

3.2.1 Producing monoclonal antibodies

AQA GCSE Biology (Higher) Question and answer notes

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How to use these notes

These notes cover everything you need to know for this part of the specification. They have been written in question-answer format to make them easier for you to study from.

In order to study successfully, I recommend you do the following for each question and answer:

- Read it carefully and make sure you **understand** it.
- **Memorise** the answer.
- **Practice** applying your understanding to past exam questions.

A good way to memorise information is to use **retrieval practice**. This is when you practise retrieving information from your memory. You could do this by making a flashcard for each question with the question on one side and the answer on the other. Or you could use a flashcard app. Alternatively, use a sheet of paper to cover up the answer so you can only see the question. Try to answer the question and then check how you did.

You should practise retrieving each answer from your memory until you can do it perfectly. Even once you can retrieve the answer perfectly, your ability to retrieve it will probably fade as time passes without practising. Therefore you will need to keep going back to the questions that you have previously mastered and practising them again. However, each time you re-learn the answer, the memory will be stronger and will last longer than the time before.

What are lymphocytes?

Lymphocytes are a type of white blood cell. They produce proteins called antibodies and secrete them into the blood.

What are antibodies?

Antibodies are proteins produced by lymphocytes. They have the ability to bind to molecules called antigens. Each antibody binds to one specific site on one specific antigen.

What is an antigen?

An antigen is the molecule that an antibody binds to. An antigen could be:

- A molecule on the surface of a pathogen
- A molecule on the surface of a specific type of body cell - such as a cancer cell
- A molecule that is circulating in the blood

What happens when a new antigen appears in the body?

When a new antigen appears in the body, lymphocytes make lots of different shapes of antibodies until eventually a lymphocyte makes an antibody that can bind to the antigen. This lymphocyte then produces large amounts of that antibody.

What are monoclonal antibodies?

Monoclonal antibodies are antibodies that are produced in a lab using a specific technique. This technique involves cloning an antibody-producing cell so that the cloned cells all produce identical antibodies which all bind to the same site on the same antigen. The monoclonal antibodies can then be used to detect specific substances or to treat diseases.

How do you make monoclonal antibodies that bind to a specific molecule?

To make monoclonal antibodies that bind to a specific molecule, you need to do the following:

1. Inject the molecule into a mouse's blood stream. The mouse's immune system will treat the molecule as a new antigen and produce lymphocytes which can make antibodies that bind to the molecule.
2. Extract one of these lymphocytes from the mouse.
3. Fuse this lymphocyte with a particular kind of tumour cell that can divide indefinitely. This makes a hybrid cell called a hybridoma, which has the ability to make the antibodies and the ability to divide indefinitely.
4. Clone the hybridoma cell to produce many identical cells that all make exactly the same antibody.
5. Allow the cloned hybridoma cells to produce the antibodies in large quantities, then collect and purify the antibodies.