Name:	Target Grade:	Actual Grade:

BRIGHT CULTURE

INFECTIOUS DISEASE IN HUMAN
MCQ and STRUCTURED QUESTIONS

READ THESE INSTRUCTIONS FIRST

INSTRUCTIONS TO CANDIDATES

1. Find a quiet, comfortable spot free place from distractions.

2. Spend one minute on each mark.

3. Time yourself for every single question.

4. Every chapter has their own question types. Ensure that you know the different question type for each chapter.

5. Make a conscientious effort to remember your mistakes, especially in terms of answering techniques. E.g Take a picture for the mistakes that you made, keep it in a photo album, and revise it over and over again.

6. Highlight question types that you tend to keep making mistakes and review them nearing exams.

7. Always review the common questions and question type that you tend to make mistakes nearing exams.

8. During exams, classify the question type and recall what you have learnt, how you need to analyse the questions for the different question type, what you need to take note of and answer with the correct answering techniques!

✨ **Wishing you all the best for this test!**

You've got this!

💡 **With lots of love,**
Bright Culture 💛

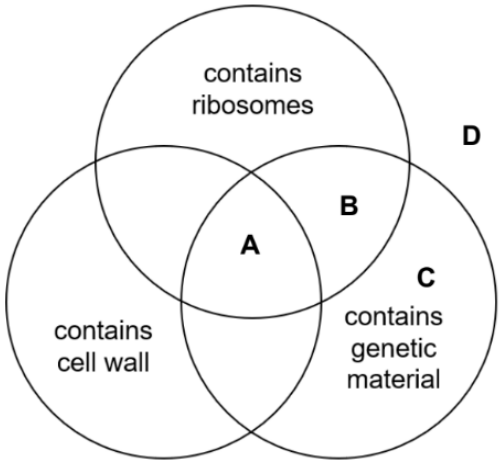
GOOD LUCK FOR YOUR EXAM!

MARKS

INFECTIOUS DISEASE IN HUMAN MCQ

1 The venn diagram shows the presence of various structures in bacteria and viruses.

Which option shows where viruses will be placed?



2 Which row correctly identifies an infectious and a non-infectious disease?

	infectious disease	non-infectious disease
A	coronary heart disease	influenza
B	COVID-19	pneumococcal disease
C	diabetes	sickle-cell anaemia
D	HIV	cancer

3 Which of the following is true about the differences between a bacterial cell and a virus?

	bacterial cell	virus
A	covered with a protein coat	covered with a cell wall
B	cell membrane is present	cell membrane is absent
C	does not possess ribosomes	possesses ribosomes
D	uses RNA as its genetic material	uses DNA as its genetic material

4 What is the pathogen, method of spread and method of control for influenza?

	pathogen	spread	control
A	bacterium	droplets	antibiotics
B	bacterium	Insect bite	vaccination
C	virus	shared needles	isolate patients
D	virus	droplets	vaccination

5 What is one way that development of antibiotic-resistant bacteria can be minimised?

A sharing antibiotics with family members
B use of antibiotics only when necessary
C use of antibiotics to prevent infection
D use of antibiotics to treat all infections

6 These actions may be important in controlling the spread of disease.

1 disposing of waste frequently

2 disposing of raw sewage into a river

3 using separate cutting boards for meat and salad

4 washing hands after going to the toilet

Which would help control the spread of disease?

A 1, 2, 3 and 4
B 1, 3 and 4 only
C 2 and 3 only
D 4 only

7 Lyme disease is a disease which can be transmitted to humans in the following way.

a mouse carries the bacteria Borrelia burgdorferi in its blood

↓

a tick bites the mouse and the bacteria are transferred into the tick

↓

the tick bites a human and bacteria are transferred to the human

↓

the human becomes infected with Lyme disease

What is the pathogen in this process?

A blood
B Borrelia burgdorferi
C mouse
D tick

8 Some features that help to defend the body against pathogens are listed.

1 mucus
2 skin
3 stomach acid
4 phagocytosis

Which feature(s) can prevent pathogens entering body tissues?

A 1, 2, 3 and 4

B 1, 2 and 3 only

C 2 and 3 only

D 4 only

9 Which disease might be treated successfully with an antibiotic?

A HIV

B influenza

C pneumonia

D sickle-cell anaemia

10 Which of the following best describes the mechanism of vaccines?

A Injected vaccines contain agents that destroy specific pathogens.

B Injected vaccines contain agents that increases specific antibodies.

C Injected vaccines contain agents that resemble white blood cells.

D Injected vaccines contain other pathogens stronger than those present.

11 In 2005, there were an estimated 2.3 million HIV-related deaths worldwide. In 2011, there were an estimated 1.7 million HIV-related deaths worldwide. Which of the following is not a possible cause of this trend?

A Decreased number of people sharing food.

B Increased access to antiviral drugs.

C Increased screening of blood that has been donated.

D Decreased used of contaminated medical equipment.

12 Below are some structures of pathogens.

1 cell wall

2 cytoplasm

3 genetic material

4 protein coat

5 ribosomes

Which of the following structures can be found in both virus and bacteria?

A 3 only

B 1 and 3

C 1, 2, 3 and 5

D 1, 2, 3, 4 and 5

13 Which of the following row shows the correct descriptions of the diseases?

	disease	pathogen	transmission	signs and symptoms
A	pneumococcal disease	bacteria	droplets in the air	shortness of breath
B	influenza	virus	direct contact	photophobia
C	cholera	virus	contaminated food genetics	vomiting
D	coronary heart disease	bacteria		heart attack

14 Which statement makes an accurate comparison between a virus and a bacterial cell?

A Both the virus and bacterium have a cell wall that is rigid and tough.

B Both the virus and bacterium store genetic information within DNA.

C Both the virus and bacterium can reproduce in living cells.

D Both the virus and bacterium have mitochondria for respiration.

15 Mr Tan suffered an eye infection caused by the bacteria Bacillus cereus. He was prescribed antibiotics but occasionally forgot to take his medicine. After a week he noticed the infection remained.

What could be a possible reason for this?

A Bacillus cereus is better treated with a vaccine.
B Bacillus cereus grew resistant to antibiotics.
C Mr Tan was given the wrong dosage of antibiotics.
D Mr Tan was prescribed the wrong type of antibiotics.

16 David recently received his vaccination for Covid-19.
Which statement correctly describes how vaccines work?

A cell wall synthesis by pathogen is inhibited
B enzymes activity of pathogen is disrupted
C ribosomes of pathogen cannot produce proteins
D stimulation of antibodies by white blood cells

17 Which correctly describe the difference between a bacterium and a virus?

	feature	bacterium	virus
A	cell membrane	present	present
B	cytoplasm	absent	absent
C	ribosome	present	present
D	protein coat	absent	present

18 Which of the following scenarios best illustrates the difference between infectious and non-infectious disease?

A A person breaks his leg in an accident, while another person develops hypertension due to chronic stress.
B A person contracts food poisoning after eating contaminated food, while another person inherits a genetic disorder from their parents.
C A person develops type 2 diabetes after years of poor diet and exercise habits, while another person catches the flu from a coworker who sneezed nearby.
D A person experiences an allergic reaction to pollen, while another person recovers from a bacterial infection after taking antibiotics.

19 In Singapore, it is compulsory for children to be vaccinated against serious infectious diseases such as polio, and measles, mumps and rubella (MMR).

How do children who are vaccinated help provide protection to those who are not vaccinated?

A There are many children immune to a pathogen, making it harder for the pathogen to spread in a community.
B They allow the pathogen to infect the unvaccinated children in a milder form.
C They prevent the pathogen from mutating and becoming resistant to the vaccine.
D They reduce the number of instances when pathogen may be present and can spread.

20 Some features that help to defend the body against pathogens are listed.

1 mucus
2 skin
3 stomach acid
4 phagocytosis

Which features can prevent pathogens entering body tissues?
A 1, 2 and 3 only
B 2 and 3 only
C 4 only
D 1, 2, 3 and 4

21 Which of the following processes will result in antibiotic-resistant bacteria?

1 not completing dose of antibiotics
2 vaccination
3 taking antibiotics for viral disease
4 infrequent use of antibiotics

A 1 and 2 only
B 1 and 3 only
C 2 and 4 only
D 1, 2, 3 and 4

22 Acquired Immune Deficiency Syndrome (AIDS) is a disease caused by the Human Immunodeficiency Virus (HIV). A student makes some statements about the similarities between AIDS and influenza.

1 Both are caused by viruses.
2 Both can be treated by antibiotics.
3 Both can be spread from one person to another.
4 Both can be spread through contaminated food.

Which statements are correct?

A 1 and 3 only
B 2 and 4 only
C 1, 2 and 4 only
D 1, 2, 3 and 4

23 Which row correctly describes the difference between a bacterium and a virus?

	feature	bacterium	virus
A	cell membrane	absent	present
B	protein coat	present	absent
C	cytoplasm	absent	present
D	ribosome	present	absent

24 Which symptoms are presented in both influenza and pneumococcus diseases?

A fever and cough
B sore throat and fever
C vomiting and sore throat
D cough and shortness of breath

25 Which method can reduce the transmission of pneumococcus diseases?

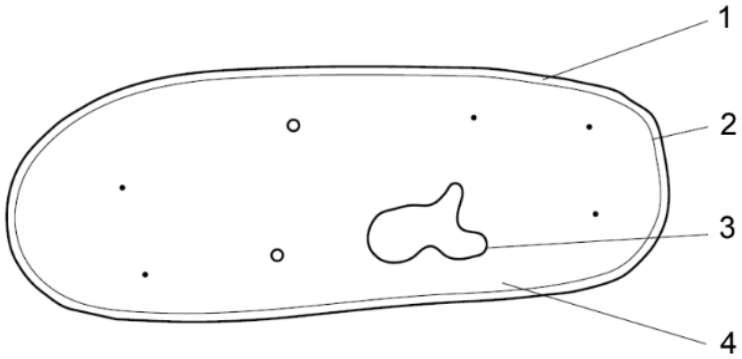
A drinking herbal tea frequently
B taking antiviral drugs
C huddling closely in groups
D taking antibiotics

26 Which statement about AIDS is true?

A AIDS can be treated with antibiotics.
B AIDS is caused by the human immunodeficiency bacteria.
C AIDS can be transmitted through exchange of any bodily fluids.
D AIDS is a sexually transmitted infection that affects the immune system.

27 The diagram shows a bacterial cell with labelled features, 1 to 4.

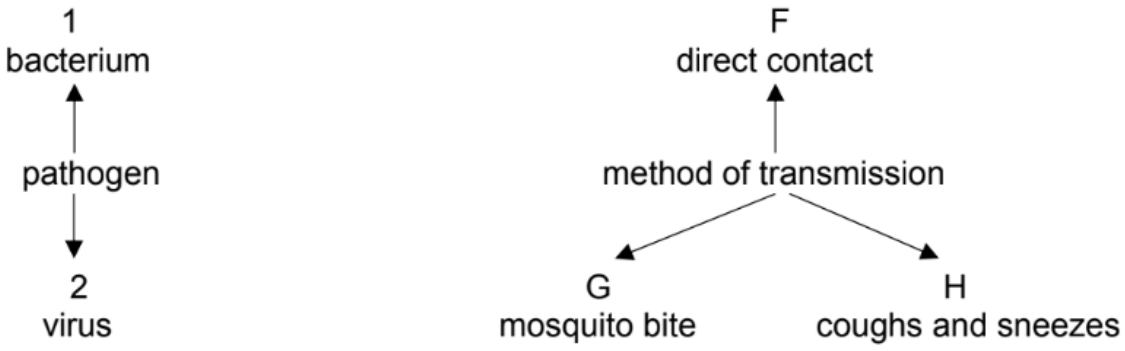
1 cell wall
2 cell membrane
3 genetic material
4 cytoplasm



Which feature(s) is/are also found in a virus?

A 2 only
B 3 only
C 1 and 3 only
D 2 and 4 only

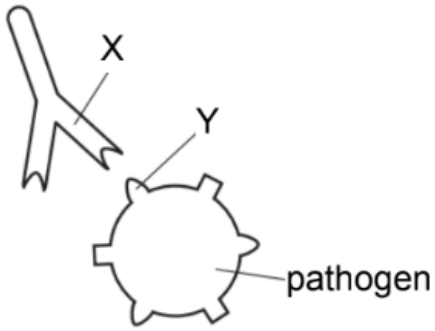
28 The diagram shows some of the pathogens that cause disease in humans and some of the ways they are transmitted.



What is the correct pathogen and methods of transmission for influenza?

A 1, F and H
B 1, G and H
C 2, F and G
D 2, F and H

29 When a pathogen enters the blood, the immune system uses different mechanisms to destroy the pathogen.
The diagram shows one of these mechanisms.



Which row describes the structures involved?

	structure X	X is made by	structure Y
A	antibody	lymphocytes	antibody
B	antibody	phagocytes	antigen
C	antigen	lymphocytes	antibody
D	antigen	phagocytes	antigen

30 What is an example of an infectious and non-infectious disease?

	infectious disease	non-infectious disease
A	AIDS	fatty liver
B	coronary heart	asthma
C	disease fatty liver	coronary heart
D	influenza	disease AIDS

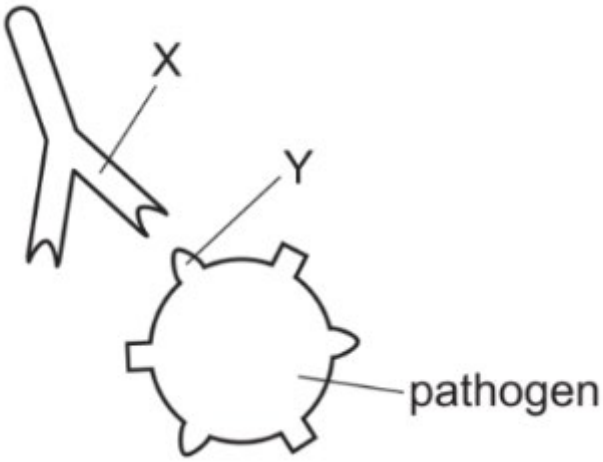
31 Which row correctly matches the features of the pathogen which causes pneumococcal disease?

	genetic material	ribosomes	cell wall	undergoes respiration
A	DNA	absent	absent	yes
B	DNA	present	present	yes
C	RNA	absent	absent	no
D	RNA	present	present	yes

32 Which is not an example of antibiotic action?

A damage to cell surface membranes
B prevention of protein synthesis
C prevention of synthesis of new cell walls
D stimulation of antibody production

33 The diagram shows one of the mechanisms used by the immune system to destroy a pathogen that enters the body.



Which row describes the structures involved?

	structure X	X is made by	structure Y
A	antigen	lymphocytes	antibody
B	antigen	phagocytes	antibody
C	antibody	lymphocytes	antigen
D	antibody	phagocytes	antigen

34 Which is a common symptom of both influenza and pneumococcal disease?

A cough
B nausea
C runny nose
D skin rash

35 Which of the following is present in a virus but not in a bacterium?

A cell wall
B nucleus
C protein coat
D ribosome

INFECTIOUS DISEASE IN HUMAN STRUCTURED QUESTIONS

1 **(a)** Explain how the human gas exchange system is protected against pathogens.

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..... [3]

(b) Tuberculosis (TB) is an infectious disease caused by a bacterial pathogen. The spread of this disease can be controlled by vaccination.
Explain how vaccination provides a defence against infectious diseases.

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(c) TB is a disease that can be treated with antibiotics.

Explain why viral diseases cannot be treated with antibiotics.

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[Total: 8]

2 Microorganisms can be grown in the laboratory on agar (a jelly-like medium) in a Petri dish.

Nutrients required by the microorganisms are added to the agar.

(a) Name a nutrient that should be added to ensure the maximum rates of

(i) respiration .....[1]

(ii) growth .....[1]

(b) Respiration and growth are enzyme-controlled processes.

A student is provided with a Petri dish containing agar with the optimum concentration of nutrients. Explain how the student could speed up the rate of growth of microorganisms growing in this Petri dish.

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(c) Fig. 5.1 shows the stages in an experiment to show the effect of different antibiotics on a type of microorganism.

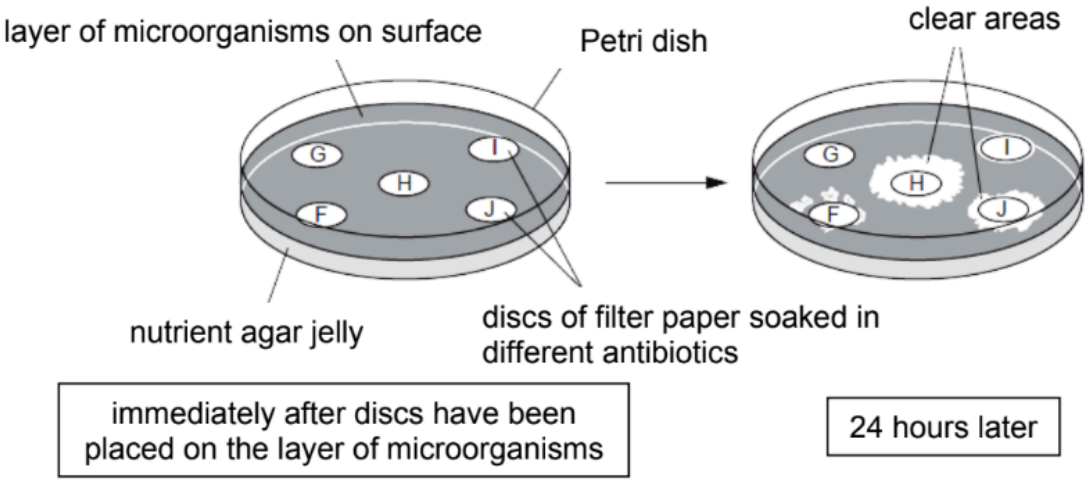

Fig. 5.1

The microorganism originally came from the throat of a person suffering from a throat infection.

Using the information in Fig. 5.1,

(i) identify by letter the antibiotic which might be best for treating the infection.

.....[1]

(ii) state which type of microorganism was probably causing the throat infection and give a reason for your answer.

type of microorganism .....

reason .....

.....[2]

(d) Antibiotic F used to be the most effective in treating the infection.

Suggest and explain why it has become less effective.

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.....[3]

[Total: 10]

3 (c) Cholera is an infectious disease spread through contaminated water and food. Cholera vaccines can be taken orally to reduce the risk of contracting cholera.

(i) Describe how the vaccine reduces the risk of contracting cholera.

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..... [2]

(ii) Suggest two other ways to prevent the spread of cholera.

1 .....

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2 .....

..... [2]

4 Pathogens cause diseases.

(a) Fig. 9.1 shows some cells that are part of the human immune system. These cells are responding to one type of pathogen.

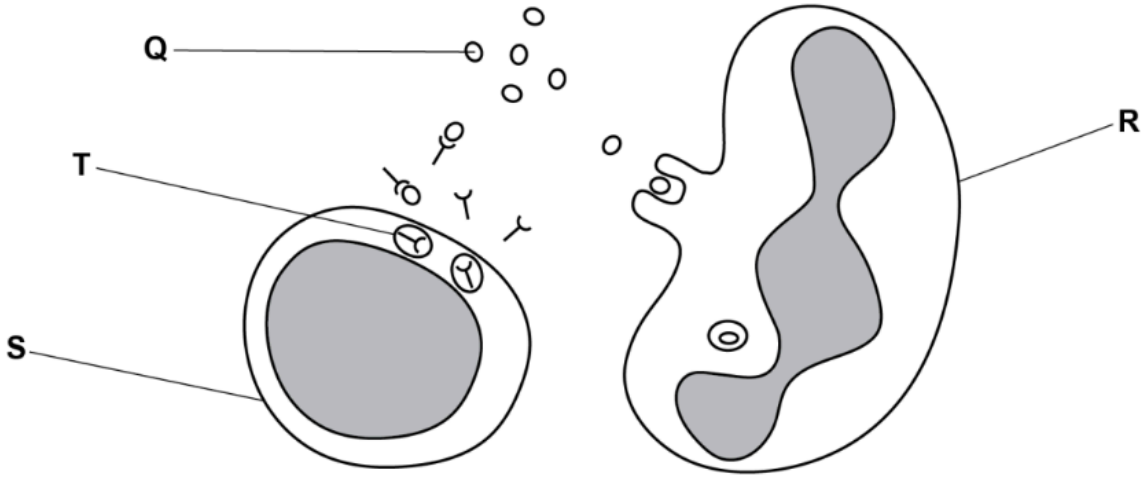

Fig. 9.1

Explain how the immune system responds to an invasion of pathogens. Use the letters in Fig. 9.1 in your answer.

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(b) A vaccine was introduced in 1942 for a particular disease. Fig. 9.2 shows the effect of introducing the vaccine on the number of cases of the disease in one country.

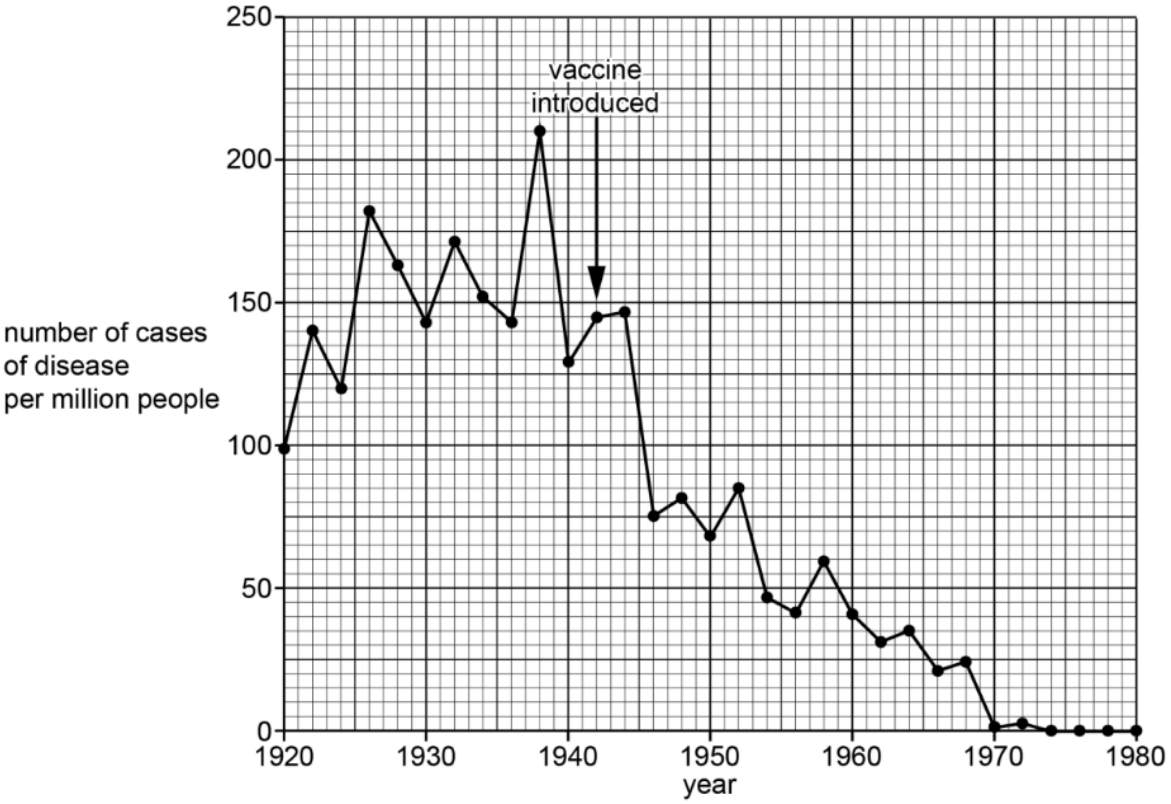

Fig. 9.2

In 1946, the government of the country concluded that the vaccine was successful.Discuss the evidence, shown in Fig. 9.2, for and against this conclusion.

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[Total: 10]

5 (a) Fig. 7.1. shows a pathogen.

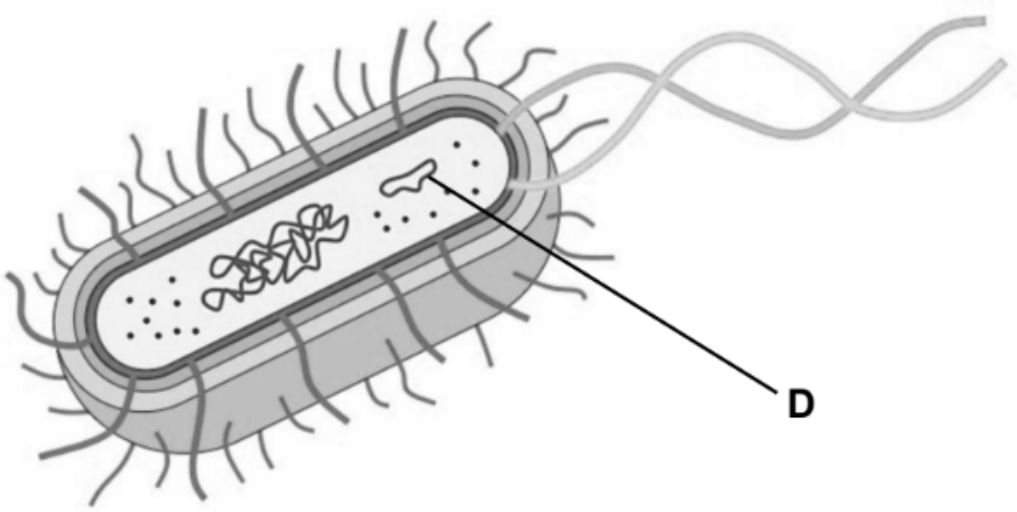

Fig. 7.1

(i) Identify the type of pathogen shown in Fig. 7.1.

..... [1]

(ii) Name structure D.

..... [1]

(b) "Viruses are able to evolve faster than humans, hence humans will eventually succumb to the ever-evolving viruses and go extinct." Discuss the validity of this statement.

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(c) Viruses are unable to replicate by themselves and require a host cell for replication. Describe how the virus makes use of named human cell components to synthesise viral proteins needed for the virus' assembly.

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[Total: 10]

6 Fig. 6.1 shows structure of a virus.

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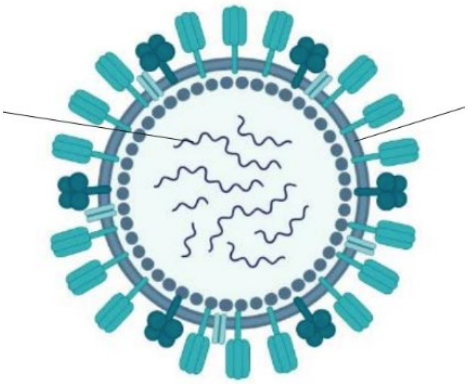

Fig. 6.1

(a) (i) Label Fig. 6.1. [2]

(ii) With reference to Fig. 6.1, describe the differences between the structure of a virus and that of a bacterium. [3]

(b) While vaccinations do not cure infectious diseases, compulsory vaccinations remain as one of the key government measures that help fighting infectious diseases. [2]

Suggest why.

[Total: 7]

7 Outline how overuse of antibiotics may accelerate the emergence of antibiotic- resistant bacteria. [5]

8 HIV is a pathogen that can transmit an infectious disease.

(a) Explain what is meant by an infectious disease.

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(b) Fig 11.1 shows the different modes of transmission of HIV in a certain country.

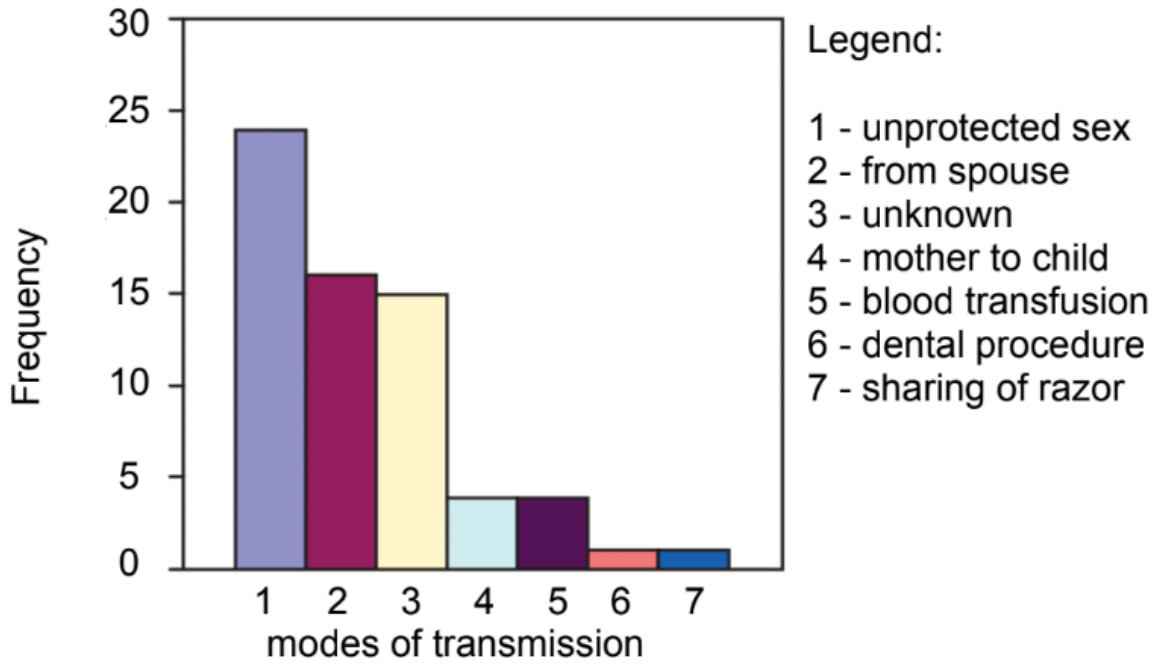

Fig 11.1

(i) Using information from Fig 11.1, explain how transmission of HIV can be greatly reduced.

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(ii) Suggest why there is a high frequency of unknown transmission of HIV.

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..... [2]

(c) Explain why antibiotics is not effective in treating HIV.

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[Total: 10]

9 Influenza is an infectious disease caused by the influenza virus, which primarily affects the respiratory system. It spreads through respiratory droplets when an infected person coughs or sneezes.
On the other hand, cancer is a non-infectious disease characterised by the uncontrolled growth and spread of abnormal cells.
Fig. 4.1 shows an image of influenza virus and a cancer cell.

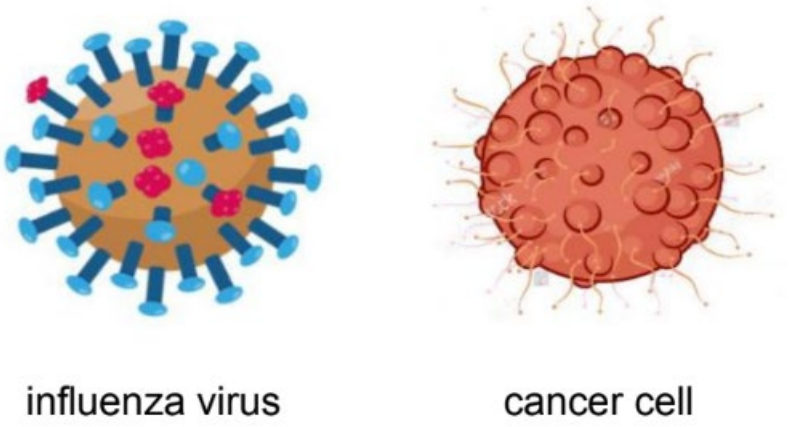

Fig. 4.1

(a) Compare how the spread of influenza differs from the development of cancer.

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(b) Describe one preventive measure that individuals can take to reduce their risk of contracting influenza.

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..... [1]

(c) Explain why antibiotics is not suitable for treating influenza and suggest how antibiotics should be used.

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[Total: 5]

10 Tuberculosis is caused by bacteria called mycobacterium tuberculosis.

(a) Describe two features of a bacterial cell that are different from an animal cell.

1 .....

2 ..... [2]

(b) Fig. 10.1 shows the annual hospitalisation rate for tuberculosis by age group in Singapore between 1998 and 2004.

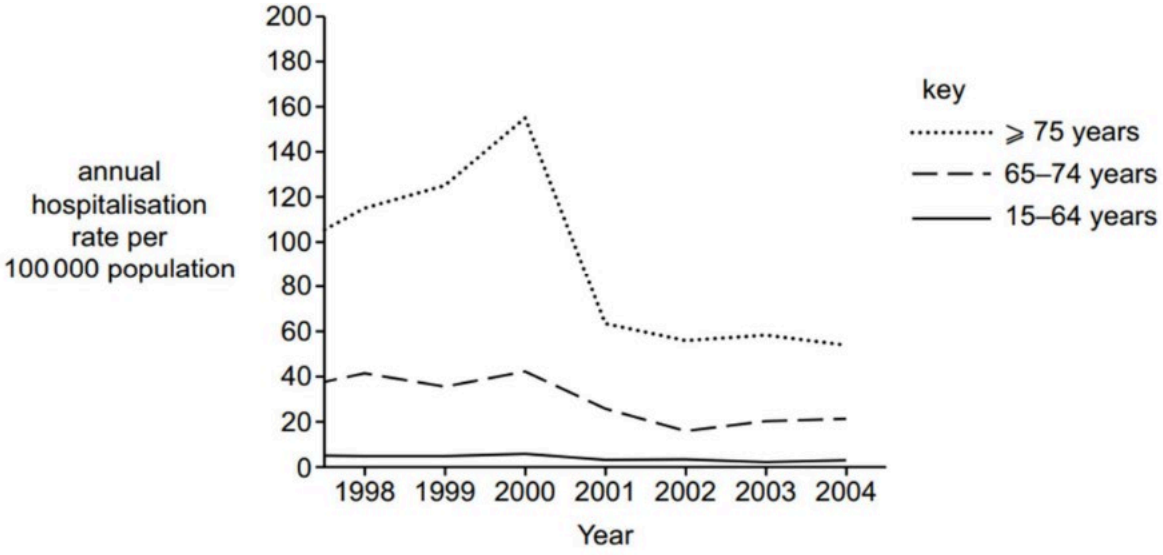

Fig. 10.1

Using Fig. 10.1, describe the differences in the hospitalisation rate for people aged 75 and above with people aged 15 to 74.

Suggest a reason for the differences.

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(c) National Childhood Immunisation Programme (NCIP) in Singapore started to cover vaccination against tuberculosis in the 1950s.

Explain the different ways in which vaccines and antibiotics are used to reduce the number of deaths by tuberculosis.

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[Total: 10]

11 Some diseases can be cured by using antibiotics or prevented by vaccination.

(a) (i) Explain why antibiotics are not used to treat viral infections.

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(ii) In recent years, there has been a large increase in the populations of many antibiotic-resistant strains of bacteria.
Explain why.

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.....[2]

(b) A person can be immunised against a disease when injected with an inactive form of a pathogen.
Explain how this makes the person immune to the disease.

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.....[3]

[Total: 6]

12 Food poisoning can be caused by bacteria-infested foods that have been left out in the open for a long time. One such bacteria is Campylobacter.

People with Campylobacter infections in the intestines are often prescribed a medicine called erythromycin. Erythromycin is an antibiotic that is known to reduce Campylobacter bacteria counts.

Fig. 1.1 below shows the concentration of Campylobacter protein after erythromycin intake.

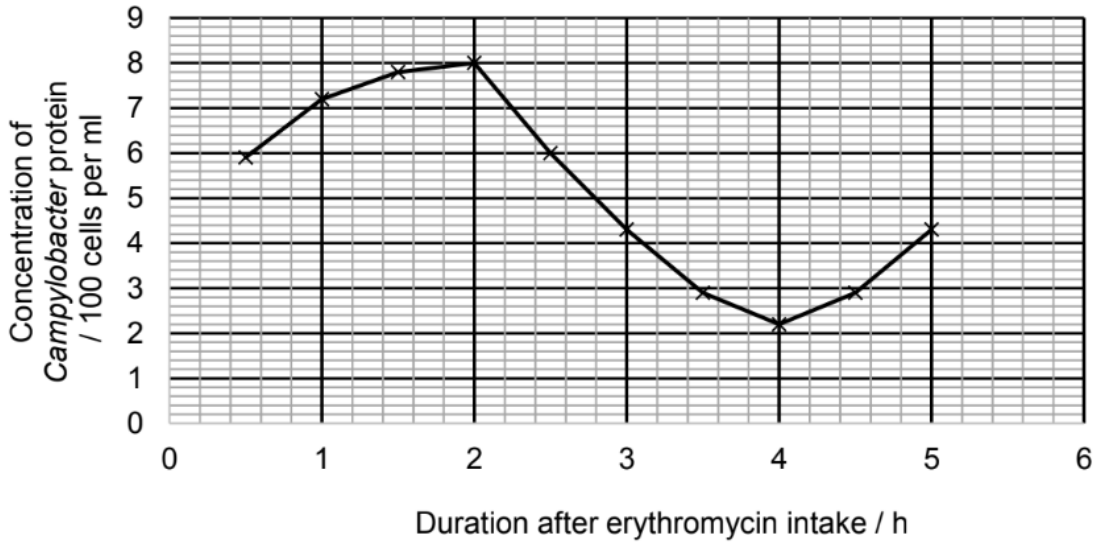

Fig. 1.1

(a) Patients are advised to be administered erythromycin every 6 hours.
Suggest the concentration of Campylobacter protein at the sixth hour by extending the line, before the next dose of erythromycin is administered.

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(b) Describe and explain the results in Fig. 1.1, from 2 h to 4 h after erythromycin intake.

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(c) Some Campylobacter samples have been obtained from the patient before taking erythromycin and have been placed under the light microscope for research.

Fig. 1.2 shows the possible appearance of the Campylobacter bacterium obtained from the patient before taking erythromycin.

Draw label lines to the Campylobacter bacterium obtained in Fig. 1.2 and annotate your labels to identify two structures absent in a typical virus.

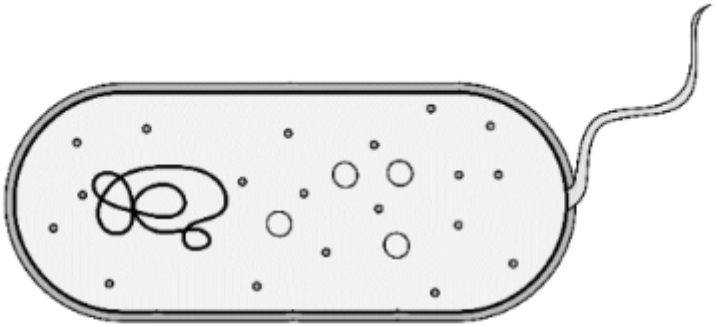

Fig. 1.2

[2]

(d) Campylobacteriosis is an illness caused by the Campylobacter bacteria. Development of an effective vaccine for the prevention of campylobacteriosis has been ongoing for over 20 years. In recent research, scientists have found that the Campylobacter vaccination not only reduces intestinal disease but also prevents stunted growth in infants.

The production of the vaccine involves the culturing, inactivation of Campylobacter strains, and removal of toxins to produce a “whole-cell” vaccine.

(i) Suggest and explain whether Campylobacter infections are infectious.

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..... [2]

(ii) Suggest how the vaccine prevents Campylobacter infection in an individual.

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[Total: 12]

13 Infectious diseases can be caused by organisms such as bacteria, viruses, fungi or parasites.

(a) Discuss on how infectious diseases can be transmitted.

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(b) The World Health Organisation reported that in 2022, the global number of people living with HIV was 39.0 million, compared to 26.6 million in 2000.
Explain the effect of HIV on human body and suggest why it is difficult to control the spread of HIV.

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[Total: 10]

14 The discovery of antibiotics is a breakthrough in modern medicine.

(a) State one way how antibiotics is effective against bacteria.

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..... [1]

(b) Antibiotic resistance is an increasing problem worldwide.
Erythromycin is an antibiotic.
Fig. 5.1 shows the daily doses of erythromycin per 1000 people over a 13-year period.
The number of bacterial infections resistant to erythromycin per 1000 people is also shown.

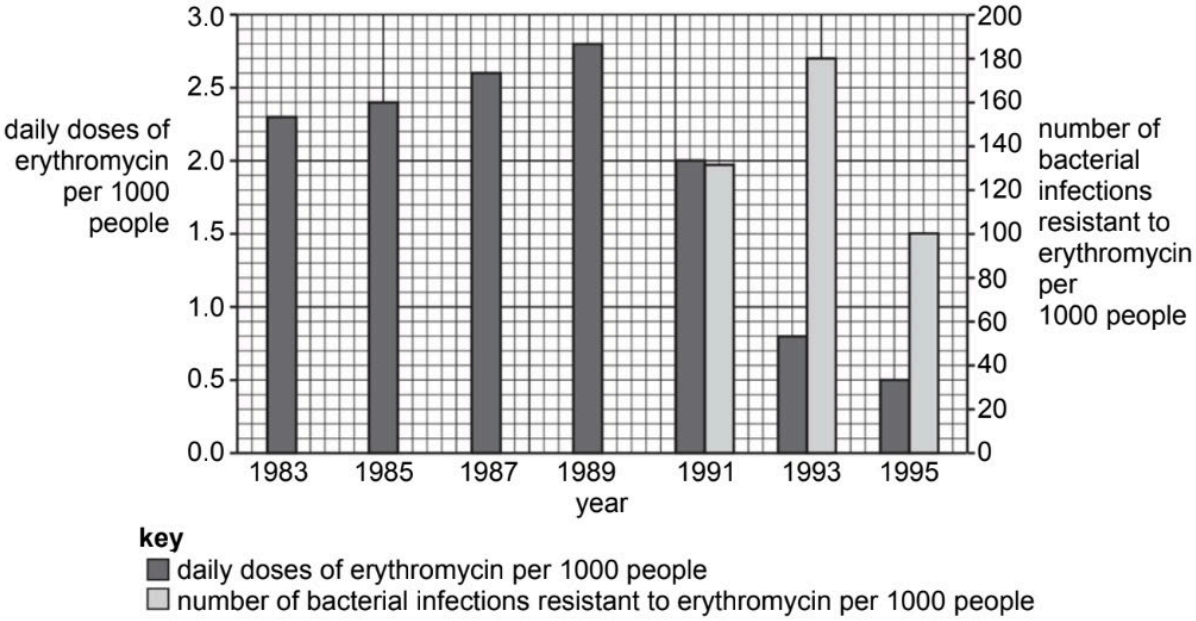

Fig. 5.1

(i) Calculate the percentage change in the number of bacterial infections resistant to erythromycin per 1000 people between 1993 and 1995.

Give your answer to two significant figures.

Show your working.

..... % [2]

(ii) Describe the data shown in Fig. 5.1.

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(iii) Suggest reasons for the change in the number of bacterial infections resistant to erythromycin from 1993 to 1995 shown in Fig. 5.1.

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(c) The discovery of vaccines is another breakthrough in modern medicine. Suggest one reason why the use of vaccine is more effective than the use of antibiotics.

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[Total: 9]

15 Some people are infected with HIV across the world.

(a) Fig. 11.1 shows the number of people who have been newly infected with HIV (new infections) in 2018 across the world and the percentage changes in the number of new infections since 2010.

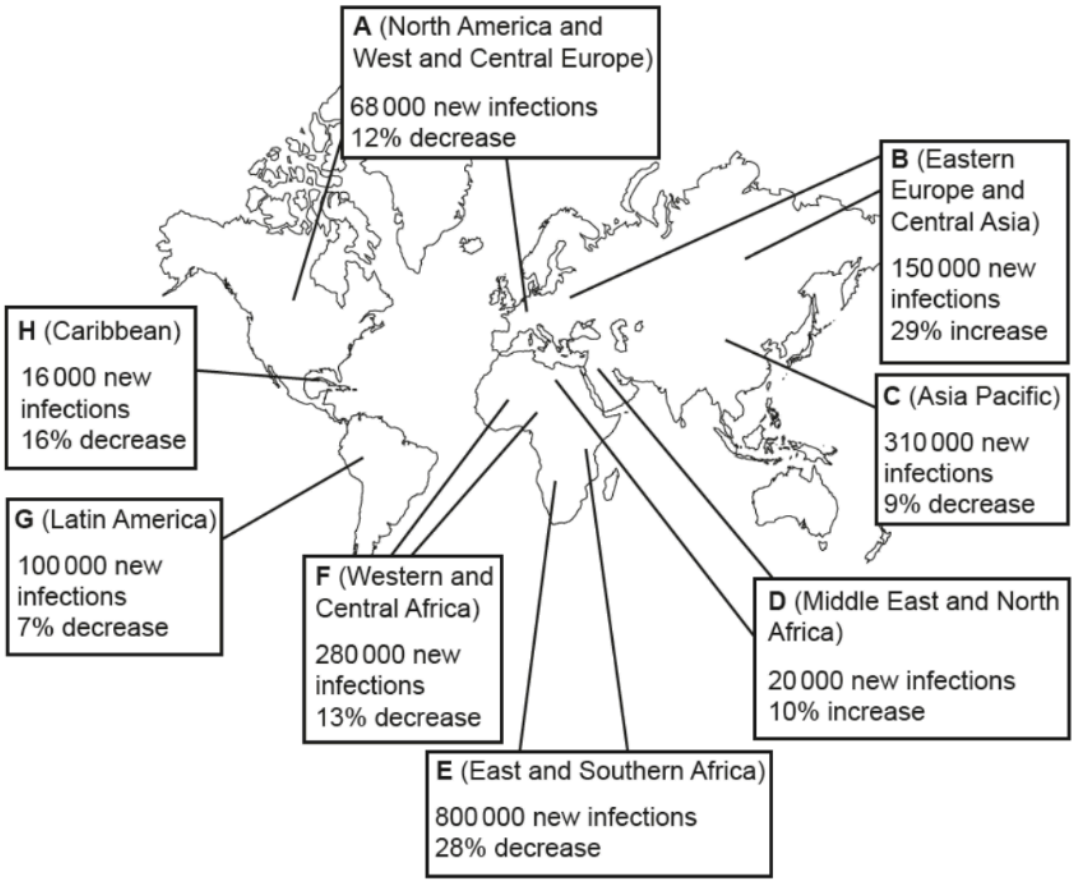

Fig. 11.1

(i) State the name of the disease which is caused by HIV. [1]

.....

(ii) Using only the data in Fig. 11.1, state two conclusions that can be made about the change in number of new HIV infections across the world between 2010 and 2018. You may use the letters in Fig. 11.1 to identify the regions of the world. [3]

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(b) HIV infection cannot be treated using vaccination while other diseases due to viral infections can.
Define vaccination and how it can be used to prevent viral infections. [6]

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INFECTIOUS DISEASE IN HUMAN PRACTICAL QUESTIONS

1 Fig. 2.1 is a photomicrograph of some blood cells.

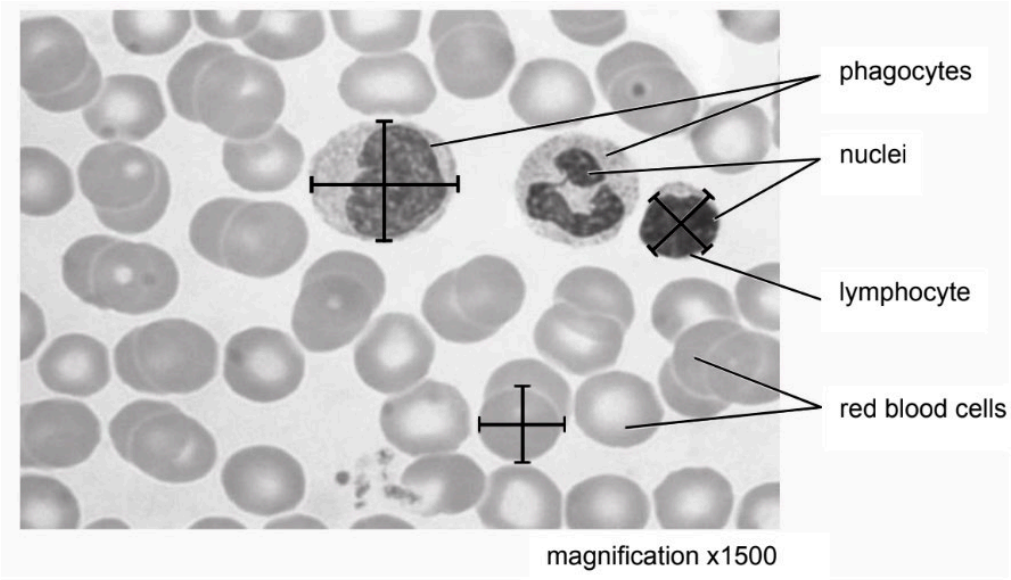

Fig. 2.1

(a) (i) State two visible differences between the red blood cells and the white blood cells (phagocytes and lymphocytes) in Fig. 2.1

1 .....

.....

2 .....

..... [2]

(ii) Make a large drawing of the two cells labelled **phagocytes** in Fig. 2.1. [4]

(b) **(i)** Measure the diameters of the three marked blood cells, along both the lines drawn on each of the cells, in Fig. 2.1.

Record these measurements in Table 2.1.

Add the missing units to Table 2.1.

Calculate the average diameter for each type of blood cell and write your results in Table 2.1.

Table 2.1

type of blood cell	diameter 1 /.....	diameter 2 /.....	average diameter /.....
red blood cell			
lymphocyte			
phagocyte			

[3]

(ii) Calculate the actual average diameter of the red blood cell using your answer in 2(b)(i) and the following equation.

$$\text{magnification} = \frac{\textit{average diameter of the red blood cell in Fig.2.1}}{\textit{actual average diameter of the red blood cell}}$$

Give your answers in micrometres (μm) to the nearest whole number.

1 mm = 1000 μm

Show your working.

..... μm [3]

[Total: 12]

ANSWERS FOR INFECTIOUS DISEASE IN HUMAN MCQ

Q1: C	Q11: A	Q21: B	Q31: B
Q2: D	Q12: A	Q22: A	Q32: D
Q3: B	Q13: A	Q23: D	Q33: C
Q4: D	Q14: C	Q24: A	Q34: A
Q5: B	Q15: B	Q25: D	Q35: C
Q6: B	Q16: D	Q26: D	
Q7: B	Q17: D	Q27: B	
Q8: A	Q18: C	Q28: D	
Q9: C	Q19: A	Q29: B	
Q10: B	Q20: A	Q30: A	

ANSWERS FOR INFECTIOUS DISEASE IN HUMAN STRUCTURED QUESTIONS

1 **(a)** Explain how the human gas exchange system is protected against pathogens.

[1] Cells in the trachea / bronchial tubes secretes mucus.
[2] Mucus traps bacteria / germs / pathogens.
[3] Cilia sweep the mucus containing bacteria / germs / pathogens upwards and out of the body / prevent it from entering lungs. [3]

(b) Tuberculosis (TB) is an infectious disease caused by a bacterial pathogen. The spread of this disease can be controlled by vaccination.

Explain how vaccination provides a defence against infectious diseases.

[1] Vaccine contains an agent that resembles a pathogen.
[2] Which stimulate white blood cells to produce antibodies.
[3] These antibodies kill pathogens that cause infectious diseases. [3]

(c) TB is a disease that can be treated with antibiotics.

Explain why viral diseases cannot be treated with antibiotics.

[1] Virus does not have cellular structures that antibiotic target.
[2] Antibiotic acts on bacterial cell walls but viruses do not have cell walls.
[3] Antibiotic break up cell membranes but viruses do not have cell membranes.
[4] Antibiotic act on ribosomes inhibiting protein synthesis and growth but viruses do not have ribosomes and they do not grow.

Any two points [2]

[Total: 8]

2 Microorganisms can be grown in the laboratory on agar (a jelly-like medium) in a Petri dish.

Nutrients required by the microorganisms are added to the agar.

(a) Name a nutrient that should be added to ensure the maximum rates of

(i) respiration carbohydrate / sugar / glucose / maltose / sucrose / starch [1]

(ii) growth protein / amino acids (vitamins / ions etc.) (Ig: glucose) [1]

(b) Respiration and growth are enzyme-controlled processes.

A student is provided with a Petri dish containing agar with the optimum concentration of nutrients. Explain how the student could speed up the rate of growth of microorganisms growing in this Petri dish.

incubate/ place in + suitable/ optimum temperature [1]

OR

add pH buffer + suitable/ optimum pH;

speeds up rate of enzyme reaction / enzyme most active / faster

formation of enzyme-substrate complex / higher rate of effective

collision between enzyme and substrate ;[1] [2]

(c) Fig. 5.1 shows the stages in an experiment to show the effect of different antibiotics on a type of microorganism.

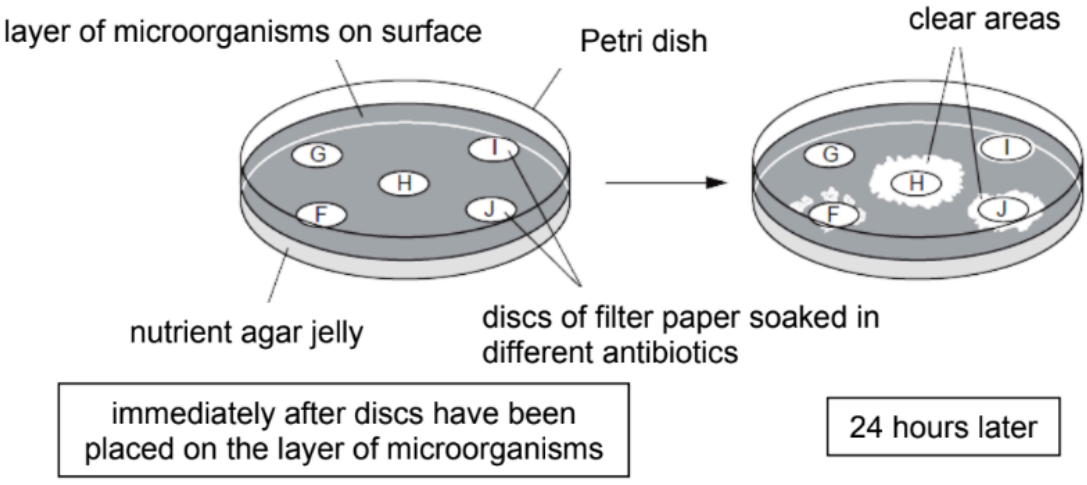

Fig. 5.1

The microorganism originally came from the throat of a person suffering from a throat infection.

Using the information in Fig. 5.1,

(i) identify by letter the antibiotic which might be best for treating the infection.

H [1]

(ii) state which type of microorganism was probably causing the throat infection and give a reason for your answer.

type of microorganism bacterium/ bacteria (or named e.g. Streptococcus);

reason antibiotics effective against / inhibits / kills bacteria [1]

(R: antibiotics treat/work on bacteria – answer is too vague). [2]

(d) Antibiotic F used to be the most effective in treating the infection.

Suggest and explain why it has become less effective.

(A: ECF for virus)

different variety of bacteria exist/ some bacteria are more resistant to antibiotic (R: immune) (Ig bacteria develop resistance, need to show how); [1]

antibiotic too readily prescribed/ available/ patients not completing course; [1]

more resistant bacteria survive and reproduce [1] [3]

[Total: 10]

3 Cholera is an infectious disease spread through contaminated water and food. Cholera vaccines can be taken orally to reduce the risk of contracting cholera.

(i) Describe how the vaccine reduces the risk of contracting cholera.

The vaccine contains antigens / part of the pathogen/ weakened form of the pathogen/cholera bacteria [1]

The vaccine stimulates the white blood cells to produce antibodies quickly to destroy the pathogen before they infect the body cells. [1] [2]

(ii) Suggest two other ways to prevent the spread of cholera.

- wash hands with soap and water before handling food [1]

- drink boiled water/ bottled drinking water [1]

Accept any logical answers [2]

4 Pathogens cause diseases.

(a) Fig. 9.1 shows some cells that are part of the human immune system. These cells are responding to one type of pathogen.

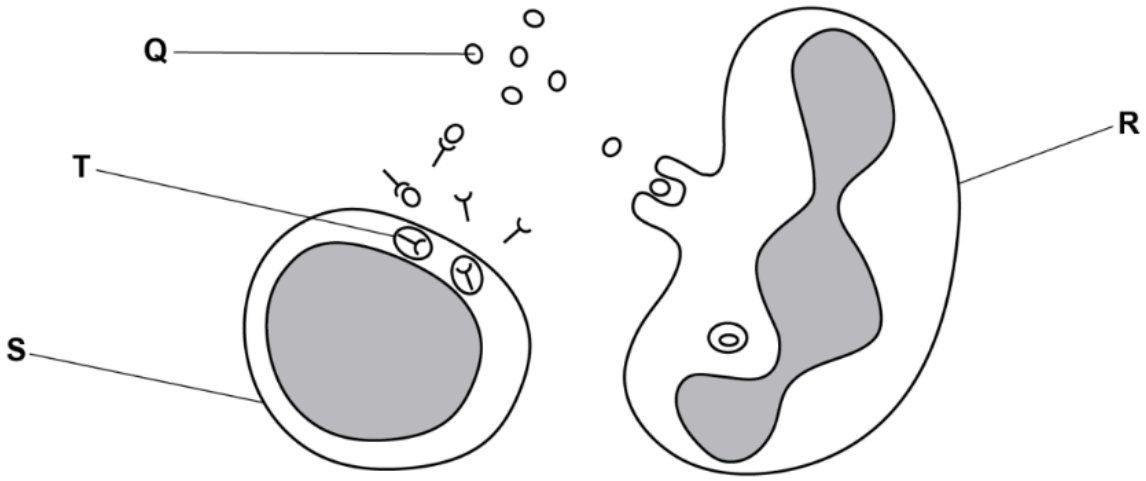

Fig. 9.1

Explain how the immune system responds to an invasion of pathogens. Use the letters in Fig. 9.1 in your answer.

Q / pathogen, have specific / unique antigen that is complementary to antibodies [1]

S / lymphocyte produces antibodies [1]

T / antibodies bind to, antigen / pathogen [1]

to cause clumping or agglutination [1]

R / phagocytes, engulf, pathogens / antigens [1]

R / phagocytes, have enzymes / digest pathogens OR antigens [1][6]

(b) A vaccine was introduced in 1942 for a particular disease. Fig. 9.2 shows the effect of introducing the vaccine on the number of cases of the disease in one country.

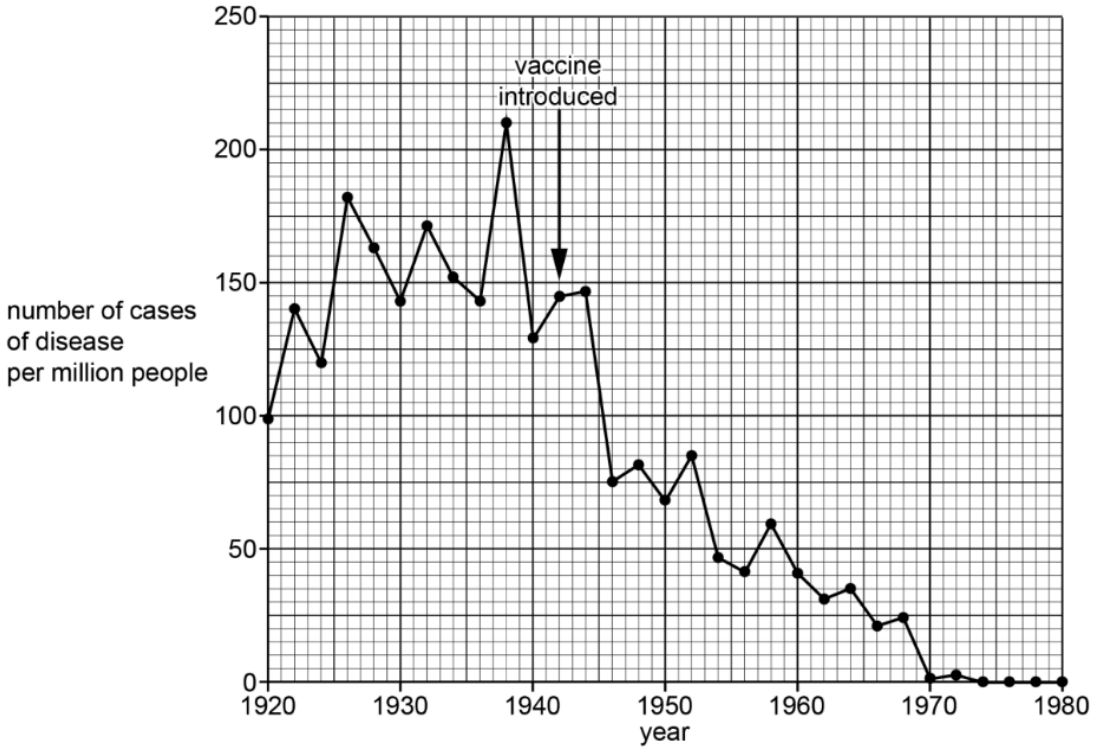

Fig. 9.2

In 1946, the government of the country concluded that the vaccine was successful.Discuss the evidence, shown in Fig. 9.2, for and against this conclusion.

support of conclusion:

general decrease, from 1942 / vaccination [1]

cases do not return to pre-vaccine levels / AW [1]

no cases from 1974 [1]

against conclusion (max 3):

number of cases increased, (during the 2 years) after the vaccine was introduced / until government made its conclusion [1]

took 32 years after vaccine introduced before no cases of disease [1]

but there are (small) peaks (in cases) / fluctuation (in cases) [1]

comparative data quote [1]

Any 4 points [4]

[Total: 10]

5 (a) Fig. 7.1. shows a pathogen.

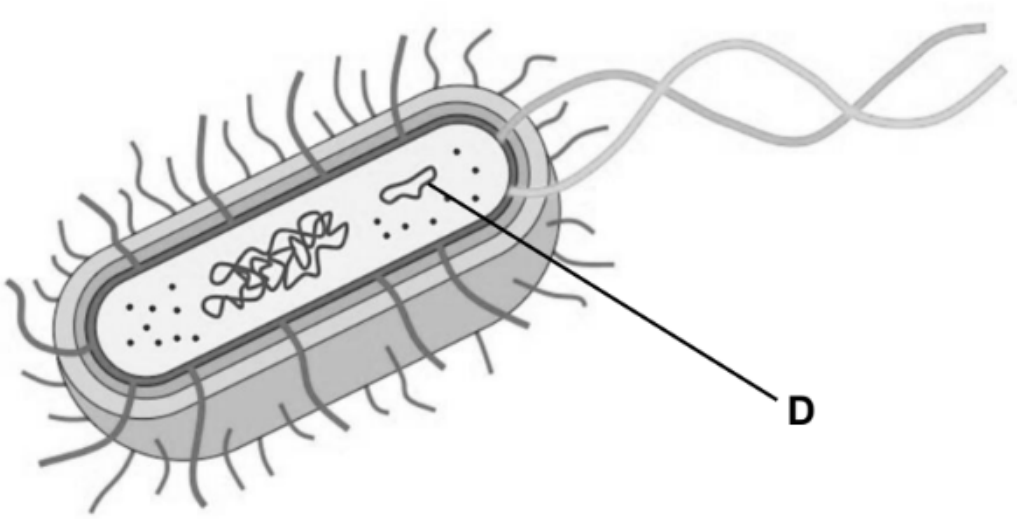

Fig. 7.1

(i) Identify the type of pathogen shown in Fig. 7.1.

Bacteria [1]

(ii) Name structure D.

Plasmid 1 [1]

(b) "Viruses are able to evolve faster than humans, hence humans will eventually succumb to the ever-evolving viruses and go extinct." Discuss the validity of this statement.

Invalid (max 3m)
- Humans overcome viruses using their adaptive immune system/active immunity/antibodies, not by evolving
- Immune system able to adapt to new strains of viruses within a very short time period/operate on a shorter timeframe than evolution
- Quick production of vaccines can provide protection before any infection
- Weakened virus injected, where its antigens stimulate antibody production by lymphocytes
- Memory cells produced for immunological memory/long-term immunity
- Memory cells recognise virus' antigens during reinfection, triggering a rapid immune response
- Use of antiviral drugs to defeat the viruses

Valid (max 3m)
- Some viruses are mutation-prone
- develop new antigens, avoiding detection by memory cells/antibodies
- Unable to stimulate immune response in humans, humans fall ill and may die
- Viruses can evolve faster than vaccines can be produced/ time needed for production of safe vaccines
- Viruses can evolve mechanisms to evade/shut down the immune system and its ability to adapt (e.g. HIV) [4]

(c) Viruses are unable to replicate by themselves and require a host cell for replication. Describe how the virus makes use of named human cell components to synthesise viral proteins needed for the virus' assembly.

• Viral DNA used as template to synthesis mRNA (reject: DNA converted to mRNA) via transcription in the nucleus

• Ribosome uses mRNA/viral RNA to synthesise specific sequence of amino acids / polypeptide chain via translation in the cytoplasm

• Polypeptide chain folds up to form viral protein • Viral protein may be further processed, packaged and modified in the Golgi apparatus

Note:

Many students jump straight into stating that ribosomes synthesise proteins, without elaborating on transcription and translation.

Candidates should also be aware that Golgi is spelled with a capital G. [4]

[Total: 10]

6 Fig. 6.1 shows structure of a virus.

.

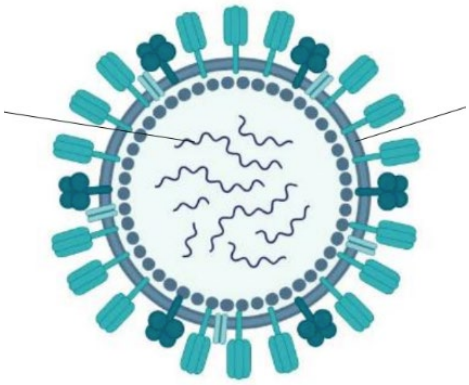

Fig. 6.1

(a) (i) Label Fig. 6.1. [2]

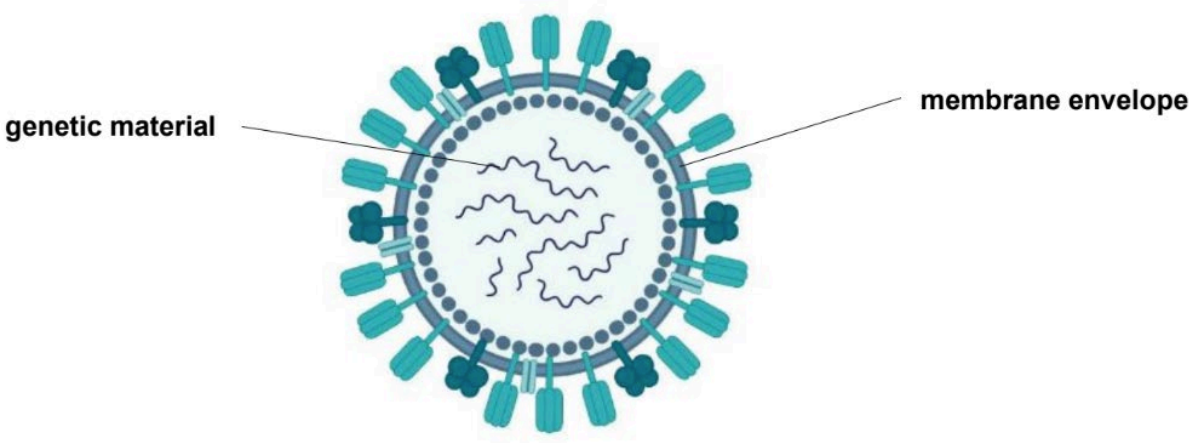

Fig. 6.1

(ii) With reference to Fig. 6.1, describe the differences between the structure of a virus and that of a bacterium. [3]

outer covering- protein coat vs cell wall
genetic material- DNA/RNA vs DNA
cell membrane- absent vs present
cytoplasm- absent vs present
ribosome- absent vs present

Any 3 for 3m

Reject if no direct comparisons are made

Teacher's Comments:
Recurring issue with command 'distinguish' and 'compare'; candidates need to do a point-by-point comparison and not a regurgitation of descriptions for each system

(b) While vaccinations do not cure infectious diseases, compulsory vaccinations remain as one of the key government measures that help fighting infectious diseases. [2]

Suggest why.

Vaccines contain **agents resembling pathogens** that **stimulates the production of antibodies by white blood cells. [1]**

The antibodies produced **bind to pathogens**, which helps in **preventing infections. [1]**

Teacher's Comments:

Vaccination needs to be understood and ***communicated through these two key concepts:

1. Vaccines have **agents resembling pathogens that increases production of antibodies by lymphocytes.**

2. Increased **antibodies bind to specific pathogens similar to the agent, reducing infections**

[Total: 7]

7 Outline how overuse of antibiotics may accelerate the emergence of antibiotic- resistant bacteria. [5]

Random mutations occur, **giving rise to variation** in levels of **antibiotic resistance** in the **bacterial population.** [1]

Antibiotics act as the **selection pressure**, where the **bacteria without antibiotic resistance** are **selected against** and **killed off.** [1]

The **surviving bacteria with antibiotic resistance** would reproduce offspring with similar antibiotic resistance. [1]

Over time, successive generations of **bacteria would evolve to have antibiotic resistance** as their numbers more common. [1]

The **overuse of antibiotics speeds up the natural selection** process, which in turn **selects for bacteria with increasing antibiotic resistance.** [1]

8 HIV is a pathogen that can transmit an infectious disease.

(a) Explain what is meant by an infectious disease.

- Condition that causes body to function less effectively;
- Can be spread from person to person through various means; [2]

(b) Fig 11.1 shows the different modes of transmission of HIV in a certain country.

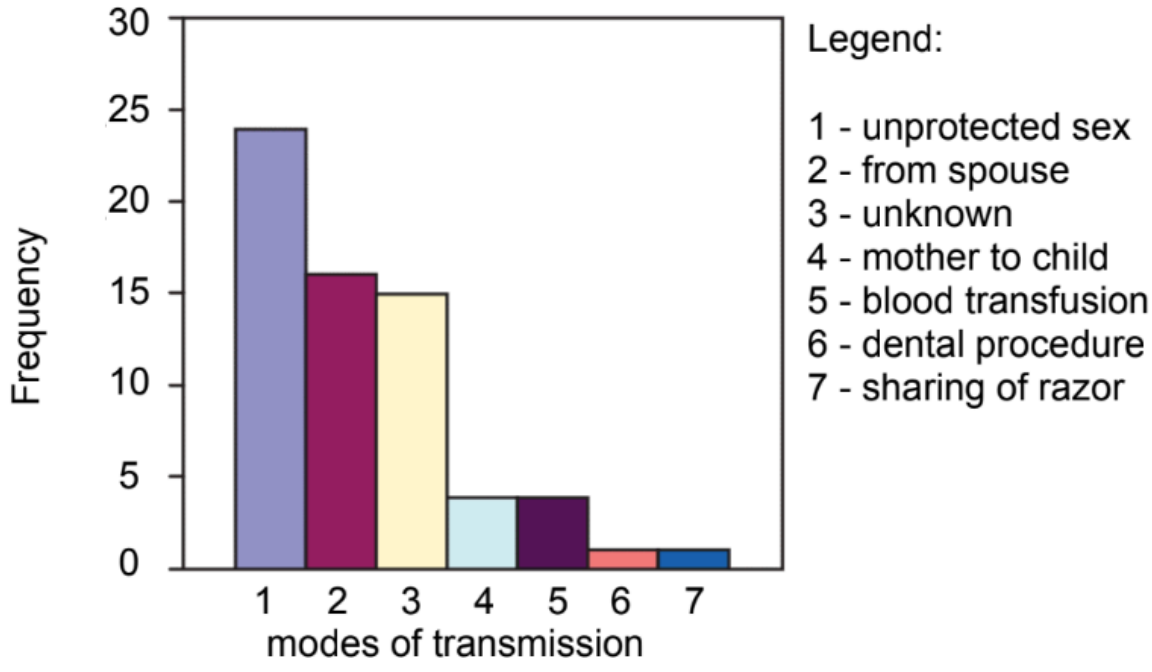

Fig 11.1

(i) Using information from Fig 11.1, explain how transmission of HIV can be greatly reduced.

• Prevention: one sexual partner or abstain from sexual intercourse OR male wear condom OR don't share instruments that are likely to break the skin OR go to reliable operators if require services that involve needles;

Any 3 points, must have at least 1 transmission AND 1 prevention point for 3 marks [3]

(ii) Suggest why there is a high frequency of unknown transmission of HIV.

• HIV remained dormant in infected person without symptoms or signs;

• Infected person may not be diagnosed immediately hence not knowing true reason of being infected;

• Any reasonable explanations; [2]

(c) Explain why antibiotics is not effective in treating HIV.

• Affects cell wall (osmotic pressure causing cell to burst);

• Affects ribosomes OR protein synthesis;

• Affects cell membrane (unable to regulate movement of substances);

• Affects production of nutrients/enzyme (e.g folic acid)

R: any vague answers or relating virus is not a cell without elaborating the action of antibiotics [3]

[Total: 10]

9 Influenza is an infectious disease caused by the influenza virus, which primarily affects the respiratory system. It spreads through respiratory droplets when an infected person coughs or sneezes.
On the other hand, cancer is a non-infectious disease characterised by the uncontrolled growth and spread of abnormal cells.
Fig. 4.1 shows an image of influenza virus and a cancer cell.

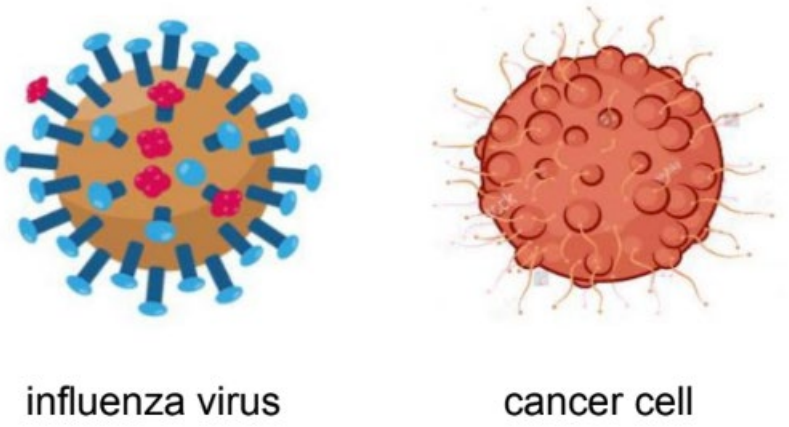

Fig. 4.1

(a) Compare how the spread of influenza differs from the development of cancer.

• Influenza can be spread from one person to another while cancer cannot be spread from one person to another/ spread within the body.
• Influenza is caused by pathogen while cancer is not caused by pathogen.
• Influenza is caused by a virus while cancer is caused by mutations.
• Influenza affects the respiratory system while cancer affects any tissues/ organs/ organ systems in the body.
(any 2) [2]

(b) Describe one preventive measure that individuals can take to reduce their risk of contracting influenza.

• get influenza vaccine.
• avoid getting into close contact with people who have the flu.
• cover your mouth and nose with a tissue when you cough or sneeze.
• wear a surgical mask.
• Wash your hands with soap and water.
• Rub your hand with disinfectant.
(Any 1 point) [1]

(c) Explain why antibiotics is not suitable for treating influenza and suggest how antibiotics should be used.

Antibiotics is administered to treat bacteria infection but influenza is caused by virus. [1m]

Any 1 point: [1m]

• Using antibiotic only when necessary

• Completing the course of the antibiotics prescribed by doctors.

• Not misusing or overusing antibiotics to treat a viral infection instead of a bacterial infection.

[2]

[Total: 5]

10 Tuberculosis is caused by bacteria called mycobacterium tuberculosis.

(a) Describe two features of a bacterial cell that are different from an animal cell.

Bacterial cell as a cell wall, but an animal cell does not; [1]

Bacterial cell does not have the DNA or genetic material enclosed within a membrane, but an animal cell has a nucleus containing genetic material;[1] [2]

(b) Fig. 10.1 shows the annual hospitalisation rate for tuberculosis by age group in Singapore between 1998 and 2004.

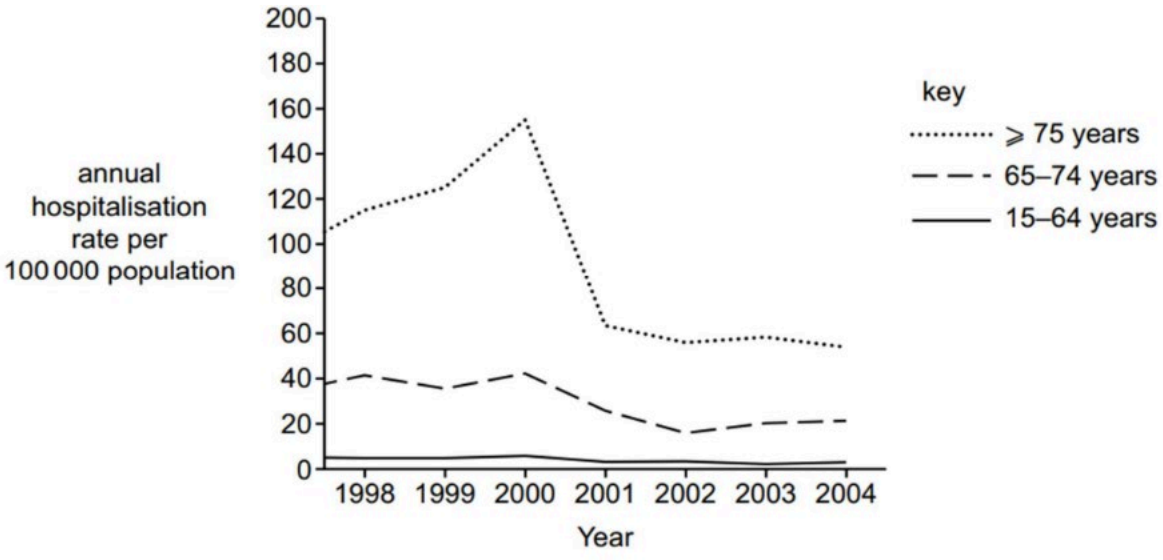

Fig. 10.1

Using Fig. 10.1, describe the differences in the hospitalisation rate for people aged 75 and above with people aged 15 to 74.

Suggest a reason for the differences.

Age group trend: more hospitalisations for group aged 75 (in 1998, around 110) and above/ 15-74 year olds (in 1998, less than 45), fewer hospitalisations;

Those above 75 may have weaker immune system/ more prone to tuberculosis;

There is a larger difference in hospitalisations between those aged 75 (and above from 1998 to 2000 (60 to 105 a year) as compared to 2001 to 2004 (around 40 a year);

Vaccines could have been administered in 2020 to those aged 75 and above; [3]

(c) National Childhood Immunisation Programme (NCIP) in Singapore started to cover vaccination against tuberculosis in the 1950s.

Explain the different ways in which vaccines and antibiotics are used to reduce the number of deaths by tuberculosis.

1. Antibiotics given during infection/ to help treat the disease/ destroy pathogen;[1]

2. It acts on pathogen directly to prevent synthesis of cellular structures;[1]

3. Vaccines are given before infection/ to prevent disease/ increase immunity;[1]

4. Vaccines contain an agent that resemble pathogen;[1]

5. Vaccines stimulate white blood cells to produce antibodies quickly when pathogen is present;[1] [5]

[Total: 10]

11 Some diseases can be cured by using antibiotics or prevented by vaccination.

(a) (i) Explain why antibiotics are not used to treat viral infections.

● Viruses are non-living + do not have (named) cell structure while antibiotics target (named) process/ (named) cell structure

OR

● antibiotics target bacteria by preventing synthesis of cellular structures but

are ineffective against viruses due to structural and reproductive differences [1]

(ii) In recent years, there has been a large increase in the populations of many antibiotic-resistant strains of bacteria.
Explain why.

● bacteria without resistance die / bacteria with resistance survive ;

● (resistant / surviving, bacteria) multiply/reproduce and pass their, alleles / genes, (for resistance) on to their offspring OR antibiotic resistance gene passed through plasmids

OR

● Overuse of antibiotics/antibiotics prescribed for mild infection/ did not finish course of antibiotics+ resistant / surviving, bacteria multiply

● and pass their, alleles / genes, (for resistance) on to their offspring

OR

antibiotic resistance gene passed through plasmids [2]

(b) A person can be immunised against a disease when injected with an inactive form of a pathogen.
Explain how this makes the person immune to the disease.

● Inactive form of pathogen/ antigen recognized (as foreign) by lymphocytes or WBCs.

● These lymphocytes/ WBCs will produce complementary antibodies OR

lymphocytes/ WBCs will produce specific antibody

● Upon reinfection or if the person is exposed to the same pathogen again, memory cells (developed during immunization) will rapidly recognize and make antibodies to destroy the pathogen

OR

Active immunity is gained by vaccination and the WBCs (memory cells) are stimulated to multiply to form clones, which would then produce many antibodies against the antigens of on the pathogen. (idea that antibody production rapid if pathogen enters body again)

3m

1m for idea that antibodies are quickly produced on reinfection (IGNORE antibodies remain in blood)

1m (whole question) on idea of ingestion by WBCs/ phagocytosis [3]

[Total: 6]

12 Food poisoning can be caused by bacteria-infested foods that have been left out in the open for a long time. One such bacteria is Campylobacter.

People with Campylobacter infections in the intestines are often prescribed a medicine called erythromycin. Erythromycin is an antibiotic that is known to reduce Campylobacter bacteria counts.

Fig. 1.1 below shows the concentration of Campylobacter protein after erythromycin intake.

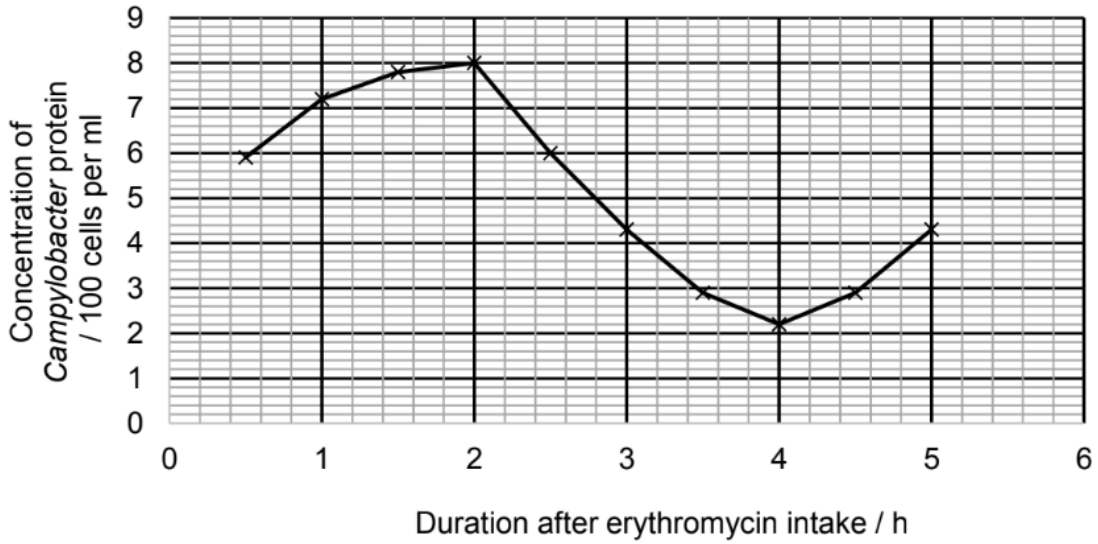

Fig. 1.1

(a) Patients are advised to be administered erythromycin every 6 hours.
Suggest the concentration of Campylobacter protein at the sixth hour by extending the line, before the next dose of erythromycin is administered.

• Between 650 and 900 cells per ml [1] [1]

(b) Describe and explain the results in Fig. 1.1, from 2 h to 4 h after erythromycin intake.

• [D1] From the 2nd to the 4th hour, the concentration of Campylobacter protein decreased from 800 cells per ml to about 220 cells per ml, by about 580 cells per ml

• [D2a] From the 2nd to the 3rd hour, the concentration of Campylobacter protein decreased steeply from 800 cells per ml to about 420 cells per ml, by about 380 cells per ml

• [D2b] From the 3nd to the 4th hour, the concentration of Campylobacter protein decreased less steeply from 420 cells per ml to about 220 cells per ml, by about 200 cells per ml

• [E1] Antibiotics kill / inhibit bacteria growth by interfering with bacterial growth & metabolic activities,

• [E2] such as inhibiting cell wall synthesis / cell membrane function / protein synthesis in ribosomes / enzyme action in cytoplasm hence concentration of Campylobacter protein decreased

• [E3] Time is needed for digestion of coating / absorption / transport to area of effect, hence takes 2-4 hours for effect to show

(max 4)

[4]

(c) Some Campylobacter samples have been obtained from the patient before taking erythromycin and have been placed under the light microscope for research.

Fig. 1.2 shows the possible appearance of the Campylobacter bacterium obtained from the patient before taking erythromycin.

Draw label lines to the Campylobacter bacterium obtained in Fig. 1.2 and annotate your labels to identify two structures absent in a typical virus.

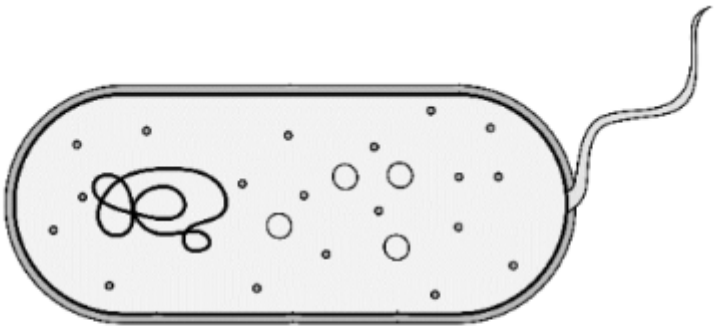

Fig. 1.2

[2]

• Cell wall
• Cell membrane
• (free) ribosome
• flagellum
• circular DNA
• plasmid

R DNA / genetic material

(d) Campylobacteriosis is an illness caused by the Campylobacter bacteria. Development of an effective vaccine for the prevention of campylobacteriosis has been ongoing for over 20 years. In recent research, scientists have found that the Campylobacter vaccination not only reduces intestinal disease but also prevents stunted growth in infants.

The production of the vaccine involves the culturing, inactivation of Campylobacter strains, and removal of toxins to produce a “whole-cell” vaccine.

(i) Suggest and explain whether Campylobacter infections are infectious.

• Yes, Infectious diseases can be spread from person to person
• Campylobacter spreads by contaminated food / ORA [2]

(ii) Suggest how the vaccine prevents Campylobacter infection in an individual.

• A vaccine contains an agent that resembles Campylobacter
• White blood cells binds to antigens on vaccine
• Some white blood cells remain in the blood stream for a long time as memory cells.
• In the future, when the Campylobacter enters the body, memory cells recognise the pathogen
• produce the antibodies to destroy it
(max 3) [3]

[Total: 12]

13 Infectious diseases can be caused by organisms such as bacteria, viruses, fungi or parasites.

(a) Discuss on how infectious diseases can be transmitted.

Through droplets in the air / airborne transmission + when individual talks / sneezes / coughs;

The droplets inhaled by another individual;

Exchange of body fluids during sexual intercourse;

Baby receiving milk from mother through breastfeeding;

Direct contact through mucous membranes e.g. conjunctivitis / HFMD / chicken pox;

Transmitted through ingestion of contaminated food / water e.g. cholera, typhoid;

Max 4m
.[4]

(b) The World Health Organisation reported that in 2022, the global number of people living with HIV was 39.0 million, compared to 26.6 million in 2000.
Explain the effect of HIV on human body and suggest why it is difficult to control the spread of HIV.

HIV destroys/lowers a person's immune system by destroying white blood cells;

Hence the body is unable to produce antibodies to protect the person

from foreign pathogens;

Person infected might not display signs and symptoms for a long time and may

unknowingly transmit the virus during this period of time;

Social stigma and discrimination against people who are affected will deter

affected individuals from seeking medical treatment;

Lack of awareness and education about HIV transmission / HIV prevention /

misconceptions about viral infections;

High-risk behaviours from affected individuals through sharing of unsterilised

needles / sharp instruments due to lack of resources, education, awareness, etc;

Limited access to healthcare in low-income / remote areas;

Virus is able to mutate rapidly which slows down the research on a vaccine

against HIV infection;

Hard to track movement of people on a global scale, which can spread the

infection;

(any four) [6]

[Total: 10]

14 The discovery of antibiotics is a breakthrough in modern medicine.

(a) State one way how antibiotics is effective against bacteria.

Any one from:
1 Inhibits the synthesis of bacterial cell walls
2 Inhibit cell membrane function
3 Inhibits protein synthesis in ribosome
4 Inhibits enzyme action in cytoplasm [1]

(b) Antibiotic resistance is an increasing problem worldwide.
Erythromycin is an antibiotic.
Fig. 5.1 shows the daily doses of erythromycin per 1000 people over a 13-year period.
The number of bacterial infections resistant to erythromycin per 1000 people is also shown.

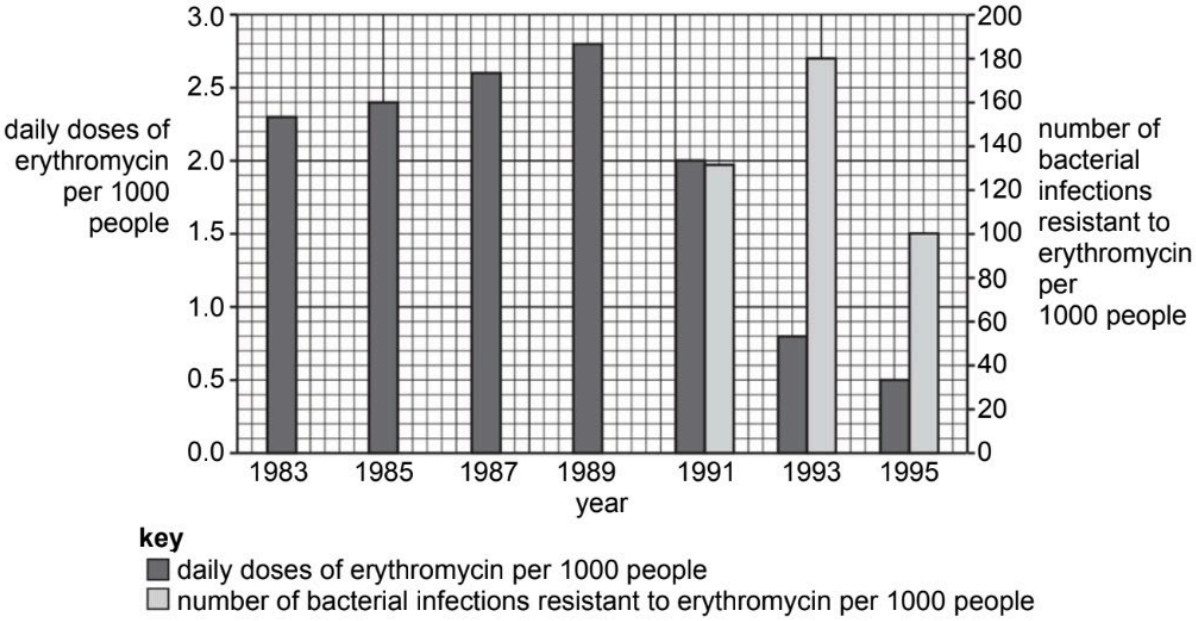

Fig. 5.1

(i) Calculate the percentage change in the number of bacterial infections resistant to erythromycin per 1000 people between 1993 and 1995.

Give your answer to two significant figures.

Show your working.

[(100 – 180) / 180] x 100% [1]

– 44% [1] [2]

(ii) Describe the data shown in Fig. 5.1.

Any three from:

1 daily doses / use (of erythromycin), peak, 1989 / at 2.8 doses per 1000 people

2 (bacterial) infections (resistant to erythromycin) peak, in 1993 / at 180 bacterial infections per 1000 people

3 no record of resistant infections, until 1991 / from 1983 to 1989 / first 6 years

4 delay (of 4 years) between peak of doses and peak of (resistant) infections [3]

(iii) Suggest reasons for the change in the number of bacterial infections resistant to erythromycin from 1993 to 1995 shown in Fig. 5.1.

any two from:

1 fewer doses of erythromycin used

2 development of new, antibiotics / treatments / vaccines

(or any example that would cause a reduced usage of antibiotics)

3 more, awareness / education about, overuse of antibiotics / antibiotic resistance

4 improved, detection / screening (of pathogens to avoid spread)

(reference to improved, cleanliness / hygiene or more people vaccinated /

population has reached herd immunity)

5 isolating infected individuals [2]

(c) The discovery of vaccines is another breakthrough in modern medicine. Suggest one reason why the use of vaccine is more effective than the use of antibiotics.

any one from:

1 vaccines are able to stimulate the production of WBCs in the body which provides longer term of protection against the disease while antibiotics does not provide long term protection as it does not stimulate the production of WBCs

2 vaccines are able to provide protection against bacteria and viruses while antibiotics are only able to provide cure for bacterial infections

3 vaccines help to provide prevention to the onset of a disease while antibiotics help to cure a bacterial infection after the onset of the disease [1]

[Total: 9]

15 Some people are infected with HIV across the world.

(a) Fig. 11.1 shows the number of people who have been newly infected with HIV (new infections) in 2018 across the world and the percentage changes in the number of new infections since 2010.

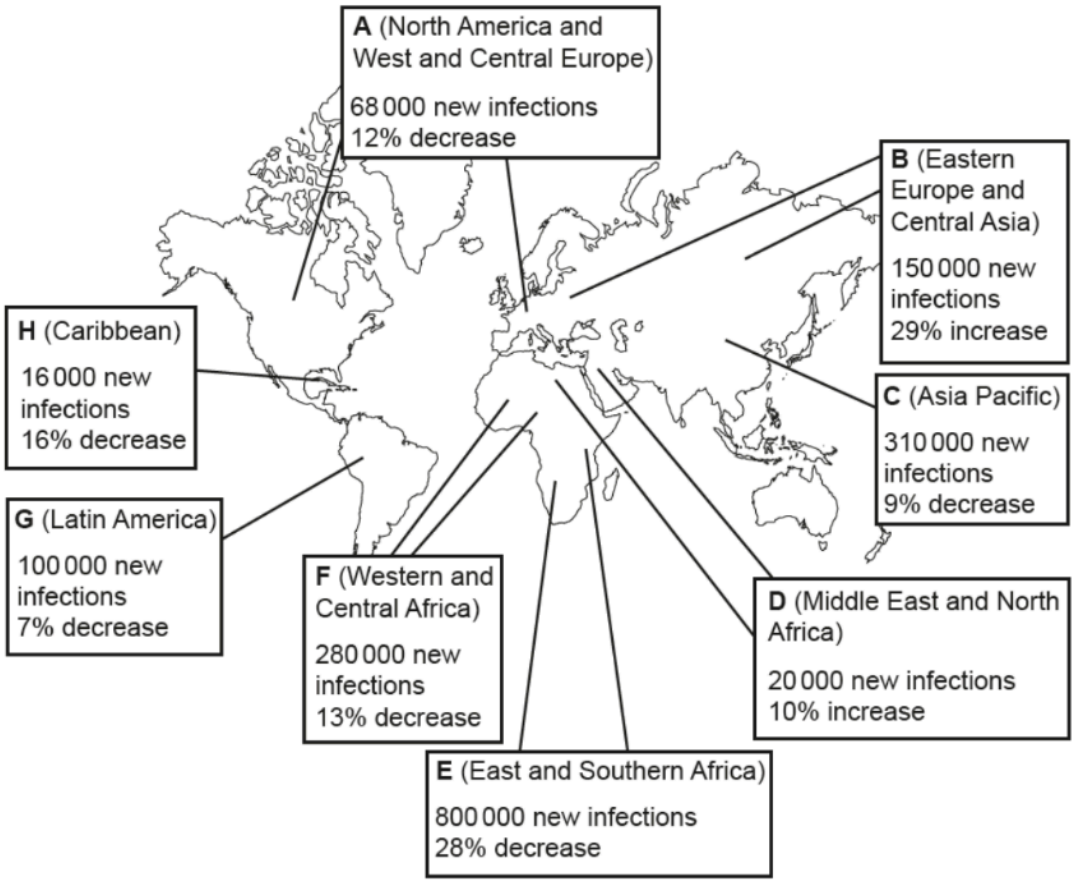

Fig. 11.1

(i) State the name of the disease which is caused by HIV. [1]

Acquired immune deficiency syndrome
Must spell in full

(ii) Using only the data in Fig. 11.1, state two conclusions that can be made about the change in number of new HIV infections across the world between 2010 and 2018. You may use the letters in Fig. 11.1 to identify the regions of the world. [3]

• there is a decrease in the percentage infections in, most regions / regions A,C,E,F,G,H (or named regions) [1]
• there is an increase in the percentage infections in, some regions / regions B, D (or named regions) [1]
• the biggest percentage decrease, in E (East and Southern Africa) [1]
• the smallest percentage decrease, in G (Latin America) [1]
• any 2 (1mark each) + data quote to support described trend [1]
(max 3 marks)

(b) HIV infection cannot be treated using vaccination while other diseases due to viral infections can.
Define vaccination and how it can be used to prevent viral infections. [6]

• Vaccine contains, an agent that resembles virus OR inactivated/weakened, virus/pathogen [1]

• vaccination + is the process of taking a vaccine / being vaccinated [1]

• either orally or through an injection [1]

• receptors on, white blood cells/antibodies + complementary to the antigen + will bind OR antibodies are specific in action [1]

• This stimulates white blood cells (to divide and) [1]

• produce more antibodies + to destroy/kill the agent/virus [1]

• Some white blood cells remain in the blood stream for a long time as memory cells. [1]

• In the future, when the same pathogen enters the body, memory cells can recognise [1]

• and quickly produce the antibodies to destroy it. [1]

ANSWERS FOR INFECTIOUS DISEASE IN HUMAN PRACTICAL QUESTIONS

1 Fig. 2.1 is a photomicrograph of some blood cells.

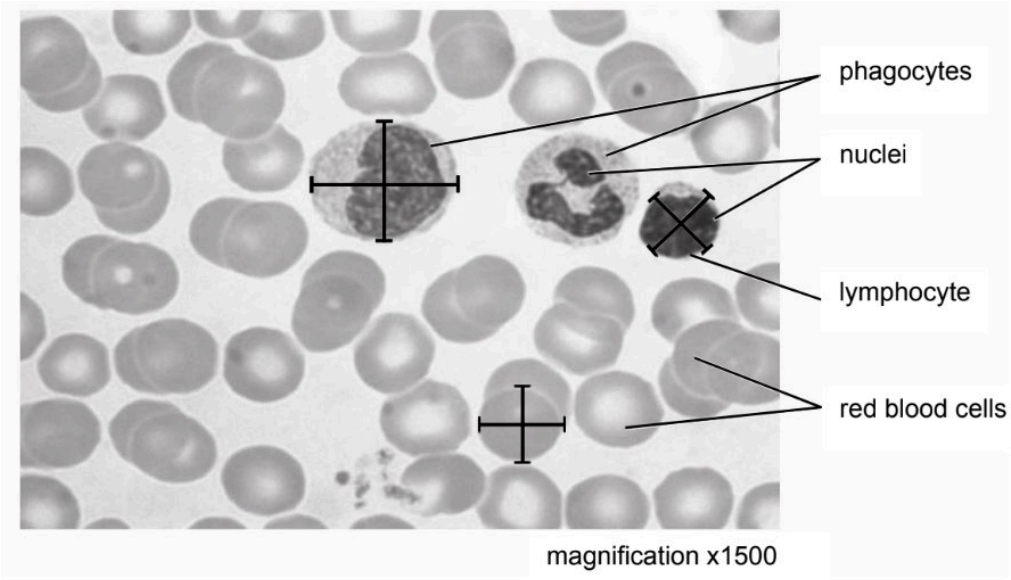

Fig. 2.1

(a) (i) State two visible differences between the red blood cells and the white blood cells (phagocytes and lymphocytes) in Fig. 2.1

1. red blood cells do not have a nucleus /white blood cells have a nucleus
2. red blood cells, have a light area in the centre /are biconcave but white blood cells do not
3. there are more red blood cells /fewer white blood cells
4. red blood cells contents not granular/white blood cells contents granular
5. red blood cells smaller thanphagocytes
6. red blood cells are overlapping /white blood cells do not overlap

Any two points 2 [2]

(ii) Make a large drawing of the two cells labelled **phagocytes** in Fig. 2.1. [4]

1. single clear lines on both cell membrane and no shading in the nucleus
2. size of phagocyte must be larger than red blood cells (size must be exceed size of RBC in diagram, >15mm)
3. size of the left phagocyte must be larger than the phagocyte on the right
4. the nucleus on the right phagocytehas two distinct parts joined by a narrow section

(b) **(i)** Measure the diameters of the three marked blood cells, along both the lines drawn on each of the cells, in Fig. 2.1.

Record these measurements in Table 2.1.

Add the missing units to Table 2.1.

Calculate the average diameter for each type of blood cell and write your results in Table 2.1.

Table 2.1

type of blood cell	diameter 1 /.....	diameter 2 /.....	average diameter /.....
red blood cell	12 ± 1	13 ± 1	12.5 ± 1
lymphocyte	12 ± 1	11 ± 1	11.5 ± 1
phagocyte	22 ± 1	18 ± 1	20.0 ±1

mp 1 for header units
mp 2 for six
measurements (correct dp for average)
mp 3 for three correct averages from candidates results

Accept cm [3]

(ii) Calculate the actual average diameter of the red blood cell using your answer in 2(b)(i) and the following equation.

$$\text{magnification} = \frac{\textit{average diameter of the red blood cell in Fig.2.1}}{\textit{actual average diameter of the red blood cell}}$$

Give your answers in micrometres (μm) to the nearest whole number.

1 mm = 1000 μm

Show your working.

8 or 9 μm

mp 1 working

mp 2 answer in mm/cm

mp 3 answer in μm

no.	materials and apparatus	quantity per candidate
1	standard Petri dish base containing agar mixed with Universal Indicator, on a piece of white paper labelled agar plate A lid is not required.	1
2	plastic drinking straws approximately 100 mm long, 4–5 mm diameter	1
3	standard test-tubes	3
4	test-tube rack	1
5	disposable 1 cm3 plastic pipettes or very fine Pasteur pipettes	3
6	30 cm3 of 5% citric acid in a container labelled 5% citric acid	1
7	30 cm3 of distilled water in a container labelled distilled water	1
8	5 cm3 syringes	2
9	marker	1
10	paper towels	4
11	stopwatch	1
12	eye goggles	1
13	gloves	1 pair
14	hand lens	1
15	30 cm ruler	1

[3]

[Total: 12]