

# GCSE

BIOLOGY

AQA - COMBINED SCIENCE

MARK SCHEME

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B3

INFECTION & RESPONSE

TEST 2

## Mark schemes

1

(a) virus

*allow viral*

*ignore communicable / airborne / microorganism /  
microbe*

*do **not** accept bacteria / bacterial / fungus / fungal /  
protist*

1

(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

1

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

**[8]**

2

(a) (i) small amounts of dead pathogens

1

(ii) decrease

1

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*

2

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

1

[7]

3

**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 fluoroquinolone / antibiotics for mild infections
- because they will get better due to the body's normal immune system
- do not prescribe fluoroquinolone / antibiotics for viral infections / colds / flu
- because antibiotics do not kill viruses
- if you do prescribe fluoroquinolone / 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 fluoroquinolone 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

[6]

4

(a) ionising radiation

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

1

(b) enzymes

1

vectors

1

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

4-6

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

1-3

**No relevant content**

0

**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

[9]

5

(a) any **one** from:

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

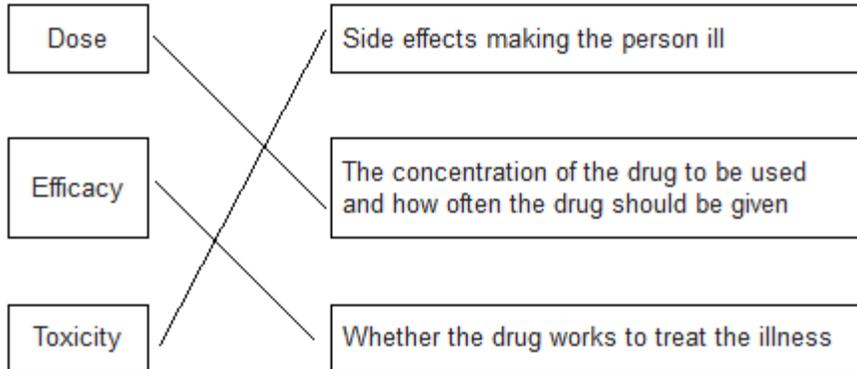
1

(b) antibiotics do not kill viruses

*allow antibiotics only kill bacteria*

1

(c)



*all correct for 2 marks*

*1 or 2 correct for 1 mark*

2

(d) any **one** from:

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

1

(e) some people would be immune to EVD

*allow those vaccinated would not contract the disease*

1

if less people (in a population) have EVD less chance of it being passed on

1

(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

[13]

6

(a)  $(1\,572\,189 \times 3\,467) / 100\,000$

1

54 507.79263 or any correct rounding

1

54 508

*an answer of 54 508 scores 3 marks*

1

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

*allow so the different groups can be compared*

1

- (c) thick yellow / green discharge from penis / vagina  
**and**  
pain on urinating

*allow any **two** correct symptoms*

1

- (d) diameter of clear area

1

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

1

227

*allow 226.865 or any correct rounding for max **1** mark*

*an answer 227 scores **2** marks*

1

- (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

1

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

1

(g)

<b>Level 3:</b> Relevant points (correct stages / reasons) are identified, given in detail and linked logically to form a clear account.	5-6
<b>Level 2:</b> Relevant points (correct stages / reasons) are identified and there are attempts at logical thinking. The resulting account is not fully clear.	3-4
<b>Level 1:</b> 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
<b>Indicative content</b> names of stages are not required, but a logical progression through stages of testing is required for Levels 2 and 3. <b>phase 1 clinical testing:</b> <ul style="list-style-type: none"><li>• tested on healthy volunteers</li><li>• low doses used</li></ul> <b>reason:</b> <ul style="list-style-type: none"><li>• to test for side effects / toxicity / safety</li></ul> <b>phase 2 clinical testing:</b> <ul style="list-style-type: none"><li>• tested on patients</li><li>• patients given placebo or drug</li><li>• double blind trial</li></ul> <b>reason:</b> <ul style="list-style-type: none"><li>• to test for side effects / toxicity / safety</li><li>• to test its efficacy / effectiveness</li></ul> <b>phase 3 clinical testing:</b> <ul style="list-style-type: none"><li>• larger numbers of patients used</li><li>• patients given placebo or drug</li><li>• double blind trial</li></ul> <b>reason:</b> <ul style="list-style-type: none"><li>• to verify efficacy / effectiveness</li><li>• to determine correct dose</li></ul> <b>prior to licensing:</b> <ul style="list-style-type: none"><li>• analysis of results</li><li>• peer review</li></ul> <b>reason:</b>	

<ul style="list-style-type: none"> <li>• to check results are valid</li> <li>• to avoid bias</li> </ul>	
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6  
[16]

7

(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*

1

(b)  $\frac{1939}{2030} \times 100$

*allow for 1 mark:*

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

1

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*

1

*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*

1

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*

1

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

5–6

**Level 2:** Relevant points (comparisons / 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**

**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

[11]

8

- (a) (i) dead / inactive / weakened  
*allow antigen / protein*  
*ignore ref to other components*  
*ignore small amount*

1

pathogen / bacterium / virus / microorganism  
*ignore germs / disease*

1

- (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*

1

antibodies produced quickly

1

(these) antibodies destroy the pathogen

*allow kill*

*do **not** accept antibodies engulf pathogens*

1

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

*ignore numbers*

1

would reproduce

*ignore mutation / growth*

1

(ii) antibiotics / treatment ineffective **or** resistant pathogens survive

*accept resistant out compete non-resistant*

1

these reproduce

1

population of resistant pathogens increases

*allow (resistant pathogens reproduce) rapidly*

1

**[10]**