

1

(c) (i) any **four** of the following points:-

example of a 3 mark answer: Lymphocytes produce specific antibodies……

comment on specificity applied to antibodies or lymphocytes

(recognition by) lymphocytes;

(white cells) make antibodies;

antibodies destroy/neutralise the virus/antigen/protein subunit;

*do **not** accept antibodies KILL viruses*

accept white blood cells replicate

accept some white cells form memory cells/live a long time;

accept subsequent infection results in very rapid antibody production;

max 4

(ii) active;

1

(d) any **three** of the following points

Structure change in:
protein for binding to host cell;

accept changes in surface proteins (of protein coat)

spike containing enzyme;

changes in antigen

Fit: existing/circulating/old antibodies don't match new virus strain shape/new antigen/new binding protein;

Wrong antibodies: injection does not stimulate antibodies against all strains/different antigens;

accept wrong antibodies for 1 mark

max 3

[10]

7. mutation or description of mutation (gives resistance to penicillin)

1

<u>some</u> survive (penicillin)

1

(survivors) reproduce **or** multiply

1

asexual reproduction **or** binary fission **or** cloning

accept mitosis

1

<u>gene</u> for resistance **or** the mutation is passed on (to offspring)

allow reference to bacteria being immune

ignore reference to survival of fittest

1

[5]

8. (a) shape of antibody is not complementary;

*accept shapes of antibody and antigen do not match or antibody does not correspond to antigen **Y or** is not the same shape as antigen **Y or** antibody different shape*

1

so unable to attach or join to antigen **Y**

accept they do not fit

1

(b) (i) antibodies in blood or in skin or in body;

accept already have the antibodies

1

react with (injected) antigens or bacteria;

*accept skin affected by antigen-antibody complex **or** blood vessels in skin enlarge **or** dilate*

*do **not** accept attack instead of react*

1

(ii) any **three** from

bacteria weak so do not cause disease

accept not harmful

*do **not** accept bacteria are dead*

cause antibody production;

memory cells remain;

accept a suitable description

so body can quickly produce more antibodies in a real infection;

*accept antibodies remain in blood **or** in body*

3

[7]

9. (a) decrease in number of deaths (after vaccination started)

1

(b) in correct sequence:

bacteria

1

white blood cells

1

antibodies

1

[4]

10. (a) (i) diagram shows extensions of intact cell membrane around viruses

1

(ii) antibodies

allow enzymes re (ii)
allow interferon
ignore antitoxins / proteins

1

(b) virus is transferred

1

(virus in) blood / body fluids – transfer (via needles)

1

[4]

11. (a) antibiotics diffuse / pass (into agar)

*do **not** allow into dish*

1

kill / prevent growth of bacteria or destroy cell wall / bacteria

accept bacteria are dead

1

(b) it / higher concentration kills more bacteria **or** causes less growth

*do **not** accept anything referring to size of circle*

1

levels off (at 6 units)

accept above 4 units

1

(c) **Quality of written communication**:
for correct sequencing or linking of ideas or points

this mark can only be awarded for a plausible attempt (not necessarily biologically correct) to link a precaution to a purpose

Q ✓ or Q ✗

1

Loop flamed

to sterilise it / kill unwanted microorganisms

*accept so no bacteria present do **not** accept to clean it*

1

Lid taped

prevent bacteria getting in / out **or** prevent someone touching bacteria

accept microorganisms/fungi for bacteria
*do **not** accept viruses or germs*

1

25°C

prevents / reduces growth of / reproduction

1

harmful bacteria / microorganisms or pathogens

1

(d) any **two** from:

- to avoid over-use of antibiotics **or** use no / less / low concentration antibiotics
- select antibiotic that is most effective
- finish the course
- don't give or use for animals
- develop new antibiotics **or** alternatives

2

[11]