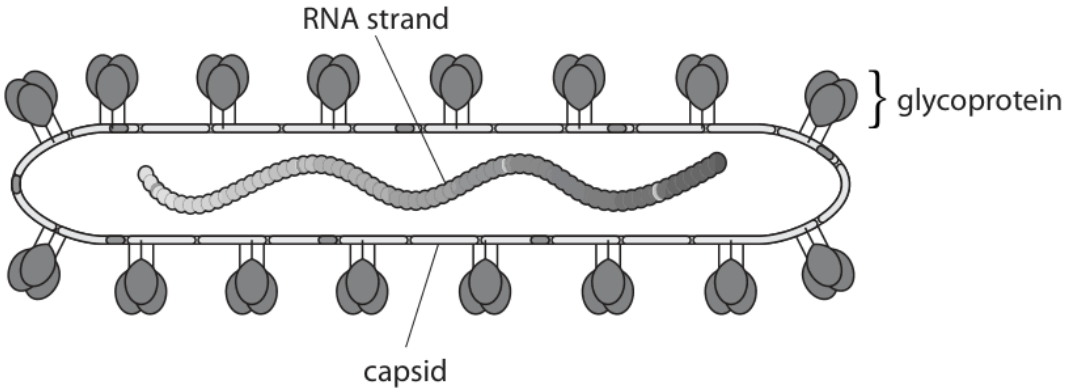
Pathogens, Immunity and Antibiotics (Topic 6): Edexcel SNAB A Level Biology Exam Questions by Topic

20 questions · 50 marks · about 60 minutes. Answer in the spaces, then check the mark schemes at the end.

Question 1 · A level Paper 1 · October 2020 · Q9(a) · 3 marks

9 Ebola virus disease (EVD) is a rare and deadly disease most commonly found in Africa. Following a severe outbreak in 2014, in which 11 000 people died, work has been underway to develop a vaccine.

The diagram shows the structure of an Ebola virus.

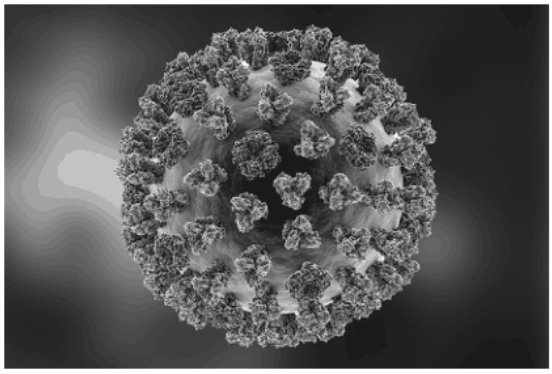


(a) Compare and contrast the structure of Ebola virus with that of the human immunodeficiency virus (HIV).

(3)

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2 The diagram shows an RNA virus that causes influenza.



(Source: © Kateryna Kon/Shutterstock)

(a) Influenza cannot be treated with antibiotics.

Explain why antibiotics cannot be used to treat influenza.

(2)

Questions, mark schemes and examiners' report extracts © Pearson Education Ltd.

Question 3 · A level Paper 1 · November 2021 · Q9(b)(i) · 3 marks

(b) HIV enters and destroys T helper cells. This can cause AIDS.

(i) Describe how HIV particles are able to enter T helper cells.

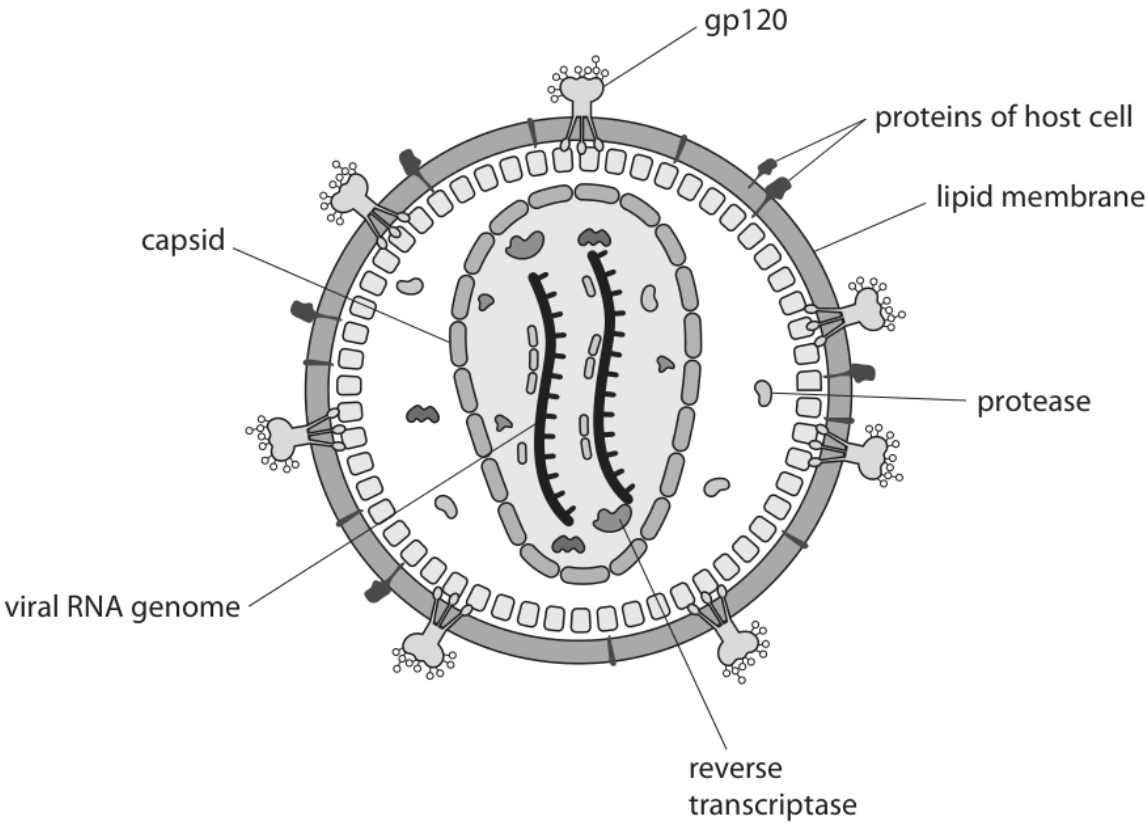
(3)

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Question 4 · A level Paper 3 · June 2024 · Q5(a)(i) · 1 mark

5 Human immune deficiency virus (HIV) can cause acquired immune deficiency syndrome (AIDS).

(a) The diagram shows an HIV virus particle.



(i) State the role of gp120 in the life cycle of the HIV virus.

(1)

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Question 5 · A level Paper 3 · June 2024 · Q5(a)(ii) · 1 mark

(ii) Give a reason why there are proteins from the host cell in the lipid membrane surrounding the virus particle.

(1)

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.....

.....

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Question 6 · A level Paper 1 · June 2018 · Q3(b) · 4 marks

(b) Inflammation is a non-specific response to an infection.

Explain how changes in the blood vessels result in the redness and swelling seen at the site of inflammation.

(4)

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Question 7 · A level Paper 1 · June 2018 · Q3(c)(i) · 3 marks

(c) Interferon is involved in the response to viral infections.

(i) The influenza virus can be lethal to mice.

The effects of interferon on influenza infection in mice was investigated.

Mice were infected with influenza virus and then given interferon.

The results of the investigation are shown in the table.

Interferon dose / units per mouse	Median survival time / days
No dose	3.3
8×10^3	4.4
8×10^4	8.5
8×10^5	>42

Explain these results.

(3)

Questions, mark schemes and examiners' report extracts © Pearson Education Ltd.

Question 8 · A level Paper 3 · June 2023 · Q2(b)(i) · 1 mark

(b) The table shows some properties of neutrophils and monocytes.

Activated monocytes are called macrophages.

Property	Neutrophil	Monocyte
Material taken up by phagocytosis	Bacteria and fungi	Dead cell debris, bacteria and fungi
Antigen presentation	No	Yes
Production of cytokines	No	Yes

(i) State what is meant by the term phagocytosis.

(1)

Question 9 · A level Paper 3 · June 2023 · Q2(b)(ii) · 3 marks

(ii) Explain why monocytes play a role in the antigen specific immune response to viruses but neutrophils do not.

(3)

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Question 10 · A level Paper 1 · June 2024 · Q9(a)(ii) · 4 marks

(ii) Individuals infected with hepatitis C produce antibodies.

Describe how the activation of T helper cells leads to the production of antibodies.

(4)

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Question 11 · A level Paper 1 · November 2021 · Q9(b)(ii) · 4 marks

(ii) Explain why the destruction of T helper cells causes the symptoms of AIDS.

(4)

Question 12 · information from earlier in the question

(b) A vaccine has been developed by genetically modifying a virus that infects cattle. In the genetically modified virus, one of the genes was replaced with a gene for a protein found in the Ebola virus.

In a trial of 52 volunteers, 48 developed antibodies against the Ebola virus within 14 days of injection.

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Question 12 · A level Paper 1 · October 2020 · Q9(b)(ii) · 3 marks

(ii) Explain the role of T cells in the immunity to the Ebola virus that develops following the use of this vaccine.

(3)

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Question 13 · A level Paper 1 · June 2023 · Q5(c) · 2 marks

(c) The gut has barriers to prevent pathogens entering the body.

Explain the role of conditions in the gut in preventing infection by microorganisms.

(2)

Question 14 · A level Paper 1 · October 2020 · Q3(b) · 3 marks

(b) Explain why the presence of microorganisms on the skin and in the gut helps to prevent pathogenic organisms multiplying in the body.

(3)

Questions, mark schemes and examiners' report extracts © Pearson Education Ltd.

7 Measles is a contagious disease that can be controlled by vaccination.

Not all parents choose to have their children vaccinated.

The table shows the number of cases of measles and the percentage of children vaccinated in the UK between 2012 and 2017.

Year	Number of cases of measles	Percentage of children vaccinated (%)
2012	1564	91.2
2013	1855	92.3
2014	135	92.7
2015	71	92.3
2016	556	91.9
2017	216	91.6

Questions, mark schemes and examiners' report extracts © Pearson Education Ltd.

Question 15 · A level Paper 1 · June 2022 · Q7(a)(ii) · 4 marks

(ii) One conclusion from the data is that it takes time for an increase in vaccination rate to reduce the number of cases of measles in children.

Explain why this is a valid conclusion.

(4)

Question 16 · A level Paper 3 · June 2023 · Q7(a) · 2 marks

7 Tuberculosis is an infectious disease caused by the bacterium *Mycobacterium tuberculosis*.

(a) Describe how *M. tuberculosis* bacteria evade the immune system.

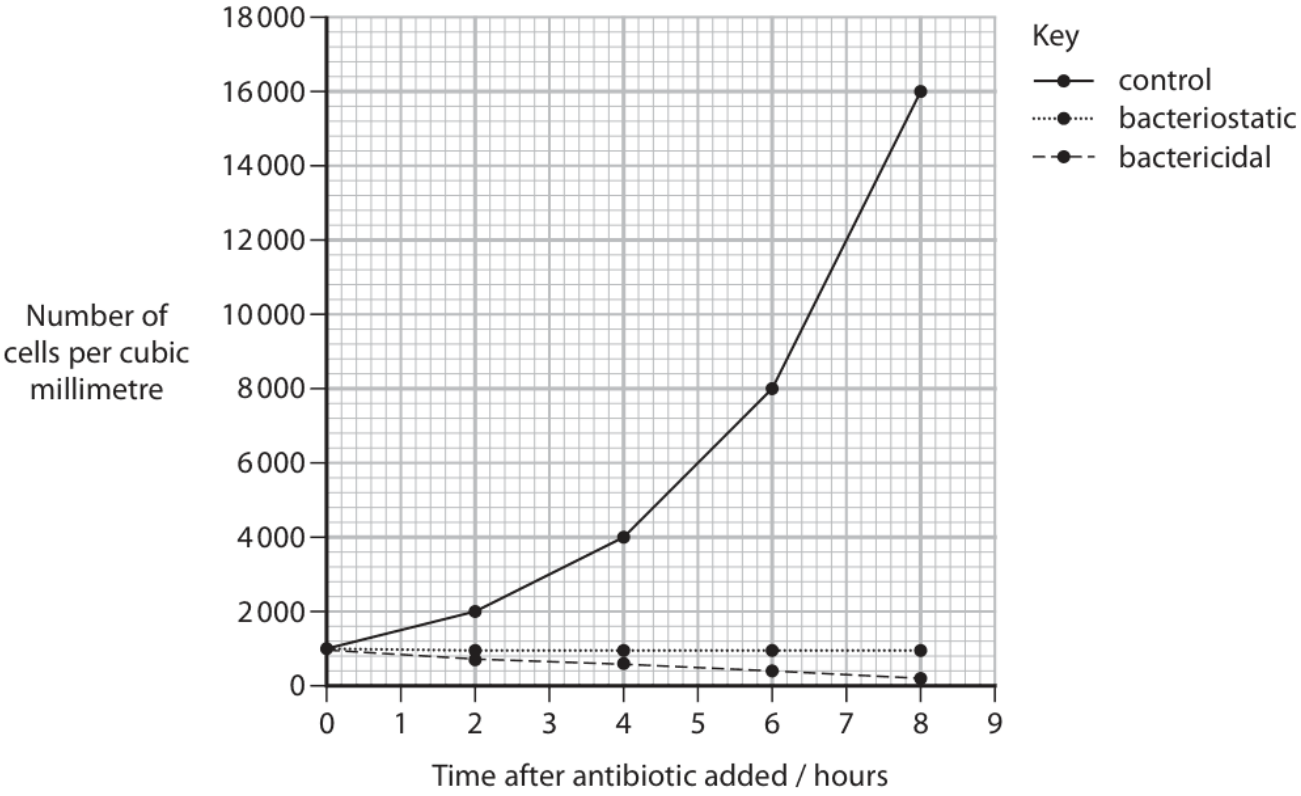
(2)

Questions, mark schemes and examiners' report extracts © Pearson Education Ltd.

Question 17 · A level Paper 1 · June 2023 · Q7(b)(i) · 1 mark

(b) Some bacteria are pathogenic. Bacteriostatic and bactericidal antibiotics are drugs used to treat diseases caused by bacteria.

The graph shows the effects of two types of antibiotic on the growth of bacteria. The control line shows the growth of bacteria with no antibiotic present.



(i) State what is meant by the term **bactericidal** antibiotic.

(1)

.....

.....

.....

Question 18 · A level Paper 3 · June 2025 · Q5(a) · 1 mark

5 Doxycycline (DOX) is a bacteriostatic antibiotic.

(a) State what is meant by the term **bacteriostatic antibiotic**.

(1)

.....

.....

.....

Questions, mark schemes and examiners' report extracts © Pearson Education Ltd.

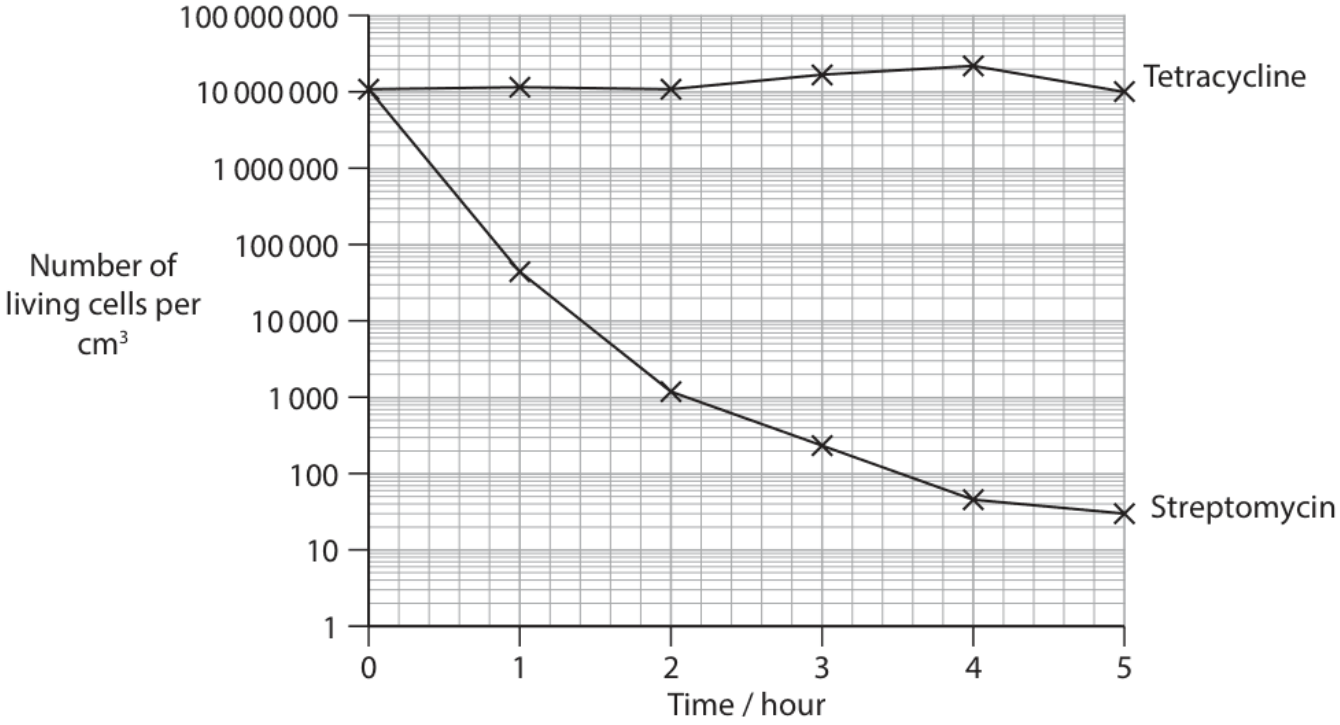
Question 19 · information from earlier in the question

(c) In a different investigation the effects of two antibiotics, tetracycline and streptomycin, were compared on cultures of *E. coli*.

Each antibiotic was added to a culture containing 10 000 000 living *E. coli* bacteria at time 0.

Samples were removed from the cultures every hour and the number of living bacteria was determined.

The results are shown in the graph.



Question 19 · A level Paper 3 · June 2025 · Q5(c)(ii) · 2 marks

(ii) Deduce the effects of these two antibiotics on *E. coli*.

(2)

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Question 20 · A level Paper 1 · June 2019 · Q7(d) · 3 marks

(d) Hospitals have developed practices in response to the increase in hospital acquired infections.

Describe the infection control practices hospitals have introduced.

(3)

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Mark schemes

Question 1 · A level Paper 1 · October 2020 · Q9(a) · 3 marks

Question Number	Answer
9(a)	An answer that makes reference to three of the following Similarities • both contain RNA (1) • both have {a (protein) capsid / glycoproteins} (1) Differences • Ebola contains one strand of RNA but HIV contains two strands of RNA (1) • HIV is spherical, Ebola virus is elongated (1)

Additional guidance	Mark
IGNORE retrovirus ALLOW protein coat ALLOW HIV is icosahedral / Ebola is filamentous ALLOW HIV is round ALLOW HIV has a lipid layer/envelope and Ebola does not (acceptable on basis of diagram provided)	**(3)**

Questions, mark schemes and examiners' report extracts © Pearson Education Ltd.

Question 2 · A level Paper 3 · June 2022 · Q2(a) · 2 marks

Question number	Answer
2(a)	An explanation that makes reference to two of the following: • because influenza is (caused by) a virus (1) • antibiotics target {prokaryotes / bacteria} (1) • structure of a virus is different to that of a {prokaryote / bacteria} (1)

Additional guidance	Mark
IGNORE antibiotics only kill bacteria ALLOW treat bacterial infections ALLOW description of structure or process targeted by antibiotics and only found in bacteria e.g cell wall, (70S) ribosomes IGNORE receptors / antigens / processes	(2)

Questions, mark schemes and examiners' report extracts © Pearson Education Ltd.

Question 3 · A level Paper 1 · November 2021 · Q9(b)(i) · 3 marks

Question Number	Answer
9(b)(i)	A description that makes reference to three of the following: • {glycoproteins / GP120} on the (surface of the) virus (1) • bind to (CD4) receptors on the (surface of the) T (helper) cells (1) • viral envelope fuses with cell membrane of T helper cell (1) • viral RNA enters the cell (1)

Additional guidance	Mark
ALLOW GP130 IGNORE capsid	**(3)**

Question 4 · A level Paper 3 · June 2024 · Q5(a)(i) · 1 mark

Question number	Answer
5(a)(i)	• attach to {CD4 receptor / T helper cell} (1)

Additional guidance	Mark
ALLOW other terms for attach	Choose an item. (1)

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Question 5 · A level Paper 3 · June 2024 · Q5(a)(ii) · 1 mark

Question number	Answer
5(a)(ii)	An answer that makes reference to the following: • because the virus {buds off from cell surface / is surrounded by (the host) cell membrane} (1)

Additional guidance	Mark
ALLOW because lipid membrane is {taken / formed} from the host cell (membrane) IGNORE comments about immune recognition IGNORE exocytosis	Choose an item. (1)

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Question 6 · A level Paper 1 · June 2018 · Q3(b) · 4 marks

Question Number	Answer
3(b)	An explanation that makes reference to four of the following: • histamine is released (1) • (histamine) causes {arterioles to dilate/ vasodilation} (1) • which increases the blood flow (to the site causing redness) (1) • (histamine) also causes the permeability of capillaries to increase (1) • allowing blood plasma to {leave the capillary / enter the tissues} (causing oedema / swelling) (1)

Additional Guidance	Mark
ALLOW reference to 'leaky' capillaries	**(4)**

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Question 7 · A level Paper 1 · June 2018 · Q3(c)(i) · 3 marks

Question Number	Answer
3(c)(i)	An explanation that makes reference to the following: • increasing dose of interferon increases the survival time of the mice (1) • because interferon inhibits viral replication (inside cells) (1) • the greater the dose of interferon the fewer virus particles {produced / released} (to infect other cells) (1)

Additional Guidance	Mark
ALLOW positive correlation between interferon dose and survival time ALLOW interferon prevents virus infecting other cells	**(3)**

Question 8 · A level Paper 3 · June 2023 · Q2(b)(i) · 1 mark

Question number	Answer
2(b)(i)	An answer that makes reference to the following: • {engulfing / ingesting / endocytosis} of {pathogen / cell debris / bacteria / virus / fungi / microbes}

Additional guidance	Mark
IGNORE foreign bodies / cell unqualified	(1)

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Question 9 · A level Paper 3 · June 2023 · Q2(b)(ii) · 3 marks

Question number	Answer
2(b)(ii)	An explanation that makes reference to the following: • (monocytes / macrophages) {phagocytose / digest / break down} {virus / pathogen} (1) • (monocytes / macrophages) present {virus / antigens} to T cells (1) • (produce) cytokines involved in the immune response (1)

Additional guidance	Mark
ALLOW both can phagocytose {virus / pathogen} ALLOW converse for neutrophils ALLOW examples of role of cytokines e.g. activate B cells	(3)

Question 10 · A level Paper 1 · June 2024 · Q9(a)(ii) · 4 marks

Question Number	**Answer**
9(a)(ii)	A description that makes reference to the following • (activated) T (helper) cells release cytokines (1) • B cells stimulated to produce B effector cells (1) • (B effector) cells differentiate into plasma cells (1) • antibodies are released (by plasma cells) (1)

Additional guidance	**Mark**
ALLOW activated B cells	(4)

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Question 11 · A level Paper 1 · November 2021 · Q9(b)(ii) · 4 marks

Question Number	Answer
9(b)(ii)	An explanation that makes reference to the following • (lack of T helper cells) reduces cytokine production (1) • therefore reducing { cloning / activation } of B cells (1) • reducing antibody production (1) • there is an increased risk of opportunistic infections (1)

Additional guidance	Mark
ALLOW reduced production of {B effector cells/plasma cells} ALLOW example eg TB	**(4)**

Question 12 · A level Paper 1 · October 2020 · Q9(b)(ii) · 3 marks

Question Number	Answer
9(b)(ii)	An explanation that makes reference to three of the following • T helper cells bind to { protein / antigen } the APC (1) • (therefore) leading to the production of {active T helper cells / T memory cells} (1) • the T helper cells activate the B cells to { divide / become } cells capable of producing antibodies (1) • The memory cells remain in the body so antibodies can be produced quickly (on re-infection) (1)

Additional guidance	Mark
ALLOW B cells develop into B effector cells or plasma cells	**(3)**

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Question 13 · A level Paper 1 · June 2023 · Q5(c) · 2 marks

Question Number	Answer
5(c)	An explanation that makes reference to two of the following • acidic conditions in the stomach (1) • (because acidic conditions) denature the enzymes of microorganisms (1) OR • gut flora {outcompete / compete with} other microorganisms (1) • therefore inhibiting {growth / reproduction} of pathogens (1)

Additional guidance	Mark
ALLOW HCl / hydrochloric acid /low pH ALLOW gut flora produce lactic acid / chemicals to destroy microorganisms ALLOW gut bacteria or microorganisms for gut flora ALLOW bacteria cannot increase in number ALLOW disease causing organisms for pathogens	(2)

Questions, mark schemes and examiners' report extracts © Pearson Education Ltd.

Question 14 · A level Paper 1 · October 2020 · Q3(b) · 3 marks

Question Number	Answer
3(b)	An explanation that makes reference to the following • flora in the gut and skin are better adapted to the conditions (1) • therefore they can outcompete pathogenic organisms (1) • bacteria in the gut secrete {chemicals /lactic acid} which help to destroy pathogens (1)

Additional guidance	Mark
ALLOW details of competition for space or nutrients ALLOW enzymes	**(3)**

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Question 15 · A level Paper 1 · June 2022 · Q7(a)(ii) · 4 marks

Question Number	Answer
7(a)(ii)	An explanation that makes reference to the following • as the vaccination rate increases the number of cases of measles decreases (in some years) (1) • example from data to show why the conclusion is valid (1) • (the effects of changes in percentage vaccination are seen in the following year) because it takes time for {antibodies / memory cells } to be produced (1) • time taken for herd immunity to develop (1)

Additional guidance	Mark
ALLOW reference to data from specific years such as 2013 to 2014, 2014 to 2015	(4)

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Question 16 · A level Paper 3 · June 2023 · Q7(a) · 2 marks

Question number	Answer
7(a)	A description that makes reference to two of the following: • (*M tuberculosis*) survive inside macrophages (1) • (*M tuberculosis*) {survive / remain dormant} in tubercles (1) • (*M tuberculosis*) {inhibit T helper cells / supress the (acquired) immune response} (1)

Additional guidance	Mark
ALLOW description of how {*M tuberculosis* / bacteria} survive e.g. have thick waxy (coat / cell wall) / (macrophage) lysosomes cannot fuse with the (phagocytic) vacuole ALLOW antigen presentation {is disrupted / does not occur}	(2)

Question 17 · A level Paper 1 · June 2023 · Q7(b)(i) · 1 mark

Question Number	Answer	Additional guidance	Mark
7(b)(i)	• (a substance that) can kill bacteria		(1)

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Question 18 · A level Paper 3 · June 2025 · Q5(a) · 1 mark

Question number	Answer
5(a)	An answer that makes reference to the following: • (a substance) that inhibits the {increase in number / division / reproduction / multiplication / replication} of bacteria

Additional guidance	Mark
ALLOW prevents or stops for inhibiting ALLOW reduces instead of inhibits	(1)

Question 19 · A level Paper 3 · June 2025 · Q5(c)(ii) · 2 marks

Question number	Answer
5(c)(ii)	An explanation that makes reference to the following: • tetracycline has little effect on number of living cells / therefore tetracycline is bacteriostatic (1) • streptomycin decreases number of living cells / streptomycin is bactericidal (1)

Additional guidance	Mark
ALLOW tetracycline stops {E.coli / bacteria} increasing in number ALLOW streptomycin kills {E.coli / bacteria}	(2)

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Question 20 · A level Paper 1 · June 2019 · Q7(d) · 3 marks

Question Number	Answer
7(d)	A description that makes reference to three of the following: • hand wash (stations) (1) • (doctors / nurses) not to wear { ties / watches / long sleeves } (1) • testing patients for the presence of antibiotic resistant bacteria before admission / {isolation / quarantine} of infected patients (1) • increased washing of bedding / disinfection of { beds / surfaces } (1)

Additional guidance	Mark
ALLOW antibacterial / antiseptic /alcohol gel / hand sanitisers ALLOW use of disposable bedding	**(3)**

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