Questions are for both separate science and combined science students unless indicated in the question

Q1.

This question is about exercise.

(a) During vigorous exercise, anaerobic respiration occurs in a person's body.

Explain **two** effects of anaerobic respiration on the person's body.

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2 _____

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(4)

(b) Design an investigation to show the effect of different types of exercise on the heart rate of athletes.

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(6)

Anabolic steroids are drugs.

Anabolic steroids:

- increase muscle mass in humans
- are banned in most competitive sports.

Some athletes take anabolic steroids to improve their performance in sport.

(c) Explain how taking anabolic steroids could improve an athlete's performance.

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(2)

Scientists use monoclonal antibodies to test for the presence of anabolic steroids in an athlete's urine.

To produce monoclonal antibodies, a mouse lymphocyte is combined with a tumour cell.

(d) What type of cell is created when a mouse lymphocyte and a tumour cell combine? **(biology only) (HT only)**

Tick (✓) **one** box.

Embryo ☐

Hybridoma ☐

Phagocyte ☐

Stem cell ☐

(1)

(e) Describe how scientists make monoclonal antibodies using the cell created when a mouse lymphocyte and a tumour cell combine. **(biology only) (HT only)**

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(3)

(f) What property makes a monoclonal antibody useful in detecting the presence of an anabolic steroid in urine? **(biology only) (HT only)**

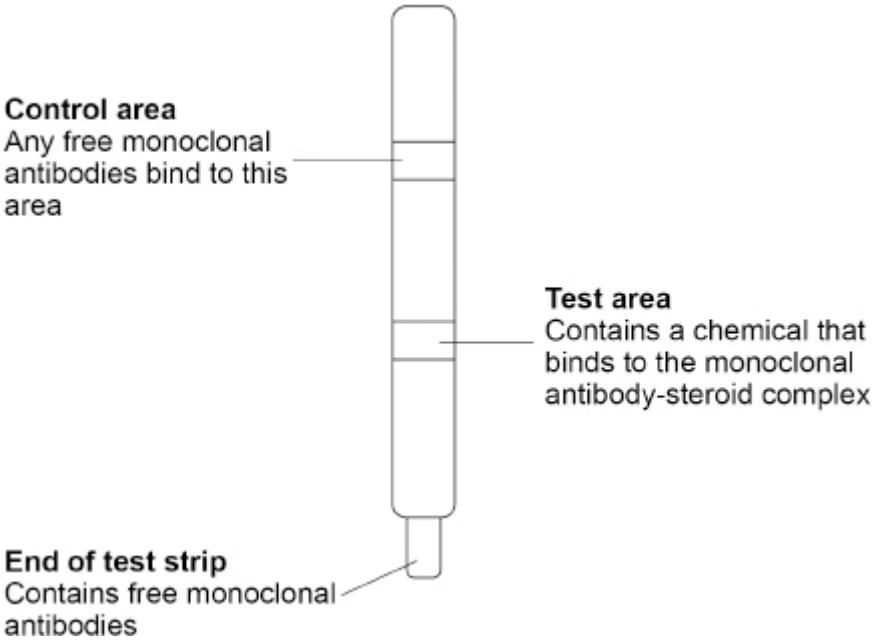
Tick (✓) **one** box.

A monoclonal antibody is quick and easy to produce.	☐
A monoclonal antibody is specific to only one person's urine.	☐
A monoclonal antibody only binds to the anabolic steroid.	☐
A monoclonal antibody can identify many different drugs at the same time.	☐

(1)

Figure 1 shows a test strip that can detect the presence of an anabolic steroid in an athlete's urine.

Figure 1



The end of the test strip is dipped in urine.

The urine moves up through the test strip.

The test area and the control area contain a dye.
The dye turns blue when monoclonal antibodies bind to it.

(g) Suggest the purpose of the control area in the test strip. **(biology only) (HT only)**

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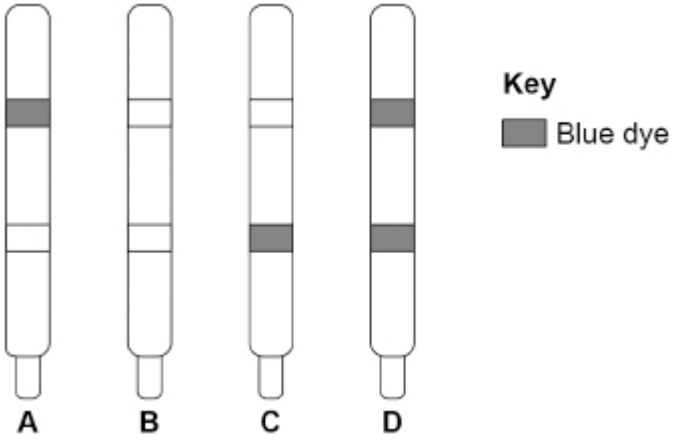
(1)

Figure 2 shows the urine test results of four athletes.

Figure 2



(h) Describe the evidence in **Figure 2** that shows the test for athlete **B** has **not** worked.

Suggest **one** reason why the test did **not** work. **(biology only) (HT only)**

Evidence _____

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Reason _____

_____

(2)

(i) Which athlete has tested positive for anabolic steroids in their urine? **(biology only) (HT only)**

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

(1)

(Total 21 marks)