Question			Expected Answer	Mark	Additional Guidance
1	(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
1	(b)				**Mark first F mark on line and assume explanation relates to that** **ACCEPT** named example(s) of pathogen or parasite **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**
		F1	skin **;**		
		E1	*idea of:* physical barrier to prevent entry of microorganisms **;**		**E1 ACCEPT** 'pathogens cannot pass through cells' **E1 ACCEPT** antibacterial effects of sebum or sweat **E1 DO NOT CREDIT** physical barrier unqualified
		F2	mucous membrane(s) / goblet cells **;**		
		E2	(produce) mucus to trap, pathogens / parasite **;**		
			OR		
		F2	mucus **;**		
		E2	traps pathogens **;**		
		F3	cilia / ciliated epithelium **;**		
		E3	remove, pathogen / parasite, laden / AW, mucus **;**		
		F4	blood clotting **;**		
		E4	prevents, pathogens / parasite, entering bloodstream **;**		
		F5	ear wax / nasal hairs **;**		
		E5	traps, pathogens / parasite **;**		
		F6	lysozyme / tears / nasal secretions / saliva **;**		**F6 IGNORE** lysosome(s)
		E6	kills bacteria / contains antibacterial agent **;**		**E6 ACCEPT** contains antibodies
		F7	gastric juice / stomach acid **;**		**F7 ACCEPT** 'enzymes in the stomach' or 'acid in vagina'
		E7	kills, pathogens / parasite **;**		
				4 max	

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

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

Question			Expected Answer	Mark	Additional Guidance
3	(a)		young / elderly / HIV infected / malnourished / post-operative / on immunosuppressants / leukaemia / undergoing cancer treatment / anorexics **;** immature / compromised / weak / AW, immune system **;**	**2**	**IGNORE** prompt lines and mark the answer as a whole **ACCEPT** AW for young / elderly etc **IGNORE** 'ill' or 'unfit' **IGNORE** any reference to populations e.g. those living in vicinity of outbreak **ACCEPT** description **ACCEPT** no immunity
3	(b)	(i)			**DO NOT CREDIT** 'mould' – penalise once only
		1	bacteria / (bacterial) cells, divide / increase in number / multiply / reproduce / proliferate / replicate **;**		***1*** **IGNORE** 'growth' **DO NOT CREDIT** 'mitosis'
		2	(secrete) enzymes / named enzyme **;**		***2*** **DO NOT CREDIT** excrete Answer should **not** imply intracellular enzymes
		3	food, digested / broken down **;**		
		4a	protein / named protein / polypeptides → peptides / amino acids		
			OR		
		4b	fat / triglycerides → fatty acids		***4b*** **IGNORE** cholesterol
			OR		
		4c	starch / amylose / glycogen → glucose / sugar **;**		***4c*** **ACCEPT** other correct carbohydrate breakdown
		5	production / release / excretion / secretion, of, toxins / named toxin / waste products **;**		
		6	(causes) change in, appearance / smell / texture / taste **;**	**3 max**	***6*** **CREDIT** suitable example e.g. 'goes mushy'

Question			Expected Answer	Mark	Additional Guidance
3	(b)	(ii)			Idea of 'more' is needed for all marking points but it can be stated once and linked to more than one point. • e.g. 'more bacteria secreting enzymes' = mp 2 and 4 **ACCEPT** converse argument throughout **ACCEPT** 'fungi' / 'mould' in place of bacteria as question stem does not specify
		1	bacteria, reproduce / AW, more rapidly / faster **;**		***1*** **IGNORE** 'grow' **IGNORE** 'more easily' or 'effectively' **DO NOT CREDIT** if the candidate thinks there is no reproduction at 5°C
		2	(so) more bacteria present **;**		
		3	more, toxins / waste, produced / released / AW **;**		
		4	more enzymes, secreted / AW **;**		***4*** **DO NOT CREDIT** excreted
		5	enzyme, action faster / works better / more effective, at higher temperatures **;**		***5*** **IGNORE** optimum
		6	(substrate and enzymes have) more kinetic energy **;**		
		7	more, enzyme-substrate complexes / ESC / (successful) collisions between substrate and active site **;**	**3 max**	

Question			Expected Answer	Mark	Additional Guidance
3	(b)	(iii)	max 2 for 2 distinct methods max 2 for 2 **correctly linked** explanations Only credit the explanation mark if the method mark has been awarded.		Where more than one method is given, mark first on line and assume explanation linked with that **DO NOT CREDIT** chilling or freezing (as in question)
		M1 **E1**	salting **;** lack of <u>water</u> due to, osmosis / low water potential (outside cell) **;**		***M1*** **IGNORE** drying ***E1*** **ALLOW** low Ψ / high solute potential
		M2 **E2**	sugar **;** lack of <u>water</u> due to, osmosis / low water potential (outside cell) **;**		***M2*** **IGNORE** drying ***E2*** **ALLOW** low Ψ / high solute potential
		M3 **E3**	(air / freeze) drying **;** *idea that* enzymes cannot mobilise / intracellular transport impaired / reactions have no medium in which to occur / (microbes) cannot move **;**		
		M4 **E4**	pickling / (use of) vinegar **;** (low pH) denatures / changes tertiary structure of / changes 3D shape of, enzymes / proteins **OR** substrate no longer fits active site / active site shape changes / prevents ESC **;**		***E4*** **DO NOT CREDIT** high pH
		M5 **E5**	heat treatment / cooking **;** denatures / changes tertiary structure of / changes 3D shape of, enzymes / proteins **OR** substrate no longer fits active site / active site shape changes / prevents ESC **;**		***M5*** **ACCEPT** pasteurising **IGNORE** canning for this mp ***E5, E 6 & E7*** **ACCEPT** 'kills bacteria' or 'kills microbes' as a reason supporting heat treatment, irradiation or smoking **only once**
		M6 **E6**	irradiation / UV / gamma rays / X-rays / <u>ionising</u> radiation **;** destroys / damages / changes / mutates, DNA / genes / genetic material **;**		***M6*** **CREDIT** radiation if correctly qualified in explanation
		M7 **E7**	smoking **;** (so exposed to) antibacterial / named antibacterial, chemical(s) **;**		***M7*** **CREDIT** addition of, sulphites / sodium benzoate / alcohol
		M8 **E8**	vacuum packing / canning / bottling **;** microorganisms cannot respire <u>aerobic</u>ally **;**		***E8*** **IGNORE** 'denaturing' as a consequence of canning / bottling
				4	

Question			Expected Answer	Mark	Additional Guidance
3	(c)		**This is a QWC question** **Ignore sections and mark as continuous prose**		Assume candidate is talking about mycoprotein unless otherwise stated. **CREDIT** ora for beef throughout. **IGNORE** use of figures alone when awarding mps **1, 3, 6, 7, 9** – look for **descriptive statement**, e.g. • '12 g of protein' = no mark • 'only 12 g protein' = 1 mark (mp 9)
		1	low(er) / less, energy (than beef) ;		
		2	useful for, slimming / weight control / AW ;		***2*** **ACCEPT** preventing obesity **ACCEPT** 'less energy to burn off *during exercise*' **DO NOT CREDIT** 'burn off' unqualified
		3	low(er) / less, (total) fat ;		
		4	(very) low / (much) less, saturated fat ;		
		5	lower, cholesterol **OR** lower risk of, (coronary) heart disease / CHD / cardio-vascular diseases / heart attack / cardiac arrest / myocardial infarction / MI / angina / atherosclerosis / atheroma / stroke / hypertension ;		
		6	contains carbohydrate / AW ;		***6*** **ACCEPT** 'more carbohydrate than beef' **IGNORE** 'carbs'
		7	low(er) / less, iron content ;		
		8	(increased risk of) anaemia / fewer RBCs / less haemoglobin / reduced oxygen carrying capacity of blood ;		***8*** **IGNORE** answers phrased in terms of role of iron alone e.g. 'haemoglobin contains iron' = 0 Answers must show consequence of deficiency e.g. 'less haemoglobin' = 1
		9	low(er) / less, protein ;		
		10	(mycoprotein provides) more balanced diet ;		
		11	need larger intake to meet requirements / AW ;	**7 max**	
			QWC – award for 2 clear references to the table ;	**1**	Award for 2 sets of comparative figures (stated or calculated) with units – 'content per 100g' not needed **IGNORE** vague terms like 'about' as long as figs are correct
			Total	**20**	

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

Question			Expected Answer	Mark	Additional Guidance
4	(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 ;	**6 max**	*11* **ACCEPT** ref. to antitoxin
			QWC – award when 2 marks are given in any two of the grouped sections ;	**1**	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

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