

# Immune System

Total marks: 18

Q1.

Answer the question with a cross in the box you think is correct . If you change your mind about an answer, put a line through the box  and then mark your new answer with a cross .

Monoclonal antibodies are proteins.

Figure 16 shows the process of monoclonal antibody production.

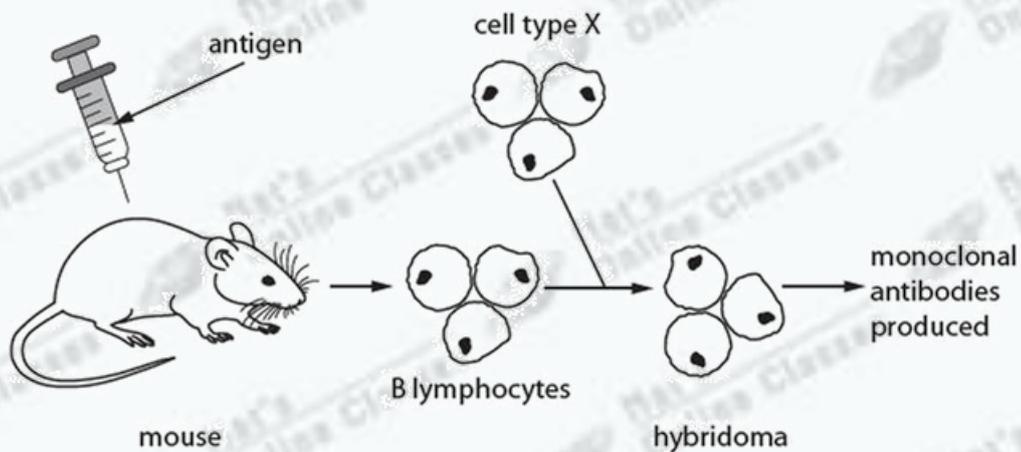


Figure 16

(i) Which type of cell is added to the B lymphocytes to produce the hybridoma?

- A phagocytic cell
- B red blood cell
- C cancer cell
- D epithelial cell

(1)

(ii) A person with blood group A has the A antigen on the surface of their red blood cells.

Monoclonal antibodies can be used to detect the A antigen on red blood cells to determine the blood group of a person.

Explain why monoclonal antibodies, used to detect blood group A, would not react with the blood of a person with blood group B.

(3)

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**(Total for question = 4 marks)**

**Q2.**

Cancer Research UK found that many people do not realise that obesity is linked to an increased risk of developing cancer.

In the body, fat tissue sends signals that cause other cells to divide.

Obesity can also cause cardiovascular disease to develop.

Describe the different treatments available for cardiovascular disease.

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**(Total for question = 3 marks)**

**Q3.**

Most cases of scarlet fever occur in children.

Adults have usually developed immunity to a toxin that the Streptococcus bacteria produce during infection.

Explain how an adult develops immunity to the toxin.

(3)

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**(Total for question = 3 marks)**

**Q4.**

The wire loop used to spread bacteria on an agar plate was heated in a Bunsen burner flame before being used.

Explain why this aseptic precaution was used.

(2)

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**(Total for question = 2 marks)**

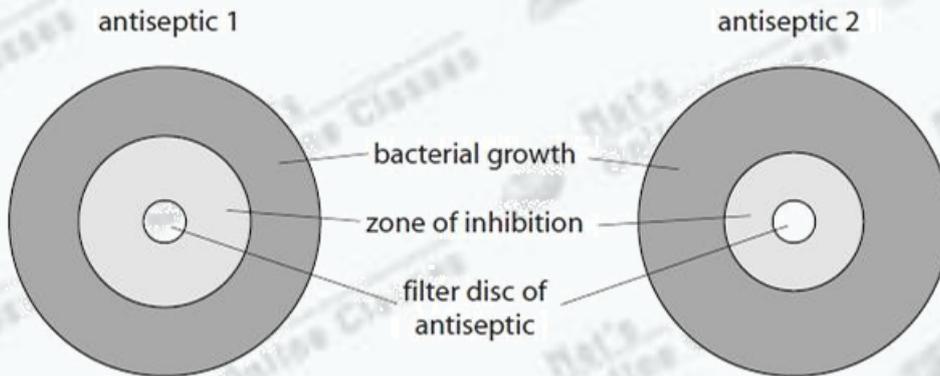
Q5.

*Streptococcus pyogenes* is a bacterium that causes communicable infections.

Scientists tested the ability of two antiseptics to kill *Streptococcus pyogenes* bacteria.

They spread *Streptococcus pyogenes* bacteria on two agar jelly plates and placed a small disc of filter paper containing antiseptic in the centre of each dish.

Figure 3 shows the results of the test after 24 hours of incubation.



(i) Calculate the area of the zone of inhibition for antiseptic 2.

Give the answer to 3 significant figures.

( $\pi = 3.14$ )

(3)

zone of inhibition for antiseptic 2 = ..... mm<sup>2</sup>

(ii) Explain which antiseptic is the most effective.

(2)

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(iii) After the bacteria were spread on the plates, both plates were incubated for 24 hours at 37°C.

Give a reason why the plates were incubated at 37°C.

(1)

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**(Total for question = 6 marks)**

## Mark scheme:

Q1.

Question Number	Answer	Mark
(i)	<p>C cancer cell</p> <p><b>The only correct answer is C</b></p> <p><i>A is not correct because a phagocytic cell is a white blood cell</i></p> <p><i>B is not correct because a red blood cell does not divide</i></p> <p><i>D is not correct because an epithelial cell does not divide rapidly</i></p>	<p>(1)</p> <p><b>AO1 1</b></p>

Question Number	Answer	Additional Guidance	Mark
(ii)	<p>An explanation linking:</p> <ul style="list-style-type: none"> <li>the shape of the antibody is complementary to the A antigen / antibodies only react with specific antigens</li> <li>the B antigen has a different {shape / structure} (1)</li> <li>(therefore) it will only <b>bind</b> to the A antigen / it will not bind to the B antigen (1)</li> </ul>	<p>accept antigen A has a specific structure</p> <p>accept blood group B does not have the A antigen</p>	<p>(3)</p> <p><b>AO2 1</b></p>

Q2.

Question number	Answer	Additional guidance	Mark
	<p>An answer including:</p> <ul style="list-style-type: none"> <li>• surgery to treat narrow or blocked arteries (1)</li> <li>• lifestyle changes including {healthy diet/more exercise} (1)</li> <li>• (life-long) medication to {prevent blood clots/reduce blood pressure/thin the blood} (1)</li> </ul>	<p>accept by-pass surgery / stents / heart surgery / other relevant surgeries such as gastric bands</p> <p>accept examples of lifestyle changes e.g. stop smoking</p> <p>accept named medications used for cardiovascular disease</p>	<p>(3)</p> <p><b>AO1 1</b></p>

Q3.

Question Number	Answer	Additional guidance	Mark
	<p>An answer linking three of the following:</p> <ul style="list-style-type: none"> <li>• exposure to the {toxin/antigen/pathogen/bacteria} (1)</li> <li>• stimulates an <b>immune response</b> (1)</li> <li>• production of {(B)<b>lymphocytes</b> /antibodies} (1)</li> <li>• production of memory lymphocytes (1)</li> </ul>	<p>accept immunised /vaccinated</p> <p>accept antitoxins</p>	<p>(3)</p> <p>AO 2 1</p>

Q4.

Question number	Answer	Mark
	An explanation that combines identification – understanding (1 mark) and reasoning/justification – understanding (1 mark): <ul style="list-style-type: none"> <li>the Bunsen burner flame kills all microorganisms on the loop (1)</li> <li>so only the desired bacteria are transferred to the loop/no unwanted microorganisms spread on the agar plate (1)</li> </ul>	(2)

Q5.

Question number	Answer	Additional guidance	Mark
(i)	<ul style="list-style-type: none"> <li>radius 10 mm <math>\pm</math> 1 mm (1)</li> <li>area = <math>\pi r^2</math> (1)</li> <li>area 314 (mm<sup>2</sup>) (1)</li> </ul> answer must be to 3 significant figures	if radius outside range but area calculated max 2 marks  award full marks for correct numerical answer without working	(3)

Question number	Answer	Additional guidance	Mark
(ii)	An explanation that combines identification via a judgement (1 mark) to reach a conclusion via justification/reasoning (1 mark): <ul style="list-style-type: none"> <li>antiseptic 1 has a larger zone of inhibition (1)</li> <li>so more of <i>Streptococcus pyogenes</i> have been killed (1)</li> </ul>	ecf from (a)(i)	(2)

Question number	Answer	Additional guidance	Mark
(iii)	<ul style="list-style-type: none"> <li>to provide optimal growth conditions</li> </ul>	<i>S. pyogenes</i> grow at body temperature	(1)