



Exampro GCSE Biology

B1 Chapter 1 Keeping Healthy
Higher tier

Name:

Class:

Author:

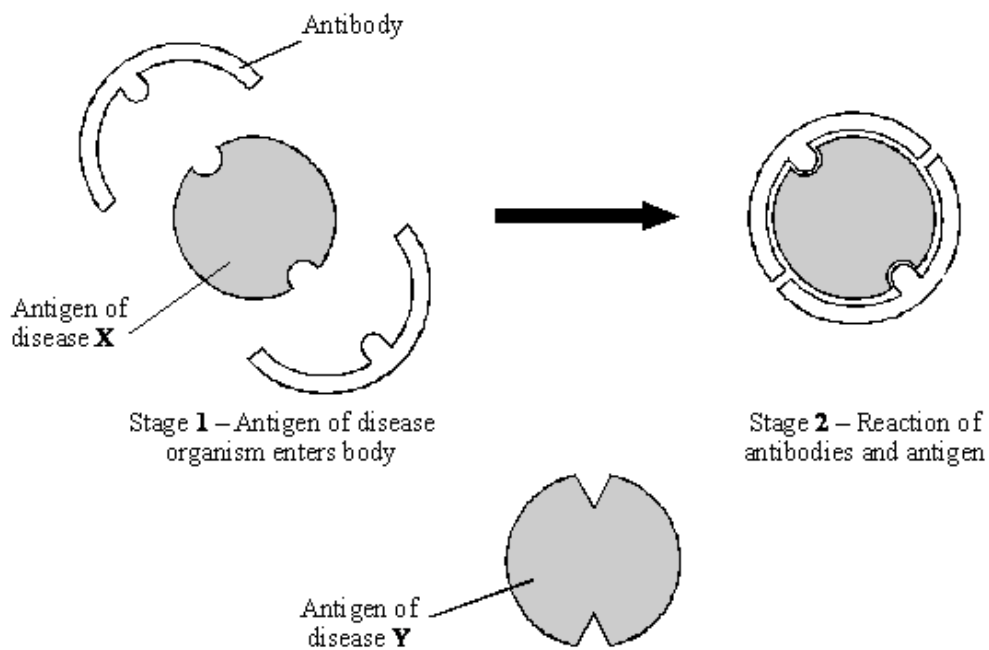
Date:

Time: 81

Marks: 81

Comments:

Q1. (a) Antibodies help to defend the body against disease. The diagram represents the reaction of antibody and antigen for disease X.



Using the diagram to help you, suggest why the body's defence against disease X would not be effective against disease Y.

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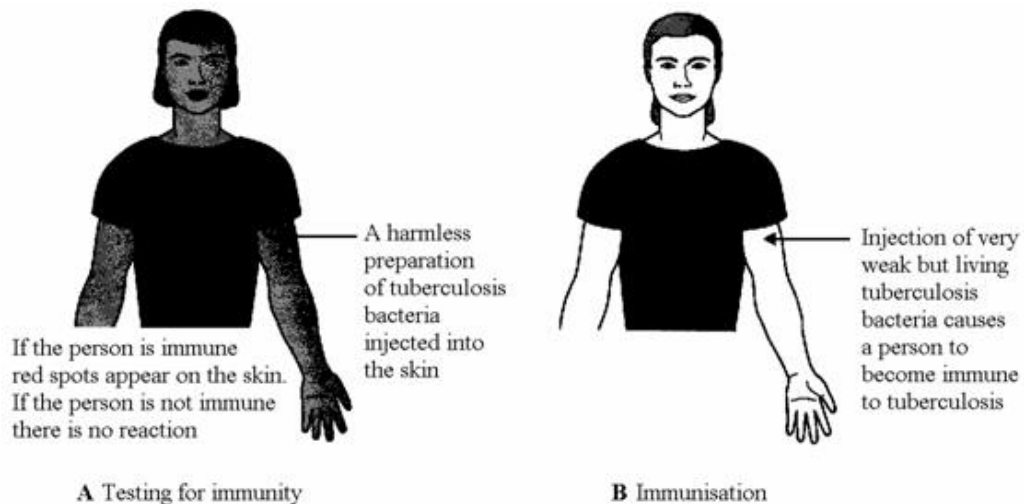
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(2)

(b) Tuberculosis is a disease which is caused by a bacterium. The body is able to produce antibodies to destroy the bacteria which cause the disease. Some people are naturally immune. A person can be tested to find if they are immune.

Use information in the diagrams to help you answer the questions.



- (i) Suggest the possible cause of the reaction when a person who is already immune is tested, as shown in diagram A.

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(2)

- (ii) Explain why the injection of tuberculosis bacteria (diagram B) causes immunity but does not cause the disease.

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(3)

(Total 7 marks)

Q2. Penicillin is an antibiotic which stops bacteria from reproducing. It was used a lot in the past to treat bacterial infections in humans and other animals. In many hospitals there are now strains of penicillin resistant bacteria.

Explain how natural selection could have produced these strains of penicillin resistant bacteria.

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(Total 5 marks)

Q3. The influenza virus damages the cells lining the respiratory tract causing sore throats.

Coughing and sneezing spread the virus.

(a) Give the correct term for this method of spreading an infection.

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(1)

(b) In an immunisation programme such as that for MMR (Measles, Mumps and Rubella), suggest why it is essential for a large proportion of the child population to be vaccinated in order to protect the few individuals who are unable to be vaccinated.

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(1)

(c) In some modern influenza vaccines the protein surface sub-units are separated from the virus coat and used for the vaccine. This stimulates an effective immune response in the same way as inactive pathogens.

(i) Explain how this immunity is produced in the body following vaccination, and how further illness from the same virus is prevented.

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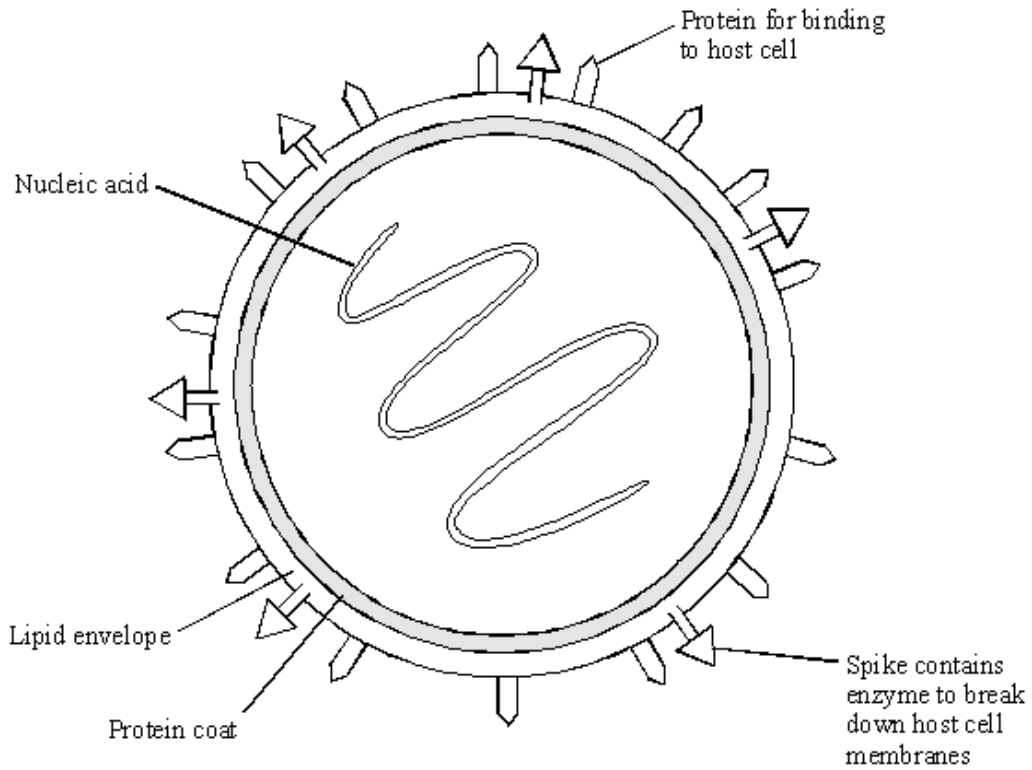
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(4)

(ii) This type of immunity resulting from an influenza injection is described as immunity.

(1)

(d) The diagram shows the structure of an influenza virus.



Influenza epidemics can arise because the nucleic acid of the virus frequently changes. This results in changes in the virus structure and so a new strain of the virus is formed. A person who has had influenza or who has been vaccinated may not be immune to the new strain.

Explain why this is so, using the diagram of the influenza virus structure and your knowledge of immunity.

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(3)
(Total 10 marks)

Q4. (a) Explain, as fully as you can, how the body's white blood cells respond to infections.

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(4)

(b) Describe, in as much detail you can, how **one** method of immunisation protects us from a named disease.

Name of disease

How immunisation protects us from this disease.

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(3)

(Total 7 marks)

Q5. White blood cells protect the body against pathogens such as bacteria and viruses.

(a) (i) Pathogens make us feel ill.

Give **one** reason why.

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(1)

- (ii) White blood cells produce antibodies. This is one way white blood cells protect us against pathogens.

Give **two** other ways that white blood cells protect us against pathogens.

1.....

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2.....

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(2)

- (b) Vaccination can protect us from the diseases pathogens cause.

- (i) One type of virus causes measles.

A doctor vaccinates a child against measles.

What does the doctor inject into the child to make the child immune to measles?

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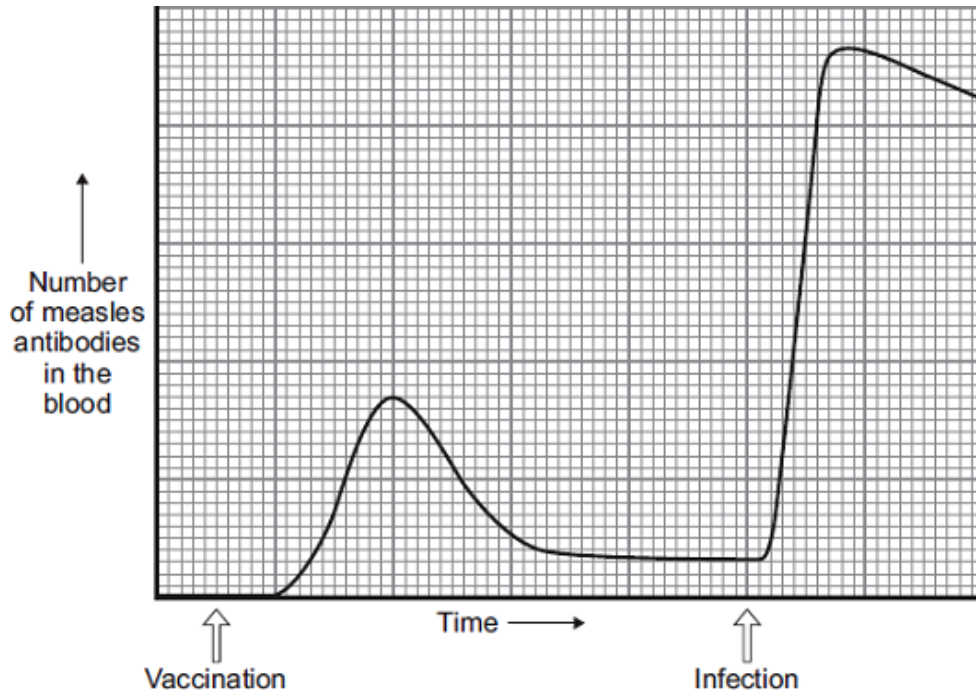
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(2)

- (ii) A few weeks after the vaccination, the child becomes infected with measles viruses from another person.

The graph shows the number of measles antibodies in the child's blood from before the vaccination until after the infection.



More measles antibodies are produced after the infection than after the vaccination.

Describe other differences in antibody production after infection compared with after vaccination.

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(3)

- (iii) Vaccination against the measles virus will **not** protect the child against the rubella virus.

Why?

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(1)

- (c) What is the advantage of vaccinating a large proportion of the population against measles?

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(1)

(Total 10 marks)

Q6. Some diseases can be cured by using antibiotics or prevented by vaccination.

(a) (i) Explain fully why antibiotics cannot be used to cure viral diseases.

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(2)

(ii) There has been a large increase in the populations of many antibiotic-resistant strains of bacteria in recent years.

Explain why.

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(2)

(b) A person can be immunised against a disease by injecting them with an inactive form of a pathogen.

Explain how this makes the person immune to the disease.

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(3)

(Total 7 marks)

Q7. The MMR vaccine is used to protect children against measles, mumps and rubella.

(a) Explain, as fully as you can, how the MMR vaccine protects children from these diseases.

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(3)

(b) Read the passage.

Autism is a brain disorder that can result in behavioural problems. In 1998, Dr Andrew Wakefield published a report in a medical journal. Dr Wakefield and his colleagues had carried out tests on 12 autistic children.

Dr Wakefield and his colleagues claimed to have found a possible link between the MMR vaccine and autism.

Dr Wakefield wrote that the parents of eight of the twelve children blamed the MMR vaccine for autism. He said that symptoms of autism had started within days of vaccination.

Some newspapers used parts of the report in scare stories about the MMR vaccine. As a result, many parents refused to have their children vaccinated.

Dr Wakefield's research was being funded through solicitors for the twelve children. The lawyers wanted evidence to use against vaccine manufacturers.

Use information from the passage above to answer these questions.

(i) Was Dr Wakefield's report based on reliable scientific evidence?

Explain the reasons for your answer.

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(2)

(ii) Might Dr Wakefield's report have been biased?

Give the reason for your answer.

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(1)
(Total 6 marks)

Q8. Influenza is a disease caused by a virus.

(a) Explain why it is difficult to treat diseases caused by viruses.

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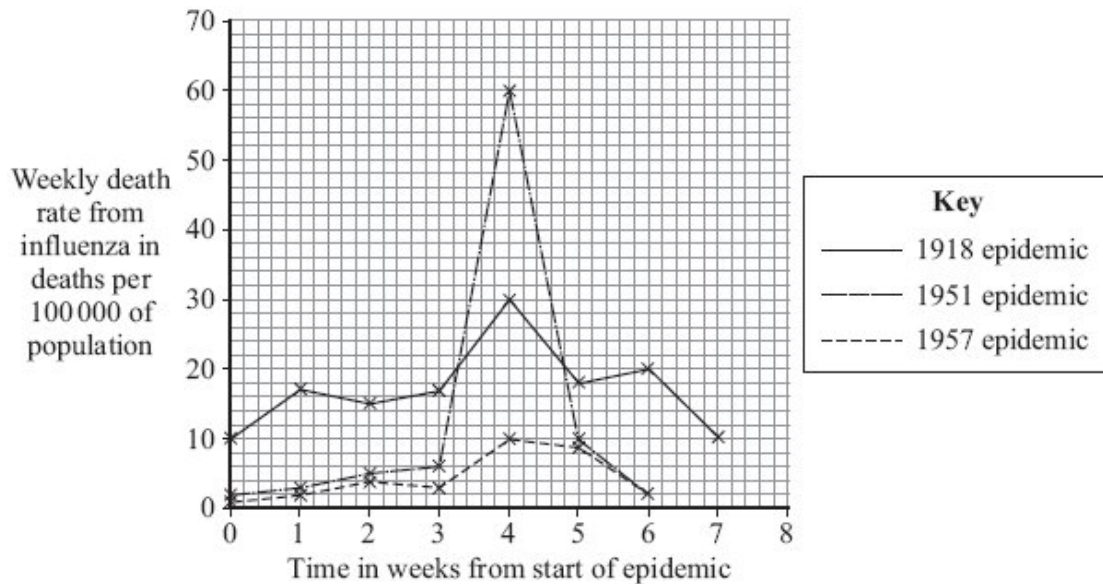
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(2)

(b) In some years there are influenza epidemics.

The graph shows the death rate in Liverpool during three influenza epidemics.



- (i) The population of Liverpool in 1951 was approximately 700 000.

Calculate the approximate number of deaths from influenza in week 4 of the 1951 epidemic.

Show clearly how you work out your answer.

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Number of deaths

(2)

- (ii) In most years, the number of deaths from influenza in Liverpool is very low.

Explain, in terms of the influenza virus and the body's immune system, why there were large numbers of deaths in years such as 1918 and 1951.

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(3)

(Total 7 marks)

- Q9.** (a) Explain how vaccination makes a person immune to a disease.

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(4)

(b) Scientists are trialling a 'nicotine vaccine' that might help **wean smokers off** the drug nicotine.
The trials so far have produced very mixed results.
Nicotine molecules are very small and can get through the protective layers around the brain.

(i) How does nicotine cause a person to become addicted?

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(1)

(ii) The 'nicotine vaccine' is made by attaching proteins to nicotine molecules. After 'vaccination' the body reacts to the nicotine in the same way as it reacts to pathogens.

Suggest how the 'nicotine vaccine' might help wean a smoker off nicotine.

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(2)

(Total 7 marks)

Q10. Some students investigated the effect of pH on the growth of one species of bacterium.

They transferred samples of bacteria from a culture of this species to each of eight flasks. Each flask contained a solution of nutrients but at a different pH.

After 24 hours, the students measured the amount of bacterial growth.

(a) It was important that the flasks in which the bacteria grew were not contaminated with other microorganisms.

Describe **two** precautions the students should have taken to prevent this contamination.

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(2)

- (b) To see the effect of pH on the growth of the bacteria, other conditions should be kept constant.

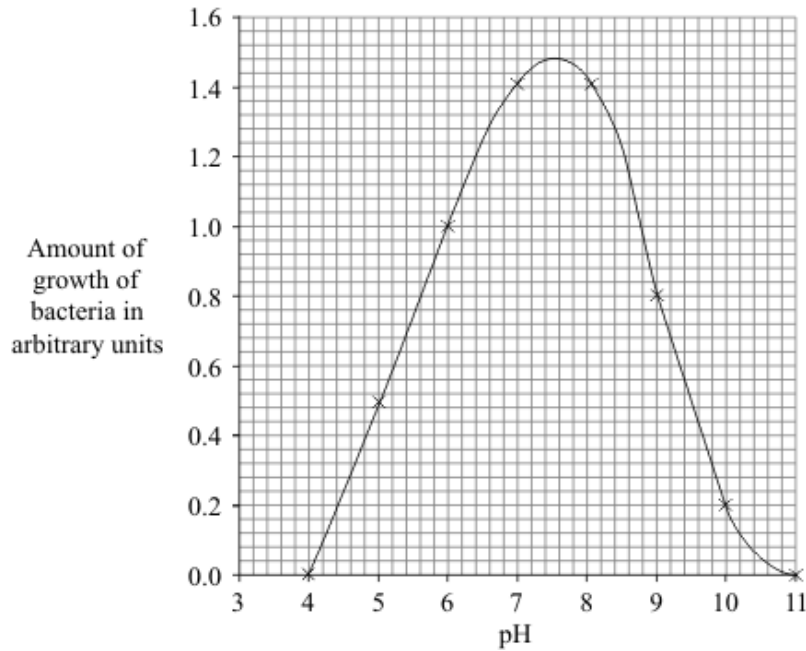
Suggest **two** conditions which should have been kept constant for all eight flasks.

1

2

(2)

- (c) The graph shows the results of the investigation.



The students wanted to find the best pH for the growth of this species of bacterium.

- (i) Use the graph to estimate the pH at which the bacteria would grow best.

pH

(1)

- (ii) What could the students do to find a more accurate value for the best pH for growth of the bacteria?

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(1)

(Total 6 marks)

Q11. Many strains of bacteria have developed resistance to antibiotics.

The table shows the number of people infected with a resistant strain of one species of bacterium in the UK.

Year	2004	2005	2006	2007	2008
Number of people infected with the resistant strain	3499	3553	3767	3809	4131

(a) Calculate the percentage increase in the number of people infected with the resistant strain between 2004 and 2008.

Show clearly how you work out your answer.

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Percentage increase =

(2)

(b) Explain, in terms of natural selection, why the number of people infected with the resistant strain of the bacterium is increasing.

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(3)

(Total 5 marks)

Q12. Influenza is caused by a virus.

(a) How do viruses cause illness?

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(1)

- (b) A British company making a reality television show in the Peruvian Amazon has been accused of starting an influenza epidemic. This epidemic allegedly killed four members of a remote Indian tribe and left others seriously ill.

The members of the television crew did not show symptoms of influenza, but members of the Indian tribe died from the disease.

Suggest an explanation for this.

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(3)
(Total 4 marks)

M1. (a) shape of antibody is not complementary;
accept shapes of antibody and antigen do not match or antibody does not correspond to antigen Y or is not the same shape as antigen Y or antibody different shape 1

so unable to attach or join to antigen Y
accept they do not fit 1

(b) (i) antibodies in blood or in skin or in body;
accept already have the antibodies 1

react with (injected) antigens or bacteria;
accept skin affected by antigen-antibody complex or blood vessels in skin enlarge or dilate
do not accept attack instead of react 1

(ii) any **three** from
bacteria weak so do not cause disease
accept not harmful
do not accept bacteria are dead
cause antibody production;
memory cells remain;
accept a suitable description
so body can quickly produce more antibodies in a real infection;
accept antibodies remain in blood or in body 3

[7]

M2. mutation or description of mutation (gives resistance to penicillin) 1

some survive (penicillin) 1

(survivors) reproduce **or** multiply 1

asexual reproduction **or** binary fission **or** cloning
accept mitosis 1

gene for resistance **or** the mutation is passed on (to offspring)
allow reference to bacteria being immune
ignore reference to survival of fittest 1

[5]

M3. (a) droplet infection **or** aerosol infection
do not accept airborne
accept airborne droplets 1

(b) so there is no large group which could catch the infection/pass on the infection
converse – if large numbers can't pass it on the virus is less likely to reach those few who are susceptible 1

(c) (i) any **four** of the following points:-
example of a 3 mark answer: Lymphocytes produce specific antibodies.....
 comment on specificity applied to antibodies or lymphocytes
 (recognition by) lymphocytes;
 (white cells) make antibodies;
 antibodies destroy/neutralise the virus/antigen/protein subunit;
do not accept antibodies KILL viruses
accept white blood cells replicate
accept some white cells form memory cells/live a long time;
accept subsequent infection results in very rapid antibody production; max 4

(ii) active; 1

(d) any **three** of the following points

Structure change in:

protein for binding to host cell;

accept changes in surface proteins (of protein coat)

spike containing enzyme;

changes in antigen

Fit: existing/circulating/old antibodies don't match new virus strain shape/new antigen/new binding protein;

Wrong antibodies: injection does not stimulate antibodies against all strains/different antigens;

accept wrong antibodies for 1 mark

max 3

[10]

M4. (a) engulf bacteria
produce antibodies
produce antitoxins
effect of antibodies/antitoxins
for 1 mark each

4

(b) method must be related to disease
dead/weakened microbes (as appropriate)
stimulate antibody production
antibody production rapid if microbe enters again
for 1 mark each

3

[7]

M5. (a) (i) any **one** from:

- (produce) toxins / poisons
- (cause) damage to cells
kill / destroy cells
allow kills white blood cells

1

(ii) produce antitoxins

1

engulf / ingest / digest pathogens / viruses / bacteria / microorganisms
accept phagocytosis or description
ignore eat / consume / absorb for engulf
ignore references to memory cells

1

(b)	(i)	<p>dead / inactive / weakened <i>accept idea of antigen / protein</i></p>	1	
		<p>(measles) pathogen / virus <i>ignore bacteria</i></p>	1	
	(ii)	<p>(after infection) <i>accept converse if clearly referring to before vaccination</i></p> <p>rise begins sooner / less lag time</p> <p>steeper / faster rise (in number)</p> <p>longer lasting or doesn't drop so quickly <i>idea of staying high for longer</i> <i>ignore reference to higher starting point</i></p>	1	
	(iii)	<p>antibodies are specific or needs different antibodies <i>accept antigens are different or white blood cells do not recognise virus</i></p>	1	
	(c)	<p>reduces <u>spread</u> of infection / less likely to get an epidemic <i>accept idea of eradicating measles</i></p>	1	
			[10]	
M6.	(a)	(i)	<p>viruses live inside cells</p> <p>viruses inaccessible to antibiotic <i>allow drug / antibiotic (if used)</i> <i>would (have to) kill cell</i></p>	1
		(ii)	<p>any two from eg</p> <ul style="list-style-type: none"> • non-resistant strains killed (by antibiotics) • so less competition • overuse of antibiotics / antibiotics prescribed for mild infections <i>if no marks gained allow one mark for 'people do not finish course of antibiotics'</i> 	2
	(b)	<p>(stimulate) antibody production <i>ignore antitoxin</i></p>	1	

(by) white cells

1

rapidly produce antibody on re-infection

ignore antibodies remain in blood

1

[7]

M7. (a) any **three** from:

- vaccine is inactive / dead form of (pathogen)
allow antigens
- stimulates antibody production
- stimulates antitoxin production
- by white cells
- antibodies kill (pathogen)
- antitoxins neutralise poisons
- antibodies quickly produced on reinfection
ignore antibodies remain in blood
- reference to ingestion by white cells

3

(b) (i) (no)

any **two** from

- sample size small / only 12
- conclusion based on hearsay from parents
- only 8 parents linked autism to MMR
- no control used

2

(ii) (yes)
being paid by parents / lawyers

1

[6]

- M8.** (a) any **two** from
- live inside / infect body cells
 - difficult for drugs to enter (body) cells / drug would kill (body) cell
 - antibiotics ineffective against viruses
 - viruses mutate **frequently**
- 2

- (b) (i) 420
- correct answer with **or** without working*
*if answer incorrect evidence of 'number of deaths' × 7 **or** 60 seen*
gains 1 mark
ignore 6 000 000
- 2

- (ii) any **three** from:
- virus / flu mutates
 - people no longer / not immune
ignore resistance
 - white blood cells / memory cells / immune system do not recognise virus
 - relevant reference to antibodies / antigens
 - current vaccine ineffective **or** no vaccine available then
or takes time to develop new vaccine
allow no tamiflu / anti-viral drugs
 - conditions less hygienic / lack of hygiene
 - people in poor health (following world wars)
allow people had 'weak' immune system
- 3

[7]

- M9.** (a) dead or inactive or weak form of pathogen / bacterium / virus / microorganism introduced
- ignore disease / germ*
- 1

- (stimulates) white cells / lymphocytes / leucocytes
- accept B and T cells*
ignore phagocytes
- 1

- to produce antibodies
- ignore antitoxins / antigens*
- 1

antibodies made quickly on re-infection / idea of memory cells

ignore already has antibodies

ignore 'body remembers'

1

(b) (i) alters / causes chemical processes / body chemistry

ignore craving / withdrawal symptoms

1

(ii) any **two** from:

- combined molecule / vaccine stimulates antibody production
- if nicotine taken, antibodies bind to nicotine molecules
ignore destroys nicotine
- making them too large to get to brain / making them ineffective
allow prevents nicotine entering brain

2

[7]

M10. (a) any **two** from:

- sterilise / kill microorganisms
ignore 'cleaning' / 'disinfect'
ignore 'germs'
- method of sterilisation eg apparatus / media sterilised in oven / autoclave
allow pressure cooker / boiling water
- pass flask mouth / pipette tip / loop / test tube mouth through flame
- work near a flame
- minimise opening of flask / test tube **or** hold non-vertical
*allow idea of sealing / covering **or** prevent entry of air*

2

(b) any **two** from:

- temperature
ignore references to time / type of bacterium
- concentration / amount of nutrients / ions
- type of nutrient
- volume / amount of solution
- amount of bacteria added
- agitation **or** amount of oxygen

2

- (c) (i) 7.5
accept in range 7.4 – 7.6 1
- (ii) use more pH values around / close to pH 7.5 / between 7 and 8 1

[6]

- M11.** (a) 18.06 / 18 / 18.1
correct answer gains 2 marks
if answer incorrect evidence of
 $(4131 - 3499) \div 3499 \times 100$
or $632 \div 3499 \times 100$
or $((4131 \div 3499) \times 100) - 100$
or 0.18
gains 1 mark 2

- (b) antibiotics kill non-resistant strain
or resistant strain bacteria survive
accept resistant strain the successful competitor
*do **not** accept intentional adaptation*
ignore strongest / fittest survive
ignore mutation
ignore people do not finish antibiotic course 1

resistant strain bacteria reproduce
or resistant strain bacteria pass on genes 1

population of resistant strain increases **or** proportion of resistant bacteria increases
allow high numbers of resistant bacteria

or
 people more likely to be infected by resistant strain (than non-resistant strain) 1

[5]

- M12.** (a) produces toxins / damage cells / reproduce rapidly **or** reproduce in cells
ignore invade cells 1

(b) any **three** from:

- TV crew immune / Indians not immune / Indians have weak(er) immune system
ignore resistant
- TV crew had / produced antibodies / Indians had no antibodies **or** antibody production faster in TV crew
- TV crew had previous exposure to flu / had been vaccinated
or
Indian tribe had no previous exposure to flu / had not been vaccinated
allow immunised
- Indians caught disease from TV crew
or
TV crew were carriers (of the virus)

3

[4]

