

Question number	Answer	Marks	Guidance
1 a	<p>small amount of dead or inactive form of disease-causing pathogen introduced into body</p> <p>stimulating white blood cells to produce antibodies needed to fight pathogen and prevent illness</p> <p>if same, live pathogen is encountered later, immune system can respond rapidly to make correct antibodies</p> <p>to destroy pathogen before it can cause illness</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p>	
1 b i	<p>flow chart should include:</p> <ul style="list-style-type: none"> • exposure to pathogen • white blood cells produce antibodies against antigens on pathogen (whilst you have symptoms of disease) • antibodies bind to antigens on pathogen • pathogens inactivated or destroyed • when exposed to pathogen again memory cells make correct antibodies immediately • illness prevented 	4	
1 b ii	<p>flow chart should include:</p> <ul style="list-style-type: none"> • exposure to weakened or dead pathogen • white blood cells produce antibodies against antigens on pathogen (without you suffering from disease) • antibodies bind to vaccine • pathogens removed • when exposed to pathogen again memory cells make correct antibodies immediately • illness prevented 	4	

1 c	Some diseases are so dangerous that death or permanent damage can occur before body has time to develop correct antibodies. These are the diseases usually vaccinated against. It is not worth the expense of vaccinating against less serious diseases such as the common cold, which are often caused by viruses that mutate very quickly (faster than vaccines can be developed).	1 1	
2 a	meningitis B: 1450 cases meningitis C: 980 cases	1 1	
2 b	meningitis B: 1280 cases in 2005, 900 cases in 2009 meningitis C: 25 cases in 2005, 10 cases in 2009	1 1	
2 c	Vaccine probably responsible for reduction in meningitis cases – fall was dramatic and was maintained after vaccine was introduced. However, other factors may have contributed to dramatic reduction as recorded meningitis B cases also went down over same period without introduction of vaccine. Such factors may include increased overall health (fewer infections) and increased awareness (treatment sought sooner, before passing illness on).	1 1 1 1	Credit other valid answers.
2 d	for: <ul style="list-style-type: none"> 800 people affected by meningitis B in 2010 (almost as many as were affected by meningitis C when vaccine introduced) meningitis can cause death or permanent damage vaccine could alleviate death and suffering against: <ul style="list-style-type: none"> high cost of vaccine over number of people affected each year recorded meningitis B cases falling steadily without vaccine 	2	1 mark for argument for. 1 mark for argument against.

3 a	They are viruses.	1	
3 b	aspirin or paracetamol	1	
3 c	high vaccination levels provide herd immunity meaning that enough people are given immunity through vaccination to protect those who are not vaccinated	1 1 1	
4 a	Any five from: <ul style="list-style-type: none"> • medicine is effective at treating disease • medicine is safe for patient • medicine is taken into body effectively • medicine can be removed from body • dosage is correct • medicine is stable 	5	Credit other valid answers.
4 b	development and testing of new medicine can take up to 12 years involving multiple stages and extensive lab resources that make each stage very expensive only a small proportion of the thousands of chemicals put through lab trials are eventually put through animal testing, and an even smaller proportion through human trials	1 1 1 1	

4 c	<p>Example answers for yes:</p> <ul style="list-style-type: none"> • if drug seems so good during trials that it would be unethical not to treat with it • if need for drug to be used on individual patient as only chance of avoiding death is very clear <p>Example answers for no:</p> <ul style="list-style-type: none"> • unethical to use drugs that have not been fully tested • outcomes such as those associated with Thalidomide are to be avoided 	5	Award marks for any valid and sensible reasons to justify their conclusion.
5 a	<p>Number of new antibiotics introduced in USA between 1983 and 2011 has dropped sharply.</p> <p>There remain lots of diseases for which we don't yet have effective cures, and some antibiotics are becoming less effective as bacteria become resistant.</p>	1 1	
5 b	<p>Traditionally many medicines were developed from plants animals.</p> <p>Some medicines still begin as molecules from plants.</p> <p>However, synthetic chemistry in which molecules are designed for specific effect is now a source of many potential drug molecules so medicine not entirely dependent on biodiversity.</p>	1 1 1 1	

5 c	Researchers target disease and make lots of possible new drugs. Lab tests determine efficacy and toxicity.	1	
	Effective and non-toxic drug tested on animals to investigate dosage and side effects.	1	
	Clinical trials begin with healthy volunteers and patients. Low dosage used to check for side effects.	1	
	Drug found to be safe tested on small number of patients to determine efficacy.	1	
	Drug found to be safe and effective tested in bigger, double blind trials to determine optimum dosage.	1	
	Drug licenced for prescription by GPs and hospitals. Safety monitored for as long as drug is used.	1	

GCSE Biology only

6	Monoclonal antibodies used to treat cancer either by triggering immune system to recognise and destroy cancer cells	1	6
	or by blocking receptors on cancer cells to inhibit growth and division.	1	
	May also be used to carry toxic drugs, radioactive substances, or chemicals directly to cancer cells.	1	
	Monoclonal antibodies could potentially target diseased or damaged cells only, protecting healthy cells (advantage over conventional treatments).	1	
	Monoclonal antibody treatments have created more side effects than expected (e.g., immune response triggered by mouse cells), but technology is improving and doctors are now better prepared for side effects.	1	
	Monoclonal antibody treatments could eventually become cheaper than conventional ones.	1	

