Question Number	Answer	Acceptable answers	Mark
1(a)(i)1	immune (1)		**(1)**

Question Number	Answer	Acceptable answers	Mark
1(a)(i)2	memory lymphocytes (1)		**(1)**

Question Number	Answer	Acceptable answers	Mark
1(a)(ii)	**B** hybridomas		**(1)**

Question Number	Answer	Acceptable answers	Mark
1(a)(iii)	**Two** of the following: pregnancy testing (1) locating the position of blood clots (1) locating the position of cancers (1)	 accept detecting blood clots accept detecting cancer cells	**(2)**

Question Number	Answer	Acceptable answers	Mark
1(b)(i)	A comparison including two from: first response • delay in production of antibodies (1) • less antibodies produced (1) • production of antibodies slower (1)	or a second response • no delay in production of antibodies (1) • more antibodies produced (1) • production of antibodies faster (1) accept comparisons of data ignore references to decrease in antibody number	**(2)**

Question Number	Answer	Acceptable answers	Mark
1(b)(ii)	faster recovery / {no/less} symptoms of infection / increased chance of survival / kills pathogen faster(1)	accept more <u>memory</u> lymphocytes produced/ immune / fights infection faster	**(1)**

Question Number	Answer	Acceptable answers	Mark
1(b)(iii)	**B** Edward Jenner		**(1)**

(Total for question 1 = 9 marks)

Question Number	Answer	Acceptable answers	Mark
2(a)(i)	(1600 + 1000) - (1400 + 200) Or 2600 - 1600 Or (1600 - 1400) + (1000 - 200) or 200 + 800 (1) = 1000	2 marks for bald answer - 1000	 **(2)**

Question Number	Answer	Acceptable answers	Mark
2(a)(ii)	Description including **two** of the following: • no (overall) / little effect on cases of meningitis B (1) • (significant overall) decrease in meningitis C (1) • correct manipulation of data (1)	 fluctuates a little / rises and then goes slightly down	 **(2)**

Question Number	Answer	Acceptable answers	Mark
2(b)	**A** ☒ antigens		**(1)**

Question Number	Answer	Acceptable answers	Mark
2(c)(i)	A description linking three of the following • inject mammal / named mammal with antigen (1) • (select) B lymphocytes / lymphocyte that produces the (specific) antibody / spleen cells(1) • fuse with tumour / myeloma cells (1) • (to produce a) <u>hybridoma</u> (which divide)(1) • antibodies are isolated / screened(1)	Accept animal for mammal Accept B cells Accept cancer cells Ignore antibodies produced	**(3)**

Question Number	Answer	Acceptable answers	Mark
2(c)(ii)	An explanation linking **two** of the following: • antibody (only) attach to cancer cell (1) • drug / radioactive source / toxin bound to antibody / alerts immune system to target cancer cells (1) • no / fewer adverse effect to non cancerous cells (1)	Accept named effect	**(2)**

(Total for question 2 = 10 marks)

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

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

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

Question Number	Answer	Acceptable answers	Mark
3 (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	***3(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	

(Total for question 3 = 12 marks)

Question Number	Answer	Acceptable answers	Mark
4(a)(i)	an increase in cases until **October** and then a decrease (in the number of cases) (1)	accept an increase in cases till **November** when it decreases	**(1)**

Question Number	Answer	Acceptable answers	Mark
4(a)(ii)	1320 (1) 1320 – 168 = 1152	**2 marks for correct answer**	**(2)**

Question Number	Answer	Acceptable answers	Mark
4(b)	exponential (growth)	log / logarithmic (growth)	**(1)**

Question Number	Answer	Acceptable answers	Mark
4(c)	**A suggestion including two of the following** not everyone has been immunised (1) immigration introduces people who are not immunised (1) immunisation not fully effective (1) immunity can decrease with age (1)	 accept no herd immunity accept bacteria mutates (making immunisation ineffective) accept immunity requires boosters/loss of memory lymphocytes	**(2)**

Question Number	Answer	Acceptable answers	Mark
4(d)	**A description including the following** (immunisation) introduces an antigen/(immunisation) causes an immune response (1) (B) lymphocytes (1) production of antibodies (1) (the production of) memory lymphocytes (1)	 accept immune system recognises an antigen (in the immunisation) ignore white blood cells	**(3)**

Total for Question 4 = 9 marks

Question Number	Answer	Acceptable answers	Mark
5 (a)(i)	**A** ☒ FSH		**(1)**

Question Number	Answer	Acceptable answers	Mark
5(a)(ii)	**An explanation linking two of the following** more than one egg {released / fertilised }(1) multiple birth / pregnancy (1) increased risk of complications for mother/babies (1) OR women affected by side effects (1) treatment has to be stopped reducing chance of pregnancy (1)	accept headaches, mood swings, nausea, abdominal pain, diarrhoea, weight gain ignore references to cost	**(2)**

Question Number	Answer	Acceptable answers	Mark
5 (a)(iii)	**D** ☒ progesterone		**(1)**

Question Number	Answer	Acceptable answers	Mark
5(b)(i)	**An explanation linking three from the following** urine sample (1) coloured bead attached to a (mobile monoclonal) antibody (1) antibody {specific to/detects/binds to} { hormone/hCG} (1) immobile antibody at test strip (1) colour accumulates in positive test window (1)	accept named female sex hormones	**(3)**

Question Number	Answer	Acceptable answers	Mark
5(b)(ii)	**An explanation linking two of the following** chemotherapy/radiotherapy drug attached to the monoclonal antibody (1) less use of the drug (1) only binds to cancer cells/doesn't target normal cells (1) reduces side effects/named side effects (1)	monoclonal antibody binds to {**tumour markers/cancer antigens**} (1)	**(2)**

Question Number	Answer	Acceptable answers	Mark
5(b)(iii)	hybridoma (cell)		**(1)**

Total for Question 5 = 10 marks