

F212: Module 2
2.2.2 Health and Disease
June 2009-January 2013
Mark schemes

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| (a) discuss what is meant by the terms <i>health</i> and <i>disease</i> ; |
| (b) define and discuss the meanings of the terms <i>parasite</i> and <i>pathogen</i> ; |
| (c) describe the causes and means of transmission of malaria, AIDS/HIV and TB (knowledge of the symptoms of these diseases is not required); |
| (d) discuss the global impact of malaria, AIDS/HIV and TB |
| (e) define the terms <i>immune response</i> , <i>antigen</i> and <i>antibody</i> ; |
| (f) describe the primary defences against pathogens and parasites (including skin and mucus membranes) and outline their importance. (No details of skin structure are required); |
| (g) describe, with the aid of diagrams and photographs, the structure and mode of action of phagocytes |
| (h) describe, with the aid of diagrams, the structure of antibodies; |
| (i) outline the mode of action of antibodies, with reference to the neutralisation and agglutination of pathogens; |
| (j) describe the structure and mode of action of T lymphocytes and B lymphocytes, including the significance of cell signalling and the role of memory cells; |
| (k) compare and contrast the primary and secondary immune responses; |
| (l) compare and contrast active, passive, natural and artificial immunity; |
| (m) explain how vaccination can control disease |
| (n) discuss the responses of governments and other organisations to the threat of new strains of influenza each year |
| (o) outline possible new sources of medicines, with reference to microorganisms and plants and the need to maintain biodiversity |
| (p) describe the effects of smoking on the mammalian gas exchange system, with reference to the symptoms of chronic bronchitis, emphysema (chronic obstructive pulmonary disease) and lung cancer; |
| (q) describe the effects of nicotine and carbon monoxide in tobacco smoke on the cardiovascular system with reference to the course of events that lead to atherosclerosis, coronary heart disease and stroke; |
| (r) evaluate the epidemiological and experimental evidence linking cigarette smoking to disease and early death |

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Question	Answer	Marks	Guidance
2 (a)	<p>1 pathogen causes disease / <u>not all</u> parasites cause disease ;</p> <p>2 (influenza) virus <u>causes</u> a disease / influenza is a disease ;</p> <p>3 parasite gains , nutrition / energy , from <u>host</u> ; or (influenza virus) does not gain , nutrients / energy , from host ;</p> <p>4 virus takes over / AW , (host cell) DNA / genetic material ;</p>	3	<p>ACCEPT damage to health / illness , as AW for 'disease'</p> <p>1 IGNORE 'parasites do not cause disease'</p> <p>2 DO NOT CREDIT 'virus is a disease' / 'influenza causes disease'</p> <p>2 ACCEPT '(swine) flu is a disease'</p> <p>Note: the influenza virus is a pathogen because it causes disease = 2 marks (mp1 and mp2)</p> <p>3 ACCEPT AW for 'gains nutrition from', e.g. 'feeds on'</p> <p>3 IGNORE 'lives off host' / 'benefits from host'</p> <p>3 ACCEPT idea of 'host' in context of suitable example</p>
2 (b)	<p>(i) (response) to an antigen ; involves , lymphocytes / production of antibodies ;</p>	2	

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Question	Answer	Marks	Guidance
2 (b) (iii)	<p>1 antibodies are proteins ;</p> <p>2 DNA unable to leave nucleus ;</p> <p>3 (m)RNA copies / is a copy of gene(s) / part of DNA ;</p> <p>4 (RNA) passes out of nucleus / through nuclear pore / into cytoplasm ;</p> <p>5 to / at , ribosome / RER ;</p> <p>6 ribosome made of (r)RNA ;</p> <p>7 (RNA needed for) protein synthesis / formation of polypeptides / AW ;</p> <p>8 amino acids brought by (t)RNA ;</p>	5	<p>The type of RNA does not need to be specified but, if stated, AWARD only if used in the correct context.</p> <p>1 Must be a clear statement 1 ACCEPT proteins make antibodies 1 ACCEPT antibodies are polypeptides</p> <p>3 ACCEPT (m)RNA involved in transcription of DNA 3 IGNORE transcription unqualified 3 ACCEPT 'a section of DNA acts as a template for RNA' if the idea of RNA copying part of DNA is clearly present</p> <p>5 ACCEPT in context of mRNA or tRNA</p> <p>6 IGNORE 'ribosomal RNA' unqualified</p> <p>7 IGNORE translation unqualified</p>
	<p>QWC: 2 roles of RNA ; Award if one mark is given from each of the shaded areas</p>	1	<p>AWARD if marking point 3 or 4 plus marking point 6 or 7 or 8 are seen</p>

Question	Answer	Marks	Guidance
<p>2 (b) (iii)</p>	<p><i>if no other marks have been awarded, credit one mark max for</i></p> <p>Z antibodies bind to antigens (on pathogen) ;</p> <p><i>otherwise, mark as follows:</i></p> <p>N1 neutralisation ;</p> <p>N2 antibodies , cover binding sites on pathogen / bind to toxins ;</p> <p>N3 prevent , binding / entry , to (host) cell ;</p> <p>A1 agglutination ;</p> <p>A2 clump / bind together , (many) pathogens ;</p> <p>A3 (clump) too large to enter host cell / increase likelihood of being consumed by (named) phagocyte;</p> <p><i>the following could be credited</i></p> <p>O1 opsonisation ;</p> <p>O2 activation of complement ;</p> <p>O3 increase likelihood of being consumed by (named) phagocyte ;</p> <p>L1 lysins ;</p> <p>L2 destroy / AW , pathogens ;</p>	<p>4</p>	<p>With the exception of L2, if name does not match description, IGNORE description and mark name</p> <p>N1 CREDIT derived term eg neutralised</p> <p>N3 IGNORE 'harm host cell' unqualified</p> <p>N3 ACCEPT 'prevent (host) cell becoming infected'</p> <p>A1 CREDIT derived term eg agglutinated</p> <p>A1 ACCEPT 'agglutination'</p> <p>A3 IGNORE 'white blood cell'</p> <p>A3 DO NOT CREDIT lymphocyte</p> <p>A3 ACCEPT neutrophils / macrophages / monocytes</p> <p>O3 IGNORE white blood cell</p> <p>O3 DO NOT CREDIT 'lymphocyte'</p> <p>O3 ACCEPT neutrophils / macrophages / monocytes</p> <p>L2 Must be in context of lysins</p>

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Question	Answer	Marks	Guidance
<p>2 (c) (i)</p>	<p>G1 patients with , HIV+ / AIDS / transplant / chemotherapy ;</p> <p>E1 weak immune system / cannot produce (many) antibodies ;</p> <p>G2 pregnant women ;</p> <p>E2 foetus / embryo , has undeveloped immune system</p> <p style="text-align: center;">or</p> <p>antibodies can cross placenta ;</p> <p>G3 health workers</p> <p style="text-align: center;">or</p> <p>people , living / working , close to outbreak ;</p> <p>E3 likely to be at (increased) risk (of disease) ;</p> <p>G4 those with (named) chronic diseases ;</p> <p>E4 idea of inability to withstand further disease / already being in poor health ;</p>	<p>4</p>	<p>E marks can be awarded without awarding corresponding G mark unless clearly incorrect in context <i>Mark the first two groups of people mentioned max 2 marks for each group</i></p> <p>G1 ACCEPT 'patients with weak immune system' but do not also credit for E1, G1 ACCEPT 'cancer' IGNORE 'homeless people'</p> <p>G2 IGNORE babies (as close to stem)</p> <p>E2 ACCEPT 'baby as AV for embryo' E2 IGNORE weak immune system E2 ACCEPT underdeveloped immune system</p> <p>E2 IGNORE foetus gets antibodies from mother</p> <p>G3 ACCEPT suitable named professional eg nurse / doctor G3 ACCEPT 'people who have been in contact with disease' unqualified G3 IGNORE refs to overcrowding G3 IGNORE 'working with animals' unless it is clear that the animals are infected</p> <p>E3 ACCEPT ref to health workers being important in control of outbreak</p> <p>G4 eg asthma / diabetic / heart disease / TB / autoimmune disease G4 IGNORE 'lung disease' G4 IGNORE 'homeless people'</p> <p>E4 ACCEPT idea of weakened immune system for this marking point if not credited in E1 or G1</p>

Question	Answer	Marks	Guidance
2 (c) (ii)	<p>idea of days lost at work / effect on economy ;</p> <p>idea of costing more to deal with the ill people (than the cost of vaccination) ; ora</p> <p>idea of response to public opinion ;</p> <p>idea of health service unable to cope ;</p> <p>idea of eliminating a disease ;</p>	1	<p>DO NOT CREDIT ref to antibiotics treating viruses</p>
2 (c) (iii)	<p>idea of:</p> <p>being too busy / can't be bothered / feel it is unnecessary ;</p> <p>lack of trust in government ;</p> <p>media scare stories ;</p> <p>concerned about side effects ;</p> <p>cost implication to individuals ;</p> <p>allergic to vaccine ;</p> <p>altruistic reason / other people more deserving ;</p> <p>fear of needles ;</p> <p>religious / cultural / ethical , reasons ;</p>	1	<p>IGNORE 'risk' unqualified throughout</p> <p>ACCEPT 'conflicting research'</p> <p>IGNORE 'not natural'</p>
Total		21	

Question	Answer	Marks	Guidance
5 (a)	(i) 11.3 ; ;	2	<p>Correct answer = 2 marks even if no working shown. IGNORE ' ' before the number</p> <p>If the answer is incorrect, ALLOW 1 mark for seeing $\frac{(2.75 - 2.44)}{2.75} \times 100$ or $\frac{0.31}{2.75} \times 100$</p> <p>If the answer is not given to 1 decimal place, ALLOW 1 mark for A correct but unrounded answer (11.2727..., 11.27 etc) or A correct answer that has been rounded to the wrong number or decimal places or A correct answer seen but has been rounded incorrectly (eg 11.2)</p>

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Question	Answer	Marks	Guidance
5 (a) (ii)	<p>1 non-smokers' FEV higher than smokers'; ora</p> <p>2 smokers' FEV , declines / falls / drops / decreases (over time) ;</p> <p>3 widening gap (between smokers and non-smokers) / rate of decline is lower in non-smokers / smaller reduction in non-smokers ;</p> <p>4 non smokers' (FEV) increases then decreases / peaks ;</p> <p>5 non-smokers' (curve / FEV / lung function) has peak at 1.5 years and 2.88 dm³ ;</p> <p>6 appropriate figures to support mp 1 - 3 ;</p>	4 max	<p>ACCEPT curve / lung function / amount of exhaled air , as Aw for FEV</p> <p>1 DO NOT CREDIT FEV is higher at the start (alone) as this implies it is lower later on</p> <p>2 IGNORE 'both decline'</p> <p>3 ACCEPT ora for decline and extent of reduction</p>
			<p>6 Figures must include 2 FEVs with units linked to time in years and must support the point being made.</p> <p>6 ALLOW valid calculated comparison</p> <p>6 ALLOW comparative dates such as '2 years later'</p>

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Time (years)	FEV ₁ (dm ³) had stopped smoking	FEV ₁ (dm ³) continue to smoke	Acceptable range for difference	Other useful figures:
0.0	2.82	2.75	0.07	Increase over 1 ½ years for stopped smoking = 0.06 dm ³ Decrease over 1 ½ years for continue to smoke = 0.06 – 0.07 dm ³ Decrease over from 1 ½ years to 5 years for stopped smoking = 0.10 – 0.11 dm ³ Decrease over from 1 ½ years to 5 years for continue to smoke = 0.24 – 0.25 dm ³ Decrease over 5 years for stopped smoking = 0.04 – 0.05 dm ³ Decrease over 5 years for continuing smokers = 0.31 dm ³
0.5	2.85	2.73	0.12	
1.0	2.87	2.71	0.16	
1.5	2.88	2.68 – 2.69	0.19 – 0.20	
2.0	2.87	2.67 – 2.68	0.19 – 0.20	
2.5	2.86	2.64	0.22	
3.0	2.84	2.60	0.24	
3.5	2.82 – 2.83	2.56 – 2.57	0.25 – 0.27	
4.0	2.80	2.53	0.27	
4.5	2.78 – 2.79	2.49	0.29 – 0.30	
5.0	2.77 – 2.78	2.44	0.33 – 0.34	

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Question	Answer	Marks	Guidance
5 (b) (i)	<p>1 causes tar ;</p> <p>2 (cigarette smoke) destroys / damages / paralyzes, cilia / ciliated epithelium ;</p> <p>3 (cigarette smoke stimulates) <u>goblet</u> cells to release <u>more</u> mucus ;</p> <p>4 mucus (in airways) , bulids up / cannot be removed / AW ;</p> <p>5 more, pathogens / bacteria / viruses / microbes, collect / trapped / accumulate (in mucus) ;</p> <p>6 <i>idea that cough is an attempt to , increase air flow / remove microbes , by removing mucus ;</i></p> <p>7 (frequent coughing) damages / inflames, (named) airway / alveoli / elastic fibres ;</p> <p>8 formation of scar tissue ;</p> <p>9 airway / bronchi / bronchiole, walls thicken ;</p> <p>10 <u>lumen</u> of , airway / bronchi / bronchiole , narrows ;</p> <p>11 flow of air restricted ;</p> <p>12 (damage to alveoli causes) reduced surface area for , gas exchange / oxygen diffusion ;</p>	6 max	<p>2 ALLOW in response to any component of cigarette smoke</p> <p>2 DO NOT CREDIT 'kills cilia / cilia die'</p> <p>2 IGNORE 'cilia stick together'</p> <p>3 ALLOW in response to any component of cigarette smoke</p> <p>3 Must contain the idea of more mucus than normal</p> <p>5 IGNORE 'pathogens' alone must have idea of increasing number of pathogens e.g. ACCEPT 'breeding' 'multiplying' /AW</p> <p>5 ACCEPT 'higher number of pathogens present'</p> <p>5 ACCEPT 'infections more likely'</p> <p>6 There must be a reason for removing the mucus</p> <p>6 ACCEPT 'to clear the throat by removing mucus'</p> <p>6 ACCEPT 'to reduce infections by removing mucus'</p> <p>7 IGNORE damage to lungs</p> <p>7 IGNORE damage as a result of elastase / emphysema</p> <p>8 CREDIT in any part of lung</p> <p>9 IGNORE 'trachea'</p> <p>9 CREDIT 'smooth muscle (in wall) thickens'</p> <p>10 IGNORE 'trachea'</p> <p>11 'airflow restricted due to extra smooth muscle' = 2 marks, mp</p> <p>9 and 11</p>
	QWC – One cause of cough and one effect of cough	1	Award if at least 1 mark has been given from each of the mark scheme sections (1-6 and 7-11) for this question.

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Question	Answer	Marks	Guidance
5 (b)	(ii)	2 max	<p>Mark the first answer on each prompt line. If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = 0 marks</p> <p>ACCEPT phonetic spellings</p> <p>IGNORE emphysemia</p>
	(iii)	5 max	<p>1 Must be a clear statement</p> <p>2 IGNORE complementary</p> <p>2 ACCEPT goes in to</p> <p>3/4 CREDIT 'mould around' once for either mp 3 or mp 4 but award the alternate marking point if seen</p> <p>4 ACCEPT eg tighter / more precisely / in a better position</p> <p>5 ACCEPT 'interactions'</p> <p>7 ACCEPT e.g. puts, pressure / strains, on</p> <p>9 IGNORE 'the enzyme is unchanged'</p>
Total		20	

Question	Answer	Marks	Guidance
2 (a)	<ol style="list-style-type: none"> 1 nucleus / nuclei ; 2 other named organelle / membrane bound organelles ; 3 linear chromosomes ; 4 DNA, associated with / AW, histones / protein ; 5 80S / 22nm / large, ribosomes ; 6 large cells / AW ; 7 no cell wall ; 	2 max	<p>Mark the first answer on each prompt line. ACCEPT ora throughout</p> <ol style="list-style-type: none"> 1 ACCEPT 'DNA not free' 2 e.g. mitochondria / Golgi / etc 2 ACCEPT compartmentalized organelles 2 ACCEPT don't have a mesosome 4 ACCEPT 'DNA not naked'
2 (b)	<p>capital letter on, specific name / Vivax ;</p> <p>not italicised / not underlined ;</p>	1 max	<p>Mark the first answer</p> <p>ACCEPT ora for what student should have typed</p> <p>ACCEPT 'the parasite is Plasmodium falciparum / malariae / ovale' if candidate uses capital 'P' and lower case 'f / m / o'</p>
2 (c) (i)	<ol style="list-style-type: none"> 1 (mosquito), is <u>vector</u> ; 2 <i>Plasmodium</i> / parasite, present in (mosquito), saliva / salivary gland ; 3 <i>idea that infected mosquito, feeds on / bites, human ;</i> 4 <i>Plasmodium</i> / parasite, passes (from saliva) to blood ; 	3 max	<p>IGNORE references to stages of life-cycle</p> <p>Max 2 if virus / bacterium appears anywhere</p> <ol style="list-style-type: none"> 3 IGNORE case of initial 'P' 3 Must be in context of transmission from mosquito to human 4 'blood' can be inferred, e.g. from refs to anticoagulant 4 IGNORE ref to parasite in blood after liver

Question	Answer	Marks	Guidance
2 (c) (ii)	<p>destruction of a species is, morally / ethically, wrong ; might cause unintended health problems in humans ; might harm, other / unintended, species ; <i>idea of bioaccumulation / biomagnification ;</i></p>	1 max	<p>Mark the first suggestion</p> <p>IGNORE 'might enter human food' unqualified Answers must imply idea of harm</p>

Question	Answer	Marks	Guidance
2 (c) (iii)	<p><i>Field investigation</i> (sampling) before and after insecticide treatment ;</p> <p>F1</p> <p><i>idea of</i>, unbiased / random, sampling of population ; example of sampling technique ;</p> <p>F2</p> <p>F3</p> <p>(sampling in) different, times / weather ;</p> <p>F4</p> <p>large number of samples taken ;</p> <p>F5</p> <p><i>idea of</i> standardised sampling procedure ;</p> <p>F6</p> <p><i>idea of</i> preventing counting same individual more than once ;</p> <p>F7</p> <p><i>idea of</i> capture – recapture ;</p> <p>F8</p> <p>calculate mean / calculate standard deviation / apply statistical test ;</p> <p>F9</p>	5 max	<p>Award marks for either a field or laboratory investigation – must read whole answer before beginning to mark to decide if field or laboratory.</p> <p>If candidates answer in terms of incidence of malaria award no marks as question states population of mosquitoes but read whole question in case mosquito study described in addition.</p> <p>If the investigation is in the both field and laboratory mark the investigation which gives candidate most marks.</p> <p>F1 IGNORE refs to treated and untreated areas as stem refers to 'a population'</p> <p>F3 e.g. sweep net, pond net, light trap</p> <p>F3 ACCEPT insect net</p> <p>F3 IGNORE 'net' or 'trap' unqualified</p> <p>F4 IGNORE intervals unqualified. Answers must refer to time or weather</p> <p>F5 Must imply large number or state five or more</p> <p>F6 ACCEPT idea of counting by the <u>same method</u></p>
			Continued.....

Question	Answer	Marks	Guidance
	<p>OR</p> <p><i>Laboratory investigation</i></p> <p><i>idea of:</i></p> <p>with and without insecticide exposure ;</p>		<p>Laboratory investigation could be done outside</p>
L1			<p>L1 is for changing the independent variable</p>
L2	<p>measuring <u>mosquito</u> survival / count surviving mosquitoes ;</p>		<p>L2 is for measuring the dependent variable</p>
L3	<p>controlling one named key variable ;</p>		<p>ACCEPT count the number of dead ones</p>
L4	<p>controlling second named key variable ;</p>		<p>L3 and L4 <i>award up to 2 marks for</i></p> <ul style="list-style-type: none"> exposure time species of mosquito stage of mosquito life cycle sex of mosquito number of mosquitos insecticide type insecticide concentration volume of insecticide temperature
L5	<p><i>idea of using a range of insecticide concentrations ;</i></p>		<p>L6 Minimum of 3 in total, i.e. original plus two</p>
L6	<p>replicates ;</p>		<p>L7 IGNORE average</p>
L7	<p>calculate <u>mean</u> / calculate standard deviation / apply statistical test ;</p>		
	<p>Total</p>	<p>12</p>	

Question	Answer	Marks	Guidance												
7 (a)	<table border="1"> <tr> <td>form part of cellular response</td> <td><i>both</i></td> </tr> <tr> <td>mature in thymus</td> <td>(only) T (lymphocytes) ;</td> </tr> <tr> <td>secrete substances which kill infected cells</td> <td>(only) T (lymphocytes) ;</td> </tr> <tr> <td>manufacture antibodies</td> <td>(only) B (lymphocytes) ;</td> </tr> <tr> <td>undergo clonal expansion</td> <td>both / B and T ;</td> </tr> <tr> <td>activate other lymphocytes</td> <td>(only) T (lymphocytes) ;</td> </tr> </table>	form part of cellular response	<i>both</i>	mature in thymus	(only) T (lymphocytes) ;	secrete substances which kill infected cells	(only) T (lymphocytes) ;	manufacture antibodies	(only) B (lymphocytes) ;	undergo clonal expansion	both / B and T ;	activate other lymphocytes	(only) T (lymphocytes) ;	5	
form part of cellular response	<i>both</i>														
mature in thymus	(only) T (lymphocytes) ;														
secrete substances which kill infected cells	(only) T (lymphocytes) ;														
manufacture antibodies	(only) B (lymphocytes) ;														
undergo clonal expansion	both / B and T ;														
activate other lymphocytes	(only) T (lymphocytes) ;														
(b) (i)	<p>no antibodies detected before 4 days / antibodies appear at 4 days ;</p> <p>increase then decrease / peak ;</p> <p>figures for peak with time and antibody concentration ;</p> <p>decrease less steep than increase / AW ; ora</p> <p>antibody concentration returns to zero at <u>27</u> days ;</p>	3 max	<p>ACCEPT 'around 4 days'</p> <p>ACCEPT upper limit of 4.5 days for first appearance of antibodies</p> <p>IGNORE 'before 5 days'</p> <p>IGNORE references to increase at 4 days, answers must imply none to begin with</p> <p>ACCEPT 13 days \pm 0.5 day, 25 units \pm 0.5 units</p> <p>ACCEPT 25 au \pm 0.5 au 9 days \pm 0.5 day after initial appearance</p>												

Question	Answer	Marks	Guidance												
7 (b) (ii)	<p>the drawn line should show higher peak and steeper initial increase ;</p> <p>antibodies appear between days 30 and 34 and concentration at 60 days above peak for primary response ;</p>	2	<p>Peak must be at least 30 au</p> <p>Compare gradient with initial increase up to day 10</p> <p>NBOD if gradients are similar</p> <p>ACCEPT ruled line close to vertical</p> <p>DO NOT CREDIT vertical</p> <p>ACCEPT a line that starts to rise at 30 or 34 days</p>												
7 (c)	<table border="1"> <thead> <tr> <th>region</th> <th>name</th> <th>function</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>hinge (region) ;</td> <td>flexibility / binding of <u>more than one</u> antigen ;</td> </tr> <tr> <td>B</td> <td>constant / Fc (region) ;</td> <td>attachment / binding , to phagocytes ;</td> </tr> <tr> <td>C</td> <td>variable / hypervariable / Fab (region) ;</td> <td>binding / attachment , to <u>antigens</u> ;</td> </tr> </tbody> </table>	region	name	function	A	hinge (region) ;	flexibility / binding of <u>more than one</u> antigen ;	B	constant / Fc (region) ;	attachment / binding , to phagocytes ;	C	variable / hypervariable / Fab (region) ;	binding / attachment , to <u>antigens</u> ;	6	<p>Marks for name and function should be awarded independently.</p> <p>DO NOT CREDIT if incorrect answer appears in same box</p> <p>ACCEPT hinges / hinged</p> <p>ACCEPT neutrophils / macrophages / granulocytes</p> <p>ACCEPT monocytes</p> <p>IGNORE recognise antigens</p>
region	name	function													
A	hinge (region) ;	flexibility / binding of <u>more than one</u> antigen ;													
B	constant / Fc (region) ;	attachment / binding , to phagocytes ;													
C	variable / hypervariable / Fab (region) ;	binding / attachment , to <u>antigens</u> ;													
Total		16													

Question		Expected Answers	Mark	Additional Guidance		
4	(a)	(i)				
		1		the elderly / older people ;		
		2		'at risk' children / young people ;		
		3		pregnant women ;		
		4		those with compromised immune systems ;		
		5		those with chronic diseases ;		
		6		health workers ;		
7		poultry workers / pig farmers ;				
4	(a)	(ii)		different strains of the virus / virus mutates (each year) ; (new strains have) different <u>antigens</u> ; <i>idea that antibody produced , needs to match new strain / antigen ; ora</i>	2 max	Mark the first answer on each numbered line. 1 ACCEPT ref to any age over 50 2 ACCEPT the young / infants / babies IGNORE refs to age 4 ACCEPT weak ACCEPT e.g. with AIDS / HIV / on immunosuppressant drugs / ref cancer 5 ACCEPT e.g. heart conditions / lung conditions / asthma / diabetes 7 ACCEPT other professions working with animals, e.g. vets IGNORE 'different types' or 'virus changes' or 'different strands' ACCEPT (influenza) pathogen CREDIT antigenic shift / drift ora original antibody does not match new antigen

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Question	Expected Answers	Mark	Additional Guidance
4			
(a)			
(iii)	secondary response , starts earlier / has shorter delay before response ; ora secondary response , more rapid / faster ; ora secondary response , higher / produces more antibodies ; ora	2 max	Mark the first <u>two</u> differences IGNORE answers, e.g. 'size of response' or 'response is faster' that do not refer to a feature of the secondary or primary response CREDIT 'shorter lag time' ACCEPT steeper ACCEPT bigger IGNORE 'secondary response lasts longer' as this is not clear from graph
4			
(a)			
(iv)	1 recognise , virus / antigen / pathogen ; 2 produce a clone ; 3 can , change to / form , plasma cells (on infection) ; 4 make antibodies (against influenza , virus / antigen) ; 5 responsible for secondary response / destroy virus before symptoms appear ; 6 can , change to / form , named T-cell ;	3 max	1 ACCEPT description of recognition IGNORE find / detect 2 ACCEPT ref to clonal expansion ACCEPT 'divide by mitosis to produce large numbers' 4 IGNORE 'reproduce antibodies' IGNORE 'release antibodies' 5 IGNORE refs to speed of response unqualified

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June 2011

Question	Expected Answers	Mark	Additional Guidance
4 (b) (i)	(antibiotics) are, not effective against viruses / effective (only) against bacteria (and fungi / protozoa) ;	1	ACCEPT antibiotics do not kill viruses IGNORE viruses are resistant to antibiotics ACCEPT correct ref to detail of antibiotic action, e.g. 'antibiotics attack cell wall which is not present in influenza (virus)'
4 (b) (ii)	1 Tamiflu® is, competitive / non-competitive inhibitor ; 2 correct detail of inhibition method that does not contradict stated type of inhibition ;	1	2 e.g. fits or binds to <u>active site</u> / complementary shape to <u>active site</u> / competes for the <u>active site</u> OR fits into allosteric site or site other than active site / changes shape of <u>active site</u> 3 IGNORE substrate binding to enzyme
4 (b) (iii)	3 prevents, substrate binding to active site / formation of enzyme-substrate complex / formation of ESC ; fewer, viruses / pathogens, produced ; fewer, viruses / pathogens, (in droplets) when, sneezing / coughing ; (as) viruses / pathogens, cannot leave cell ; (so) cannot, infect / spread to, <u>other cells</u> ; idea of treating, large / proximate, population ;	2 max	IGNORE herd immunity / ring vaccination
4 (c)	(plants) already identified as likely to have, medicinal properties / few side effects / AW ; reduces, time / effort, in finding, plants / active chemicals ; (possibly) reduces cost ;	2 max	ACCEPT 'known / proven to work' ACCEPT reduced time for testing
Total		[16]	

F212

Mark Scheme

June 2011

Question	Expected Answers	Mark	Additional Guidance
5	<p>(a) (i) both rise (between 1920 and 1960) ; men started smoking before, ca. 1900 / women's smoking started increasing after 1920 - 1925 ; similar levels of smoking (in men and women) by 1990 ; smoking in men , levelled off / plateaued</p> <p>OR</p> <p>smoking in women continues to rise ;</p>	2 max	<p>Needs direct comparison in single statement</p> <p>ACCEPT comparative statement, e.g. 'women started smoking later than men'</p> <p>ACCEPT 5000 in both by the end of the 1980s</p> <p>DO NOT CREDIT if plateau described before 1940</p>
5	<p>(a) (ii) (positive) correlation / similar pattern , between smoking and lung cancer ; <i>idea that increase in incidence of lung cancer lags behind increase in smoking ;</i> <i>idea of once smoking has levelled off there is a corresponding levelling off in incidence of lung cancer ;</i> <i>idea of men always smoking more and men having higher rates of cancer ; ora</i></p>	2	<p>ACCEPT similar shaped graphs</p> <p>IGNORE 'as smoking increases, so does lung cancer'</p> <p>ACCEPT followed by</p> <p>ACCEPT if answer implies levelling off at same time</p>

F212

Mark Scheme

June 2011

Question	Expected Answers	Mark	Additional Guidance
5 (b)	<p>1 tar / (cigarette) smoke , contains <u>carcinogens</u> / is <u>carcinogenic</u> ;</p> <p>2 benzopyrene / formaldehyde / other e.g. ;</p> <p>3 enters , lung / epithelial , <u>cells</u> ;</p> <p>4 <i>idea that destroyed cilia prevent removal of , carcinogens / tar , which then have greater contact time with epithelial cells ;</i></p> <p>5 enters nucleus / in contact with DNA ;</p> <p>6 causes <u>mutation</u> ;</p> <p>7 proto-oncogenes to oncogenes ;</p> <p>8 uncontrollable , cell division / mitosis ;</p> <p>9 formation of , tumour / mass of cells ;</p> <p>10 no , programmed cell death / apoptosis ;</p> <p>QWC ~ showing link between smoking and lung cancer ;</p>	<p>5 max</p> <p>1</p>	<p>1 IGNORE cigarettes</p> <p>5 'contact with DNA' needs to be stated not implied</p> <p>6 IGNORE description</p> <p>7 ACCEPT switching on (proto)oncogenes</p> <p>8 ACCEPT cell multiplication</p> <p>IGNORE growth</p> <p>IGNORE ref to speed of cell division</p> <p>9 ACCEPT lump (of cells)</p> <p>1 mark awarded from mps 1 to 5 and 1 mark awarded from mps 6 to 10</p>

F212

Mark Scheme

June 2011

Question	Expected Answers	Mark	Additional Guidance
5 (c)	1 mouth / tongue / throat / oesophageal , cancer ; 2 chronic bronchitis / COPD ; 3 emphysema / COPD ; 4 atherosclerosis ; 5 thrombosis ; 6 coronary heart disease / CHD / angina / heart attack / myocardial infarction / MI ; 7 stroke ; 8 peripheral vascular disease / <u>arteriosclerosis</u> ;	max 3	Mark the first answer on each numbered line. 1 ACCEPT <u>secondary</u> cancers 2 DO NOT CREDIT smoker's cough 3 CREDIT COPD once only 5 IGNORE thrombus 6 IGNORE cardiovascular disease / hypertension / chronic heart disease
Total		[13]	

Mark Scheme

F212

Question		Expected Answer	Mark	Additional Guidance
1	(a) (i)	human immunodeficiency virus / HIV ;	1	DO NOT CREDIT if there is any ref to AIDS
1	(a) (ii)	<p>1 (infective agent), in blood / body fluids ;</p> <p>2 <i>idea of: used needles are contaminated ; ora</i></p> <p>3 reduces chance of sharing needles ; ora</p>	2 max	<p>1 ACCEPT any infective agent even if incorrect as question asks for <i>mode of transmission</i></p> <p>2 ACCEPT e.g. 'used needles are infected'</p> <p>2 ACCEPT e.g. 'new needles are sterile'</p> <p>2 DO NOT CREDIT 'dirty' / 'clean' needles</p> <p>3 IGNORE 'prevents' / 'stops'</p>
1	(b) (i)	<p><u>amino acid(s)</u> ;</p> <p><u>nucleotide(s)</u> ;</p>	2	<p><i>Answers must be on correct line</i></p> <p>ACCEPT phonetic spelling for both</p> <p>DO NOT CREDIT if ref to DNA / 'nucleosides'</p> <p>ACCEPT 'ribonucleotides'</p>
1	(b) (ii)	<p>1 reverse transcriptase in (host) nucleus ;</p> <p>2 viral DNA, (inserted) in (host), chromosome / DNA ;</p> <p>3 <i>idea of: (viral) RNA / mRNA produced / transcribed ;</i></p> <p>4 (to) code for / make / translate, <u>viral</u> proteins ;</p>	2 max	<p>4 IGNORE 'different protein'</p>

Question	Expected Answer	Mark	Additional Guidance
1 (c) (i)	<p>1 not vaccinated against TB ;</p> <p>2 weakened immune system ;</p> <p>3 (lifestyle) e.g. poor diet / lack of protein / malnourished / smoking / <u>alcoholism</u> ;</p> <p>4 homelessness ;</p> <p>5 poor ventilation (of housing) / AW ;</p> <p>6 <u>overcrowding</u> ;</p> <p>7 close contact with people from / visiting, <u>area</u> where TB is common ;</p> <p>8 close / prolonged, contact with individual(s) with TB ;</p> <p>9 consumption of milk or beef, from infected cattle / in developing countries ;</p>		<p>Mark the first three answers only regardless of which line they are on</p> <p>1 IGNORE general refs to lack of medical care</p> <p>3 DO NOT CREDIT 'alcohol' unqualified IGNORE 'poor health'</p> <p>7 ACCEPT area where those with TB are not quarantined</p>
		3 max	

Mark Scheme

F212

Question	Expected Answer	Mark	Additional Guidance
(c)			
1	cytokine / interleukin / receptor has, specific / unique, shape ;		1 DO NOT CREDIT 'cytokine is specific to receptor' as this is implied in question
2	(cytokine / interleukin), binds / attaches / bonds to / fits into, receptor ;		
3	receptor on (cell surface) membrane (of B lymphocyte) ;		3 DO NOT CREDIT 'antibodies' (on cell surface)
4	(receptor and cytokine have) <u>complementary shapes</u> ;		
5	<u>activates</u> / stimulates, clonal expansion / <u>mitosis</u> ;	3 max	5 ACCEPT activates / releases 2 nd messenger
	Total	13	

Question	Expected Answer	Mark	Additional Guidance
4	(a)		
1	free from, disease / illness ;		1 ALLOW infection CREDIT 'not just the absence of disease'
2	physical and mental and social wellbeing / AW ;		2 DO NOT CREDIT 'state' / 'condition'
3	good nutrition ;		3 ACCEPT balanced diet
4	suitably housed ;	2 max	4 ACCEPT ref to economic wellbeing

Question	Expected Answer	Mark	Additional Guidance
4 (b)	<p>F1 skin ; E1 <i>idea of: physical barrier to prevent entry of microorganisms ;</i></p> <p>F2 mucous <u>membrane(s)</u> / goblet cells ; E2 (produce) <u>mucus</u> to trap, pathogens / parasite ; OR F2 mucus ; E2 traps pathogens ;</p> <p>F3 cilia / ciliated epithelium ; E3 remove, pathogen / parasite, laden / AW, mucus ;</p> <p>F4 blood clotting ; E4 prevents, pathogens / parasite, entering bloodstream ;</p> <p>F5 ear wax / nasal hairs ; E5 traps, pathogens / parasite ;</p> <p>F6 lysozyme / tears / nasal secretions / saliva ; E6 kills bacteria / contains antibacterial agent ;</p> <p>F7 gastric juice / stomach acid ; E7 kills, pathogens / parasite ;</p>	4 max	<p>Mark first F mark on line and assume explanation relates to that</p> <p>ACCEPT named example(s) of pathogen or parasite</p> <p>CREDIT E marks if a reasonable, but non-creditworthy, attempt at an F mark has been made, e.g. 'lining of nasal passages' for F2</p> <p>E1 ACCEPT 'pathogens cannot pass through cells'</p> <p>E1 ACCEPT antibacterial effects of sebum or sweat</p> <p>E1 DO NOT CREDIT physical barrier unqualified</p> <p>F6 IGNORE lysosome(s)</p> <p>E6 ACCEPT contains antibodies</p> <p>F7 ACCEPT 'enzymes in the stomach' or 'acid in vagina'</p>

Mark Scheme

F212

Question	Expected Answer	Mark	Additional Guidance
4 (c)	<p>(i)</p> <p>1 lives, on / in / in contact with, and harms <u>host</u> ;</p> <p>2 takes nutrition from / feeds on (host) ;</p> <p>3 warmth ;</p> <p>4 protection / safe place / AW ;</p> <p>5 allows transmission / spread, to a new host / AW ;</p>	4 max	<p>1 living on / in must be stated, cannot be implied from feeding</p> <p>1 IGNORE 'live off'</p> <p>3 ACCEPT 'incubate'</p> <p>5 ACCEPT 'distributed' / 'passed on' as implies new host</p>
4 (c)	<p>(ii)</p> <p>1 wash / clean / disinfect / sterilize, hands ;</p> <p>2 not, scratching / touching, of anus ;</p> <p>3 drugs to, kill / remove, parasite / eggs ;</p>	2 max	<p>2 ACCEPT method to prevent scratching e.g. cutting nails</p> <p>2 IGNORE 'wash anus'</p> <p>3 DO NOT CREDIT 'antibiotics'</p> <p>3 IGNORE 'anti-bacterial'</p>
Total		12	

Question	Expected Answer	Mark	Additional Guidance
7 (b)			Assume answer refers to collagen unless stated if the answer mentions only collagen, assume that the candidate thinks any features mentioned also apply to haemoglobin.
1	(collagen has) amino acid, <u>chain / sequence</u> ;		1 IGNORE polypeptide
2	peptide bonds ;		1 IGNORE repeating units
3	helical / helix ;		3 DO NOT CREDIT if candidate refers to collagen having an α helix
4	3 bonds / interactions from: disulfide / ionic / hydrogen / hydrophobic or hydrophilic ;		5 IGNORE primary /secondary / tertiary
5	quaternary structure ;		6 ACCEPT polypeptides but DO NOT CREDIT 3 polypeptides if number in haemoglobin not specified
6	more than one polypeptide / subunit ;	4 max	
	Total	11	

Question	Expected Answer	Mark	Additional Guidance
8			ACCEPT minor mis-spellings so long as word can not be confused with another word in the list
1	antibodies ;		
2	natural ;		
3	artificial ;		
4	natural ;		
5	antigen ;		
6	vaccination ;	6	
	Total	6	

Question	Expected Answer	Mark	Additional Guidance
5 (a) (i)	mucus traps, bacteria / microbes / pathogens / microorganisms / viruses / spores ; cilia, sweep / move / waft, mucus / bacteria / pathogens / microorganisms / viruses / spore, upwards / AW ;	2	For both marking points ACCEPT ora for what would happen if they didn't work IGNORE ref to dirt / dust / etc ACCEPT answers that imply out of airways e.g. to the throat / coughed / swallowed

Question	Expected Answer	Mark	Additional Guidance
5 (a)	(ii)		<p>IGNORE stage letters and look for correct sequence DO NOT CREDIT steps that are biologically out of sequence, e.g. mp6 before mp5. Penalise once only. ACCEPT 'bacteria' throughout</p>
1	<p><i>stage A</i> phagocyte, attaches / binds / AW, to bacterium / pathogen ; <u>receptor</u> (on phagocyte), attaches to / binds to / recognises / AW, antigen (on bacterium) ;</p>		<p>2 CREDIT PAMP / antibody marker / complement marker, as AW for antigen</p>
2			<p>3 DO NOT CREDIT 'eaten' IGNORE pseudopodia or any other structure</p>
3	<p><i>stage B</i> bacterium, engulfed / enters by endocytosis / enters by phagocytosis / AW ; (formulation of) <u>phagosome</u> / phagocytic vacuole ;</p>		<p>5 DO NOT CREDIT 'binds with'</p>
4			<p>7 DO NOT CREDIT destroyed (as in the question)</p>
5	<p><i>stage C</i> lysosomes, fuse with / join with / move towards (phagosome) ; release / secrete, enzymes / lysins / named enzyme / hydrogen peroxide / free radicals (into phagosome) ;</p>		<p>IGNORE refs to antigen presentation as this happens after the stage shown in the diagram</p>
6			<p>ACCEPT B lymphocyte ACCEPT effector <u>cell</u> DO NOT CREDIT lymphocyte unqualified</p>
7	<p><i>stage C/D</i> bacterium, digested / broken down / hydrolysed ; (to) amino acid / sugar / glucose / fatty acid / glycerol ;</p>	6 max	
8			
9	<p><i>stage D</i> absorbed / AW, into, <u>cytoplasm</u> / <u>cytosol</u> ; by, (facilitated / simple) diffusion / active transport ;</p>	1	
10	<p>plasma (cell) ;</p>		
5 (b)	(i)		

Question	Expected Answer	Mark	Additional Guidance
5 (b) (ii)	This is a QWC question		CREDIT a correctly labelled diagram that is clearly an antibody CON if diagram and text are contradictory MPs 3, 5, 6, 8, 10 are stand alone but DO NOT CREDIT if context is clearly incorrect. e.g. 'constant region gives specificity' AWARD mp 2 but not mp 5
1	Y-shaped molecule / light and heavy chains / disulfide bonds / 4 polypeptide chains ;		
2	constant region ;		
3	marker for / binds to, phagocytes / AW ;		3 ACCEPT ref to opsonisation
4	variable region ;		
5	(antibody) specificity ;		
6	(has) complementary shape to antigen (on pathogen) ;		'Complimentary shape to specific antigen' = 2 marks (mps 5 & 6)
7	hinge (region) ;		
8	allows flexibility ;		8 IGNORE 'movement' unqualified
9	more than one variable region :		9 DO NOT CREDIT from diagram unless more than one is explicitly labelled or clearly keyed (e.g. by shading)
10	allows, agglutination / description of agglutination or attachment to more than one, pathogen / antigen ;		
11	neutralisation / blocking pathogen's binding sites ;		11 ACCEPT ref. to antitoxin
	QWC – award when 2 marks are given in any two of the grouped sections ;	6 max	2 marks had been awarded from 2 of the following groups of marks (4 marks in total) mps 2 & 3 mps 4 & 5/6 mps 7 & 8 mps 9 & 10
		1	

Question	Expected Answer	Mark	Additional Guidance
5 (b) (iii)	<p>type of immunity</p> <p>artificial active</p> <p>artificial passive</p> <p>natural active</p> <p>natural passive ;</p>	1	<p>DO NOT CREDIT if more than 1 box is ticked</p> <p>DO NOT CREDIT a cross</p> <p>DO NOT CREDIT a tick that has been crossed out and is a 'hybrid' tick</p>
Total		17	

Question	Expected Answers	Marks	Additional Guidance
5 (a) (i)	(diagram shows that some) individuals have more than one risk factor ;	1	DO NOT CREDIT CHD is multifactorial
5 (a) (ii)	<ol style="list-style-type: none"> 1 high, saturated / animal, fat diet ; 2 high salt intake ; 3 (diet) low in (named) antioxidants / vitamin A / vitamin C / vitamin E ; 4 obesity ; 5 genetic / heredity / inherited / ethnicity / race ; 6 gender / sex ; 7 excess alcohol consumption ; 8 (increasing) age ; 9 diabetes ; 10 stress ; 	2 max	<p>Mark the 1st answer on each numbered line.</p> <p>1 ACCEPT absence of polyunsaturated fats</p> <p>7 must indicate, excess / high levels</p>

Question	Expected Answers	Marks	Additional Guidance																		
5 (a) (iii)	<table border="1"> <thead> <tr> <th>effect</th> <th>nicotine</th> <th>carbon monoxide</th> </tr> </thead> <tbody> <tr> <td>increases heart rate</td> <td>✓</td> <td></td> </tr> <tr> <td>constricts arterioles</td> <td>✓</td> <td></td> </tr> <tr> <td>damages the lining of arteries</td> <td></td> <td>✓</td> </tr> <tr> <td>reduces the ability of haemoglobin to carry oxygen</td> <td></td> <td>✓</td> </tr> <tr> <td>makes platelets sticky</td> <td>✓</td> <td></td> </tr> </tbody> </table>	effect	nicotine	carbon monoxide	increases heart rate	✓		constricts arterioles	✓		damages the lining of arteries		✓	reduces the ability of haemoglobin to carry oxygen		✓	makes platelets sticky	✓		4	<p>DO NOT CREDIT hybrid ticks</p> <p>IGNORE crosses in the 'blank' boxes</p>
effect	nicotine	carbon monoxide																			
increases heart rate	✓																				
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makes platelets sticky	✓																				

Question	Expected Answers	Marks	Additional Guidance
5 (b)	<p>1 damage to <u>endothelium</u> ;</p> <p>2 LDLs <u>contain</u>, saturated fat / cholesterol ;</p> <p>3 LDLs collect at site of damage ;</p> <p>4 fatty substances / cholesterol / LDLs, deposited, <u>in</u> artery wall / <u>under</u> endothelium ;</p>	2 max	<p>2 DO NOT CREDIT moves / transports</p> <p>CREDIT LDLs are <u>protein and</u> saturated fat / cholesterol</p> <p>3 must be stated</p> <p>4 ACCEPT fats / lipids</p> <p>ACCEPT under lining of artery wall</p> <p>DO NOT CREDIT veins / vessels / capillaries</p>
5 (c)	<p>1 increases size / AW, of <u>lumen</u> ;</p> <p>2 increases / eases / decreases resistance to, blood flow ;</p> <p>3 (therefore) more, O₂ / glucose ;</p> <p>4 for <u>aerobic</u> respiration ;</p> <p>5 in, heart <u>muscle</u> / <u>cardiac muscle</u> / myocardium ;</p> <p>6 more CO₂ removed ;</p>	4 max	<p>1 ACCEPT reduces blockage in lumen</p> <p>2 ACCEPT 'more blood' / 'blood flows more freely' / 'blood flows as normal' / 'quicker blood flow'</p> <p>3 needs idea of more oxygen (than before operation)</p> <p>CREDIT idea of preventing oxygen starvation</p> <p>'more oxygenated blood' gets mark points 2 and 3</p>
Total		13	

Question	Expected Answers	Marks	Additional Guidance
2 (a) (i)	<u>Plasmodium</u> ;	1	Look for correct spelling of generic name but do not penalise the use of lower case initial letter. We are not looking for specific name(s), so IGNORE species name. So e.g. <i>Plasmodium falciparum</i> should be credited but NOT <i>P. falciparum</i> / <i>P. vivax</i> / <i>P. ovale</i> / <i>P. malariae</i>
2 (a) (ii)	<u>female Anopheles</u> ;	1	CREDIT phonetic spelling but genus must be correct
2 (a) (iii)	hepatocyte / liver (cell) ; erythrocyte / red blood (cell) ;	1 max	If a choice of answers is given do not credit unless both are valid. DO NOT CREDIT 'RBC' as this is not a name

Question	Expected Answers	Marks	Additional Guidance
2			
1	humoral response ;		
2	(B) cell / lymphocyte, has antigen receptor / carries antibody on its surface ;		
3	specific to / matches / complementary to , only one <u>antigen</u> ;		
4	<u>clonal selection</u> ;		
5	selection / activation , of , appropriate / specific , B lymphocyte / B cell ;		
6	by , macrophages / antigen presenting cells / dendritic cells / T helper cells / cytokines / interleukins ;		
7	<u>clonal expansion</u> ;		
8	(selected cell) divides by mitosis / clones ;		
9	(B) cells , differentiate / specialise ;		
10	(B cells) form , plasma / effector , cells ;		
11	(which) secrete / produce , antibodies ;		
12	antibodies are , specific / complementary , to <u>antigen</u> ;		
13	(B cells) form memory cells ;		
14	Either (memory cells) long-lived / remain in circulation / remain in body / provide immunological memory or (provides) secondary response or faster / stronger , response to subsequent exposure (of same antigen / pathogen / parasite) ;		
	QWC ~ correct sequence ;	7 max	
		1	Clonal selection, then clonal expansion, then differentiation (stages named or described) Use the QWC tool to indicate these in the correct sequence and add 1 mark to the 7max for content when all 3 stages have been addressed in the correct sequence.

Question	Expected Answers	Marks	Additional Guidance
2 (c)	<p>Assume that candidates are answering in terms of a person <u>leaving the malarial area</u> (unless otherwise stated).</p> <p>no repeat infections / no further exposure (to antigen / pathogen / parasite) ; no booster / lose immunological memory ;</p> <p>limited life for memory cells / numbers of memory cells reduce / memory cells lost ;</p> <p>so no , secondary response / secondary response described ;</p>	2 max	<p>DO NOT CREDIT disease / malaria / bacterium / virus</p> <p>CREDIT converse points if they answer the question in the context of a person <u>staying</u> in the malarial area. e.g. repeat infections ; maintain immunological memory ; memory cells present ; secondary response available ;</p>

Question	Expected Answers	Marks	Additional Guidance
2 (d)	<p>different , strains / species / types (of <i>Plasmodium</i>) ; different antigens ; due to , mutation / variation ;</p> <p>more than one stage in the life cycle (within human) ; different stages have different antigens ;</p> <p>so will need , a different vaccine / components of vaccine , for each , strain / stage ;</p> <p>(parasite) concealed / hidden , in cells ; (parasite) only , exposed / in circulation , for short time ;</p> <p>AVP ;</p>	<p>3 max</p>	<p>DO NOT CREDIT 'disease' or 'malaria' unqualified Max 2 if they think it is a virus / bacterium</p> <p>'different strains will require different vaccines' = 2 (mp 1 & 6)</p> <p>CREDIT antigenic concealment</p> <p>e.g. antigenic , shift / drift eukaryotes have greater capacity for variation antigens (on parasite) change over time when in human</p>
Total		16	

Question	Expected Answers	Marks	Additional Guidance
6	<p>(a) (i) named component of cigarette smoke (correctly linked to a stated problem) ;</p> <p><i>tar, hydrogen cyanide, carbon monoxide (but NOT in context of Hb), ammonia, sulphur dioxide</i></p> <p>destroy / paralyse , cilia ; mucus not removed ;</p> <p><i>tar</i></p> <p>over-active goblet cells / extra mucus produced ;</p> <p>(accumulation of mucus) leads to , infections / bronchitis ;</p> <p>neutrophils / phagocytes / macrophages / monocytes (invade) ;</p> <p>secrete , enzyme / elastase ;</p> <p>elastin / elastic fibres , digested / destroyed ;</p> <p>low(er) level of , elastase inhibitor / α antitrypsinase ;</p> <p>alveoli fail to <u>recoil</u> ;</p> <p>constriction of (terminal) bronchioles ;</p> <p>(so) coughing / forced expiration , causes alveoli to burst ;</p> <p>reduced surface area ;</p>	5 max	<p>e.g. 'tar destroys cilia' = 2 (1 for this mark, linking the component with a stated problem, and also the mark for destroying cilia)</p> <p>DO NOT CREDIT tar more than once</p> <p>IGNORE nicotine</p> <p>ALLOW white blood cells</p> <p>DO NOT CREDIT lymphocytes</p> <p>CREDIT formation of scar tissue / fibrosis</p>
	QWC ;	1	<p>Award if at least 1 mark has been given from each of the mark scheme sections for this question.</p> <p>Use the QWC symbol and add to the content mark(s).</p>

Question	Expected Answers	Marks	Additional Guidance
6	(a)		DO NOT CREDIT difficulty in breathing / heavy breathing / hard to breathe in e.g. cannot walk far
	(ii)		
6	(a)	2 max	DO NOT CREDIT heart attack / MI / CHD / COPD ALLOW grey / ashen DO NOT CREDIT pale unqualified
	(iii)		
6	(a)	2 max	ALLOW no cure / irreversible IGNORE ref to death
	(i)		
6	(b)	4 max	Two sets of x and y figures with units for peak flow rate at least once – must compare either peak flow of smoker and non-smoker at same stated age or peak flow at two different stated ages for same person Could be in the same place or in different parts of the answer

Question	Expected Answers	Marks	Additional Guidance
6 (b) (ii)	<p>(initial increase as) lungs grow with age ;</p> <p>loss of , elastin / elastic fibres , in alveoli ; reduced / no , recoil ;</p> <p>decreased diameter of / thicker smooth muscle in / scar tissue in / inflammation of / blockage due to mucus of , (named) airways ;</p> <p>increase in resistance to air flow ;</p> <p>suitable explanation for , low / anomalous , reading at 17 ;</p>	2 max	<p>e.g. infection / unreliable (procedure) / asthma IGNORE ref to increased smoking</p>
6 (b) (iii)	<p>more individuals (male) should be used ; replicates / repeat measurements (at one time) ; calculate , mean / average ; identify / deal with , anomalous results ; take measurements at more frequent intervals ; controlled variable ;</p>	3 max	<p>e.g. every 6 months Suitable examples include but are not limited to <i>make sure that ...</i></p> <ul style="list-style-type: none"> • same number of cigarettes smoked • same type of cigarette • similar level of fitness • similar , build / body size • exclude individuals with other respiratory problems (e.g. asthma / bronchitis) • same exposure to , passive smoking / environmental pollution <p>DO NOT CREDIT ref to females / (general) health / occupation unqualified / lifestyle</p>
Total		19	