Q1.

Monoclonal antibodies (mAbs) are usually made using mouse lymphocytes.

Candida albicans infection produces serious symptoms in patients with a poor immune system.
Recently scientists have produced mAbs to *Candida albicans* using human lymphocytes produced naturally after an infection.

(a) *Candida albicans* lives in the throat of infected patients.

A sample is taken from the throat of a patient with a suspected *Candida albicans* infection.
The sample is transferred onto a microscope slide.

Describe how the mAbs and a fluorescent dye could be used to see any *Candida albicans* pathogens on the slide.

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(3)

In a laboratory the human lymphocyte mAbs were injected into animals infected with *Candida albicans*.

The mAbs caused increased phagocytosis of the *Candida albicans* pathogens.

Doctors intend to start a trial to give the mAbs to patients severely ill with *Candida albicans.*

(b) Explain how increased phagocytosis of the *Candida albicans* pathogen will help the patient.

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(2)

(c) It has been shown that this mAbs treatment is effective in the laboratory using both:

- infected tissue culture cells
- infected live animals.

The mAbs treatment for *Candida albicans* is now ready for clinical trials on people.

Describe how the clinical trials should be carried out.

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(6)

(d) Scientists have also used human lymphocytes to make mAbs to other pathogens and to some types of cancer cells.

Suggest one reason why these new mAbs have been more successful in treating diseases in humans than mAbs made using mice.

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(1)

(Total 12 marks)

Q2.

A virus called RSV causes severe respiratory disease.

(a) Suggest two precautions that a person with RSV could take to reduce the spread of the virus to other people.

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(2)

(b) One treatment for RSV uses monoclonal antibodies which can be injected into the patient.

Scientists can produce monoclonal antibodies using mice.

The first step is to inject the virus into a mouse.

Describe the remaining steps in the procedure to produce monoclonal antibodies.

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(3)

(c) Describe how injecting a monoclonal antibody for RSV helps to treat a patient suffering with the disease.

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(2)

A trial was carried out to assess the effectiveness of using monoclonal antibodies to treat patients with RSV.

Some patients were given a placebo.

(d) Why were some patients given a placebo?

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(1)

A number of patients had to be admitted to hospital as they became so ill with RSV.

The results are shown in the table below.

Treatment received by patient	% of patients within each group admitted to hospital with RSV
Group A: Monoclonal antibody for RSV	4.8
Group B: Placebo	10.4

The trial involved 1 500 patients.

- Half of the patients (group A) were given the monoclonal antibodies.
- Half of the patients (group B) were given the placebo.

(e) Calculate the total number of patients admitted to hospital with RSV during the trial.

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Total number of patients admitted to hospital = _____

(2)

(f) Evaluate how well the data in the table above supports the conclusion:

'monoclonal antibodies are more effective at treating RSV than a placebo'.

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(2)

(Total 12 marks)

Q3.

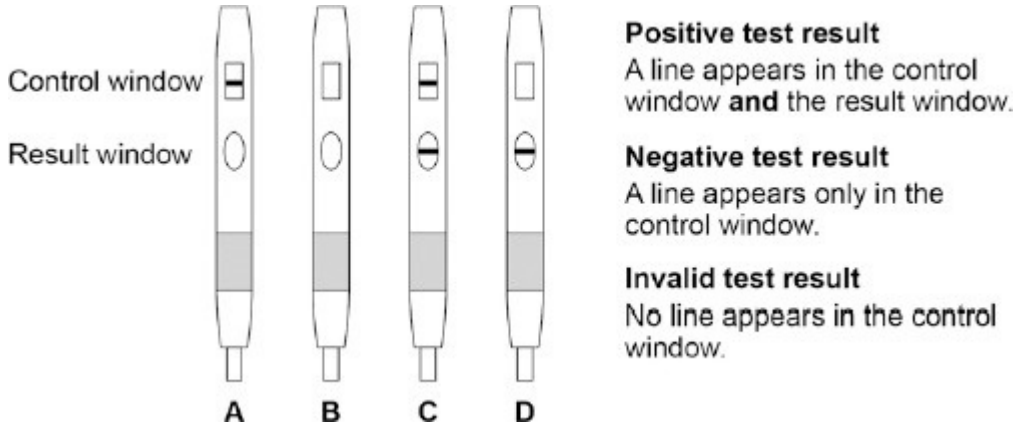
Monoclonal antibodies are used to measure the levels of hormones in the blood.

Pregnant women produce the hormone HCG.

HCG is excreted in urine.

Figure 1 shows four pregnancy test strips.

Figure 1



(a) Which test strip shows a negative test result?

Tick one box.

A ☐ B ☐ C ☐ D ☐

(1)

(b) Monoclonal antibodies are used for pregnancy testing.

Give one other use of monoclonal antibodies.

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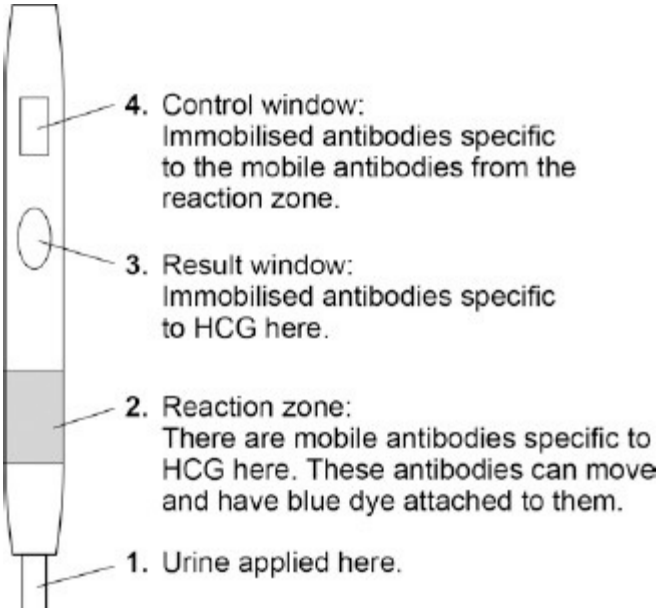
(1)

(c) Figure 2 shows the parts of a pregnancy test strip.

Figure 2



The pregnancy test strip will show a positive test result when a woman is pregnant.
Explain how the pregnancy test strip works to show a positive result.

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(6)
(Total 8 marks)