Question			Expected Answers	Mark	Additional Guidance
1	(a)	(i)	lives , in / on , host ; gains nutrition / feeds , from (host) ; at the expense of / harms (host) ;	3	The word 'host' must appear at least once in order to gain 3 marks **IGNORE** lives off host **IGNORE** binds to host **ACCEPT** e.g. feeds on blood / get food from it / obtains nutrients from the larger organism **DO NOT CREDIT** sometimes harm **ACCEPT** causes disease
1	(a)	(ii)	mosquito / vector / *Anopheles* , feeds on blood ; breaks skin / skin cannot act as barrier / mosquito pierces skin / mosquito bites skin ;	2	**IGNORE** insect **IGNORE** anticoagulant prevents clot formation (as primary defence has already been breached)

Question			Expected Answers	Mark	Additional Guidance
1	(a)	(iii)	suitable / AW , climate / temperature , for , mosquito / vector / *Anopheles* **;** **ora** more mosquitoes live there / AW ; **ora** *idea of* relatively poor so methods of prevention less effective **;**	1	**ACCEPT** 'warm enough for mosquitoes' **IGNORE** tropical as AW for 'warm' **IGNORE** mosquito is adapted to survive there **ACCEPT** e.g. can't afford , drugs / mosquito nets / habitat management / insecticides **ACCEPT** lack of education
1	(a)	(iv)	**1** climate change / global warming / AW , may result in spread to other parts of the world / AW **;** **2** *idea of* increased movement of (infected) people **;** **3** *idea that* (non-malaria) countries fund anti-malaria measures via international aid **;** **4** resistance of , parasite to drugs / mosquito to insecticides **;**	2 max	**2 ACCEPT** increased tourism / easier to travel **2 ACCEPT** inadvertent transport of mosquitoes **4 IGNORE** 'resistance' without further qualification **4 DO NOT CREDIT** immune
1	(b)	(i)	**A** antigen **;** **B** (extension of) cytoplasm **;** **C** lysosome **;** **D** phagosome / phagocytic vesicle / phago-lysosome **;**	4	**Mark the first answer.** If the answer is correct and another answer is given that is incorrect or contradicts the original answer, then = **0 marks** **B ACCEPT** pseudopod (ia / ium) or close spelling **B IGNORE** neutrophil **C IGNORE** lysome / lysozyme **D ACCEPT** phagocytic vacuole / secondary lysosome

Question			Expected Answers	Mark	Additional Guidance
1	(b)	(ii)	(different) chemicals that attract phagocytes (released from infected erythrocytes) **;**	1	**ACCEPT** in the context of chemicals released by erythrocyte or *Plasmodium* **ACCEPT** cytokines / histamine / interleukin , released **IGNORE** references to antigens on surface
1	(c)		*Globular* **G1** ball (shaped) / spherical / AW **;** **G2** hydrophilic , (R-)groups / regions , on outside (of 3-D structure) / hydrophobic (R-)groups on inside **;** **G3** form H-bonds with water **;** **G4** soluble **;** **G5** example of globular protein (other than haemoglobin) **;** **H1** haemoglobin , carries / transports , oxygen / carbon dioxide **;** **H2** haemoglobin contains , prosthetic group / haem / Fe^{2+} / iron ion (to allow oxygen to be carried) ; **H3** (polypeptide chains within) haemoglobin have tertiary structure (in a ball shape) ;		**G1 IGNORE** round / globular **G5 ACCEPT** (named) enzyme / hormone / antibody / channel / carrier **G5 IGNORE** metabolic / transport **H1 ACCEPT** references to buffering **H2 IGNORE** Fe^{3+} **H3 ACCEPT** haemoglobin has tertiary structure

			F1 **F2** (within a molecule) **;** **F3** insoluble / few hydrophilic groups **;** **F4** strong / provide strength **;** **F5** have structural role ; **C1** collagen has high proportion of glycine , so chains can lie close together / AW **;** **C2** collagen forms , crosslinks / covalent bonds , between molecules **;** **C3** crosslinks / ends of molecules, are staggered to avoid , weak points / AW **;** **C4** collagen forms part of , tendon / cartilage / ligament / bone / connective tissue / bronchi / bronchioles / trachea / skin **;**	**7 max**	
			QWC – use of haemoglobin and collagen as examples	**1**	**AWARD** if any H mark **and** any C mark are awarded
			Total	**[21]**	

Question			Expected Answers		Mark	Additional Guidance
2	(a)				6 max	**CREDIT** marking points from a suitably annotated correctly labelled diagrams but read text first
			1	2 light chains and 2 heavy chains / 4 polypeptide chains **;**		**1 IGNORE** long / short **1 CREDIT** implication from labelled diagram
			2	variable region allows , binding / attachment , to antigen **;**		**2 IGNORE** complementary **2 ALLOW** AW for region
			3	two variable regions allow binding of more than one (of the same) antigen **;**		**3 ALLOW** AW for region
			4	variable region on different antibodies allows specificity to different antigens **;**		**4 ALLOW** AW for region
			5	constant region allows , recognition by / attachment to / binding to , (named) phagocytes **;**		**5 ALLOW** AW for region **5 IGNORE** complementary
			6	hinge (region) allows flexibility **;**		**6 ACCEPT** allows arms to , move / bend
			7	disulfide , bonds / bridges **,** hold , polypeptides / light and heavy chains , together **;**		
			QWC – statements linking structure and function for variable region and one other region		**1**	**AWARD** if one mark from 2 to 4 and one mark from 5 to 7 are given

Question			Expected Answers	Mark	Additional Guidance
2	(b)		*neutralisation* **N1** cover / block , binding site / antigen / receptor site (on pathogen) **;** **N2** bind to toxins **;** **N3** prevent **,** binding / entry **,** to (host) cell **;** *agglutination* **A1** clump / bind together , (many) pathogens **;** **A2** (clump) too large to , enter (host) cell / cross membranes **;** **A3** increase likelihood of being consumed by (named) phagocyte / more can be consumed by phagocyte at once **;**	**4**	If neutralisation is correctly described but labelled agglutination, **DO NOT CREDIT** the first mark but apply **ECF** thereafter **IGNORE** references to parts of antibody, e.g. variable / constant **N1 IGNORE** binds **N3 IGNORE** prevent pathogen reproduction **N3 GNORE** 'harm / infect , host cell' If neutralisation is correctly described but labelled agglutination, **DO NOT CREDIT** the first mark but apply **ECF** thereafter **A2 IGNORE** move **A3 IGNORE** 'white blood cell' **A3 DO NOT CREDIT** lymphocyte **A3 ACCEPT** eaten by phagocytes more easily
			Total	**[11]**	

Question			Answer	Mark	Guidance
3	(a)		antigen(s) ; specific ; memory ; strain ; mutation ;	5	
3	(b)		**1** immunity involves / bacteria do not have , lymphocytes / white blood cells / antibodies / memory cells / plasma cells / an immune system ; **2** (correct term is) resistant ; **3** bacteria are unicellular / only multicellular organisms (can) have an immune response;	3	
			Total	**8**	

Question			Answer		Marks	Guidance
4	(a)	(i)	**B** and **C** ;		1	Both need to be given for the mark to be awarded. **DO NOT CREDIT** if **A** also given.
4	(a)	(ii)	(involved) after , pathogen / AW , has entered the body ;		1	**IGNORE** ref to primary defence without the clear idea that the pathogen has entered the body **IGNORE** refs to mechanisms of action, e.g. 'phagocytes do not make antibodies' **ACCEPT** attacking foreign bodies after they have passed through the skin
4	(a)	(iii)	(phagocytes) able to, digest / break down / engulf / target / deal with, a range of / many different , pathogens **; ora**		1	**ACCEPT** bacteria or virus as synonym for pathogen if the idea of a variety is clearly present **ACCEPT** phagocytes can break down *any* pathogen **ACCEPT** phagocytes do not have (antigen-)specific receptors **IGNORE** phagocytes do not make memory cells **IGNORE** antigen if used as synonym for pathogen
4	(a)	(iv)	**1**	lobed / narrow , nucleus ;	2	
			2	(cells) can change shape ;		**2 ACCEPT** in context of cell or nucleus **2 ACCEPT** cells , are plastic / have flexible structure / have flexible membrane **2 IGNORE** squashable / stretch
			3	can squeeze / move / fit / AW , between cells / through pores , in (walls of) capillaries ;		**3 ACCEPT** holes / gaps / fenestrations
			4	histamine makes , capillary walls / endothelium , leaky ;		

Question			Answer		Marks	Guidance
4	(a)	(v)			6	**ACCEPT** phonetic spellings throughout
			1	(pathogen) engulfed / enveloped / surrounded by cytoplasm (from phagocyte) ;		**1 ACCEPT** 'pseudopodia / cytoplasm / cell membrane , extend from phagocyte' **1 DO NOT CREDIT** eaten. **ACCEPT** ingested
			2	endocytosis / phagocytosis ;		
			3	(formation of) phagosome / phagocytic vacuole / phagocytic vesicle ;		**3 CREDIT** in correct context only
			4	(phago) lysosomes ;		
			5	(lysosomes / phagosome) move towards / fuse with (each other) ;		**5 ACCEPT** attracted to / joins
			6	(named) enzyme(s) / lysins / hydrogen peroxide / free radicals (in lysosomes) ;		
			7	(pathogen) digested / broken down / hydrolysed ;		**7 IGNORE** destroyed / broken up / killed
			8	(to) amino acid / sugar / glucose / fatty acid / glycerol ;		
			9	(break down products) absorbed / AW (into cytoplasm) **or** unwanted products removed (by exocytosis) ;		**9 IGNORE** refs to antigen presentation **9 ACCEPT** enter cytoplasm
			10	cytoskeleton involved in (endocytosis / movement of vesicles) ;		
			QWC key points in sequence ;		1	**Award** if the following mark points have been awarded: **mp 1 or 2** followed by **mp 6 or 7**

Question			Answer	Marks	Guidance
4	(b)	(i)	*Mycobacterium* /*M. tuberculosis* / *M. bovis* ;	1	**ACCEPT** phonetic spellings **IGNORE** case of initial letter No need to underline
4	(b)	(ii)	droplets (containing pathogen) ; (released by) coughing / sneezing ; inhaled by (uninfected) , individual / AW ;	2	**IGNORE** airborne **IGNORE** laughing / talking / kissing / breathed out

Question			Answer		Marks	Guidance
4	(c)	(i)			3	**Mark points 1-5 cannot be inferred from figures**
			1	in both years incidence (of TB) , decreases / AW , as income , increases / AW **; ora**		**1 ACCEPT** 'incidence is higher in low income group and lower in high income group, in both years / always'
			2	no change in, low / lower middle, (income groups) **;**		
			3	increase in upper middle (income group) **;**		**3 ACCEPT** upper middle less in 2000
			4	decrease in high (income group) **;**		**4 ACCEPT** high (group) more in 2000
			5	*idea of* overall very little change between 2000 and 2008 **;**		
			6	calculated difference in figures with units to support points 3 to 5 **;**		**6 ACCEPT** any increase or decrease e.g., high group has gone down by 3 per 100000 **6 ACCEPT** also • 10% increase in upper middle group • 17.6% / 18% , decrease in high income group • 1% / 1.3% , increase overall • high income group in 2008 is , 82.4% / 82% / 0.824 / 0.82 , of original value **6 IGNORE** 0% increase in low / lower middle income groups There is no need to refer to years as only 2 are shown

Question			Answer		Marks	Guidance
4	(c)	(ii)			3	**IGNORE** prompt lines and mark as prose
			1	overcrowded / AW (living space) **;**		**1 ACCEPT** cramped
			2	poorly ventilated (living space) **;**		
			3	poor diet / malnourished **;**		
			4	poor health **;**		**4 ACCEPT** poor immune system **4 IGNORE** hygiene / standard of living
			5	homelessness **;**		
			6	*idea that* more likely to consume , meat / milk, from infected cattle **;**		
			7	*idea of* vaccination / medical treatment , more difficult to access **;**		**7 CREDIT** healthcare more expensive **7 ACCEPT** poor healthcare **7 IGNORE** less aware of the risks
				Total	**21**	