Question Number	Answer	Mark
1(a)(i)	Any characteristic symptom of TB e.g. tubercules, bloody sputum, (general)body tissue wastage ;	**(1)**

Question Number	Answer	Mark
1(a)(ii)	D ;	**(1)**

Question Number	Answer	Mark
1(a)(iii)	1. idea of {bacterium / eq} recognised as {non-self / eq} ; 2. reference to labelling of bacteria by B {lymphocytes / cells} ; 3. phagocytosis / phagocytic / phagocyte ; 4. descriptive detail of phagocytosis (involving {bacterium / eq}) ; 5. reference to formation of vacuole ;	**max (3)**

Question Number	Answer	Mark
1(a)(iv)	1. {kills / eq} {bacteria / eq} in {stomach / mouth / saliva / gastric juice} ; 2. (by) {(hydrochloric) acid / lysozyme} ;	**(2)**

Question Number	Answer	Mark
***1(b)QW**	(QWC – Spelling of technical terms must be correct and the answer must be organised in a logical sequence) **Supporting the hypothesis:** 1. both HIV and TB infection rates rise and then fall / eq ; 2. both HIV infection and TB infection increase {from 1990 to 2000 / for the first 10 years} / eq ; **Not supporting the hypothesis:** 3. TB infection falls from 2000 onwards but HIV continues to rise (until 2004) / eq ; 4. different {parameters /measures / variables / eq} for the two infections / eq ; **General points:** 5. idea of {more {data / information / eq} is needed / other factors (may be) involved} ; 6. reference to need for statistical {analysis / test} ; 7. such as correlation {data / test / named example} ; 8. there is no data that {links HIV infection with TB infection / shows that people with HIV also have TB / shows causal relationship / eq} ;	**max (4)**

Question Number	Answer	Additional Guidance	Mark
2(a)	1. bacteria have DNA, viruses have DNA or RNA ; 2. idea that bacteria have {circular / eq} genetic material, viruses have {linear / straight} ; 3. bacterial DNA is double-stranded, viral {DNA / RNA} is single (or double) stranded / eq; 4. bacteria (may) have plasmids, viruses do not have plasmids / eq;	**NB** piece answers together throughout **Do not accept** in context of plasmid	**(2)**

Question Number	Answer	Additional Guidance	Mark
2(b)(i)	1. reference to {phagocytosis /endocytosis / engulfing} ; 2. credit details of phagocytosis ; 3. reference to bacterium inside a {vacuole / vesicle / phagolysosome} ;	eg formation of {pseudopodia / membrane extensions around bacteria} / cytoplasmic streaming / binding to bacteria **Not** phagolysozyme	**(2)**

Question Number	Answer	Additional Guidance	Mark
2(b)(ii)	1. idea that bacteria need to be accessible to antibiotics ; 2. idea of bacteria inside macrophages ; 3. reference to waxy layer of (these) bacteria ; 4. idea that (bacteriostatic) antibiotics affect dividing bacteria; 5. reference to antibiotic resistance (of these bacteria) ;	**Not** bacteriocidal antibiotics	**(2)**

Question Number	Answer	Additional Guidance	Mark
2(b)(iii)	1. idea of {dead / attenuated / eq} {organisms / pathogen / bacterium / eq} put into person; 2. reference to (stimulation of) {specific / primary} (immune) response ; 3. credit details of T helper cell activation ; 4. credit details of B cell activation ; 5. credit details of T killer cell activation ; 6. reference to production of memory cells ;	**NB** not simply crediting ref to vaccination as in stem of question **Accept** antigen eg macrophages as APCs eg involvement of cytokines, B cells as APCs eg involvement of cytokines, infected cells as APCs	**(3)**

Question Number	Answer	Additional Guidance	Mark
2(c)	1. reference to {<u>further</u> lung damage / severe breathing problems / eq} ; 2. idea that the *Mycobacterium* get into the {blood / lymph}; 3. idea that organ failure (leads to death) ; 4. idea of {reduced / weakened} immune response (due to a loss of T cells) ; 5. credit detail of role of T (helper) cells ; 6. credit detail of effect of no T killer cells ; 7. credit detail of effect of no B cells ; 8. ref to {secondary / opportunistic / other} infections (causing death) ;	eg cannot obtain enough oxygen eg production of cytokines eg infected cells will not be destroyed eg no antibody produced	**(4)**

Question Number	Answer	Additional Guidance	Mark
3(a)	1. bacteria are cells, viruses are {not / particles} ; 2. idea of bacteria surrounded by {cell wall / slime / capsule } , viruses surrounded by {protein / capsids / envelope} **;** 3. bacteria have { plasmids / ribosomes / other named structure} , viruses do not have {plasmids / ribosomes / other named structure } ; 4. bacteria (genome) are DNA, viruses can be DNA or RNA ; 5. bacterial DNA is double-stranded, viral genetic material is single (or double) stranded / eq ; 6. idea that bacteria have {circular / eq} genetic material, viruses have {linear / straight} genetic material ;	**NB** piece answers together throughout **Accept** only matched structures **2. Accep** for envelope: membrane / phospholipid layer / eq **3. Accep** bacteria have membranes, flagella cytoplasm, glycogen, lipid droplets **6. No** in context of plasmid	**(3)**

Question Number	Answer	Additional Guidance	Mark
3(b)(i)	1. reference to humoral (immune) response ; 2. reference to {phagocytosis / eq} by {phagocytes /named phagocyte} ; 3. reference to macrophages as { antigen-presenting cells / APCs} (to T helper cells) ; 4. reference to B cells as { antigen-presenting cells / APCs} (to itself) ; 5. idea that T helper cells release cytokines for B cell {activation / stimulation} ; 6. idea of B cells {forming clones / dividing /eq} (to form B effector cells) ; 7. reference to {differentiation of B cells into plasma cells / formation of plasma cells from B cells} (subsequent to cloning) ;	**2. Accep** dendritic cells / Langerhans cells / B cells **3 Accept** dendritic cells / Langerhans cells 4. **Accept** antigen binds to B cells **6. No** to form plasma cells	**(4)**

Question Number	Answer	Additional Guidance	Mark
3(b)(ii)	1. reference to {opsonisation / antibodies bind to bacteria / eq} ; 2. (as a result) enhancing phagocytosis / eq ; 3. reference to {immobilisation / agglutination / eq } (of bacteria) ; 4. idea of antibodies neutralising toxins / eq ;	**1. No** reference to killing bacteria **2. Accep** easier, better	**(2)**

Question Number	Answer	Additional Guidance	Mark
3(b)(iii)	1. idea that the immune response will be weaker ; 2. person may not recover from this infection / eq ; 3. idea of {other (opportunistic) infection / cancer} ; 4. reference to cytokines released from {T helper / CD4 } cells ; 5. idea that cytokines are involved in {activation / division } of {B cells / T killer cells} ; 6. credit consequence of impaired B cell function ; 7. credit consequence of impaired T killer cell function ;	**1. Accep** in context of either humoral or cell-mediated immune response **6. Accep** e.g. no antibody produced by plasma cells **7. Acce** e.g. infected cells not destroyed	**(4)**

Question Number	Answer	Mark
4(a)	<table><tr><th>Feature</th><th>Bacteria only</th><th>Viruses only</th><th>Both bacteria and viruses</th></tr><tr><td>Glycogen granules</td><td>X</td><td></td><td></td></tr><tr><td>Nucleic acids</td><td></td><td></td><td>X</td></tr><tr><td>Protein coat (capsid)</td><td></td><td>X</td><td></td></tr></table> 1 mark per row ;;;	**(3)**

Question Number	Answer	Mark
4(b)(i)	1. viruses (and bacteria) involved ; 2. (usually) antibiotics {are only effective against bacteria / do not affect viruses / eq} ; 3. {other medication / eq} needed to deal with viruses / eq ;	**max (2)**

Question Number	Answer	Mark
4(b)(ii)	1. both enrofloxacin and florfenicol named ; 2. idea of {(high) effectiveness / eq} against all three bacteria / eq ; 3. above {80% / 83%} / eq / average above 90% / eq ;	**(3)**

Question Number	Answer	Mark
4(b)(iii)	1. idea that antibiotic used is {most effective / eq} (against the known bacterium) ; 2. idea that none of the antibiotics is 100% effective / some bacteria {survive / eq} ; 3. some bacteria {are resistant / eq} ; 4. idea of resistant strain {develops / prevented} ;	**max (3)**