Questions are for separate science science students only

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.

1 _____

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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)**

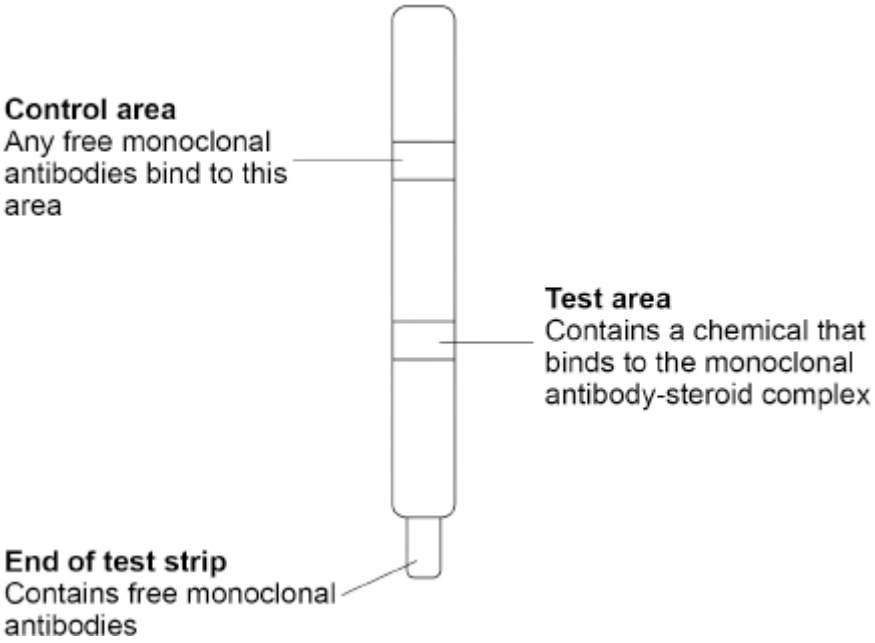
Tick (✓) **one** box.

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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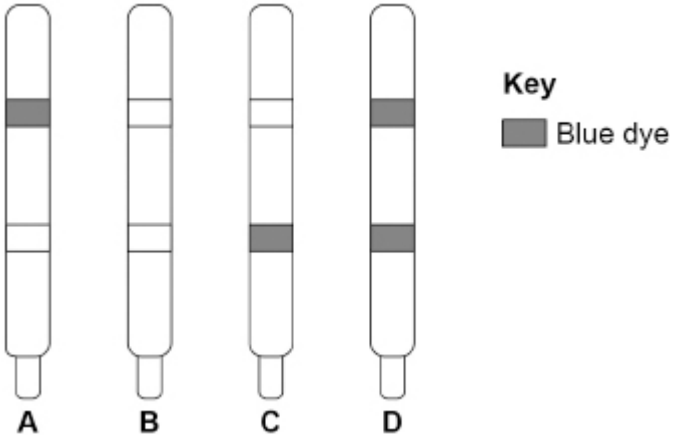
(1)

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 _____

_____

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)

Q2.

Human immunodeficiency virus (HIV) is a pathogen.

(a) Give **one** way HIV can spread from one person to another person.

_____

_____

(1)

The table below shows information about new cases of HIV diagnosed in the UK.

Year	Number of new HIV cases in women	Number of new HIV cases in men
2010	376	2266
2012	361	2310
2014	397	2370
2016	298	1886
2018	242	1288

(b) Describe the trends shown in the table above between 2010 and 2018.

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_____

(2)

(c) Suggest **one** reason for the change in the number of new HIV cases between 2014 and 2018.

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(1)

(d) Calculate the ratio of new cases of HIV in women to new cases of HIV in men in 2018.

Give your answer to 3 significant figures.

Ratio (3 significant figures) = _____ : 1

(3)

(e) In the UK population the total number of women is greater than the total number of men.

The data in the table in part (a) is used to compare the proportions of new cases of HIV in the population for men and women.

Suggest how the data could be presented differently so that a more valid comparison can be made.

(1)

Scientists have been working to produce a vaccine for HIV for many years.

(f) Explain how a vaccine for HIV could work to prevent a person developing HIV infection.

(4)

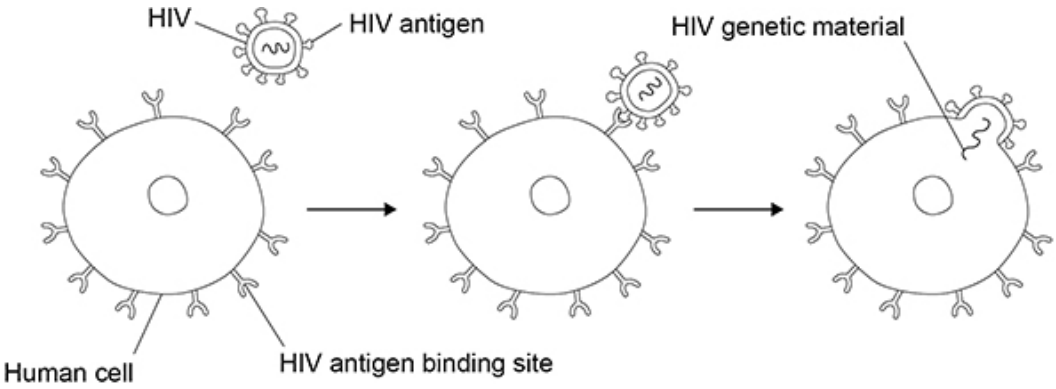
A person with late stage HIV infection has AIDS.

Scientists have produced monoclonal antibodies for HIV.
The monoclonal antibodies can prevent a person infected with HIV developing AIDS.

(g) Describe how the monoclonal antibody for HIV can be produced. **(biology only) (HT only)**

(4)

(h) The figure below shows how HIV enters a human cell.



Suggest how the monoclonal antibody for HIV helps to prevent a person infected with HIV developing AIDS.

Use information from the figure above. **(biology only) (HT only)**

(3)

(Total 19 marks)