Infection and Response part 4 AQA Triple Biology

Name: _____

Class: _____

Date: _____

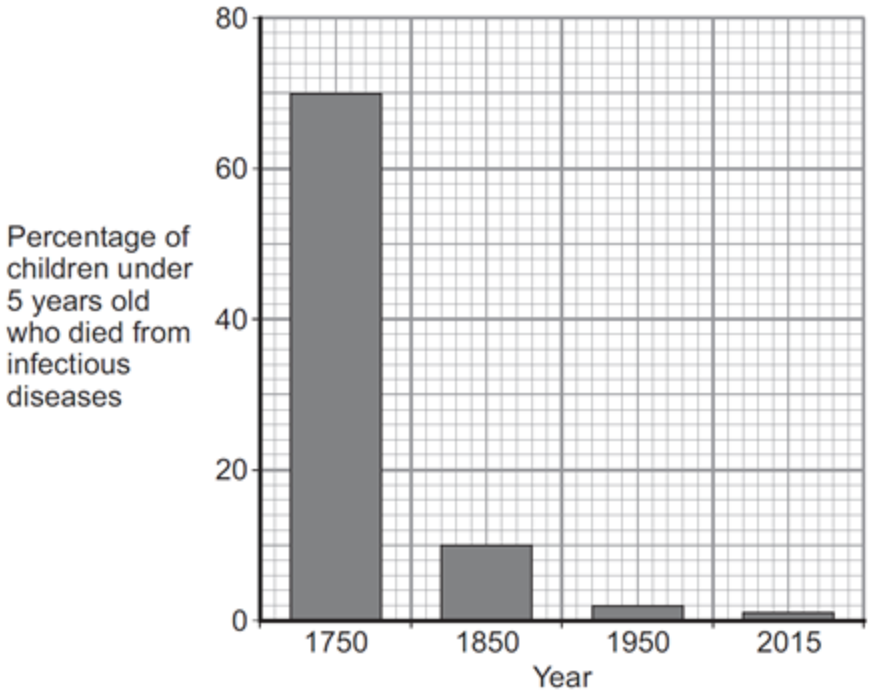
Time: **69 minutes**

Marks: **68 marks**

Comments:

1. Pathogens are microorganisms that cause infectious diseases.

(a) The graph shows the percentage of children under 5 years old who died from infectious diseases, in the UK, in four different years.



(i) Between 1750 and 1850 vaccinations were also developed.
What is in a vaccine?

Tick (✓) **one** box.

large amounts of dead pathogens ☐

large amounts of live pathogens ☐

small amounts of dead pathogens ☐

(1)

(ii) The advances in medicine had an effect on death rate.

Describe the effect these advances had between 1750 and 1850.

To gain full marks you should include data from the graph above.

_____

_____

_____

_____

(2)

(b) Antibiotics were developed in the 1940s. Antibiotics kill bacteria.

(i) Which **one** of the following is an antibiotic?

Draw a ring around the correct answer.

cholesterol **penicillin** **thalidomide**

(1)

(ii) The use of antibiotics has **not** reduced the death rate due to all diseases to zero.

Suggest **two** reasons why.

1. _____

_____

2. _____

_____

(2)

(c) In school laboratories, bacteria should be grown at a maximum temperature of 25 °C.

Give **one** reason why companies testing new antibiotics grow bacteria at 37 °C.

_____

_____

(1)

(Total 7 marks)

2. Many people in the UK take sleeping pills.

(a) The drug thalidomide was developed as a sleeping pill in the 1950s. In the 1960s thalidomide was banned. Recently thalidomide has been used to treat other diseases.

Name **one** disease thalidomide is used to treat now.

_____

(1)

(b) The table shows information about the development of a new sleeping pill.

Type of test or trial	Preclinical	Clinical phase 1	Clinical phase 2	Clinical phase 3
Tested or trialled on	Cells, tissues or animals	20 −100 healthy volunteers	100 − 500 volunteer patients	1000 − 5000 volunteer patients
Number of compounds tested	>10 000	5 −10	2 − 3	1 (new sleeping pill)
Time taken for test or trial in years	1− 4	2− 4	1 − 3	2 − 4

(i) What is the shortest time taken to develop a new sleeping pill?

_____ years

(1)

(ii) What is the **range** for the number of volunteers needed to complete all the clinical trials for the new sleeping pill?

_____

(1)

(c) Drugs are trialled to check for side effects on people.

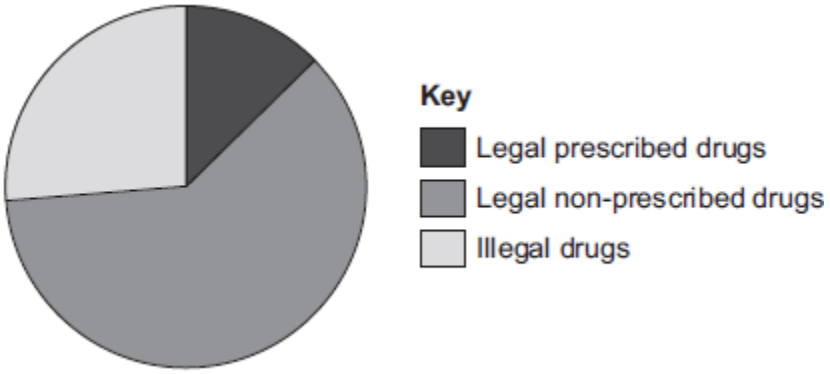
Give **one** other reason why drugs are trialled.

_____

_____

(1)

(d) The pie chart shows the impact on the health of the population caused by drugs from different sources.



(i) Legal non-prescribed drugs have a greater impact on the health of the population than illegal drugs.

Suggest **two** reasons why.

_____

_____

_____

_____

_____

_____

(2)

(ii) Drugs change chemical processes in a person's body.

Why is it difficult for a person to stop taking certain drugs?

_____

_____

(1)

(Total 7 marks)

3. The MMR vaccine is used to protect against measles.

(a) Apart from measles, which **two** other diseases does the MMR vaccine protect against?

_____ and _____

(1)

(b) Read the information.

> Measles is a dangerous disease caused by a virus.
> Normally, MMR vaccinations are given at 1 year old and again at 4 years old.
> Each vaccination is 90% effective in protecting against the measles virus.
>
> In April 2013, there were 630 cases of measles in children aged 4 and over in a small area of the UK. Of these cases, 504 children had not been vaccinated against MMR at all and only a few had been given a second vaccination.

(i) Calculate the percentage of the children who caught measles in April 2013 who had **not** been vaccinated against MMR.

_____

_____

_____

Percentage = _____

(2)

(ii) Suggest **one** advantage to the population as a whole of children having the second MMR vaccination.

_____

(1)

(c) (i) What does a vaccine contain?

_____

_____

(1)

(ii) Explain how a vaccination prevents infection.

_____

_____

_____

_____

_____

_____

_____

(3)

(d) (i) Antibiotics can only be used to treat some infections.

Explain why antibiotics **cannot** be used to treat measles.

_____

_____

_____

_____

(2)

(ii) Why do antibiotics become less useful at treating an infection if the antibiotic is overused?

_____

_____

(1)

(Total 11 marks)

4. Viruses and bacteria cause diseases in humans.

(a) Draw a ring around the correct word to complete the sentence.

Organisms that cause disease are called

algae.
pathogens.
vaccines.

(1)

(b) In August 2011 the United Nations gave a warning that there was a new strain of the bird flu virus in China.

Bird flu may kill humans. The new strain of the bird flu virus could cause a *pandemic* very quickly.

(i) What is a *pandemic*?

Tick (✓) **one** box.

A disease affecting the people all over one country.	☐
A disease affecting hundreds of people	☐
A disease affecting people in many countries.	☐

(1)

(ii) The swine flu virus is carried by pigs.

The bird flu virus is likely to spread much more quickly than the swine flu virus.

Suggest **one** reason why.

_____

_____

(1)

This notice is from a doctor's surgery.

Unfortunately, antibiotics will NOT get rid of your flu.

(c) (i) Why will antibiotics **not** get rid of flu?

_____

_____

(1)

(ii) The symptoms of flu include a sore throat and aching muscles.

What would a doctor give to a patient to relieve the symptoms of flu?

_____

(1)

(iii) It is important that antibiotics are **not** overused.

Explain why.

Use words from the box to complete the sentence.

antibody	**bacteria**	**immune**	**resistant**	**viruses**

Overuse of antibiotics might speed up the development

of _____ strains of _____ .

(2)

(Total 7 marks)

5. White blood cells protect the body against pathogens such as bacteria and viruses.

(a) (i) Pathogens make us feel ill.

Give **one** reason why.

_____

_____

(1)

(ii) White blood cells produce antibodies. This is one way white blood cells protect us against pathogens.

Give **two** other ways that white blood cells protect us against pathogens.

1. _____

_____

2. _____

_____

(2)

(b) Vaccination can protect us from the diseases pathogens cause.

(i) One type of virus causes measles.

A doctor vaccinates a child against measles.

What does the doctor inject into the child to make the child immune to measles?

_____

_____

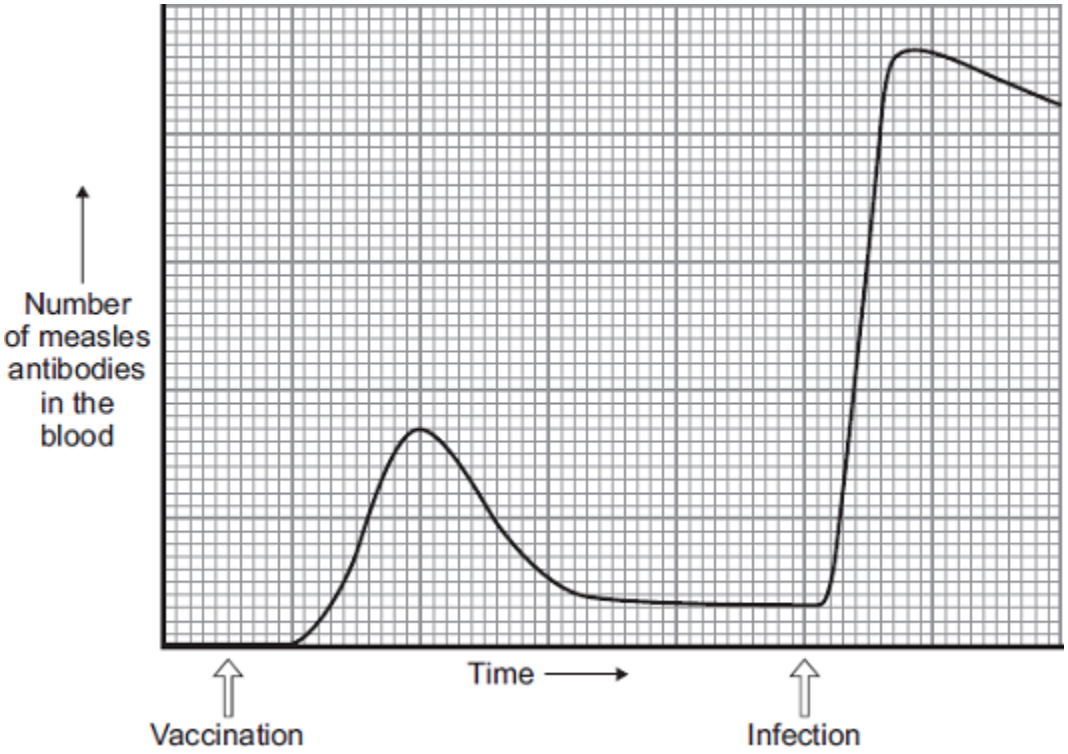
_____

_____

(2)

(ii) A few weeks after the vaccination, the child becomes infected with measles viruses from another person.

The graph shows the number of measles antibodies in the child's blood from before the vaccination until after the infection.



More measles antibodies are produced after the infection than after the vaccination.

Describe other differences in antibody production after infection compared with after vaccination.

_____

_____

_____

_____

_____

_____

(3)

(iii) Vaccination against the measles virus will **not** protect the child against the rubella virus.

Why?

_____

(1)

(c) What is the advantage of vaccinating a large proportion of the population against measles?

_____

(1)

(Total 10 marks)

6. (a) Use words from the box to complete the sentences about curing disease.

antibiotics	**antibodies**	**antitoxins**	**painkillers**	**statins**

The substances made by white blood cells to kill pathogens

are called _____ .

The substances made by white blood cells to counteract poisons produced by

pathogens are called _____ .

Medicines which kill bacteria are called _____ .

(3)

(b) The MMR vaccine protects people against three diseases.

Write down the names of **two** of these diseases.

1. _____

2. _____

(2)

(c) All vaccinations involve some risk.

The table shows the risk of developing harmful effects:

- from the disease if a child is **not** given the MMR vaccine
- if a child **is** given the MMR vaccine.

Harmful effect	**Risk of developing the harmful effect from the disease if not given the MMR vaccine**	**Risk of developing the harmful effect if given the MMR vaccine**
Convulsions	1 in 200	1 in 1000
Meningitis	1 in 3000	Less than 1 in 1 000 000
Brain damage	1 in 8000	0

A mother is considering if she should have her child vaccinated with the MMR vaccine.

Use information from the table to persuade the mother that she should have her child vaccinated.

_____

_____

_____

_____

_____

(2)

(Total 7 marks)

7. Human immunodeficiency virus (HIV) is a pathogen.

(a) Give **one** way HIV can spread from one person to another person.

_____

_____

(1)

The table below shows information about new cases of HIV diagnosed in the UK.

Year	Number of new HIV cases in women	Number of new HIV cases in men
2010	376	2266
2012	361	2310
2014	397	2370
2016	298	1886
2018	242	1288

(b) Describe the trends shown in the table above between 2010 and 2018.

_____

_____

_____

_____

(2)

(c) Suggest **one** reason for the change in the number of new HIV cases between 2014 and 2018.

_____

_____

(1)

(d) Calculate the ratio of new cases of HIV in women to new cases of HIV in men in 2018.

Give your answer to 3 significant figures.

_____

_____

_____

_____

_____

_____

Ratio (3 significant figures) = _____**:** 1

(3)

(e) In the UK population the total number of women is greater than the total number of men.

The data in the table in part (a) is used to compare the proportions of new cases of HIV in the population for men and women.

Suggest how the data could be presented differently so that a more valid comparison can be made.

_____

_____

_____

(1)

Scientists have been working to produce a vaccine for HIV for many years.

(f) Explain how a vaccine for HIV could work to prevent a person developing HIV infection.

_____

_____

_____

_____

_____

_____

_____

_____

(4)

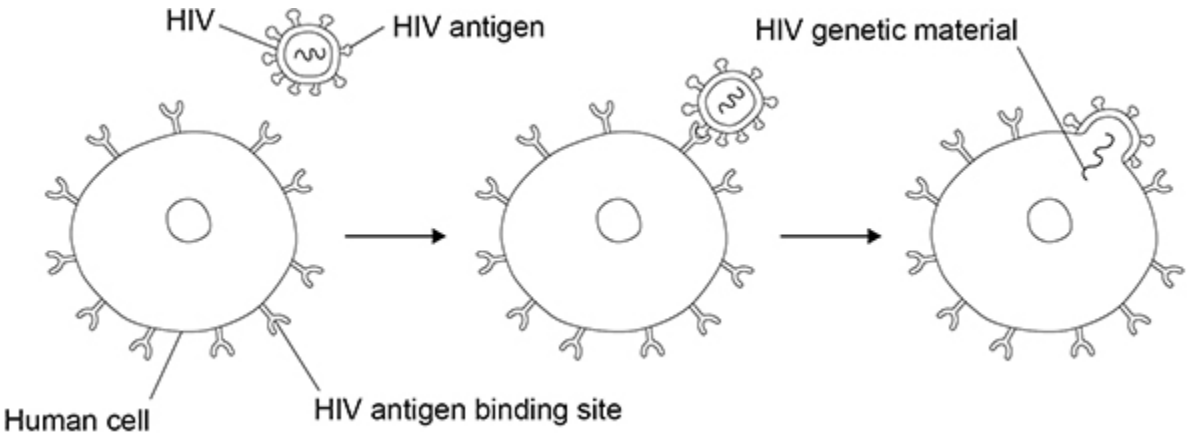
A person with late stage HIV infection has AIDS.

Scientists have produced monoclonal antibodies for HIV.
The monoclonal antibodies can prevent a person infected with HIV developing AIDS.

(g) Describe how the monoclonal antibody for HIV can be produced.

(4)

(h) The figure below shows how HIV enters a human cell.



Suggest how the monoclonal antibody for HIV helps to prevent a person infected with HIV developing AIDS.

Use information from the figure above.

_____

_____

_____

_____

_____

_____

(3)

(Total 19 marks)

1.

(a) (i) small amounts of dead pathogens

1

(ii) decrease

1

by 60 (%)

allow from 70(%) to 10(%)

allow other correct data treatment

1

(b) (i) penicillin

1

(ii) any **two** from:

- antibiotics only kill bacteria
  allow antibiotics do not kill viruses
- some bacteria are resistant (to antibiotics)
  allow MRSA not killed by antibiotics
- (correct) antibiotics not always used
  allow course not completed
- deficiency disease(s) not caused by bacteria **or** cannot be treated by antibiotics
- inherited disease(s) not caused by bacteria **or** cannot be treated by antibiotics
- 'lifestyle' diseases not caused by bacteria **or** cannot be treated by antibiotics
  eg heart disease / cancer

*if no other mark given allow **1** mark for not all diseases are caused by bacteria **or** some diseases are caused by viruses*

2

(c) bacteria grow faster

allow this is body temp (at which pathogens grow)

1

[7]

2.

(a) leprosy

allow bone / blood cancer

ignore cancer

1

(b) (i) 6 / six

1

(ii) from 1120 to 5600

allow from 5600 to 1120

allow 4480 (alone)

1

(c) any **one** from:

ignore side effects, eg allergies

ignore safety / harm unqualified

- (test for) toxicity

  allow poisonous
- (test for) dosage

  allow idea of amount
- (test for) efficacy.

  allow to see if it works

  allow to check for interaction with other drugs

1

(d) (i) any **two** from:

ignore reference to cost / addiction

- more people take / use legal / non-prescribed drugs
- legal / non-prescribed drugs are (more) readily available
- alcohol causes liver / brain damage

  or

  tobacco causes cancer.

  allow harmful effects of other named legal non-prescribed drugs

2

(ii) addiction / dependency

allow withdrawal or examples of symptoms of withdrawal (if attempting to stop)

1

[7]

3. (a) mumps

in either order rubella / German measles

both needed for the mark

ignore measles unqualified

1

(b) (i) 80(.0)

*allow **1** mark for* $\frac{504}{630}$ ***or** 0.8*

2

(ii) less chance of epidemic / pandemic

or

less chance of spread of disease / measles / mumps / rubella

allow idea of herd immunity (increased protection for those who are not vaccinated)

*ignore less chance of getting the disease **or** to eradicate the disease*

1

(c) (i) dead / inactive pathogens / viruses / bacteria

allow antigens / proteins from pathogens / viruses / bacteria

ignore microorganisms

1

(ii) white blood cells produce antibodies

1

antibodies produced rapidly (on re-infection) **or** response rapid (on re-infection)

allow ecf if antibodies incorrectly identified in first marking point

1

these antibodies kill pathogens / viruses / bacteria

*do **not** accept idea that original antibodies remain in blood and kill pathogens*

1

(d) (i) antibiotics don't kill viruses

allow antibiotics only kill bacteria

1

(because measles) virus / pathogen lives inside cells

*allow antibiotics do not work inside cells **or** killing virus / pathogen would kill / damage cell*

1

(ii) (bacteria / pathogens) develop resistance (to antibiotic)

ignore reference to immunity

ignore viruses develop resistance

1

[11]

4. (a) pathogens

1

(b) (i) A disease affecting people in many countries

1

(ii) birds fly / migrate

accept converse

OR

human contact with birds more likely

birds not contained / difficult to control movement

OR

there are more birds (than pigs)

1

(c) (i) antibiotics (only) kill bacteria

ignore flu is caused by a virus unqualified

OR

antibiotics don't kill viruses

ignore virus resistant / immune

1

(ii) painkillers

accept any correct named painkiller, eg aspirin or paracetamol

allow antivirals / Tamiflu

ignore medicine / tablets

1

(iii) resistant

1

bacteria

1

in this order

[7]

5. (a) (i) any **one** from:

- (produce) toxins / poisons
- (cause) damage to cells

kill / destroy cells

allow kills white blood cells

1

(ii) produce antitoxins

1

engulf / ingest / digest pathogens / viruses / bacteria / microorganisms

accept phagocytosis or description

ignore eat / consume / absorb for engulf

ignore references to memory cells

1

(b) (i) dead / inactive / weakened

accept idea of antigen / protein

1

(measles) pathogen / virus

ignore bacteria

1

(ii) (after infection)

accept converse if clearly referring to before vaccination

1

rise begins sooner / less lag time

steeper / faster rise (in number)

1

longer lasting **or** doesn't drop so quickly

idea of staying high for longer

ignore reference to higher starting point

1

(iii) antibodies are specific or needs different antibodies

*accept antigens are different **or** white blood cells do not recognise virus*

1

(c) reduces spread of infection / less likely to get an epidemic

accept idea of eradicating measles

1

[10]

6. (a) antibodies

1

antitoxins

1

antibiotics

1

(b) any **two** from:

- measles
- mumps
- rubella / German measles

2

(c) less / low / no chance of getting named or all condition(s) if vaccinated

1

quantitative figure(s) eg 5 times less likely to get convulsions

1

[7]

7. (a) any **one** from:

- sexual contact / intercourse

allow intercourse unqualified

ignore kissing

- exchange of body fluids

*allow example of exchange such as (drug) users sharing needles **or** blood transfusion **or** passage from mother to foetus in uterus*

1

(b) (number of cases) in women decreases then increases, then decreases

1

(number of cases) in men increases then decreases

1

*allow **total** numbers (of men and women together) increase then decrease*

ignore reference to differences between men and women

*if no other marks awarded allow overall trend decreases in **both** for **1** mark*

ignore use of figures

(c) any **one** from:

- better education (into prevention of spread of HIV)

  allow increased awareness about HIV

- condoms more widely available **or** condoms easier to source **or** condoms cheaper

  ignore contraception / protection unqualified

- new / better drugs (to prevent HIV infection / spread)

  allow PrEP / anti-retrovirals stop the virus being passed on

  ignore new treatments

  *do **not** accept antibiotics*

- better / more testing / identification (of people with HIV)

  allow less promiscuity

  ignore vaccination

1

(d) $\frac{242}{1288}$

1

0.1878…

allow a rounded answer

1

0.188 (:1)

allow a correctly rounded answer from student's incorrect division using numbers from the table

*do **not** accept if a unit is given*

1

(e) any **one** from:

- calculate as a percentage
- give the numbers per 100 000 people

  ignore calculate as a proportion allow any standard number eg 10 000 / 1000

1

(f) inactive HIV / virus is injected (into bloodstream / muscle / body)

allow dead HIV / virus is injected (into bloodstream / muscle / body)

allow (named) part of HIV / virus is injected (into bloodstream / muscle / body)

1

white bloods cells produce antibodies (against inactive virus)

allow lymphocytes produce antibodies (against inactive virus)

*do **not** accept phagocytes produce antibodies (against inactive virus)*

1

(if infected with HIV) correct / specific antibodies are produced quickly

1

antibodies destroy the (active) virus / HIV

allow antibodies 'kill' the (active) virus / HIV

1

ignore reference to WBC unqualified

(g) HIV / antigen / protein injected into mouse

1

extract / collect (mouse) lymphocytes that make a specific antibody to HIV / antigen / protein

1

allow other correct small mammals eg rat

*allow extract specific lymphocytes from someone with HIV for **2** marks*

lymphocytes are combined with tumour cell to create a <u>hybridoma</u>

allow lymphocytes are combined with a myeloma / cancer cell to create a <u>hybridoma</u>

1

(hybridoma) <u>cloned</u> to create many cells that produce the antibody

1

alternative route

HIV / antigen / protein injected into mouse (1)

lymphocytes from mouse are combined with a tumour cell to create a <u>hybridoma</u> (1)

the hybridoma that makes the specific / correct antibody is isolated (1)

(hybridoma) <u>cloned</u> to create many cells that produce the antibody (1)

(h) monoclonal antibody is complementary / specific to HIV antigen

allow correct description of complementarity

1

monoclonal antibodies attaches to (all the) HIV antigens

1

(so) HIV cannot bind to (human) cell

or

(so) HIV genetic material cannot enter (human) cell

*allow white blood cells **or** phagocytes identify (monoclonal) antibodies and engulf / destroy (antibody bound) HIV*

1

alternative route

monoclonal antibody is complementary / specific to HIV antigen (1)

monoclonal antibody with (anti-retroviral) drug attached attaches to the HIV antigens (1)

*drug destroys the virus **or** drug destroys genetic material (1)*

allow 'the virus' for HIV throughout

[19]