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]