Mark schemes

1

(a) antibodies

allow antitoxins / memory cells

*do **not** allow antigens*

1

immune

ignore protection

allow resistant

1

(b) (i) fell

1

numerical qualification to zero / nothing / by 100%

allow stopped in 1995

1

(ii) (no)

ignore circle

1

% vaccination fell **or** when no vaccination

but autism numbers did not fall / stayed high / increased

or

'(yes) might support it if time lag between vaccination and autism symptoms' / 'time lag for diagnosis' (1)

6 year time lag quantified (1)

1

[6]

2 (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]

3 (a) (i) 12
*correct answer with **or** without working*
*if answer incorrect evidence of (number of deaths) × 6 **or** 2 seen gains **1** mark*

2

(ii) (ward 2)

more deaths / infections on ward 1

or

less deaths / infections on ward 2

1

(b) (i) **both** bars correctly plotted

ie plots in spaces between 2.8 and 3.2 ***and*** *0.8 and 1.2*

ignore width and shading

1

(ii) less deaths / infections

1

(iii) bacteria / germs / microbes / infection killed / washed off

accept less infections passed on

1

[6]

4 (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

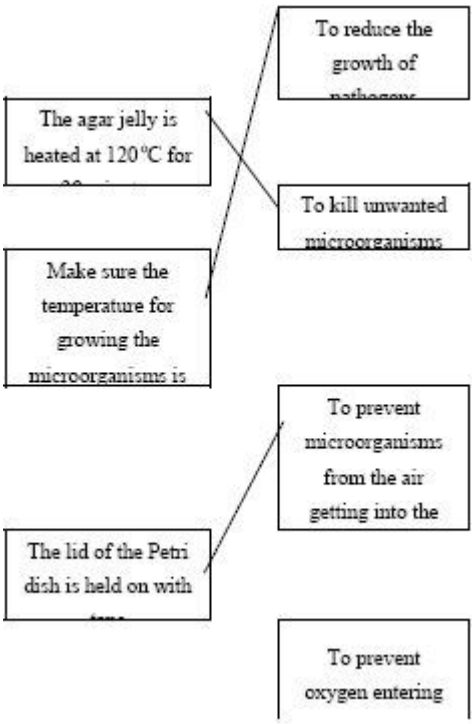
(ii) any **three** from:

- 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]

5 (a) **Liast A – Action** **List B – Effect**



1 *mark per correct line*
each extra line cancels ***1*** *mark*

3

(b) (i) dish 2 has (colonies of) microorganisms / bacteria / (but there are none in dish 1)

allow fungi / pathogens / microbes / germs
allow more microorganisms in dish 2

1

(ii) untreated milk contains <u>living</u> microorganisms

or

microorganisms killed by UHT

or

no <u>living</u> microorganisms in UHT milk

ignore microorganisms enter from the air

1

(iii) dish 3 was not opened

*do **not** allow no growth of microorganisms because of lack of air / oxygen*

or

it was sterilised

ignore microorganisms cannot enter from the air

or

nothing / no milk was added

1

[6]

6 (a) (i) lives inside cells

1

(ii) inactive

1

(iii) antibodies

1

(b) (i) 1950

1

(ii) 8 (years)

1

(iii) any **one** from: eg

- disease could be reintroduced (from abroad)
  disease might come back insufficient
- disease would spread if it came back
- protection on holiday abroad
- high proportion of immune people needed to prevent epidemic

1

[6]

7 (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

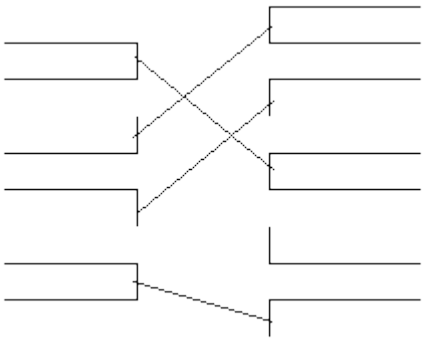
2

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

1

[6]

8



1 *mark for each line*

extra line from List A Action cancels the mark

[4]

9

(a) (i) antibiotic or named antibiotic

ignore antibodies

accept antiseptic

*do **not** accept disinfectant*

1

(ii) painkillers

accept named painkillers eg aspirin

1

(b) (i) 5.5 / 5 ½ weeks

1

(ii) rose gains **1** mark

rose, then fell then rose again gains **2** marks

a further **1** mark for **one** quantitative statement eg

- rose for 3 weeks / to 14–15 units
- dropped to 4 weeks / 9 units
- rose to 7 weeks / 64–65 units

3

(iii) (no)

level begins to fall / is falling (after 7 weeks)

1

[7]

10 (a) (bacteria) produce toxins / poisons

1

(viruses) damage / kills cells **or** toxins released from cell

1

(b) any **two** from:

- viruses live inside cells
- viruses inaccessible to drug
- drug would damage body cells / tissue

2

(c) any **four** from:

- overuse of antibiotics
- bacteria mutate

  *do **not** allow antibiotic causes mutation*
- antibiotics kill non-resistant strains **or** idea of selection
- reduced competition
- resistant bacteria reproduce

4

[8]

11 (a) antibodies

1

antitoxins

1

antibiotics

1

(b) any **two** from:

- measles
- mumps
- rubella / German measles

2

(c) less / low / no chance of getting named / all condition(s) if vaccinated

1

quantitative figure(s) e.g. 5 times less likely to get convulsions

must be comparative

1

(d) enzymes

1

genes

1

[9]

12 (a) any **two** from:

virus is neutral

- resistant to (most) antibiotics
- contagious **or** easily passed on **or** reference to open wounds
- patients ill therefore less able to combat disease

2

(b) (i) chloride of lime / hand washing killed bacteria (picked up from corpses)

allow disease / germs / infection / disinfectants

1

(ii) people to wash hands after contact with patient

1

so <u>bacteria</u> / <u>pathogen</u> / <u>MRSA</u> not transferred to other patient

1

[5]

13 (a) (i) 56

accept 54 – 58

1

(ii) increased

1

reasonable qualification eg slowly then more quickly

or

to 174 / 176

or

by 138 / 140

1

(b) any **two** from:

- no immunity **or** antibodies ineffective

  accept no resistance

- no vaccines **or** humans not immunised

- idea of large scale contact **or** large scale travel

  *do **not** accept passed on*

  ignore no cure

2

[5]

14 (a) (i) viruses live inside cells

1

viruses inaccessible to antibiotic

allow drug / antibiotic (if used) would (have to) kill cell

1

(ii) mutation

ignore mutation caused by antibiotic

1

natural selection **or** no longer recognised by antibiotics

accept description of natural selection

1

(b) (stimulate) antibody production

ignore antitoxin

1

(by) white cells

1

rapidly produce antibody on re-infection

ignore antibodies remain in blood

1

[7]

15 (a) dirty clothes/equipment/hands passed bacteria

allow bacteria from any sensible source e.g. surgeon, floor

OR

ease of entry of bacteria (during operations)

*do **not** accept germs*

1

(b) fewer died

1

indication of reduced number **or** proportion

e.g. 3000→ 600

down by 2400

20% of previous deaths

1

[3]

16 (i) kills / destroys bacteria **or**
prevents growth of bacteria

*do **not** allow germs*

*do **not** allow fights or gets rid of*

1

(ii) any **two** from:

bacteria may be resistant / immune (treatment futile)
or bacteria would not be killed

accept descriptions from table
accept "fights" here
do not accept people resistant

may select for resistant type

may cause increased incidence of resistance or Penicillin less effective in future

sore throat might be due to a virus – Penicillin would not work

2

[3]

17 (a) measles

ignore mumps

1

rubella

accept German measles

1

(b) viruses are 'dead'

accept other viral treatments
accept 'non-virulent'
mild' must be qualified
*do **not** accept 'small dose'*

1

(c) *The answer to this question requires good English in a sensible order with correct use of scientific terms. Quality of written communication should be considered in crediting points in the mark scheme.*

Maximum of 4 marks if ideas not well expressed

any **five** from:

contains antigens or proteins

accept reference to immunological memory or memory cells'

white cells (accept lymphocytes)

do not accept phagocytes

idea of specificity in antibodies or antigens

antibody <u>production</u>

ignore engulfing

antigens destroyed / virus destroyed

<u>rapid</u> antibody production if infected

max 5

(d) antibiotics do not kill / affect viruses

1

[9]

18 (a) (i) diagram shows extensions of intact cell membrane around viruses

1

(ii) antibodies

allow enzymes re (ii)
allow interferon
ignore antitoxins / proteins

1

(b) <u>virus</u> is transferred

1

(virus in) blood / body fluids – transfer (via needles)

1

[4]

19 (a) antibiotics diffuse / pass (into agar)

*do **not** allow into dish*

1

kill / prevent growth of bacteria or destroy cell wall / bacteria

accept bacteria are dead

1

(b) it / higher concentration kills more bacteria **or** causes less growth

*do **not** accept anything referring to size of circle*

1

levels off (at 6 units)

accept above 4 units

1

(c) **Quality of written communication**:
for correct sequencing or linking of ideas or points

this mark can only be awarded for a plausible attempt (not necessarily biologically correct) to link a precaution to a purpose

Q ✓ or Q ✗

1

Loop flamed

to sterilise it / kill unwanted microorganisms

*accept so no bacteria present do **not** accept to clean it*

1

Lid taped

prevent bacteria getting in / out **or** prevent someone touching bacteria

accept microorganisms/fungi for bacteria
*do **not** accept viruses or germs*

1

25°C

prevents / reduces growth of / reproduction

1

harmful bacteria / microorganisms or pathogens

1

(d) any **two** from:

- to avoid over-use of antibiotics **or** use no / less / low concentration antibiotics
- select antibiotic that is most effective
- finish the course
- don't give or use for animals
- develop new antibiotics **or** alternatives

2

[11]

20 (a) decrease in number of deaths (after vaccination started)

1

(b) <u>in correct sequence</u>:

bacteria

1

white blood cells

1

antibodies

1

[4]

21 **Quality of written communication**

*for correct use of at least **two** scientific terms eg mutation, resistant (**not** just 'antibiotic-resistant', **not** 'immune') / selection / natural selection / survival / reproduction / gene / allele / DNA*

1

any **two** from:

mutation occurs in bacteria or change in DNA / gene occurs

cancel if mutation 'caused by' antibiotic

(when antibiotic used) only resistant bacteria survive **or** non-resistant bacteria are killed **or** reference to 'natural selection'

resistant bacteria pass on the gene / allele

allow pass on the mutation
*do **not** accept just 'pass on resistance'*

2

[3]

22 (a) measles mumps rubella / German measles

any order

1

(b) **Quality of written communication**:

*for giving at least **two** statements linked to vaccination*

1

any **four** from:

*NB max **3** marks for only one side of argument*
*do **not** accept economic argument*

a valid reference to pain

eg pain of vaccination / disease

should

protect against diseases

measles / mumps / rubella are dangerous diseases / can cause lasting harm / death

cannot be treated by antibiotics

problem of epidemics

should not

may suffer autism / damage to mental / social development

may suffer large intestine disorders

separate vaccines available that cause no / less problems

4

[6]

23 (i) the loop is sterilised

accept to kill anything on the loop

or

to kill any bacteria on it;

do not credit to clean the loop

1

(ii) if hot it would kill bacteria picked up (from culture);

accept 'microorganisms' or 'microbes'
accept entry of contaminated air but reject entry of air unqualified

1

(iii) to prevent entry (from the air) of unwanted bacteria or bacterial spores or fungal spores;

accept so can't breath on it
accept 'microorganisms' or 'microbes'

1

(iv) so that the (petri) dish is not opened
(after bacteria are cultured)
or to reduce evaporation
or drying of the agar,

accept 'microorganisms' or 'microbes'

accept to prevent anything relevant getting in/out

reject references to spillage

1

[4]

24 (a) antibodies;

if incorrect term used then penalise in (a) then regard as continuous error for rest of question

1

(b) antibodies remain (for several years)
or are not removed

*accept last a long time **or** not destroyed*
***or** continues to make antibodies*
***or** causes increased number of antibodies **or** more antibodies*
***or** stays in body **or** person has made own antibodies*
***or** if memory cells named must link to antibody production*

1

(c) antibodies removed (from blood);

*accept destroyed **or** unable to make **or** replace antibodies **or** they are not human antibodies **or** person has not made own antibodies*

1

(d) so more antibodies made;

*accept so enough antibodies made **or** so correct amount of antibodies present **or** to keep antibodies high **or** so body keeps making antibodies*

1

(e) any **two** from

already has tetanus bacteria in body;

*accept could boost infection **or** make it worse*

would take too long **or**
a long time for antibodies to be made;

accept too slow forming antibodies
***or** cannot form correct amount of antibodies*

disease would have effect before
antibodies made;

accept antibodies are specific
***or** will work for one disease but not another*

2 max

(f) injection of ready made antibodies;

*accept does not have to wait for antibody formation **or** has large amount of antibodies quickly*
***or** has enough antibodies quickly*
***or** antibodies start working straight away*

1

[7]

25 (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) <u>antibodies</u> in blood or in skin or in body;

accept already have the antibodies

1

<u>react</u> with (injected) antigens or bacteria;

*accept skin affected by antigen-antibody complex **or** blood vessels <u>in skin</u> 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]

26 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]

27 (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]

28 blood clots to seal cuts;
kills microbes which enter

each for 1 mark
(allow higher level answers)

[2]

29 (i) 2 of:
ingest microbes;)allow higher level answers
produce antibodies;)allow cause and effect
produce antitoxins)eg antitoxins neutralise poisons = 2
each for 1 mark

2

(ii) injection of dead/weak microbes;
stimulates antibody production;
these can be produced again quickly on new infection
or remain for long time to 'combat' new infection
each for 1 mark

3

[5]

30 (a) use antibiotics; or named one to kill bacteria; (not microbes)
each for 1 mark

2

(b) some ingest/digest bacteria (not microbes) OWTTE
some produce antibodies;
which destroy bacteria/viruses;
some produce antitoxins;
which counteract poisons released by bacteria
each for 1 mark

5

[7]

31 (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]

32 (a) virus
bacteria (allow fungi, protozoa)

2

(b) reference to poisons/toxins produced by microbes

1

(c) 2 of e.g.
engulf microbes
produce antibodies
produce antitoxins

2

(d) dead/weakened microbes (relevant to named disease)
method e.g. injection/ swallowed (relevant to named disease)
body responds by producing antibodies

3

[8]

33 (a) lungs
for 1 mark

1

(b) microbes reproduce rapidly produce poisons
for 1 mark each

2

(c) viruses/fungi/protozoa
for 1 mark

1

(d) more likely to come into contact with infected people/more TB bacteria in air
for 1 mark

1

(e) white cells ingest bacteria
produce antibodies which destroy bacteria
produce antitoxins which counteract poisons produced by bacteria
for 1 mark each

3

[8]

34 (a) white cells ingest bacteria
produce antibodies which destroy bacteria
produce antitoxins which counteract poisons produced by bacteria
for 1 mark each

3

(b) dead/mild microbes
stimulate antibody production
white cells can quickly produce these again
for 1 mark each

3

(c) adds more bacteria (mild)
does not affect TB bacteria
for 1 mark each

2

[8]

35 (a) microbes entered body,
multiplied rapidly,
made poisons
any 2 for 1 mark each

2

(b) contact with infected people
for 1 mark

1

(c) the body kills the microbes
for 1 mark

1

[4]

36 (a) (i) white blood cells

for 1 mark

1

(ii) e.g. contact with infected person unhygienic conditions

for 1 mark each

2

(iii) broken down, by enzymes into amino acids

any 2 for 1 mark each

2

(b) reproduce rapidly produce toxins

for 1 mark each

2

(c) antibiotic or named

for 1 mark

1

(d) mild or deal microbes introduced white cells produce antibodies
which can destroy disease microbes
idea of memory cells
idea that injecting antibodies give immediate production

any 3 for 1 mark each

3

[11]

37 bacteria reproduce <u>rapidly</u> / increase <u>rapidly</u> in numbers produce poisons / toxins

each for 1 mark

2

[2]

38 bacteria reproduce <u>rapidly</u> / increase <u>rapidly</u> in numbers
produce poisons / toxins

each for 1 mark

[2]

39 (a) **Quality of written communication**

The answer to this question requires ideas in good English in a sensible order with correct use of scientific terms. Quality of written communication should be considered in crediting points in the mark scheme

idea of mutation ***or*** variation

*do **not** allow 'bacteria get used to antibiotics' **or** idea that antibiotics change the bacteria **or** 'bacteria become immune' **or** references to adaptation or evolution*

1

(resistant cells) survive antibiotic

1

(resistant cells) breed

1

(b) **EITHER** (yes)

keep animals disease free (1) so grow faster (1 mark) **or** live longer

OR (no)

resistant bacteria may develop (1)
risk to human **or** animal health (1)

allow bacteria become resistant / immune

2

[5]