Infectious Disease (Option A1): Eduqas A Level Biology Exam Questions by Topic

14 questions · 26 marks · about 31 minutes. Answer in the spaces, then check the mark schemes at the end.

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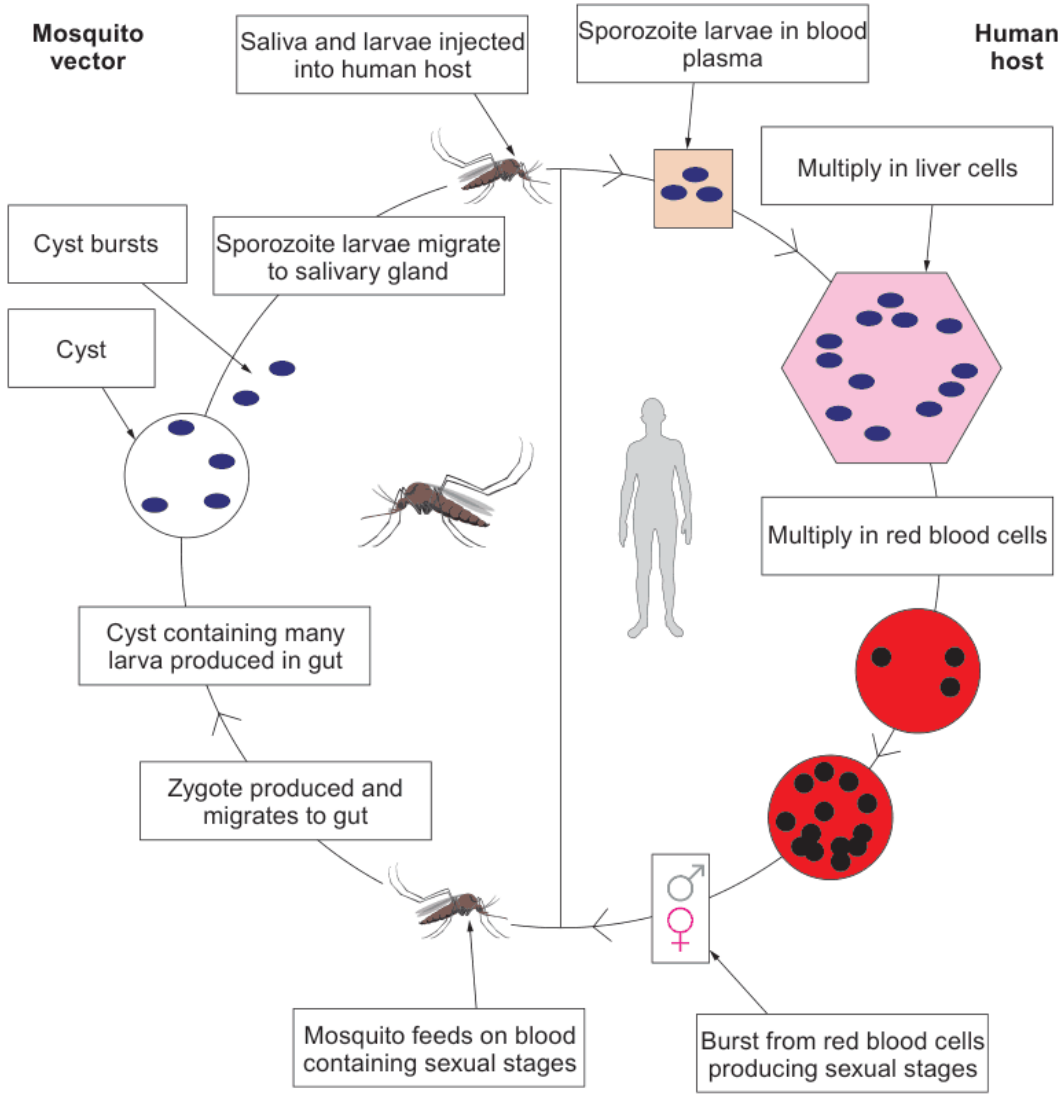
8. Malaria is a disease caused by the parasitic protoctist, *Plasmodium* and carried by a vector, the *Anopheles* mosquito.

Malaria is endemic in many tropical countries. A large proportion of the 1 million people who die from malaria each year are children under five years of age and 90% of cases occur in sub-Saharan Africa.

There are many stages in the life cycle. A larval form of the parasite is passed into human blood plasma when a mosquito feeds on blood. The parasite reproduces rapidly in the liver and erythrocytes (red blood cells) of a human host.

A summary of the life cycle of *Plasmodium falciparum* is shown in **image 8.1**.

Image 8.1



(a) State the meaning of the word 'endemic'. [1]

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Question 2 · A level Component 3 · Autumn 2021 · Q7(a)(i) · 1 mark

7. *(a)* Cholera is a disease caused by the bacterium *Vibrio cholerae* and is transmitted through contaminated water.

The last major cholera pandemic began in Indonesia in 1961 and eventually spread to parts of Europe by 1975.

(i) Describe what is meant by the term 'pandemic'. [1]

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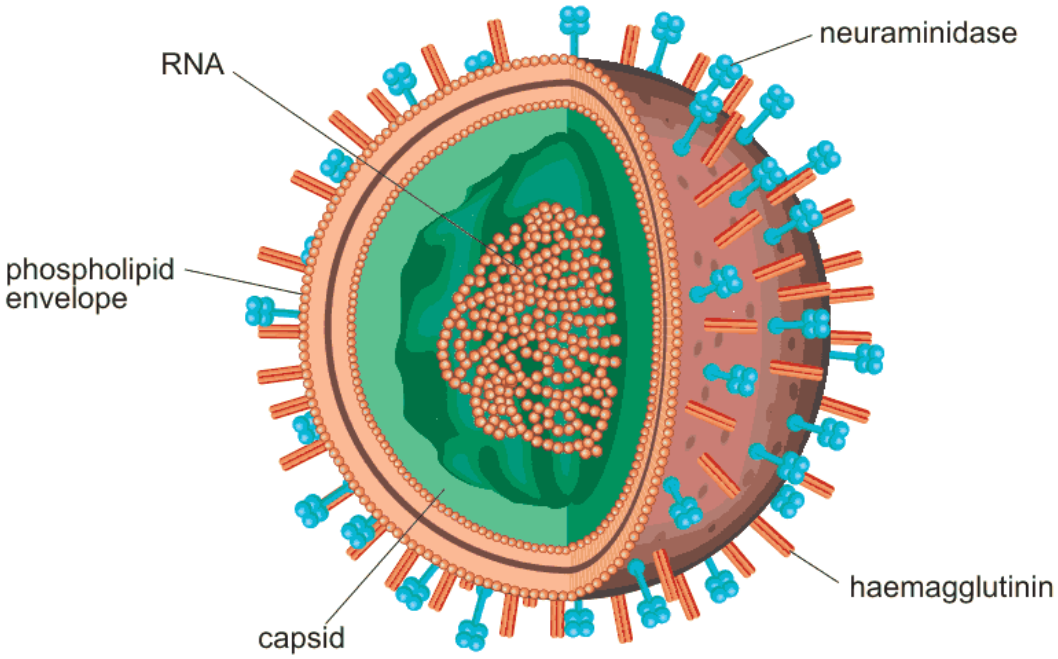
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Question 3 · A level Component 3 · June 2022 · Q7(a)(i) · 1 mark

7. (a) Influenza, 'flu', is an infectious disease of the respiratory tract caused by a retrovirus, shown in **Image 7.1**.

Symptoms include sore throat, coughing and fever.

Image 7.1



Neuraminidase and haemagglutinin are proteins on the phospholipid envelope. They are classified as antigens.

(i) Describe what is meant by the term antigen. [1]

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Question 4 · A level Component 3 · June 2025 · Q7(a) · 2 marks

7. Scarlet fever is an infectious disease of young children. The characteristic symptoms are sore throat, fever, and a red rash. The disease is caused by the bacterium *Streptococcus pyogenes* which produces a toxin that causes the symptoms. Diagnosis of scarlet fever may be confirmed by a test that detects antigens of *S. pyogenes*.

(a) Define the following terms: [2]

Infectious disease;

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Toxin;

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Antigen.

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Question 5 · A level Component 3 · June 2018 · Q8(e)(i) · 2 marks

(e) Methicillin works in a similar way to penicillin and is said to be bactericidal. It is no longer produced for medical use because of the rapid increase in bacterial resistance to it. Methicillin resistant *Staphylococcus aureus* (MRSA) is endemic in the general human population. Infections caused by MRSA are common in hospital patients.

(i) State what is meant by the term *endemic* and suggest why MRSA is not a major cause for concern amongst the general population. [2]

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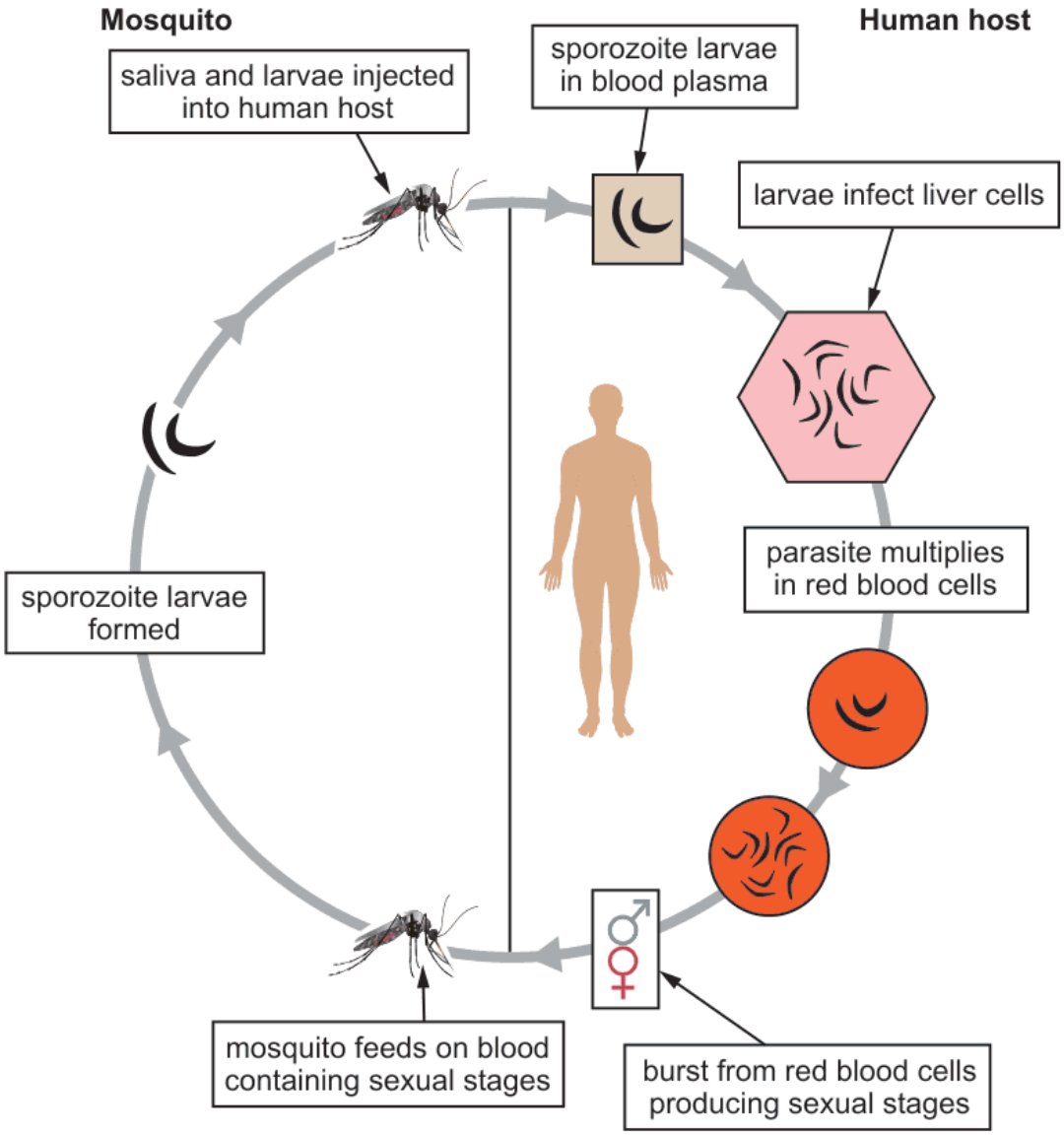
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7. (a) Malaria is a disease caused by a protoctistan parasite belonging to the genus *Plasmodium*. The disease is caused mainly by two species of *Plasmodium* (*P. vivax* and *P. falciparum*) of which there are many antigenic types.

The life cycle of malaria consists of multiple stages within two host organisms; humans and the *Anopheles* mosquito. Some of these stages are free-swimming (for example, sporozoites) while other stages happen within human liver cells and red blood cells.

Image 7.1 shows the generalised life cycle of the malaria parasite.

Image 7.1



(i) State the role of the mosquito in the life cycle of *Plasmodium*. [1]

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Question 7 · A level Component 3 · June 2024 · Q7(b)(iv) · 3 marks

(iv) *Plasmodium* sporozoites can be cultured in human cells in the laboratory under very specific conditions:

- 37 °C
- low oxygen concentrations.

Use information from **Image 7.1** to suggest why *Plasmodium* sporozoites can only be cultured under these conditions. [3]

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Question 8 · information from earlier in the question

8. Zika is an RNA virus, which can be spread by the *Aedes* mosquito. Most people infected with the Zika virus experience no or very mild symptoms. A recent outbreak in South America was accompanied by an increase in the number of babies being born with microcephaly (a significantly smaller head and abnormal brain development). The incubation period for the Zika virus is estimated to range between 3 and 12 days. The symptoms, if experienced, are similar to other mosquito-borne diseases such as malaria and include: fever, rash, muscular pain, joint pain and headaches.

In 2016, concern was expressed by athletes travelling to the Olympics in Brazil regarding possible infection with Zika. The World Health Organisation concluded that the risk of transmission was relatively low. The advice given to anyone travelling to the Olympics was:

- use insect repellent and wear loose clothing that covers the body
- keep windows closed at night and sleep under a mosquito net
- avoid areas with poor sanitation and stagnant water.

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Question 8 · A level Component 3 · June 2018 · Q8(a)(ii) · 2 marks

(ii) Explain how the preventative methods described above would help reduce the chance of infection with Zika. [2]

Question 9 · information from earlier in the question

7. *(a)* Cholera is a disease caused by the bacterium *Vibrio cholerae* and is transmitted through contaminated water.

The last major cholera pandemic began in Indonesia in 1961 and eventually spread to parts of Europe by 1975.

Question 9 · A level Component 3 · Autumn 2021 · Q7(a)(ii) · 1 mark

Some people can be carriers of *V. cholerae* and harbour a reservoir of the bacteria in their gut without showing symptoms. A vaccine against cholera exists but there is no mass vaccination programme in the UK.

(ii) Suggest why cholera is now rare in the UK despite there being no vaccination programme. [1]

Question 10 · A level Component 3 · June 2022 · Q7(b)(iii) · 2 marks

(iii) Explain why people belonging to the following specific groups are advised to obtain a flu vaccination. [2]

I. people with chronic illnesses;

II. health professionals.

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Question 11 · A level Component 3 · June 2017 · Q7(d) · 2 marks

(d) Antibiotics have no effect on viruses. Chickenpox is a highly infectious airborne disease caused by the varicella-zoster virus. The virus spreads easily in the air when an infected person coughs or sneezes. Airborne viruses have antigens that can attach to the surface membrane of cells lining the trachea.

Explain why the varicella-zoster virus needs to enter the cells of the trachea and the effect this has on the cells. [2]

Question 12 · A level Component 3 · June 2022 · Q7(a)(ii) · 2 marks

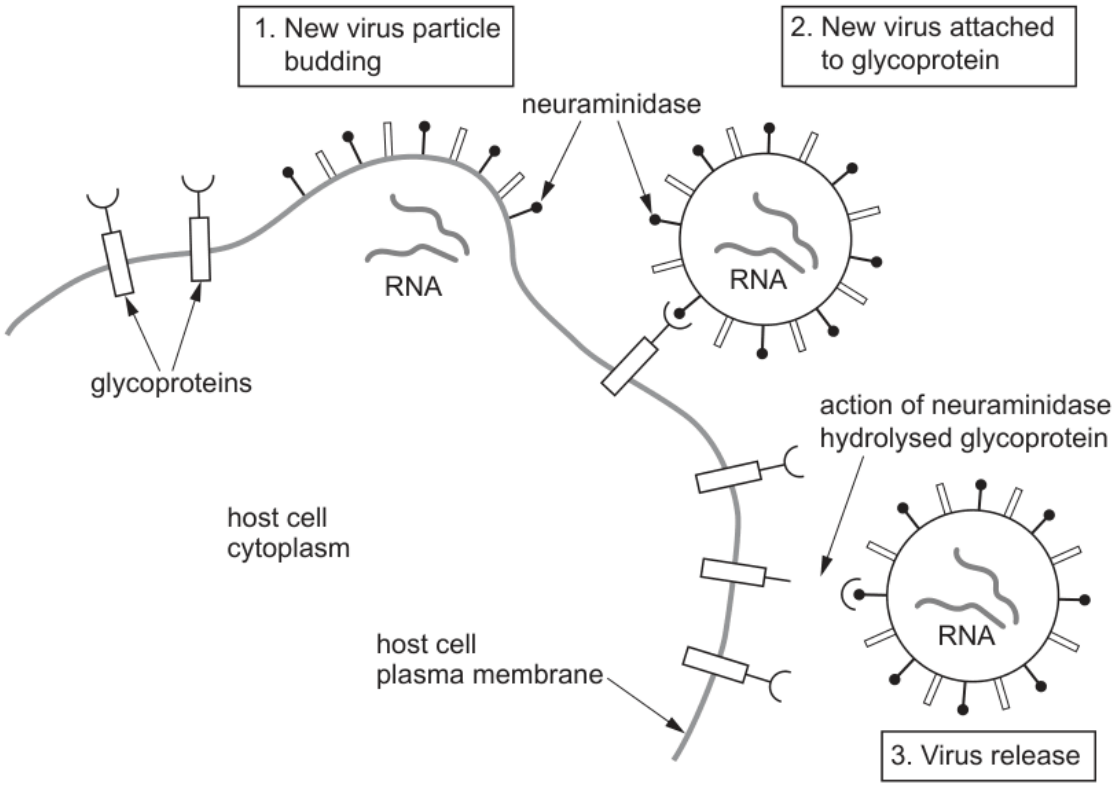
(ii) Explain why viruses require a host cell in order to be able to reproduce and why one of the symptoms of flu is a sore throat. [2]

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Newly formed virus particles are attached to the cell surface membrane of the host cell by a glycoprotein. Neuraminidase is an enzyme that hydrolyses the glycoprotein resulting in the release of the virus.

A diagram illustrating the action of neuraminidase in viral replication is shown in **Image 7.2**.

Image 7.2

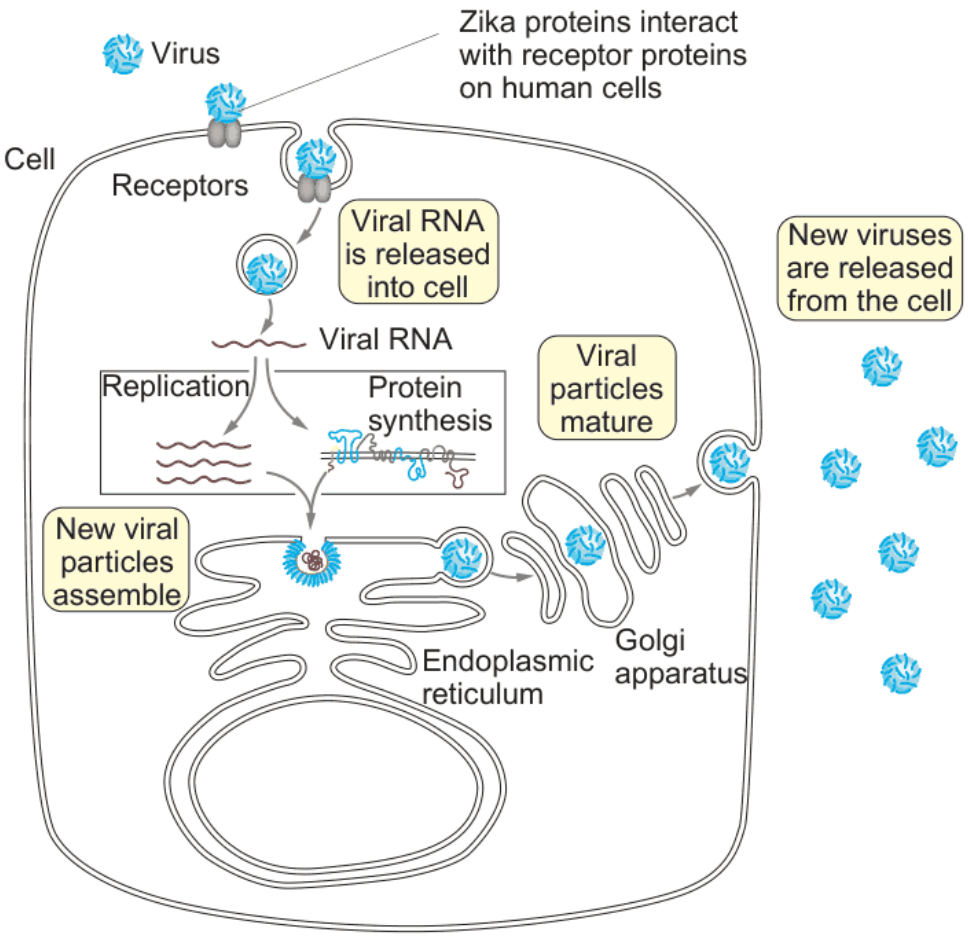


In 2007, during a flu outbreak in North Wales, some patients were treated with the drug 'Tamiflu' which contains a molecule that inhibits neuraminidase.

(iii) Explain how 'Tamiflu' could reduce or prevent the progress of the flu infection in patients. [3]

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(b) The diagram below describes how the Zika virus replicates inside a human cell.



(i) With reference to the diagram, suggest why viruses are difficult to treat with drugs and state the challenges faced when attempting to develop a vaccine against Zika. [3]

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Mark schemes

Question 1 · A level Component 3 · Autumn 2020 · Q8(a) · 1 mark

8	*(a)*	Endemic: (A disease) which is always present at low levels in an area /that occurs frequently at a predictable rate in a specific location/area or population (1)	1	1

Question 2 · A level Component 3 · Autumn 2021 · Q7(a)(i) · 1 mark

7	(a)	(i)	An epidemic occurring {worldwide /crossing international boundaries/owtte} and usually affecting a large number of people. (1)	1	1

Question 3 · A level Component 3 · June 2022 · Q7(a)(i) · 1 mark

7	(a)	(i)	A {molecule/ protein} that {causes an immune response/causes the production of antibodies/ binds to antibodies} (by the host's immune system)	1	1

Question 4 · A level Component 3 · June 2025 · Q7(a) · 2 marks

7	(a)	• Infectious disease: (a disease that) may be {passed/ transmitted/ spread} from one individual to another/ owtte • Toxin: a chemical produced by a {microorganism/ pathogen} which causes {damage/ harm} (to its host). • Antigen: Any substance which stimulates {the production of antibodies by the immune system/ immune response}/ protein on surface that antibodies bind to / owtte} 3 correct = 2 marks 2 correct = 1 mark 0/1 correct = 0 marks	2	2

Question 5 · A level Component 3 · June 2018 · Q8(e)(i) · 2 marks

(e)	(i)	Endemic: a disease, always present {at low levels (in an area)/ frequently at a predictable rate in a specific location/ population} (1) {Surgical patients – skin open to bacteria} / {Sick/elderly patients – low levels of immunity}/ ORA (1)	1 1	2

Question 6 · A level Component 3 · June 2024 · Q7(a)(i) · 1 mark

7	(a)	(i)	Vector 1	1

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Question 7 · A level Component 3 · June 2024 · Q7(b)(iv) · 3 marks

(iv)	**Any three (x1) from** • *Plasmodium* has {evolved / adapted} to grow inside host (1) • 37 °C {is body temperature / optimum temperature for sporozoites} (1) • *Plasmodium* {are predominantly anaerobic / grow better at low oxygen concentrations / owtte} (1) **not** obligate anaerobe • Liver cells (have a high metabolic rate and so) would have low oxygen concentration / oxygen is bound to haemoglobin in red blood cells / low oxygen concentration in blood plasma (1)	3	3

Question 8 · A level Component 3 · June 2018 · Q8(a)(ii) · 2 marks

(ii)	(Insect repellent/loose clothing/keeping windows closed and mosquito net) prevent mosquitoes biting (1) Not feeding (Avoiding stagnant water means) avoiding areas where mosquitoes breed (1) NOT hatching	2	2

Question 9 · A level Component 3 · Autumn 2021 · Q7(a)(ii) · 1 mark

(ii)	UK has water treatment/sewage treatment to provide uncontaminated drinking water/water supply (1)	1	1

Question 10 · A level Component 3 · June 2022 · Q7(b)(iii) · 2 marks

	(iii)	I	Weaker immune system / owtte/ flu may adversely affect symptoms of other conditions/ more likely to contract flu so increase (reservoir of) viruses in community.	1	1
		II	more likely to be infected as come into contact with greater numbers of infected people/ owtte could infect more vulnerable groups (eq) of people with flu/ reduce the number of staff available to care for vulnerable people.	1	1

Question 11 · A level Component 3 · June 2017 · Q7(d) · 2 marks

(d)	**One from why:** Needs host cell {for reproduction/ for metabolic processes}(1) Virus has no organelles/ metabolic pathways of its own (1) Uses cell metabolic pathways for reproduction (1) **One from Effects:** Kills the cell by {cell lysis/ production of toxic substances (1)	2	2

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Question 12 · A level Component 3 · June 2022 · Q7(a)(ii) · 2 marks

(ii)	Do not contain {named organelles/ ribosomes} for protein synthesis/ enzymes for replication of nucleic acid (1) (sore throat) Cell {lysis/ burst} / inflammation/ {chemical factors/ histamines} involved in immune response (1)	1	1	2

Question 13 · A level Component 3 · June 2022 · Q7(a)(iii) · 3 marks

(iii)	Neuraminidase unable to {hydrolyse/ break down} the glycoprotein (1) virus (particles) not released / virus (particles) remains attached to {host cell/glycoprotein}. (1) Could not infect other (host) cells/{antibodies/ phagocytes} better able to target virus (1)	1	2	3

Question 14 · A level Component 3 · June 2018 · Q8(b)(i) · 3 marks

(b)	(i)	**Any three (x1) from:** A. Viruses are not cellular so do not have metabolic pathways B. A vaccine would need to target {virus infected cells/ viruses directly when in tissue fluid/blood/outside cells} C. Viruses enter host cells so they avoid recognition by host immune system/drugs may not be able to get to virus D. Drugs would interfere with host cells metabolism or damage the host cells(1) E. Antigenic variation/ or description of/ drug resistance (1)	2	1	3

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