

Past-paper walk-through

Antibodies and vaccination ■ 11.2

eXercise

Questions in this set

- 9700/11 N25 Q39 ■ 1 mark
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Question 39

9700/11 N25 ■ Q39 ■ 1 mark

39 The hybridoma method is used for the production of monoclonal antibodies.

Which two types of cell are used in this method?

- A** stem cell and B-lymphocyte
- B** stem cell and T-lymphocyte
- C** tumour cell and B-lymphocyte
- D** tumour cell and T-lymphocyte

Solution 39

Answer: **C**

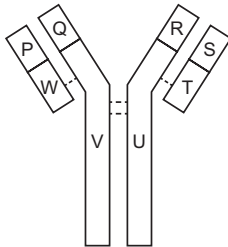
Why

- Monoclonal antibodies come from a hybridoma: one cell fused from two.
- A B-lymphocyte supplies the ability to make one specific antibody.
- A tumour cell supplies the ability to divide indefinitely.

Question 40

9700/12 N25 ■ Q40 ■ 1 mark

40 The diagram shows an antibody molecule with some parts labelled.



Which row is correct about the parts that form an antigen-binding site and have identical amino acid sequences?

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Question 40

	form an antigen-binding site	have identical amino acid sequences
A	P and Q	R and S
B	Q and V	P and S
C	R and S	U and V
D	U and V	Q and R

Solution 40

Answer: **C**

Why

- An antigen-binding site is formed where a heavy chain and a light chain meet, at the variable ends.
- There are two such sites, one on each arm of the Y.
- The two arms are identical to each other, so the corresponding parts have the same amino acid sequence.

Question 39

9700/13 N25 ■ Q39 ■ 1 mark

- 39** Four different treatments were tested in a human volunteer during a year. One of these treatments was a vaccine.

The treatments were injected into the volunteer and blood samples were taken after two weeks. The samples were analysed to obtain a cell count for four types of cell.

The results are shown in the table.

Which treatment was the vaccine?

(Assume the volunteer's baseline blood cell count was the same before each treatment.)

	cell count / cells per cm^3			
	monocytes	neutrophils	plasma cells	macrophages
A	250	180	450	230

Question 39

B	500	190	220	240
C	260	450	240	250
D	250	190	230	550

Solution 39

Answer: **A**

Why

- A vaccine causes an *active* response, so the body makes its own antibodies and memory cells.
- That means a rise in lymphocyte numbers, and a bigger, faster response on the second exposure.
- Look for the treatment that produced memory cells rather than just supplying antibodies.

Question 40

9700/13 N25 ■ Q40 ■ 1 mark

40 A bacterial pathogen produces a protein that acts as a toxin. This toxin is harmful to humans.

People can be vaccinated to protect them from the effects of this pathogen.

Which statement describes the sequences of events that occur in a vaccinated person to protect them from the effects of this pathogen?

- A** Memory cells divide by mitosis and then differentiate into macrophages that engulf and digest the toxin.
- B** Memory cells divide by mitosis and then differentiate into plasma cells that produce antibodies to bind to the toxin.
- C** Macrophages divide by mitosis and then differentiate into memory cells that engulf and digest the toxin.

Question 40

- D** Plasma cells divide by mitosis and then differentiate into memory cells that produce antibodies to bind to the toxin.

Solution 40

Answer: **B**

Why

- The vaccine contains the toxin in a harmless form, which acts as an antigen.
- B-lymphocytes with the matching receptor are selected and divide into plasma cells and memory cells.
- On real infection the memory cells respond quickly, making antibodies that neutralise the toxin.

Question 38

9700/14 N25 ■ Q38 ■ 1 mark

38 A vaccine is used to create artificial active immunity. After a person has been given a vaccine, it takes a period of time before they develop long-term immunity to the disease.

Which statement about this period of time explains the delay in developing long-term immunity?

- A** No memory cells have been produced from B-lymphocytes.
- B** No plasma cells have been produced from B-lymphocytes.
- C** The primary immune response has **not** produced enough antibodies.
- D** The secondary immune response has **not** produced enough antibodies.

Solution 38

Answer: **A**

Why

- A vaccine causes a *primary* response, which is slow because so few lymphocytes match the antigen.
- Those few must be selected and then divide many times before enough plasma cells exist.
- Long-term immunity depends on memory cells, which are only produced during that primary response.

Question 39

9700/14 N25 ■ Q39 ■ 1 mark

- 39** An antiserum to a snake toxin can be obtained by injecting the toxin into a horse. The antiserum is made from blood plasma taken from the horse a few weeks later. The antiserum is injected into a person who has been bitten by the same species of snake.

Which type of immunity occurs as a result of using this antiserum?

- A** artificial active
- B** artificial passive
- C** natural active
- D** natural passive

Solution 39

Answer: **B**

Why

- The antibodies were made by the horse, not by the patient.
- Receiving ready-made antibodies is *passive* immunity.
- It is artificial because they were injected rather than acquired naturally.

Question 40

9700/14 N25 ■ Q40 ■ 1 mark

- 40** Which statement describes the feature of monoclonal antibodies that allows them to accurately treat a specific disease?
- A** They bind to human hormones to produce a colour change.
 - B** A fluorescent dye can be attached to them.
 - C** They have active sites that are complementary to antigens.
 - D** They can carry toxic chemicals.

Solution 40

Answer: **D**

Why

- A monoclonal antibody comes from a single clone, so every molecule is identical.
- Its binding site is complementary to one specific antigen and no other.
- That specificity is what lets it target only the diseased cells.