Mark schemes

Q1.

(a) any **two** from:

mark as pairs

- *(effect)* muscle fatigue **or** oxygen debt occurs (1)

  allow muscle cramp ignore fatigue / cramp unqualified

  (reason) caused by (build-up of) lactic acid (1)

- *(effect)* (continued) heavy / deep / fast breathing (1)

  (reason) to provide the oxygen needed to break down (built-up) lactic acid (1)

  allow to repay the oxygen debt

- *(effect)* (continued) increased heart rate (1)

  (*reason)* to provide the oxygen needed to break down (built-up) lactic acid (1)

  allow to repay the oxygen debt

- *(effect)* fewer / weaker muscle <u>contract</u>ions (1)

  (reason) (because) less energy is released / available (1)

  *do **not** accept energy being produced / made / created*

4

(b) **Level 3:** The method would lead to the production of a valid outcome. The key steps are identified and logically sequenced.

5–6

Level 2: The method would not necessarily lead to a valid outcome. Most steps are identified, but the method is not fully logically sequenced.

3–4

Level 1: The method would not lead to a valid outcome. Some relevant steps are identified, but links are not made clear.

1–2

No relevant content

0

Indicative content

- test a group of athletes
- use at least two different types / intensities of exercise
- get each athlete to do all exercises **or** have a large (≥30) group doing each exercise

- record heart rate for each athlete before and after exercise **or** calculate increase in heart rate for each athlete after exercise
- calculate the mean increase in heart rates for each type / intensity of exercise
- compare mean increase in heart rates for each type / intensity of exercise

- control variables:
  - same (biological) sex **or** mix of sexes
  - same level of activity / exercise
  - same age
  - same caffeine / drug / medicine intake
  - same length of time for exercise
  - no health issues / illnesses
  - return to resting heart rate before each exercise

(c) (athlete is) faster / stronger

allow description of improved performance

allow reference to increased stamina / endurance

1

(because more muscle mass so) more / stronger muscle contractions

1

(d) hybridoma

1

(e) any **three** from:

- (cell) is cloned

  ignore name of cell

- many (identical) cells are produced

  allow many clones are produced

- all the cells make the same antibody

- the antibody is (collected and) purified

3

(f) a monoclonal antibody only binds to the anabolic steroid

1

(g) to show that the test is working

allow to prevent a false negative (result)

ignore to show there are free / remaining monoclonal antibodies

1

(h) *evidence*

no blue / visible dye (in control area)

allow no line(s) (in control area) allow no colour change (in control area)

1

reason

(because) no (free) monoclonal antibodies bound to control area

allow the (free) monoclonal antibodies did not move up the test strip

allow urine did not move up the test strip

1

or

(because) there were no (free) monoclonal antibodies on the end of the (test) strip

(i) D

1

[21]

Q2.

(a) any **one** from:

- sexual contact / intercourse

  allow intercourse unqualified

  ignore kissing

- exchange of body fluids

  *allow example of exchange such as (drug) users sharing needles **or** blood transfusion **or** passage from mother to foetus in uterus*

1

(b) (number of cases) in women decreases then increases, then decreases

1

(number of cases) in men increases then decreases

1

*allow **total** numbers (of men and women together) increase then decrease*

ignore reference to differences between men and women

*if no other marks awarded allow overall trend decreases in **both** for **1** mark*

ignore use of figures

(c) any **one** from:

- better education (into prevention of spread of HIV)

  allow increased awareness about HIV

- condoms more widely available **or** condoms easier to source **or** condoms cheaper

  ignore contraception / protection unqualified

- new / better drugs (to prevent HIV infection / spread)

  allow PrEP / anti-retrovirals stop the virus being passed on

  ignore new treatments

  *do **not** accept antibiotics*

- better / more testing / identification (of people with HIV)

  allow less promiscuity

  ignore vaccination

1

(d) $\frac{242}{1288}$

1

0.1878…

allow a rounded answer

1

0.188 (:1)

allow a correctly rounded answer from student's incorrect division using numbers from the table

*do **not** accept if a unit is given*

1

(e) any **one** from:

- calculate as a percentage
- give the numbers per 100 000 people

ignore calculate as a proportion allow any standard number eg 10 000 / 1000

1

(f) inactive HIV / virus is injected (into bloodstream / muscle / body)

allow dead HIV / virus is injected (into bloodstream / muscle / body)

allow (named) part of HIV / virus is injected (into bloodstream / muscle / body)

1

white bloods cells produce antibodies (against inactive virus)

allow lymphocytes produce antibodies (against inactive virus)

*do **not** accept phagocytes produce antibodies (against inactive virus)*

1

(if infected with HIV) correct / specific antibodies are produced quickly

1

antibodies destroy the (active) virus / HIV

allow antibodies 'kill' the (active) virus / HIV

1

ignore reference to WBC unqualified

(g) HIV / antigen / protein injected into mouse

1

extract / collect (mouse) lymphocytes that make a specific antibody to HIV / antigen / protein

1

allow other correct small mammals eg rat

*allow extract specific lymphocytes from someone with HIV for **2** marks*

lymphocytes are combined with tumour cell to create a hybridoma

allow lymphocytes are combined with a myeloma / cancer cell to create a hybridoma

1

(hybridoma) cloned to create many cells that produce the antibody

1

alternative route

HIV / antigen / protein injected into mouse (1)

lymphocytes from mouse are combined with a tumour cell to create a hybridoma (1)

the hybridoma that makes the specific / correct antibody is isolated (1)

(hybridoma) cloned to create many cells that produce the antibody (1)

(h) monoclonal antibody is complementary / specific to HIV antigen

allow correct description of complementarity

1

monoclonal antibodies attaches to (all the) HIV antigens

1

(so) HIV cannot bind to (human) cell
or
(so) HIV genetic material cannot enter (human) cell

*allow white blood cells **or** phagocytes identify (monoclonal) antibodies and engulf / destroy (antibody bound) HIV*

1

alternative route

monoclonal antibody is complementary / specific to HIV antigen (1)

monoclonal antibody with (anti-retroviral) drug attached attaches to the HIV antigens (1)

*drug destroys the virus **or** drug destroys genetic material (1)*

allow 'the virus' for HIV throughout

[19]