Answer	Key
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9.1	What is meant by the term communicable disease?	A communicable disease is caused by viruses, bacteria, protists and fungi, which are spread in animals and plants.
9.2	Name 4 ways that a pathogen can be transmitted and then prevented,	Transmitted :Through air, through water, direct contact (e.g. STD's), vectors. Prevented : Handwashing, safer sex practices, vaccination, eradication of vectors.
9.3	State 4 types of pathogens.	Viruses, bacteria, protists, fungi
9.4	How does bacteria make you ill?	Bacteria may produce poisons (toxins) that damage tissues and make us feel ill.
9.5	Why might viruses cause you more damage?	Viruses live and reproduce inside cells, causing cell damage.
9.7	What does a vaccine contain and how does it work?	A small quantity of dead or inactive forms of a pathogen. It stimulates the white blood cells to produce antibodies. If the same pathogen re- enters the body the white blood cells respond quickly to produce more of the correct antibodies quickly, preventing infection.
9.8.	What is herd immunity?	The majority of the population is vaccinated against serious diseases, which can reduce the chance of people coming into contact with specific pathogens.
9.9	How do antibodies work?	Destroys pathogens.
9.10	How are drugs tested ?	<ol> <li>Preclinical testing is done in a laboratory using cells, tissues and live animals.</li> <li>Clinical trials use small numbers of healthy volunteers and patients. Very low doses of the drug are given at the start of the clinical trial.</li> <li>If the drug is found to be safe, further clinical trials on larger groups of healthy volunteers and patients are carried out to find the optimum dose for the drug.</li> </ol>
9.11	What is meant by a double blind trial?	In double blind trails, some patients given a placebo. Neither the doctor nor patient know whether they have been given a placebo in order to reduce potential bias.
9.12	What is a placebo?	A substance that has no therapeutic effect, used as a control in testing new drugs.

## Section 10 – Non Comunicable Disease

10.1	What is meant by the term non communicable disease?	Diseases that develop and are not transferred between people and other organisms
10.2	Name 3 examples of a non- communicable disease.	Cancer, Diabetes, genetic diseases and Conditions, heart disease, neurological disorders
10.3	What is a risk factor?	Something that can increase the chances of developing a non-communicable disease
10.4	State 3 risk factors.	Lifestyle, diet, stress, situations that may occur in a person's life (trauma)
10.5	What is cancer?	Change in cells that leads to uncontrolled growth and cell division,causing a tumour to develop
10.6	Name 2 types of tumours	Benign and malignant
10.7	. What is a correlation?	A relationship between 2 sets data, such that when one changes you would expect the other one to change.
10.8	State 3 different effects of smoking	Cancers, heart disease, COPD/pulmonary disease, diabetes, increased chances of blood clot or stroke, addiction, narrowing of arteries, pneumonia, emphysema and discolouration of the skin.
10.9	State the long-term effects of alcohol abuse.	High blood pressure, stroke, pancreatitis, liver disease, liver cancer, mouth cancer, depression, dementia, sexual problems, infertility
10.10	What are the short-term effects of alcohol?	Increased heart rate, dilation of blood vessels, effects the brain (judgement, co-ordination and decision making), blurred vision, slower reaction time, slurred speech, dehydration and vomiting
10.11	State the potential effects of obesity.	Type II diabetes, coronary heart disease, cancer, stroke, depression and low self- esteem.

1.	What is an antigen?	Proteins on cell surface for cell recognition.
2.	What is a toxin?	A chemical produced by a bacteria which damages tissues and makes us feel ill.
3.	What drugs must patients who receive a transplant take? Why?	Immunosuppressant drugs to prevent rejection
4.	What is phagocytosis?	When a phagocyte (WBC) detects a pathogen, binds to it, then engulfs it. Enzymes then break down the pathogen.
5.	What is the purpose of a memory cell?	Remember the same pathogen for faster antibody production, if a person is exposed to it agiain
6.	Why is the secondary response quicker that the primary immune response?	Memory cells already know what antibodies to make to destroy the pathogen. This is done in much quicker time than when you encounter the pathogen.
7.	What are antibodies?	A protein produced in response to a specific antigen.
8.	What pathogen do antibiotics treat?	Bacteria
9.	How might an antibiotic be useless against bacteria?	The bacteria may be resistant to the antibiotic.

# Section – Monoclonal Antibodies (Triple Content)

1.	How are monoclonal antibodies made?	From a single clone cell
2.	What do antibodies recognise?	Antigens
3.	What is the name given to the section of the antibody that does this?	The antigen binding site.
4.	What is a hybridoma?	The combination of a lymphocyte and a tumour cell
5.	Why are hybridoma cells created?	They have the ability to create the required antibody and divide rapidly.
6.	Once hybridoma is made what is then done with them?	Cloned to create many identical cells.
7.	How can antibodies be used ?	<ol> <li>For pregnancy tests/diagnosis</li> <li>Measurement/hormone/chemical/pathogen levels in the blood</li> <li>Research to identify specific molecules in cells or tissues by binding with fluorescent dyes</li> <li>Treatment of some diseases like cancer</li> </ol>
8.	Why is using monoclonal antibodies good in cancer treatment?	Bind specifically to the cancer cells and deliver the substances without harming the other body cells.
9.	What do monoclonal antibodies target in a pregnancy test?	The hormones HGC produced in early pregnancy
10.	State an advantage of using monoclonal antibodies.	Cheaper to develop than conventional drugs, side effects can be treated and reduced, used in different ways, bind to specific cell.
11.	State a disadvantage of using monoclonal antibodies.	More side effects that expected, expensive, difficult to get the right antibodies to attach.

# Section – Plant Disease and Defence (Triple Content)

1.	Name 3 ways of visually detecting plant disease.	Stunted growth; spot on leaves; areas of decay (rot); growth on part of the plant; malformed stems or leaves; discolouration; the presence of pests.
2.	Name 3 ways to identify plant disease.	<ol> <li>Look symptoms up in a gardening manual or website</li> <li>Taking the infected plant to a laboratory</li> <li>Using a testing kit that contains monoclonal antibodies</li> </ol>
3.	Name 4 causes of plant disease.	Viruses; bacteria; fungi; insects
4.	How do aphids damage plants?	Pierce stems with their mouthparts to drink sugary liquid in phloem, introduce pathogens and deprive plants of sugars
5.	Name 2 problems caused by a lack of ions	Stunted growth caused by nitrate deficiency AND lack of chlorophyll caused by magnesium deficiency.
6.	Why does lack of nitrate ions affect plant growth?	Nitrate ions are used to make proteins
7.	Why does a lack of magnesium ions affect plant growth?	Magnesium ions are used to make chlorophyll so plant cannot photosynthesise to build glucose to be used in respiration that release energy to build new molecules for growth.
8.	Name 3 <b>physical defences</b> of plants.	Cellulose cell walls, tough waxy cuticle on leaves, layers of dead cells around stems (bark on trees) that fall off
9.	Name 2 chemical defences of plants	Antibacterial chemicals, poisons to deter herbivores
10.	Name 3 mechanical defences of plants.	Thorns and hairs deter animals, leaves which droop or curl when touched, mimicry to trick animals
11.	How are magnesium ions used in a plant?	To help produce chlorophyll
12.	What is a symptom of magnesium deficiency?	Yellow leaves

## **Foundation Tier**

## Q1.

The MMR vaccine is used to protect against measles.

(a) Apart from measles, which **two** other diseases does the MMR vaccine protect against?

\_\_\_\_\_ and \_\_\_\_\_

#### (b) Read the information.

Measles is a dangerous disease caused by a virus. Normally, MMR vaccinations are given at 1 year old and again at 4 years old. Each vaccination is 90% effective in protecting against the measles virus.

In April 2013, there were 630 cases of measles in children aged 4 and over in a small area of the UK. Of these cases, 504 children had not been vaccinated against MMR at all and only a few had been given a second vaccination.

(i) Calculate the percentage of the children who caught measles in April 2013 who had **not** been vaccinated against MMR.

Percentage = \_\_\_\_\_

(ii) Suggest **one** advantage to the population as a whole of children having the second MMR vaccination.

(c) (i) What does a vaccine contain?

(1)

(2)

(1)

(1)

	(ii)	Explain how a vaccination prevents infection.
		(3)
(d)	(i)	Antibiotics can only be used to treat some infections.
		Explain why antibiotics cannot be used to treat measles.
	(ii)	(2) Why do antibiotics become less useful at treating an infection if the antibiotic is overused?
		(1) (Total 11 marks)
Q2. Mos	quitoe	s carry a pathogen that causes malaria.
(a)	Wha	t type of pathogen causes malaria?
	Tick	(✓) <b>one</b> box.
	A b	acterium
	A fu	ingus

A protist

Α	virus
<i>'</i> `	viiuo

Mosquito nets can help prevent the spread of malaria.

Table 1 shows the results of a study in one area of Africa.

#### Table 1

	Number of	Percentage o mal	of people with aria
Total number of people in the study	people who use mosquito nets when sleeping	Who use mosquito nets when sleeping	Who do NOT use mosquito nets when sleeping
476	426	1.2	40

A newspaper made the following statement:

'Study shows mosquito nets are scientifically proven to prevent malaria.'

- (b) Give **one** piece of evidence that supports the statement.
- (c) Suggest **one** reason why the statement may **not** be valid.

(1)

(1)

**Table 2** shows information about the number of deaths from malaria in the same area of Africa.

Table 2	
---------	--

Year	Number of deaths from malaria per 100 000 people
2005	161
2007	136
2009	114
2011	97
2013	94
2015	92

	Number of people per 100 000 =
Use yea	of mosquito nets has helped to reduce the number of deaths from malaria each r.
Sug	gest <b>one</b> other reason for the reduced number of deaths from malaria each year
Desc	cribe how the human body:
•	prevents pathogens from entering defends itself against pathogens inside the body.

## **Higher Tier**

### Q3.

Many plants have evolved defence mechanisms.

Figure 1 shows part of a gorse plant and part of a deadly nightshade plant.



(a) The gorse plant has evolved to have sharp thorns.

What type of defence response are thorns?



(c) The deadly nightshade plant has poisonous berries.

What type of defence response are poisonous berries?

(1)

(1)

(1)

(d) A scientist noticed that in one area the gorse plants had yellow leaves and had stunted growth.

One reason for yellow leaves and stunted growth is a deficiency of nitrate ions in the soil.

Explain two other possible reasons for the yellow leaves and stunted growth.

Do <b>not</b> refer to nitrate ions in your answer.
Reason 1
Explanation
Reason 2
Explanation

The gorse plant has nodules on its roots.

The nodules are part of the living root tissue.

Bacteria which convert nitrogen gas into soluble nitrate ions live in the nodule tissue.

Figure 2 shows the nodules on the roots.



Figure 2

(5)

Explain how the nodules	benefit the gorse plant.	
For many years drugs h	ave been extracted from plants.	
For many years drugs have been been been been been been been be	ave been extracted from plants. is chewed as a painkiller?	
For many years drugs ha Which plant material wa Tick (√) <b>one</b> box. Blackcurrant berries	ave been extracted from plants. Is chewed as a painkiller?	
For many years drugs ha Which plant material wa Tick (√) <b>one</b> box. Blackcurrant berries Foxglove leaves	ave been extracted from plants. Is chewed as a painkiller?	
For many years drugs ha Which plant material wa Tick (√) <b>one</b> box. Blackcurrant berries Foxglove leaves Rose petals	ave been extracted from plants. Is chewed as a painkiller?	

## Q4.

The body's immune system protects us from diseases.

Describe the different ways in which white blood cells protect us from infectious diseases.

(Total 4	marks)

### Q5.

A virus called RSV causes severe respiratory disease.

(a) Suggest **two** precautions that a person with RSV could take to reduce the spread of the virus to other people.

1			
2			

(b) One treatment for RSV uses monoclonal antibodies which can be injected into the patient.

Scientists can produce monoclonal antibodies using mice. The first step is to inject the virus into a mouse.

Describe the remaining steps in the procedure to produce monoclonal antibodies.

(c)	Describe how injecting a monoclonal antibody for RSV helps to treat a patient
	suffering with the disease.

A trial was carried out to assess the effectiveness of using monoclonal antibodies to treat patients with RSV.

Some patients were given a placebo.

(d) Why were some patients given a placebo?

A number of patients had to be admitted to hospital as they became so ill with RSV.

The results are shown in the table below.

Treatment received by patient	% of patients within each group admitted to hospital with RSV
Group <b>A</b> : Monoclonal antibody for RSV	4.8
Group <b>B</b> : Placebo	10.4

The trial involved 1 500 patients.

- Half of the patients (group **A**) were given the monoclonal antibodies.
- Half of the patients (group **B**) were given the placebo.

(1)

(2)

(3)

_	
_	
	Total number of patients admitted to hospital =
E	Evaluate how well the data in the table above supports the conclusion:
	'monoclonal antibodies are more effective at treating RSV than a placebo'.
_	
_	
-	

## Mark schemes

## Q1.

(a) mumps

*in either order rubella / German measles both needed for the mark ignore measles unqualified* 

1

2

(b) (i) 80(.0)

allow **1** mark for  $\frac{504}{630}$  or 0.8

(ii) less chance of epidemic / pandemic

#### or

		less chance of spread of disease / measles / mumps / rubella allow idea of herd immunity (increased protection for those who are not vaccinated)	
		ignore less chance of getting the disease <b>or</b> to eradicate the disease	1
(c)	(i)	dead / inactive pathogens / viruses / bacteria	
( )	()	allow antigens / proteins from pathogens / viruses / bacteria	
		ignore microorganisms	1
	(ii)	white blood cells produce antibodies	
	()		1
		antibodies produced rapidly (on re-infection) <b>or</b> response rapid (on re-infection)	
		allow ecf if antibodies incorrectly identified in first marking point	
			1
		these antibodies kill pathogens / viruses / bacteria	
		do <b>not</b> accept idea that original antibodies remain in blood and kill pathogens	
			1
(d)	(i)	antibiotics don't kill viruses	
		allow antibiotics only kill bacteria	1
		(because measles) virus / pathogen lives inside cells	
		allow antibiotics do not work inside cells <b>or</b> killing virus / pathogen would kill / damage cell	

	<ul> <li>(ii) (bacteria / pathogens) develop resistance (to antibiotic) ignore reference to immunity ignore viruses develop resistance</li> </ul>	1 [11]
_		
<b>Q2.</b> (a)	a protist	1
(b)	lower percentage of people with malaria when using (mosquito) nets allow converse if clearly describing people who do not use (mosquito) nets allow fewer people with malaria when using (mosquito) nets allow <b>only</b> 1.2% of people with malaria when using (mosquito) nets ignore reference to data from table unqualified do <b>not</b> accept incorrectly calculated figures	1
(c)	<ul> <li>any one from:</li> <li>some people who use (mosquito) nets have malaria allow people can get malaria when they are not sleeping</li> <li>data from only one area / part of Africa</li> <li>size of group too small or sample size too small or only 476 people allow correlation does not imply causation</li> <li>only 50 people did not use (mosquito) nets or uneven group sizes (nets vs. no nets)</li> <li>no other information about people considered allow examples of information not considered e.g. age, other medical issues such as sickle cell, whether taking anti- malarial medication, vaccination ignore ref to other factors unqualified</li> <li>people may have lied about using (mosquito) nets</li> </ul>	1
(d)	any value between 88 - 91 allow decimal values	1
(e)	<ul> <li>any one from:</li> <li>improved health care         <ul> <li>allow examples of improved health care</li> <li>such as more / cheaper / new</li> <li>treatments / vaccinations / antibiotics</li> </ul> </li> </ul>	

1

	<ul> <li>use of mosquito control methods allow descriptions such as spraying of insecticides / repellent or draining water holes or preventing mosquitoes from breeding</li> <li>changing behaviour to avoid being bitten (by mosquitoes) allow descriptions such as wear long clothing or avoid going out at dusk</li> </ul>	
		1
(f)	<b>Level 2:</b> Scientifically relevant facts, events or processes are identified and given in detail to form an accurate account.	4–6
	<b>Level 1:</b> Facts, events or processes are identified and simply stated but their relevance is not clear.	1-3
	No relevant content	0
	Indicative content	
	<ul> <li>prevents pathogens from entering skin</li> <li>tough / dry / dead outer layer</li> <li>skin acts as a <u>barrier</u></li> <li>sebum / oil on (surface of) skin</li> <li>sebum / oil repels pathogens</li> <li>scabs form over cuts or scabs form a barrier</li> <li>platelets are involved in forming clots / scab</li> </ul> stomach	
	<ul> <li>contains (hydrochloric) acid</li> <li>(HCl) kills bacteria</li> <li>in food or in swallowed mucus</li> </ul>	
	<ul> <li>eyes</li> <li>produce tears</li> <li>contains enzymes to kill bacteria</li> <li>tears are antiseptic</li> </ul>	
	<ul> <li>breathing system</li> <li>trachea / bronchi / nose produce mucus</li> </ul>	

- mucus is sticky
- (mucus) traps bacteria
- (mucus) carried away by cilia

### defends itself against pathogens inside the body

- immune system / white blood cells (WBCs)
- WBCs engulf pathogens
- antitoxins are produced
- (antitoxins) neutralise toxins / poisons (produced by pathogen)
- antibodies are produced
- (antibodies) help destroy pathogens
- memory cells (are formed)

• (memory cells give a) more rapid response if pathogen re-enters

[11]

1

1

1

a **level 2** response should refer to body defence **and** the immune system

### Q3.

(a) mechanical

allow physical allow structural

- (b) any **one** from:
  - to deter herbivores ignore to injure animals, unqualified allow to deter animals eating it do **not** accept to deter predators
  - to prevent animals damaging it
- (c) chemical
- (d) any **two** from :
  - lack of magnesium (ions) (1)

(so) not enough chlorophyll for (efficient) photosynthesis (1)

(so) not enough glucose to make proteins for growth **or** not enough glucose to release energy for growth (1)

allow (so) lack of chlorophyll produced causes yellow leaves (1), (so) not enough photosynthesis to produce glucose which is used to make proteins for growth (1)

infection by pathogen / bacteria / virus / fungus (1)
 allow correctly named pathogen
 allow has rose black spot / TMV

(so) leaves become discoloured / yellow so less photosynthesis(1)

allow other symptoms of named pathogens / disease

(so) not enough glucose to make proteins for growth **or** not enough glucose to release energy for growth (1) *award once only* 

• infected by aphids (1)

(which) remove sugars from phloem (1)

		(so) not enough glucose to make proteins for growth <b>or</b> not enough glucose to release energy for growth (1) <i>award once only</i>			
		• lack of (available) light (1)			
		(so) chlorophyll breaks down (1)			
		(so) not enough glucose to make proteins for growth <b>or</b> not enough glucose to release energy for growth (1)			
		award once only		5	
	(e)	(bacteria) obtain glucose / sugar (from the plant)		1	
		(glucose used) for respiration <b>or</b> (glucose used) for making other named substances			
		allow (glucose used) to release energy		1	
	(f)	(gorse plant) obtains nitrate (ions)		1	
		needed for amino acids / proteins			
		allow needed to make chlorophyll / DNA		1	
				1	
	(g)	willow bark		1	
				1	[13]
Q4	<b>.</b>				
	(wbo	c) ingest / digest pathogens / bacteria / viruses			
		allow eat germs			
		Ignore swallow germs			
		ignore ingest the disease			
		Ignore allack / kin the disease	1		
	(who	a) produce antibodice			
	(wbc	;) produce antibodies	1		
	(who	) produce antitoxins			
	(0000		1		
	any	one from:			
	•	(antibodies) destroy or kill pathogens / bacteria / viruses / germs ignore destroy / kill disease ignore attack / fight pathogens			
	•	(antitoxins) counteract / destroy / neutralise toxins / poisons			

#### *ignore attack / killing toxins*

• reasonable reference to memory cells **or** rapid production of antibodies upon re-infection

### Q5.

- (a) any **two** from:
  - regular hand washing
    - or
    - use hand sanitiser / alcohol gel
  - cover nose / mouth when coughing / sneezing
     allow wear a face mask
  - put used tissues (straight) in the bin
  - don't kiss uninfected people
    - allow isolate patient from others
    - or
    - don't share cutlery / cups / drinks with uninfected people
      - clean / disinfect / sterilise surfaces regularly ignore responses referring to infected people

2

1

[4]

- (b) any three from:
  - stimulate (mouse) lymphocytes to produce antibody
    - for marking points 1 and 2 lymphocyte must be used at least once
  - combine (mouse) lymphocyte with tumour cell or
    - (create a) hybridoma
  - clone (hybridoma) cell
  - (hybridoma) divides rapidly **and** produces the antibody
- 3

#### (c) any **two** from:

- (monoclonal) antibody binds to virus or antibody binds to antigen on surface of virus
- (monoclonal) antibody is complementary (in shape) / specific to antigen (on surface of virus)
- white blood cells / phagocytes kill / engulf the virus(es)

2

1

1

(d) as a control

#### or

to see / compare the effects of the treatment (vs. no treatment)

(e) (4.8 + 10.4) ÷ 2 ÷ 100 × 1500 or (4.8 ÷ 100 × 750) + (10.4 ÷ 100 × 750)

114

an answer of 114 scores 2 marks

(f)	(supports the conclusion because) over double the number / % of patients (in the trial) were hospitalised with the placebo (compared to MAB)	1	
	(does not support the conclusion because) no information on patients not hospitalised / still unwell at home or		
	other factors may have affected those admitted to hospital		
	allow correct named factor e.g. age / gender / other illness		
	or		
	don't know if it was a double blind trial	1	
			[12]

1