Question number	Answer	Mark
1(a)	An explanation that combines identification – application of knowledge (1 mark) and reasoning/justification – application of understanding (1 mark): • the CD4+ count is significantly below the normal range because the HIV has destroyed the {white blood cells/CD4+ cells} (1) • so the person is more susceptible to opportunistic infections and classified as having AIDS (1)	**(2)**

Question number	Indicative content	Mark
***1(b)**	Answers will be credited according to candidate's deployment of knowledge and understanding of the material in relation to the qualities and skills outlined in the generic mark scheme. The indicative content below is not prescriptive and candidates are not required to include all the material which is indicated as relevant. Additional content included in the response must be scientific and relevant. **AO2 (6 marks)** • isolate an antigen from the pathogen which causes the STI • inject the antigen into a mouse/rodent • collect lymphocytes producing an antibody to the STI antigen • fuse the B-lymphocyte with a myeloma cell • production of a hybridoma • hybridoma produces a monoclonal antibody against the antigen of the STI • attach the monoclonal antibody to coloured bead/indicator • incorporate into a test strip.	**(6)**

Level	Mark	Descriptor
	0	No awardable content
Level 1	1-2	• The explanation attempts to link and apply knowledge and understanding of scientific enquiry, techniques and procedures, flawed or simplistic connections made between elements in the context of the question. (AO2) • Lines of reasoning are unsupported or unclear. (AO2)
Level 2	3-4	• The explanation is mostly supported through linkage and application of knowledge and understanding of scientific enquiry, techniques and procedures, some logical connections made between elements in the context of the question. (AO2) • Lines of reasoning mostly supported through the application of relevant evidence. (AO2)
Level 3	5-6	• The explanation is supported throughout by linkage and application of knowledge and understanding of scientific enquiry, techniques and procedures, logical connections made between elements in the context of the question. (AO2) • Lines of reasoning are supported by sustained application of relevant evidence. (AO2)

Question number	Answer	Additional guidance	Mark
1(c)	An explanation that combines identification – understanding (1 mark) and reasoning/justification – understanding (3 marks): • a single strand of messenger RNA is transcribed from the gene in the nucleus (1) • messenger RNA molecule binds to the ribosome (1) • the triplet code from the mRNA is matched by a complementary tRNA anticodon at the ribosome (1) • tRNA transfers amino acids to the polypeptide chain in a specific order (1)	to gain maximum marks the process must be in a logical sequence	**(4)**

Question number	Answer	Additional guidance	Mark
2(a)(i)	• 156 ÷ 10 (1) • 16 units (1) Answer to two significant figures	award full marks for correct numerical answer without working	**(2)**

Question number	Answer	Mark
2(a)(ii)	An explanation that combines identification – application of knowledge (1 mark) and reasoning/justification – application of understanding (1 mark): • an increase in the units of insulin injected would cause more blood glucose to be converted to glycogen and stored in the liver/muscles (1) • leading to blood glucose levels becoming critically low/person would become hypoglycemic (1)	**(2)**

Question number	Answer	Mark
2(b)(i)	B	**(1)**

Question Number	Indicative content	Mark
***2(b)(ii)**	Answers will be credited according to candidate's deployment of knowledge and understanding of the material in relation to the qualities and skills outlined in the generic mark scheme. The indicative content below is not prescriptive and candidates are not required to include all the material that is indicated as relevant. Additional content included in the response must be scientific and relevant. **AO1 (6 marks)** • the thyroid gland produces thyroxine • thyroxine helps to regulate metabolic rate • low levels of thyroxine should stimulate the production of TRH • TSH being produced and more thyroxine being released • an underactive thyroid would cause less thyroxine to be produced • metabolic rate to drops • less energy (calories) are available for tasks • more fat storage so the person gains body mass	**(6)**

Level	Mark	Descriptor
	0	No rewardable material.
Level 1	1–2	• Demonstrates elements of biological understanding, some of which is inaccurate. Understanding of scientific ideas lacks detail. (AO1) • Presents an explanation with some structure and coherence. (AO1)
Level 2	3–4	• Demonstrates biological understanding, which is mostly relevant but may include some inaccuracies. Understanding of scientific ideas is not fully detailed and/or developed. (AO1) • Presents an explanation that has a structure which is mostly clear, coherent and logical. (AO1)
Level 3	5–6	• Demonstrates accurate and relevant biological understanding throughout. Understanding of the scientific ideas is detailed and fully developed. (AO1) • Presents an explanation that has a well-developed structure which is clear, coherent and logical. (AO1)

Question Number	Answer	Acceptable answers	Mark
3 (a)(i)	A description including two of the following points • initial /at the start increase in concentration (1) • 06.00 to 08.00 / 12.00 to 13.00 (1) • decrease in concentration after 08.00 / fall in concentration between 08.00 and 12.00 (1) • increased again at 13.00 (1)	accept specific times eg. at 8.00 concentration high	**(2)**

Question Number	Answer	Acceptable answers	Mark
3(a) (ii)	• increase due to food intake (1) • decrease due to glucose being used up / stored /insulin released / doing exercise(1)	accept 8:00 or 13:00 for increase answers must be linked to idea of increase or decrease not simply eating food	**(2)**

Question Number	Answer	Acceptable answers	Mark
3(a)(iii)	glycogen in the liver		**(1)**

Question Number	Answer	Acceptable answers	Mark
3(b)(i)	substitution (1) $1.50^2 = 2.25$ or $67.5 / 1.5^2$ (1) evaluation (1) $67.5 \div 2.25$ = BMI of 30	 accept 45 (1) (as this is the correct calculation without squaring the 1.5) give full marks for correct answer, no working	 **(2)**

Question Number	Answer	Acceptable answers	Mark
3(b)(ii)	An explanation including the following points • physical activity can be performed (to reduce glucose levels) (1) • diet can be controlled (to reduce glucose levels) (1) • take medication (orally or injected) (1)	 accept insulin/ metformin for medication	 **(3)**

Question Number	Answer	Acceptable answers	Mark
6(a)(i)	(direct) contact (with fungus) / touch / through the skin /surfaces		**(1)**

Question Number	Answer	Acceptable answers	Mark
4(a)(ii)	antifungal	fungicide / antibiotics/ *nystatin* / *terbinafine* / *itraconazole*	**(1)**

Question Number	Answer	Acceptable answers	Mark
4 (b)(i)	**C** antibiotic C		**(1)**

Question Number	Answer	Acceptable answers	Mark
4 (b)(ii)	An explanation including 3 of the following points: • lysozymes / enzymes (1) • found in tears (1) • hydrochloric acid (1) • in the stomach (1) • (chemical defence) destroy bacteria / pathogens (1)	accept lungs/saliva for tears stomach acid (1) accept viruses for pathogens Ignore references to mucus	**(3)**

Question Number		Indicative Content	Mark
QWC	***4(c)**	An explanation of how MRSA has increased since 1993 also using the evaluation of data from the graph • the number of patients suffering from MRSA has increased / more cases of MRSA • by over 366 000 since 1993 • data quoted from the graph • ref to poor hygiene in hospitals • MRSA is a bacterium that is resistant to antibiotics • individual bacteria show variation • when a bacterial infection is treated with antibiotics those bacteria with low resistance are destroyed first • the more resistant bacteria survive • if a patient stops taking the antibiotics then the resistant bacteria will live to reproduce • the new bacteria will also be resistant to antibiotics • these bacteria will not be able to be treated with antibiotics so the number of cases continue to rise	**(6)**
Level	**0**	No rewardable content	
1	**1 - 2**	• a limited description of the graph only or the increase in bacteria only • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	
2	**3 - 4**	• a simple description of the graph with a limited explanation of how bacteria continued to increase • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy	
3	**5 - 6**	• a detailed explanation (with data) using the graph of the emergence of resistant bacteria which then reproduce, linked to antibiotic treatment • most of the steps are identified and are in a logical order • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors	