GCSE BIOLOGY AQA - COMBINED SCIENCE MARK SCHEME

B3 INFECTION & RESPONSE TEST 2
Mark schemes

(a) virus

allow viral
ignore communicable / airborne / microorganism / microbe
do not accept bacteria / bacterial / fungus / fungal / protist

(b) white blood cells

1

(c) 57

allow any answer in range 55−59

1

(d) 85

allow any answer in range 84−86

1

(e) children are less likely to come into contact with someone with the disease

more people will have the correct antibodies

1

(f) any two from:
• cost (to the NHS / government)
• money saved through not treating people with chickenpox
• how effective the vaccine is
• severity of the disease
• less effect of disease on people with weaker immune systems / elderly / HIV or on unborn babies

2

(a) (i) small amounts of dead pathogens

1

(ii) decrease

by 60 (%)

allow from 70(%) to 10(%) 

allow other correct data treatment

1

(b) (i) penicillin

1
(ii) any two from:
• antibiotics only kill bacteria
  allow antibiotics do not kill viruses
• some bacteria are resistant (to antibiotics)
  allow MRSA not killed by antibiotics
• (correct) antibiotics not always used
  allow course not completed
• deficiency disease(s) not caused by bacteria or cannot be treated by antibiotics
• inherited disease(s) not caused by bacteria or cannot be treated by antibiotics
• ‘lifestyle’ diseases not caused by bacteria or cannot be treated by antibiotics eg heart disease / cancer
  if no other mark given allow 1 mark for not all diseases are caused by bacteria or some diseases are caused by viruses

(c) bacteria grow faster
  allow this is body temp (at which pathogens grow)
  1

  [7]

Level 3: Relevant points (advice / reasons) are identified, given in detail and logically linked to form a clear account.
  5–6

Level 2: Relevant points (advice / reasons) are identified, and there are attempts at logical linking. The resulting account is not fully clear.
  3–4

Level 1: Points are identified and stated simply, but their relevance is not clear and there is no attempt at logical linking.
  1–2

No relevant content
  0

Indicative content

precautions with reasons
• do not prescribe fluroquinolone / antibiotics for mild infections
  because they will get better due to the body’s normal immune system
• do not prescribe fluroquinolone / antibiotics for viral infections / colds / flu
  because antibiotics do not kill viruses
• if you do prescribe fluroquinolone / antibiotics make sure the patient finishes the course
  because any bacteria left may develop resistance, survive and reproduce rapidly (due to lack of competition)
• only prescribe fluroquinolone if the patient has the new strain
  because routine use would lead to an increase in resistant bacteria
other relevant content
• doctors and nurses in the practice / hospital should be using antibacterial / alcohol hand wash between each patient and/or disinfectant to clean wards
to kill (resistant) bacteria
doctors should isolate patients with this strain of bacteria
to prevent other patients getting the resistant infection

(a) ionising radiation
allow UV / X-rays / gamma (radiation)
allow environmental factors qualified e.g. carcinogenic chemicals

(b) enzymes

vectors

(c) Level 2: Scientifically relevant facts, events or processes are identified and given in detail to form an accurate account.

Level 1: Facts, events or processes are identified and simply stated but their relevance is not clear.

No relevant content

Indicative content

• pre-clinical trials of the new drug on cells / tissues / live animals
to test for toxicity / dosage / efficacy

clinical trials / tests on healthy volunteers
clinical trials / tests on children with Dravet syndrome at very low doses
so you can monitor for safety / side effects
and only after these stages trial to find optimum dosage / test for efficacy

trial could be double blind / use a placebo
which does not contain the new drug
children with Dravet syndrome would be randomly allocated to the test groups
so no one knows who has the drug / placebo
comparison to existing drugs

peer review of data
to help prevent false claims
approval by NICE

to access level 2 the key ideas of testing on healthy volunteers followed by testing on patients must be given
(a) any one from:

- not all deaths recorded
- not all causes of deaths recorded  
  
  allow cause may not be known

(b) antibiotics do not kill viruses  

  allow antibiotics only kill bacteria

(c) all correct for 2 marks

  1 or 2 correct for 1 mark

(d) any one from:

- to prevent false claims
- to make sure the conclusions are correct / valid
- to avoid bias

(e) some people would be immune to EVD  

  allow those vaccinated would not contract the disease

  if less people (in a population) have EVD less chance of it being passed on
(f) **Level 3 (5–6 marks):**
A detailed and coherent evaluation is provided which considers a range of arguments for and against the use of unlicensed drugs and comes to a conclusion consistent with the reasoning.

**Level 2 (3–4 marks):**
An attempt to give arguments for and against the use of unlicensed drugs is made. The logic may be inconsistent at times but builds towards a coherent argument.

**Level 1 (1–2 marks):**
Discrete relevant points made. The logic may be unclear and the conclusion, if present, may not be consistent with the reasoning.

**0 marks:**
No relevant content

**Indicative content**

**pros**
- might save some lives
- vaccine could reduce chance of future outbreaks
- patient made aware of risk and agreed to use of drug
- sharing of results could speed up development of effective vaccines / drugs
- used mainly for health workers who were risking their lives to help

**cons**
- could be dangerous
  or
  vaccine could harm a healthy person
- goes against legislation / laws governing drug development
- might set a precedent for other drugs not to be fully tested
- unfair as not available to the African people

a justified conclusion

6

(a) \[(1572189 \times 3467) / 100000\]

54 507.79263 or any correct rounding

54 508

*an answer of 54 508 scores 3 marks*

(b) to control for the different (group) population sizes

*allow so the different groups can be compared*
(c) thick yellow / green discharge from penis / vagina and pain on urinating

allow any two correct symptoms

(d) diameter of clear area

1

(e) $3.14 \times 8.5 \times 8.5$

227

allow 226.865 or any correct rounding for max 1 mark

an answer 227 scores 2 marks

(f) comment relating to data, eg higher concentrations did not show much improvement or $5 \text{ mg/dm}^3$ was much more successful at killing bacteria than at lower concentrations

comment relating to patient safety eg much less likely to cause toxic / side effects than at higher concentrations

1
**Level 3:** Relevant points (correct stages / reasons) are identified, given in detail and linked logically to form a clear account.

5-6

**Level 2:** Relevant points (correct stages / reasons) are identified and there are attempts at logical thinking. The resulting account is not fully clear.

3-4

**Level 1:** Points are identified and stated simply, but their relevance is not clear and there is no attempt at logical thinking.

1-2

No relevant content 0

**Indicative content**

names of stages are not required, but a logical progression through stages of testing is required for Levels 2 and 3.

**phase 1 clinical testing:**
- tested on healthy volunteers
- low doses used

**reason:**
- to test for side effects / toxicity / safety

**phase 2 clinical testing:**
- tested on patients
- patients given placebo or drug
- double blind trial

**reason:**
- to test for side effects / toxicity / safety
- to test its efficacy / effectiveness

**phase 3 clinical testing:**
- larger numbers of patients used
- patients given placebo or drug
- double blind trial

**reason:**
- to verify efficacy / effectiveness
- to determine correct dose

**prior to licensing:**
- analysis of results
- peer review

**reason:**
(a) any one from:

- not everyone would go to the doctor
  - allow not all cases recorded
  - allow only medically confirmed cases recorded
  - ignore some cases are unknown

- sample will not always be sent for analysis
- some cases not tested / diagnosed / confirmed
  - allow idea that doctor may make a judgemental error or mis-diagnosis

(b) \[
\frac{1939}{2030} \times 100
\]

allow for 1 mark:

\[
\left( \frac{91}{2030} \times 100 \right) = 4.5\%
\]

96 / 95.5

allow 2 marks for correct rounding of 95.51724138
allow 1 mark for correct calculation using incorrect subtraction only if working shown

an answer of 96 / 95.5 scores 2 marks
allow 1 mark only for 95 or other incorrect rounding

(c) most people are immune so do not become ill (from infection)

allow herd / community immunity so do not become ill (from infection)
allow most people are immune so do not become infected
ignore most people are immune so don’t get / catch it

less chance of non-immune / unvaccinated individuals being exposed to pathogen / measles / virus

reference to an organism is needed
allow ‘it’ for the measles virus
allow fewer people to pass it on to non-immune people
(d) **Level 3:** Relevant points (comparisons / reasons) are identified, given in detail and logically linked to form a clear account.

**Level 2:** Relevant points (comparisons / reasons) are identified and there are attempts at logical linking. The resulting account is not fully clear.

**Level 1:** Points are identified and stated simply, but their relevance is not clear and there is no attempt at logical linking.

**No relevant content**

**Indicative content**

**differences (after exposure to measles virus):**

- greater number / higher concentration of antibodies produced
- quantitative statement, e.g. 9 times higher or 0.8 to 7.2
- antibodies produced sooner – idea of immediate response
- antibodies produced quicker
- antibodies stay (in higher concentration) for longer

**explanation**

- white blood cells / leucocytes / lymphocytes / B cells
  ignore phagocytes / macrophages
- reference to previous exposure (of white blood cells) to pathogen / virus
- (white blood cells) recognise pathogen / virus / antigen
- memory cells
- production of specific / correct antibodies

(a) (i) dead / inactive / weakened

  allow antigen / protein
  ignore ref to other components
  ignore small amount

  pathogen / bacterium / virus / microorganism
  ignore germs / disease

(ii) **antigen / antibiotic instead of antibody = max 2**

  white blood cells produce / release antibodies
  accept lymphocytes / leucocytes / memory cells produce antibodies
  do not accept phagocytes

  antibodies produced quickly
(these) antibodies destroy the pathogen

allow kill
do not accept antibodies engulf pathogens

(b) (i) (live) bacteria still in body

ignore numbers

would reproduce

ignore mutation / growth

(ii) antibiotics / treatment ineffective or resistant pathogens survive

accept resistant out compete non-resistant

these reproduce

population of resistant pathogens increases

allow (resistant pathogens reproduce) rapidly

[10]