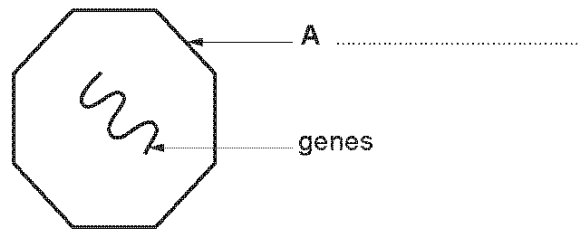


WJEC (Wales) Biology GCSE  
Topic 2.8 Disease, Defence and  
Treatment  
Questions by Topic

1. (b) (i) The diagram shows a virus. Complete label A. [1]



- (ii) How does a virus reproduce?  
Underline one answer from the three choices shown below. [1]

by budding;

by multiplying inside a host cell;

by dividing into two.

- 2.
- Sheep and cattle can be infected with a disease caused by the bluetongue virus.
  - The bluetongue virus is carried by biting insects called midges.
  - Midges can be killed by insecticides.
  - Researchers at Swansea University have discovered a fungus (*Metarhizium anisopliae*) that can kill midges under laboratory conditions.
  - In 2011 field trials began to investigate if midges can be controlled by the fungus.

- (a) (i) Describe the basic structure of a virus. [2]

.....

.....

.....

- (ii) Underline the most accurate statement below concerning the reproduction of viruses: [1]

Viruses only reproduce in

I dead cells

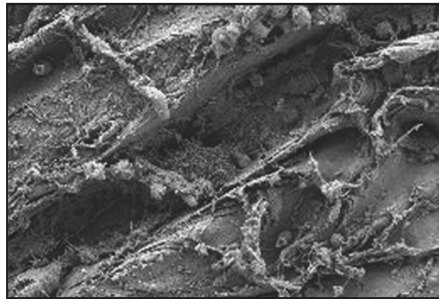
II animal cells

III living cells

IV plant cells

3.

Read the following information about pollution.



*Bacteria feeding on plastic*

The oceans of the world are accumulating large quantities of plastic which cause pollution. In 2001 the North Atlantic Ocean was estimated to have 800 tonnes of plastic. By 2011 the total was 1 100 tonnes.

Marine scientists have discovered bacteria which feed on the plastic and break it down. These bacteria belong to the genus *Vibrio*. Bacteria of this genus are usually pathogens.

Other scientists are worried that when bacteria break down plastic, they release harmful chemicals such as phthalates and organic toxins.

(a) Use this information to answer the following questions.

- (i) What is the evidence that plastic pollution in the North Atlantic Ocean is increasing? [1]

.....

- (ii) Calculate the change in the quantity of plastic, **per year** in the North Atlantic Ocean from 2001 to 2011. (Assume the rate of change is the same each year.) [2]

change in quantity of plastic ..... tonnes per year

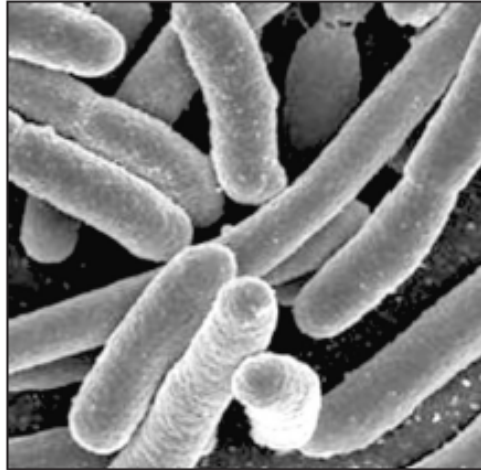
- (iii) I. Why would *Vibrio* bacteria be of possible use in reducing pollution? [1]

.....

- II. State why many *Vibrio* bacteria are dangerous to humans. [1]

.....

4. (a) The photograph shows bacteria called *E. coli*.



Bacteria such as *E. coli* can be pathogens.

- (i) State the meaning of the term *pathogen*. [1]

.....

- (ii) Describe **two** ways in which pathogens are spread from person to person. [2]

.....

.....

.....

.....

- (b) Bacterial infections may be treated by antibiotics.

- (i) State the name of **one** antibiotic. [1]

.....

- (ii) Which **one** of the following results from the over use of antibiotics?  
Underline the correct answer. [1]

People become immune to antibiotics

People become resistant to antibiotics

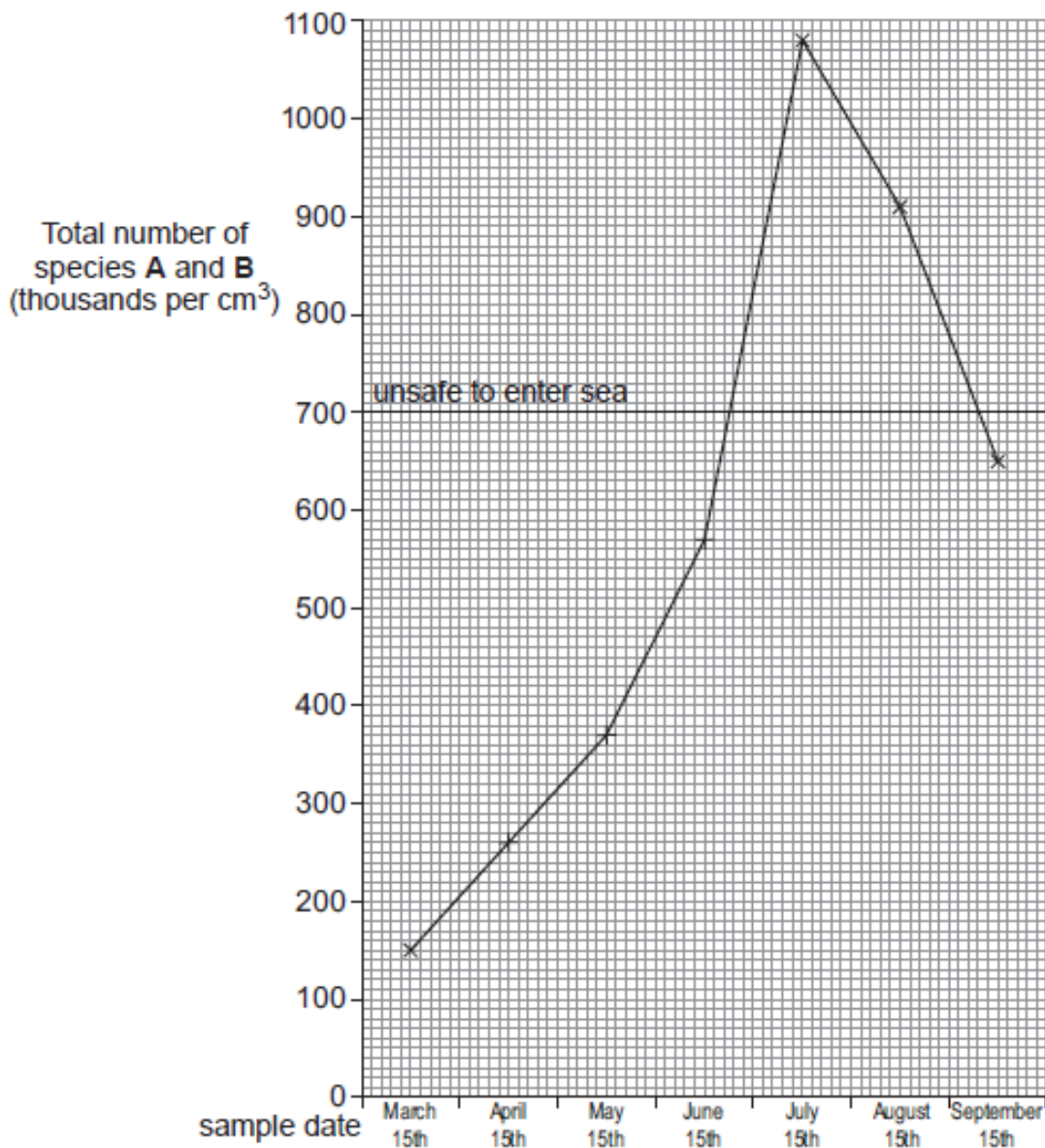
Bacteria become immune to antibiotics

Bacteria become resistant to antibiotics

- (c) The table shows the number of two species of bacteria (**A** and **B**) in samples of seawater taken near a beach.

Date of sample	Number of bacteria (thousands per cm <sup>3</sup> )		Total number of species <b>A</b> and <b>B</b> (thousands per cm <sup>3</sup> )
	Species <b>A</b>	Species <b>B</b>	
March 15 <sup>th</sup>	100	50	150
April 15 <sup>th</sup>	200	60	260
May 15 <sup>th</sup>	300	70	370
June 15 <sup>th</sup>	500	70	570
July 15 <sup>th</sup>	1000	80	1080
August 15 <sup>th</sup>	800	110	910
September 15 <sup>th</sup>	300	350	650

- (i) The graph below shows how the total number of species **A** and **B** changed between March 15<sup>th</sup> and September 15<sup>th</sup>.



- I. Between which **two** sampling dates was the increase in the total number of species **A** and **B** the fastest? [1]

Between ..... and .....

- II. If the total number of species **A** and **B** in the sample is likely to be greater than 700 000 per cm<sup>3</sup> in any month, people are advised to stay out of the sea.

A safety officer said:

"On June 15<sup>th</sup>, I decided to advise people to stay out of the sea until further notice."

Explain why the safety officer made this decision, even though the seawater was safe on that date. [2]

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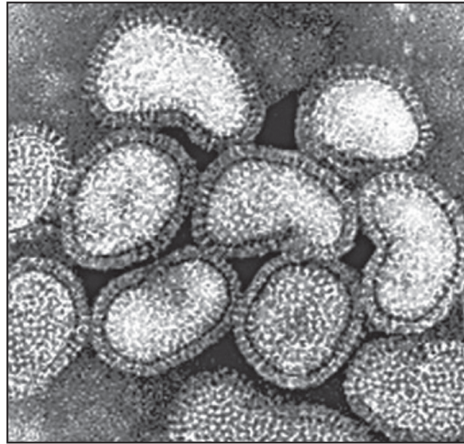
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- (ii) I. Describe the trends shown in the **table** for the numbers of species **A** and **B**. [2]

Species **A**: .....

Species **B**: .....

5. (b) The photograph below shows some viruses at a very high magnification.



- (i) How does the size of a virus compare with that of a bacterium? Underline your answer. [1]

Viruses are smaller than bacteria.

Viruses are larger than bacteria.

Viruses are equal in size to bacteria.

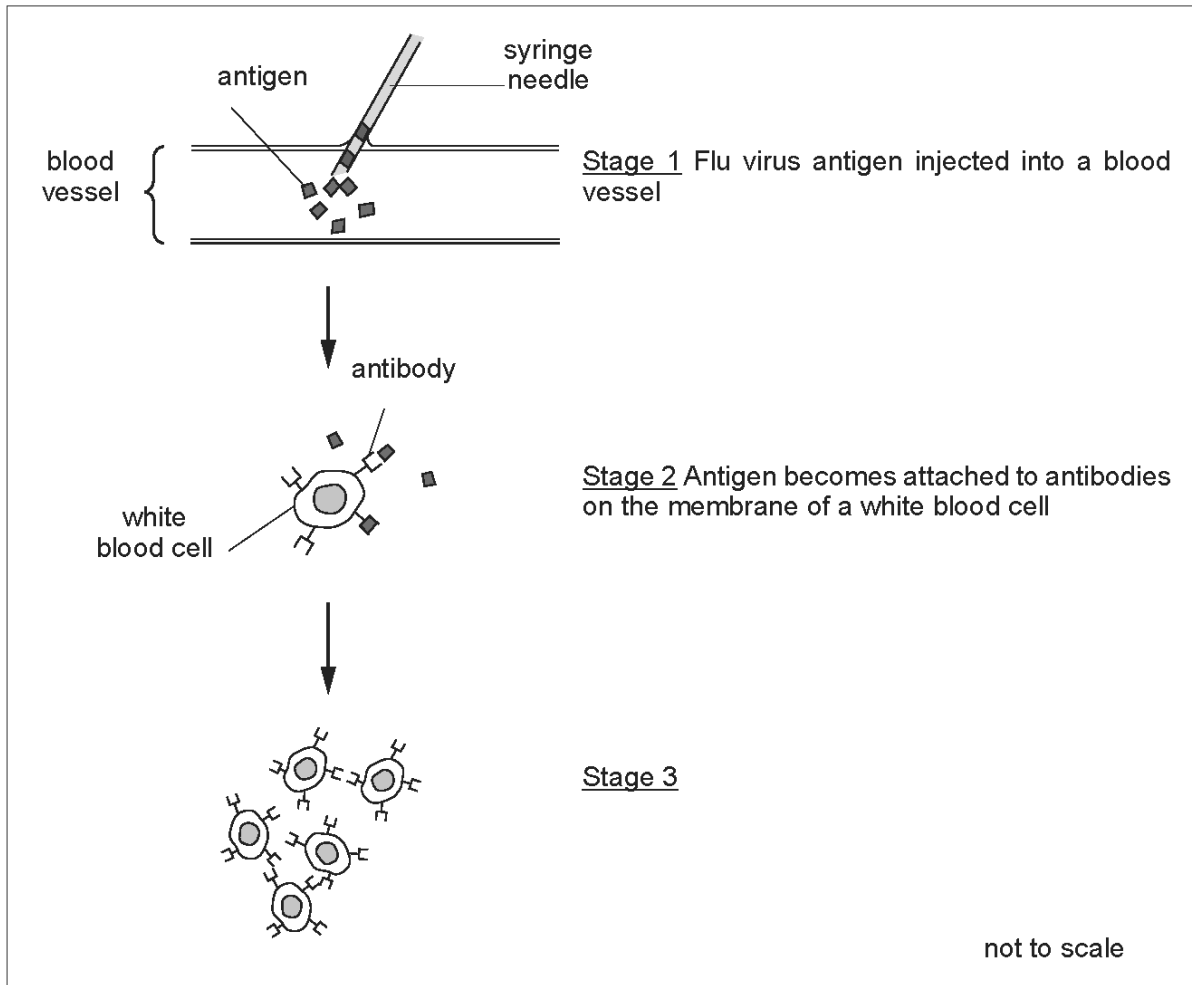
- (ii) Give **one** reason why a virus is *not* thought to be a living cell. [1]

.....

5

6.

The diagram below shows stages in the response by one type of white blood cell to a flu virus vaccination.



(a) (i) Name the type of white blood cell that produces antibodies. [1]

.....

(ii) Describe the process that has taken place between stages 2 and 3. [2]

.....  
.....  
.....

(iii) State the importance of stage 3 in protecting the body from the flu virus. [1]

.....  
.....



- (b) New forms of flu virus appear almost every year in the UK.  
Suggest why a government report recommends that flu vaccines should be given every year. [2]

.....

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- (d) After an injection, blood clots at the site of the wound.  
Suggest why it is important for blood to clot at the site of a wound. [2]

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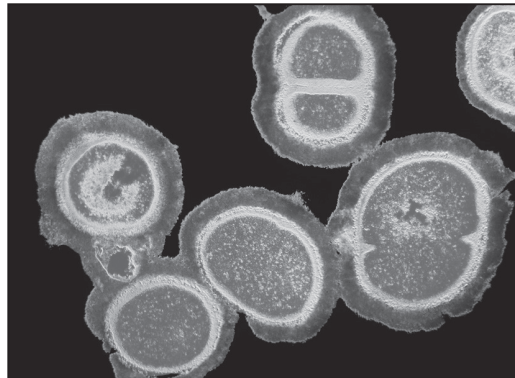
7. Read the following information about treating human diseases with antibiotics.

**Problems with antibiotics**

From 1944, the antibiotic Tetracyclin was used to treat the disease cholera. In 1952 doctors noticed that it no longer killed all cholera bacteria.

The bacterium *E.coli* often infects humans and can cause blood poisoning. Doctors recorded 18000 cases in 2000 but in 2008, the number rose to 23000 because the bacterium became more difficult to kill with antibiotics.

In 2010, a scientific investigation found that many bacteria, such as MRSA could not be killed by antibiotics.



MRSA

(a)

- (ii) I. How many extra cases of blood poisoning were reported in 2008 compared to 2000? [1]

.....

- II. Suggest why doctors are particularly worried that antibiotics are becoming less effective in controlling the bacterium, *E.coli*. [1]

.....

.....

(b) (i) What term is used to describe bacteria which cannot be killed by antibiotics? [1]

.....

(ii) How may doctors have made the problem of MRSA worse over past years? [1]

.....

.....

(c) Influenza ('flu') is caused by a virus. Why is it not possible to treat this illness with antibiotics? [1]

.....

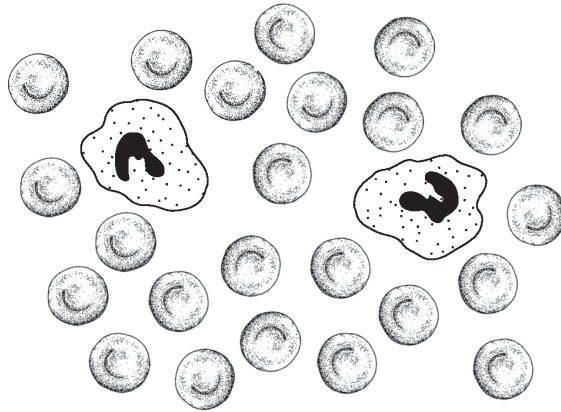
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9.

The diagram shows a blood smear as seen through a light microscope.

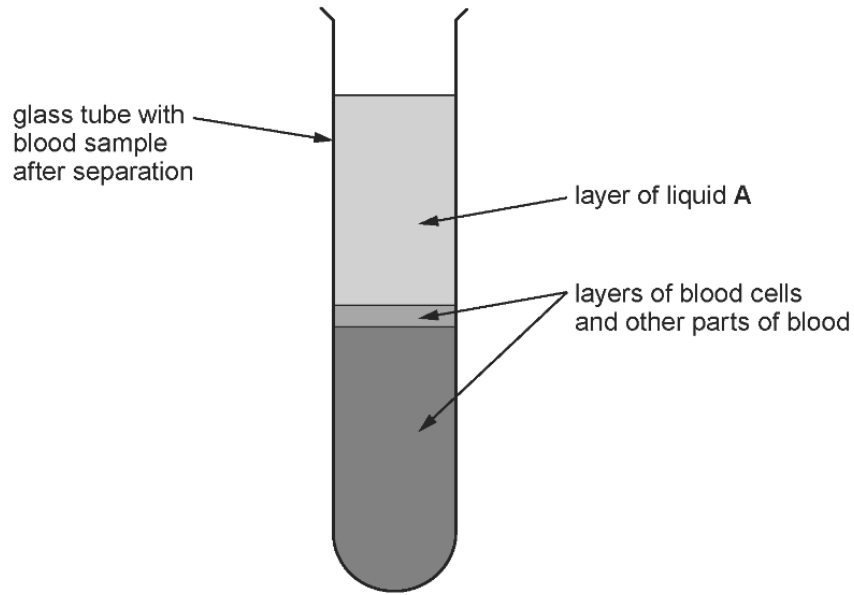


(a) Complete the table below about the different parts of the blood.

[4]

name of part	function
red cell	.....
.....	produce antibodies
phagocyte	.....
platelets	.....

10. A sample of human blood was placed in a test tube and the contents were separated by spinning the tube at high speed in a laboratory centrifuge. The diagram below shows the results.

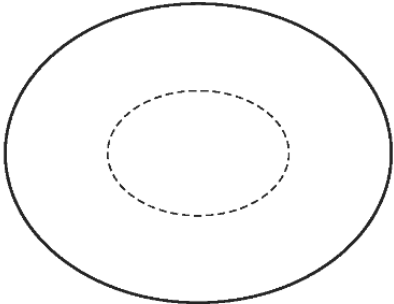


- (a) (i) The drawing below shows a red blood cell.

In the space, draw **another** type of cell which would be found in the sample.

State the name of the cell and its function.

[3]

<p>Red blood cell</p>  <p>Function – carries oxygen</p>	<p>Name of cell .....</p>     <p>Function .....</p>
--	--

- (iii) The volume of the blood sample was  $20\text{ cm}^3$ . Liquid A accounts for 45% of this volume.

Calculate the volume of liquid A.

[2]

Volume = .....  $\text{cm}^3$

11.

The World Health Organisation (WHO) collects data on the disease, tuberculosis (TB) which is caused by a bacterium. The WHO used the data shown in the table below to estimate:

- the total number of people with the disease in each region;
- the number of deaths from TB in each region.

Region	Number of people with TB per 100 000	Number of deaths from TB per 100 000
Africa	345	78
USA	43	6
Eastern Mediterranean	122	28
Europe	50	8
South East Asia	190	38
Western Pacific	112	19

(a)

- (ii) Calculate the percentage of those with TB in Europe who survive the disease. Show your working. [2]

percentage who survive ..... %

- (iii) How does the data show that Africa is less successful at treating TB than Europe? [1]

.....  
.....

- (b) A vaccine against TB has existed since 1921. Explain how a vaccine can protect the body from a disease caused by a bacterium. [4]

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- (c) The number of cases of TB decreased considerably in many countries during the 20<sup>th</sup> century. Over the past 15 years, the number of cases worldwide has greatly increased. Suggest why this has happened. [1]

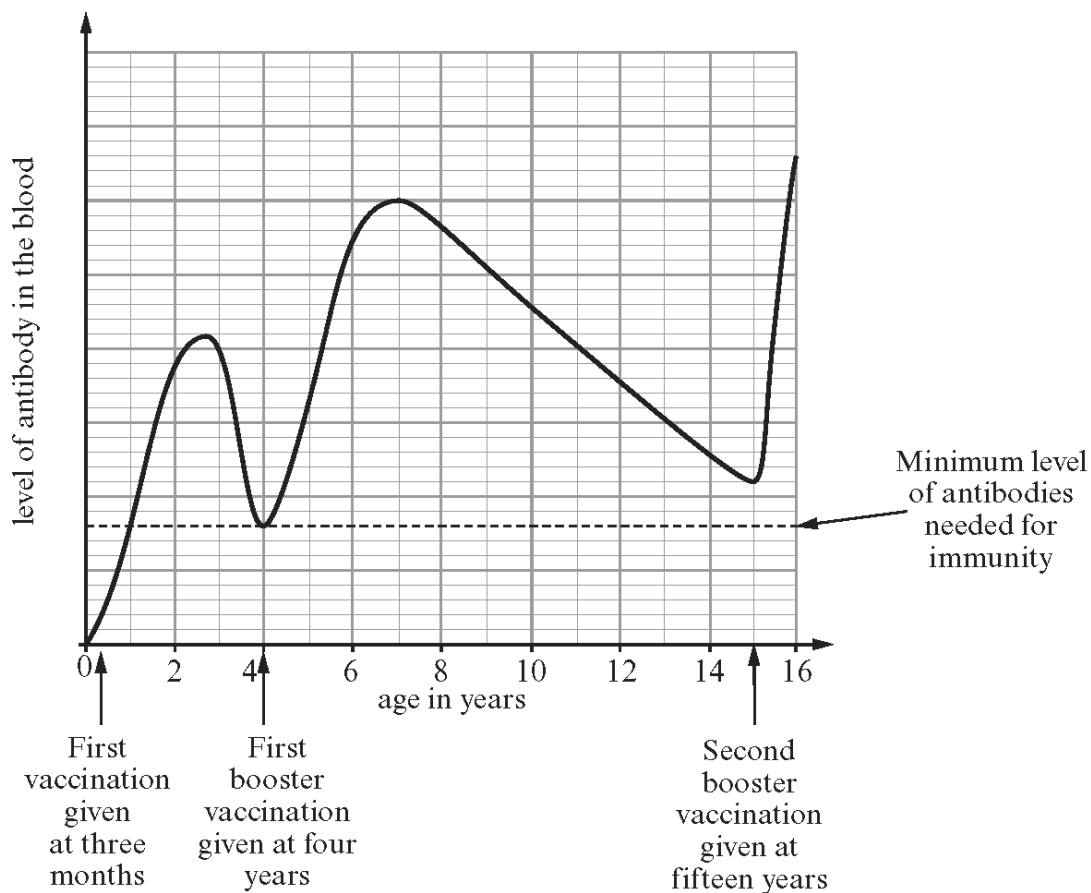
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12. Immunity against Polio is created by a series of vaccinations. The first is given at age 3 months and it is followed by a series of 'booster' vaccinations.

The following graph gives information about these vaccinations.



- (a) Use the graph and your knowledge to
- (i) State the age range during which a person is most likely to suffer from Polio. [1]
- .....
- (ii) Describe how the immune system reacts to 'booster' vaccinations. [5]

.....

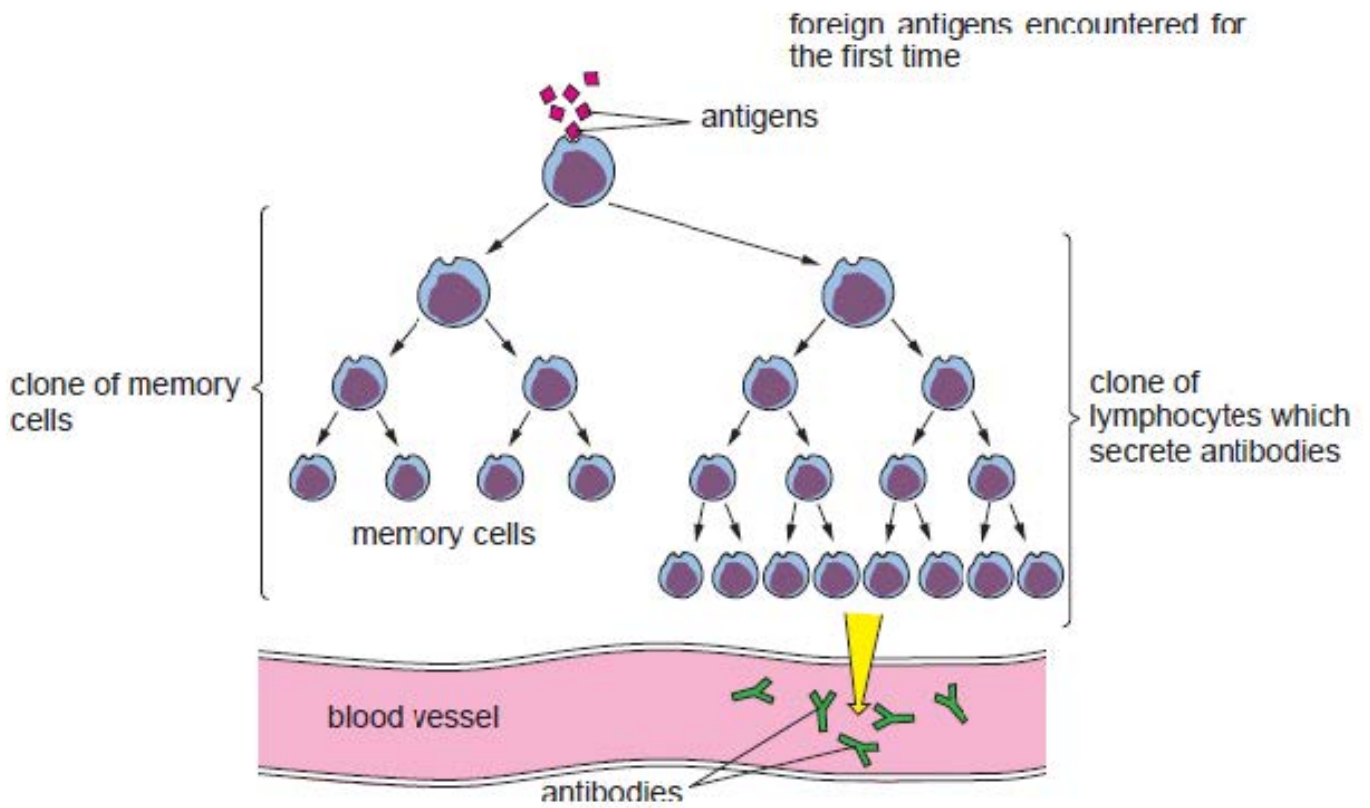
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13. The diagram below shows how a lymphocyte responds to the presence of antigens in the body.



- (a) Explain how the body responds to a foreign antigen the first time it is encountered and why the response is faster when the same antigen is encountered a second time. [3]

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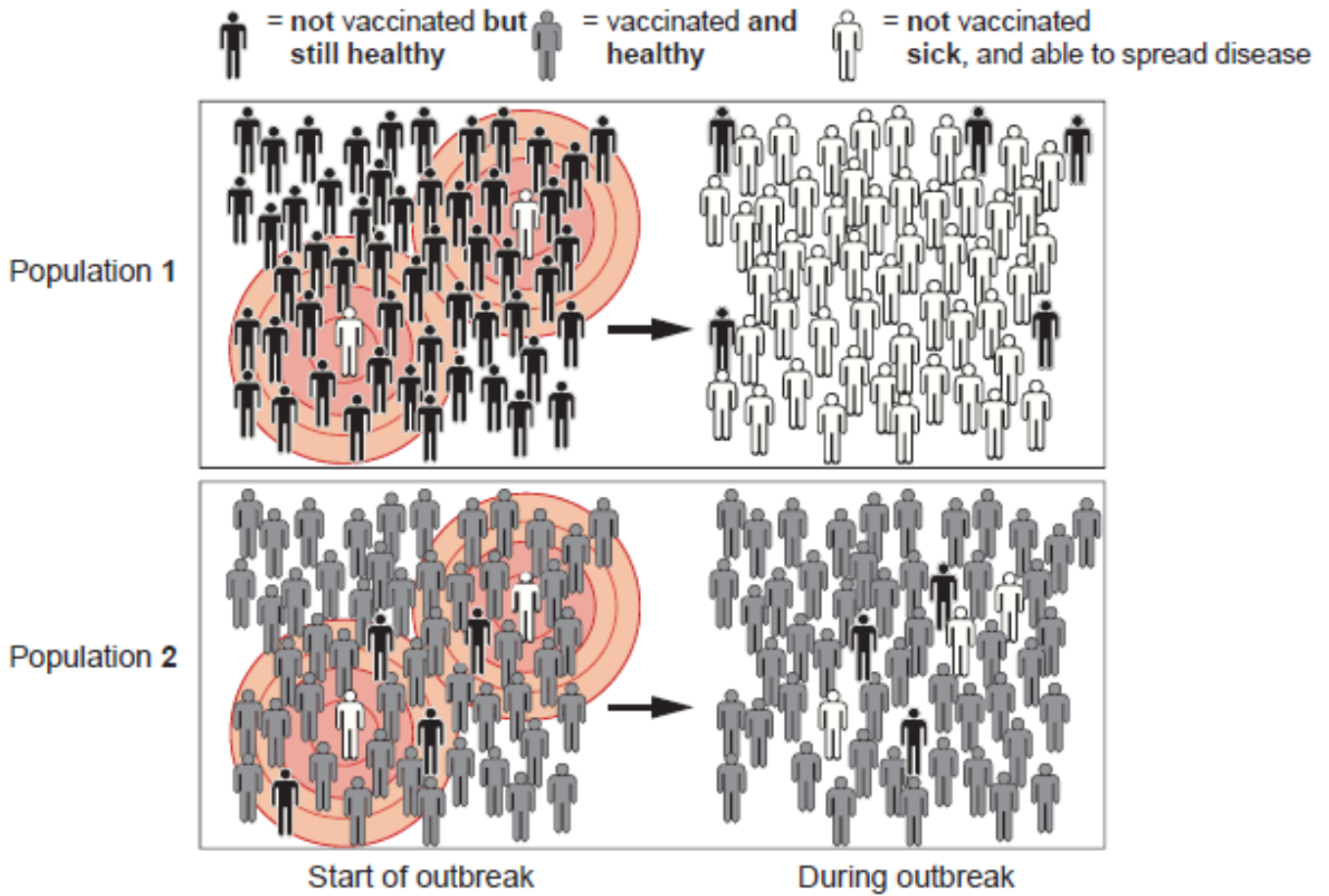
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(b) Measles is a communicable disease. The diagram shows two populations of people, during an outbreak of the measles virus.



Using **only the diagram above**, explain the advantage of a vaccination programme. [2]

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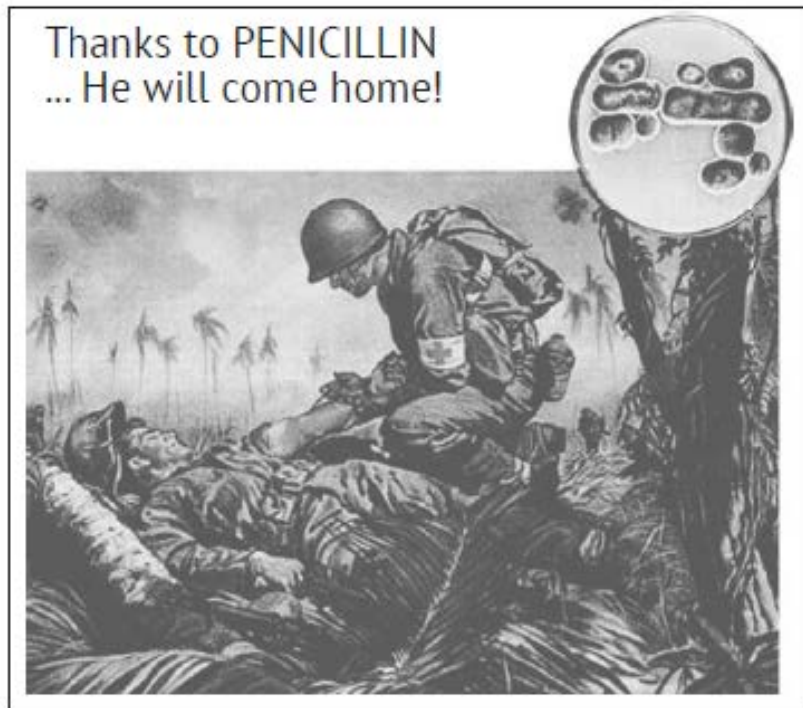
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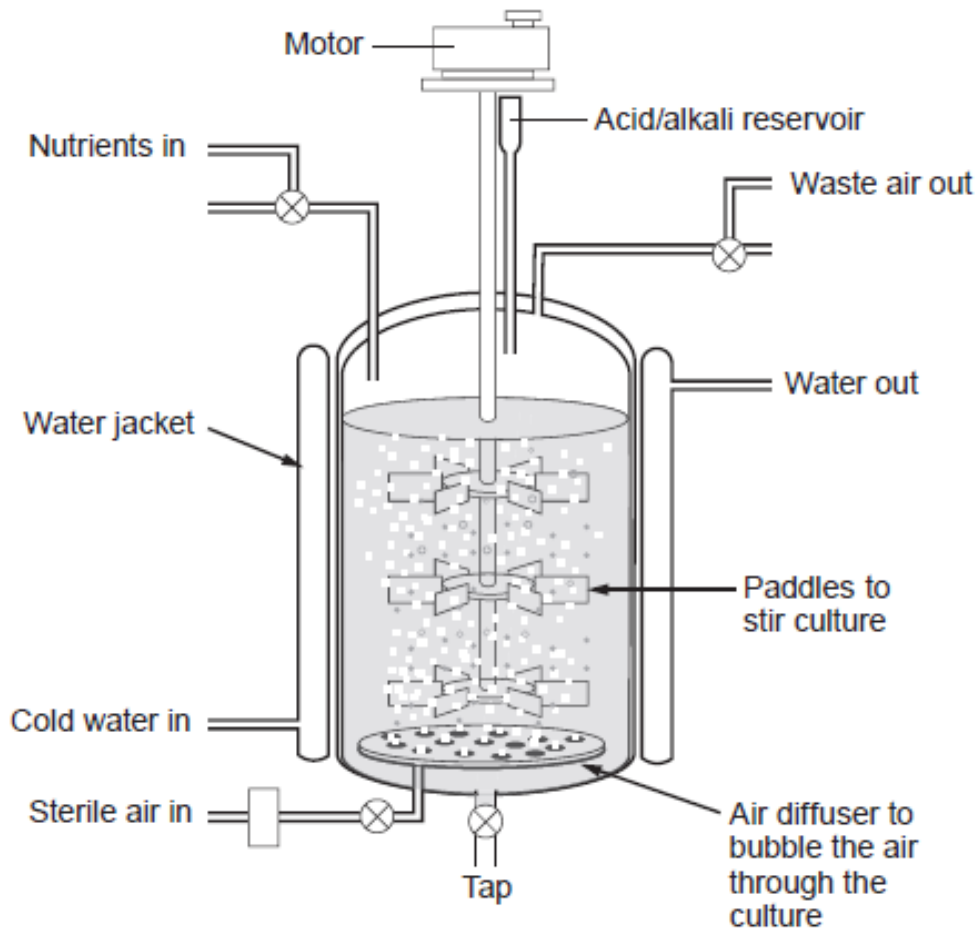
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14.



Penicillin is an antibiotic that is produced by several species of a fungus from the genus *Penicillium*. Its effect was first identified by Alexander Fleming in 1928. It was only in 1939 that Penicillin was extracted by Howard Florey and Ernst Chain at Oxford University and later developed for use as an antibiotic. The industrial scale production of penicillin was developed in the USA between 1941 and 1943 in response to the high number of soldiers who were dying due to diseases linked to their wounds during World War II.

*Penicillium* can be grown industrially in a tank called a fermenter. An example is shown in the diagram opposite:



(a) (i) State how penicillin helped save the lives of wounded soldiers. [1]

.....

.....

(ii) Name a group of microorganisms that would not be affected by antibiotics. [1]

.....

(iii) State a danger of new drug treatments. [1]

.....

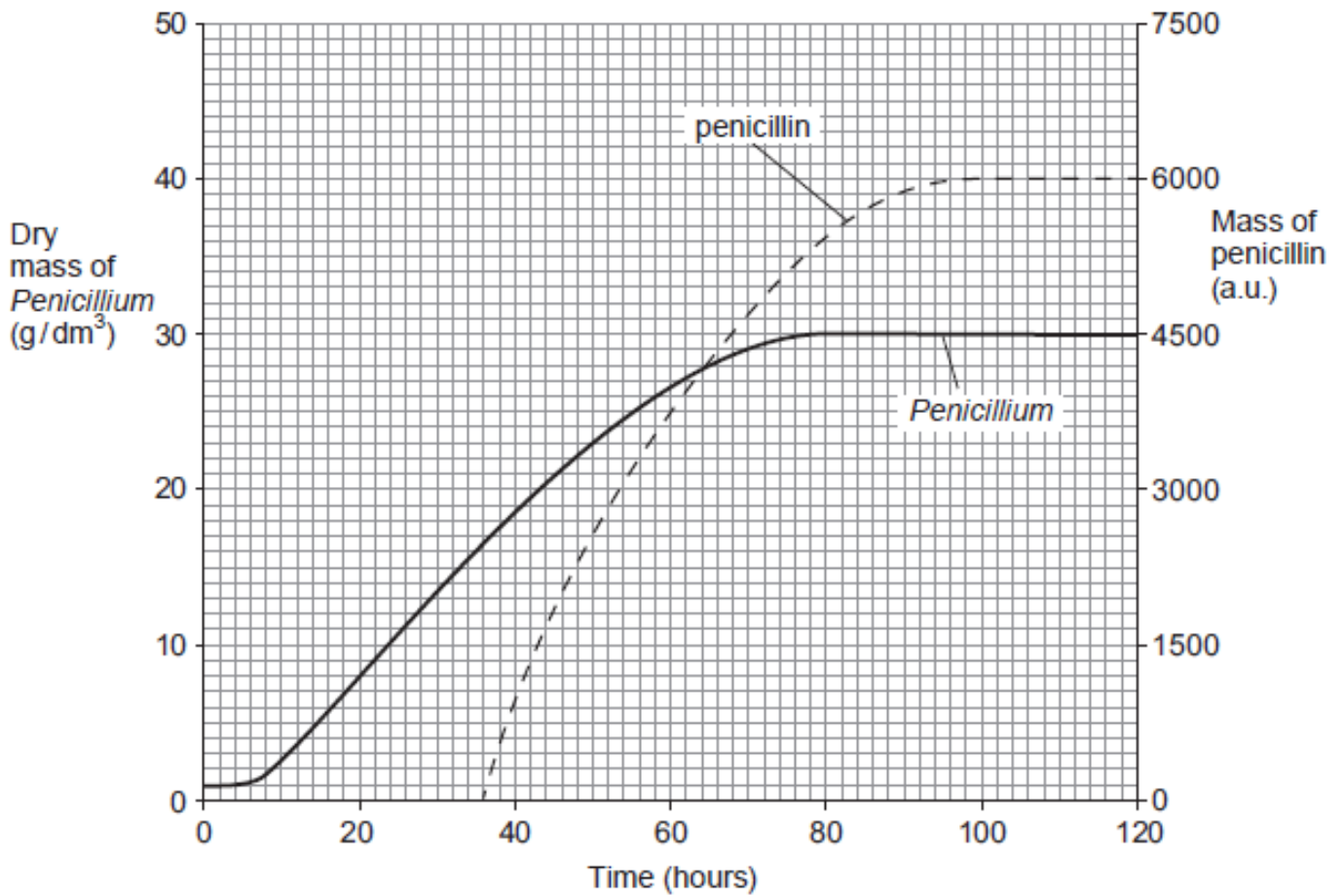
(b) Use the diagram of the fermenter and your own knowledge to answer the following question.

Other than nutrients, state **one** factor that affects the growth of *Penicillium* and state how it can be controlled by the fermenter. [1]

.....

.....

- (c) The graph below shows the quantity of penicillin and *Penicillium* inside the fermenter at 25°C over a period of time:



Using the graph:

- (i) Calculate the mean growth rate of *Penicillium* between 20 and 50 hours. [2]

Growth rate = ..... g/dm<sup>3</sup>/hour

- (ii) Identify the optimum time for the penicillin to be extracted from the fermenter and justify your answer. [2]

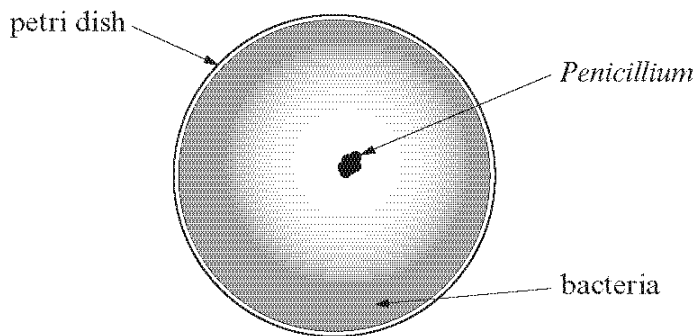
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- (d) Draw a line on the graph to estimate the effect of increasing temperature from 25°C to 28°C on the dry mass of *Penicillium* produced between 0-120 hours. [1]

15. In 1928, Alexander Fleming found a fungus called *Penicillium* in a petri dish containing a culture of bacteria growing on agar jelly. The diagram shows what he observed.



Fleming made two conclusions.

1. A chemical released from *Penicillium* was harming the bacteria.
2. The chemical was diffusing through the jelly.

(a) What is the evidence in the diagram for each conclusion? [2]

Conclusion 1

.....  
.....

Conclusion 2

.....  
.....

(b) The chemical found in *Penicillium* was extracted and is known as penicillin.

(i) What name is given to types of drugs such as penicillin? [1]

.....

(ii) Why has penicillin become less effective at killing bacteria in recent years? [2]

.....  
.....  
.....  
.....

(c) MRSA has become a serious problem in hospitals. Describe one effective control measure used in hospital against MRSA. [1]

.....

6

16. Basiliximab is a monoclonal antibody used to suppress the immune system of kidney transplant patients. It works by preventing white blood cells from attacking the cells of donor organs and therefore reduces the probability of rejection.

(ii) Explain why and how white blood cells of the recipient would attack the cells of the donor organ therefore leading to rejection. [3]

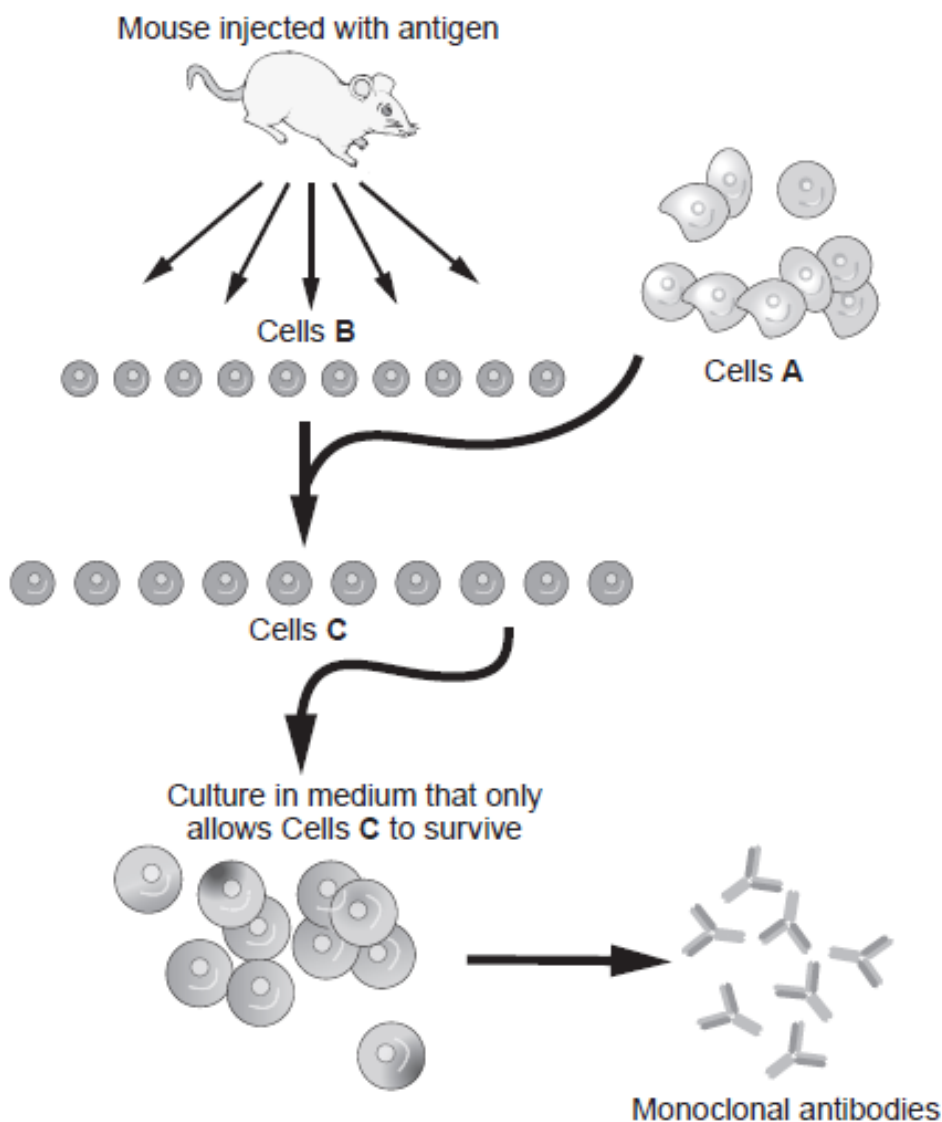
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(b) The diagram below shows a process for producing monoclonal antibodies.





Use the diagram and your own knowledge to answer the following questions.

State the name of the cells labelled:

(i) **A** ..... [1]

(ii) **B** ..... [1]

(iii) **C** ..... [1]

(iv) State how the following cells were produced: [2]

**B** .....

.....

**C** .....

.....

(c) State **two other** examples of medical uses for monoclonal antibodies. [2]

.....

.....

.....

17. (a) Complete the sentence. [1]

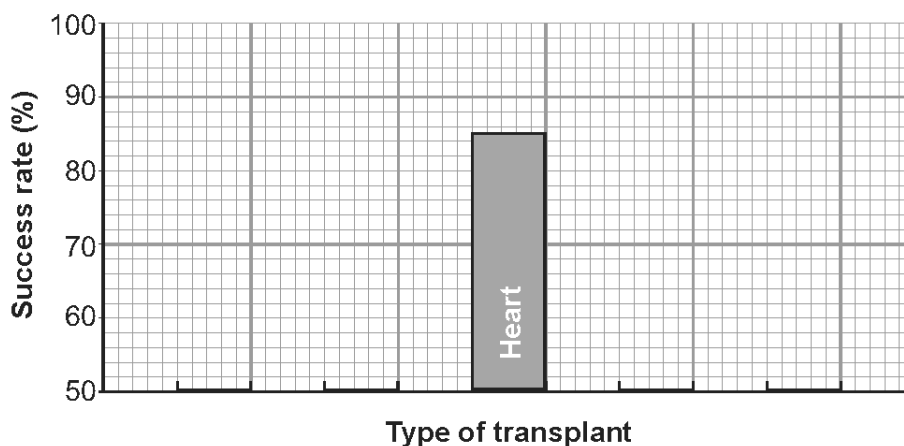
The kidneys remove waste products in a process called .....

- (b) When a human organ fails to function doctors can carry out a transplant operation using an organ from a donor. The transplant is said to be successful if the transplanted organ functions normally for at least one year.

The table below compares the success rates of some transplant operations.

type of transplant	success rate (%)	year when doctors first started transplants	number of years doctors have been doing transplants (up to 2014)
kidney ( family donor )	98	1960	54
kidney (non-family donor)	87	1960	54
lung	77	1986	.....
heart	85	1975	.....
liver	84	1983	31

- (i) Complete the table by writing your answers on the dotted lines. [1]
- (ii) Complete the bar chart below by adding the bars for kidneys, liver and lung. Place the bars in order from the **most** to the **least** successful and label them. *The bar for heart has been completed for you.* [3]



- (iii) Use only information in the table and the bar chart to suggest a reason why the success rates for the various transplant operations are different. [1]

.....

.....

- (iv) From your own knowledge, explain why a kidney transplant is more likely to be successful when the donor is a family member. [2]

.....

.....

.....

8

