

A Level OCR Biology

11 Communicable diseases – answers

Question	Answers	Extra information	Mark	AO Spec reference																		
1(a)	<table border="1"> <thead> <tr> <th>Immune cell</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>neutrophil</td> <td>contains a lobed nucleus</td> </tr> <tr> <td>B/T memory</td> <td>triggers secondary immune response</td> </tr> <tr> <td>macrophage/B cell</td> <td>contains major histocompatibility complex</td> </tr> <tr> <td>T regulatory</td> <td>suppresses the immune response</td> </tr> <tr> <td>plasma</td> <td>produces antibodies</td> </tr> <tr> <td>T killer</td> <td>releases perforin</td> </tr> <tr> <td>mast cells</td> <td>releases histamines and cytokines</td> </tr> <tr> <td>T helper</td> <td>contains a CD4 receptor</td> </tr> </tbody> </table>	Immune cell	Description	neutrophil	contains a lobed nucleus	B/T memory	triggers secondary immune response	macrophage/B cell	contains major histocompatibility complex	T regulatory	suppresses the immune response	plasma	produces antibodies	T killer	releases perforin	mast cells	releases histamines and cytokines	T helper	contains a CD4 receptor	One mark per row	8	AO1 4.1.1(f) 4.1.1.(g) 4.1.1(h) 4.1.1(i)
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1(b)	<p>Agglutination ✓ To stick various pathogens together for phagocytosis ✓ Act as opsonins ✓ To tag pathogens for easier detection by phagocytes ✓ Act as antitoxins ✓ To bind to toxins released by bacteria ✓</p>	6																				
2(a)(i)	<i>Plasmodium</i> / Protista / Protoctista ✓	1	AO1																			
2(a)(ii)	Mosquitoes ✓ ingest pathogens when sucking blood from an infected host and inject into new host during next blood meal ✓	2	AO2 UF AE Synoptic: 2.1.2(n) 3.1.2(i)																			

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2(b)(i)	Any two from: conjugated protein ✓ 4 subunits/polypeptides (2 α and 2 β) / has quaternary structure ✓ Each subunit contains an Fe ²⁺ - containing haem group ✓		2	4.1.1(a) 4.1.1(b) 4.1.1(f)
2(b)(ii)	Shortness of breath / easy to faint / out of breath ✓ Less haemoglobin available to transport oxygen ✓		2	
2(b)(iii)	Red blood cells no longer have a biconcave shape ✓ Protoctista cannot hide/reproduce within red blood cells / feed on haemoglobin ✓ Gets destroyed by (named) white blood cells ✓		3	
2(c)(i)	Any three from: Viruses / HIV ✓ Attacks T helper cells ✓ Prevents interleukins to be released to start immune response ✓ Humoral response is not triggered / antibodies are not made under infection of other pathogens ✓		3 max	
2(c)(ii)	Any four from: <u>Clonal selection</u> occurs ✓ Activated B plasma cells undergoes <u>clonal expansion</u> ✓ By mitosis ✓ B plasma cells produce a lot of specific antibodies ✓ Antibodies bind to infected cells / act as agglutinins / opsonins ✓		4	
3(a)	1. Dead / inactive / attenuated ✓ 2. Artificial ✓ 3. Memory ✓ 4. Secondary ✓ 5. Antigen ✓	Must be in the correct order	5	AO1 AO3 UF

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3(b)(i)	<u>Influenza and SARS-CoV-2 have the same shape</u> But have different antigens / Vaccines do not contain the same antigens ✓ Any memory cells produced for influenza cannot recognise / are not complementary to the antigens of SARS-CoV-2 ✓		2	4.1.1(d) 4.1.1(e) 4.1.1(f) 4.1.1(j) 4.1.1(l)
3(b)(ii)	Any three from: (viral) mRNA is translated at the ribosome ✓ Faster production of antigen-presenting cells/memory cells ✓ Non-infectious / mRNA does not integrate into host genome ✓ (mRNA vaccine) does not contain any other content of the virus itself ✓ Fewer side effects as only mRNA injected ✓ Only need a DNA template to make the vaccine ✓ The mRNA strand is broken down once protein is made ✓		3 max	
3(c)	Active immunity: the body is triggered to produce its own antibodies / have an immune response / exposed to antigens / long term immunity ✓ Passive immunity: antibodies are injected into the bloodstream / provides short-term immunity ✓		2	
3(d)	<i>Non-specific:</i> Destroy/Traps all foreign cells / pathogens ✓ e.g., Phagocytosis / hydrochloric acid in the stomach / mucus trapping pathogens / AVP ✓ <i>Specific:</i> Destroys particular pathogens by recognising their specific antigens ✓ e.g., Antibodies targeting specific antigens or toxins / AVP ✓		4	

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4(b)(i)	Any three from: Concentration increases then decreases ✓ Peaks at 25 a.u., at day 13 ✓ Rate of decrease is slower than rate of increase ✓ Level returns to zero at day 27 ✓	3 max												
4(b)(ii)	Higher peak AND steeper increase ✓ Antibodies appear between days 30 and 33 AND level at day 60 should be higher than initial peak at day 13 ✓	2												
4(c)(i)	Disulfide bridges / bonds ✓	1												
4(c)(ii)	Variable region ✓ (Has specific shape) to <u>bind</u> to <u>specific</u> antigens ✓	2												
4(c)(iii)	Any two from: Region B (constant region) forms <u>peptide</u> bonds with region C (variable region) ✓ As they are on the same (light / heavy) chain ✓ Part of its <u>primary</u> structure ✓ OR Both regions are folded into <u>secondary</u> and/or <u>tertiary</u> structures ✓ Interact by <u>hydrogen</u> bonds / <u>disulphide</u> bonds / <u>hydrophobic</u> interactions ✓	2												

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5(a)	Immune cells attack body's own healthy cells ✓		1	AO1
5(b)	Rheumatoid factors cause the activation of mast cells ✓ Release <u>histamines</u> and cytokines ✓ Histamines make blood vessel walls <u>more</u> permeable ✓ More tissue fluid formation / causes swelling ✓ Swelling / Excess tissue fluid puts pressure on pain receptors, causing pain ✓ Histamines cause <u>vasodilation</u> , causing redness and localised heat ✓		6	AO2 UF 4.1.1(d) 4.1.1(f) 4.1.1(k)
5(c)	T regulator cell ✓		1	
6(a)	Droplet infection ✓		1	AO2
6(b)	Any one pair from: Wear face masks – To stop droplets from sneezing / coughing to spread OR To avoid inhaling droplets from other people ✓ ✓ Wash hands frequently – To destroy viruses on your hands, before touching other things ✓ ✓ Avoid touching your eyes / mouth / nose / ears – To not introduce the virus into your system ✓ ✓	Accept any reasonable suggestions, supported with a valid reason Do not allow 'face'	2	AO3 UF AE Synoptic: 2.1.6(h) 3.1.1(c) 3.1.1(d) 3.1.1(e)
6(c)	Excess mucus produced to trap virus ✓ Virus infects / destroys <u>ciliated epithelial cells</u> , so unable to remove mucus ✓ Mucus and virus stay in respiratory system, causing inflammation of cells in lungs ✓		3	4.1.1(b)
6(d)	Decrease tidal volume ✓ Leads to less air being taken in ✓ Fluids fill alveoli leading to inefficient gas exchange ✓ Lower oxygen levels in the blood ✓ Less oxygen travels to the brain ✓		5	

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Skills box answers

Question	Answer
1	Pre-vaccine = 1677.34 Post-vaccine = 982.22
2	The post vaccine dataset has the least deviation from the mean (the lowest standard deviation) and therefore is more reliable
3	Outlier = 9.80, this could increase the standard deviation of the sample and reduce the reliability of the results.
4	895.67
5	The pre-vaccine sample's standard deviation has reduced, and the results are now more reliable than the post-vaccine results.