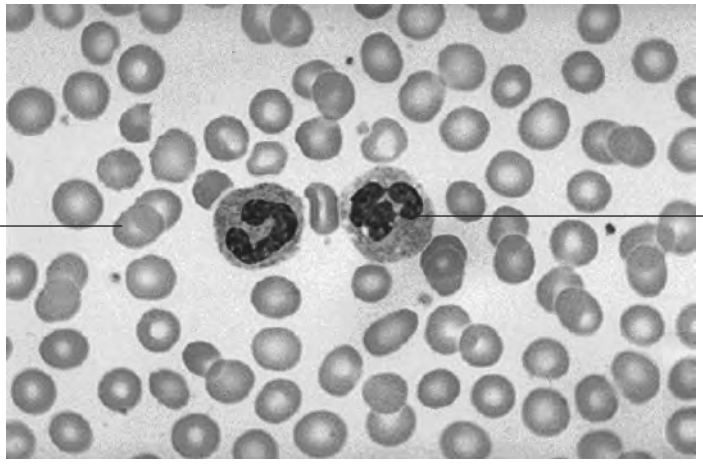
2 (a) The table below describes some features of the lymphocytes that are involved in the immune system.

Place a tick (✓) in the appropriate column to indicate whether the description is true or false.

(4)

Description	True	False
B and T cells are formed in the bone marrow		
B cells stimulate T cells to produce clones of memory cells		
T helper cells produce chemicals that destroy pathogens		
B and T cells are able to form clones by mitosis		

(b) A sample of blood was taken from a person with a bacterial infection.
The photograph below shows some of the cells in this blood sample.



Suggest **two** reasons why the bacteria that caused the infection are not visible in the photograph.

(2)

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(c) Suggest how a further sample of blood, taken a few days later, might differ from the one shown in the photograph, in each of the following circumstances. Give a reason for each answer.

(i) If the person is treated with antibiotic drugs.

(2)

(ii) If the person is given a placebo.

(2)

(Total for Question 2 = 10 marks)

3 The skin has an important role in protecting the body from infection by pathogenic bacteria. Human skin has a community of microorganisms, called the skin flora, living on it. Most of these microorganisms are harmless bacteria that feed on dead skin cells and secretions.

(a) (i) State **two** ways in which the skin flora can help to protect a person from infection by pathogenic bacteria.

(2)

1 .....

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2 .....

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(ii) Place a cross ☒ next to the part of the skin that forms a physical barrier against infection by pathogenic bacteria.

(1)

☒ **A** Epidermis

☒ **B** Erector pili

☒ **C** Malpighian layer

☒ **D** Sebaceous gland

(b) Influenza (flu) is caused by a virus.
Sometimes antibiotics are used as part of the treatment for a person with influenza.

Suggest why antibiotics may be used as part of the treatment for influenza.

(2)

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(c) The overuse of antibiotics is causing concern.
The table below shows the number of prescriptions for antibiotics per 10 000 population in the USA, given during treatment for influenza, from 2000 to 2006.

Year	Number of prescriptions per 10 000 population
2000	226
2002	164
2004	172
2006	142

(i) Calculate the overall percentage reduction in the number of prescriptions per 10 000 population in the USA from 2000 to 2006.
Show your working.

(2)

Answer ..... %

(ii) The target set by health authorities in the USA for the number of prescriptions per 10 000 population by 2012 is 128, an overall reduction of 43.4% since 2000.

Suggest whether this target will be achieved.
Give an explanation for your answer.

(3)

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(iii) Suggest why health authorities in the USA are encouraging the reduction in the number of prescriptions of antibiotics.

(2)

(Total for Question 3 = 12 marks)

4 Antibiotics are used to treat bacterial infections in eukaryotic organisms.

(a) The table below describes some of the structures that are found in cells. Complete the table by writing the name of each of the structures described and stating whether it is found in prokaryotic cells only **(P)**, eukaryotic cells only **(E)** or both types of cell **(B)**.

(3)

Description	Name of structure	P, E or B
Enclosed by outer smooth membrane; inner membrane folded forming cristae		
Long strand-like structure extending out from the cell; used for locomotion		
Small, circular loop of double-stranded DNA		

(b) Vancomycin is an antibiotic that kills bacterial cells by preventing the synthesis of peptidoglycan, a component of bacterial cell walls.

(i) State the term used to describe antibiotics, such as vancomycin, that kill bacterial cells.

(1)

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(ii) Suggest how bacterial cells are killed by vancomycin.

(2)

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(iii) Explain why doctors have been advised to limit the prescription of antibiotics.

(2)

(c) Describe how you could investigate the effect of different antibiotics on bacteria.

(4)

(Total for Question 4 = 12 marks)