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## **BIOLOGY VCE UNITS 3&4 DIAGNOSTIC TOPIC TESTS 2017**

### **TEST 6: IMMUNITY**

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#### **SUGGESTED SOLUTIONS AND MARKING SCHEME**

##### **SECTION A – MULTIPLE-CHOICE QUESTIONS**

**Question 1      A**

The secondary response is due to memory cells being present which are activated by a specific antigen. Antibiotics are not produced within the body, they are administered to it. Antigens activate the immune system, not the other way around. B plasma cells produce antibodies.

**Question 2      A**

It takes time for the immune cells to recognise the antigen as foreign and to initiate a specific response of antibody production against the antigen.

**Question 3      A**

The immune system has two kinds of responses to the entry of foreign material. One response is non-specific (chemical or physical barriers), the other is highly specific and adaptive, involving antigens and antibodies. Both can be naturally or artificially acquired. Exposure to a micro-organism is a natural occurrence, but vaccinations are generally artificial.

**Question 4      A**

All examples other than A refer to passive immunity, using ready-made antibodies rather than manufacturing them.

**Question 5      C**

For herd immunity to be effective for polio, approximately 94% of the population must be vaccinated against the polio virus. In many countries around the world, there is a low rate of immunisation meaning there is no herd immunity in those places.

**Question 6      A**

MS is thought to be triggered by an infective agent such as a virus and genetics may have a role, but it is caused by immune system damage.

**Question 7**      **D**

The common cold is mainly caused by RNA viruses that rapidly multiply and mutate. A vaccine would have to have antigens from all these strains to be effective. A cocktail vaccine would be highly unlikely; the only alternative is separate vaccines which would make it impractical, if not impossible. The common cold is more likely to be spread in cold weather due to people being indoors more and therefore greater contact with other people.

**Question 8**      **C**

IgEs bind to mast cells and, to some extent, to basophils. IgE antibodies are made against antigens such as dust, pollen and plant spores. If a person contains IgE antibodies for a particular antigen, they are said to be sensitised to that antigen. If the person is further exposed to the same antigen, cross-links are formed between the antibody on the mast cells and the antigen. These antibody–antigen cross-links trigger mast cells to release active agents such as histamine. The other cells are involved in phagocytosis and other immune functions.

**Question 9**      **D**

To make a monoclonal antibody, researchers first have to identify the right antigen(s) to attack. They generally expose antigens to antibody-producing cells in a cell culture environment. Other cells mentioned do not produce antibodies.

**Question 10**      **C**

Organisms that are not killed by the special treatment given during the preparation of a vaccine are said to be attenuated. They can still reproduce, but the special treatment has removed their disease-causing capability.

**Question 11**      **D**

Passive immunisation is the transfer of antibodies from one species/person to another. Unlike active immunisation, it can protect immediately without having a booster.; However, passive immunisation can only be delivered intravenously which is more troublesome, unlike active, which can be given intramuscularly, subcutaneous and even orally.

**Question 12**      **A**

They are only present on specialised antigen-presenting immune cells, including macrophages that engulf foreign particles such as bacteria, dendritic cells that present antigen to T cells, and B cells that produce antibodies.

**Question 13**      **B**

The bushwalker needs a quick remedy. Antibodies against tiger snake venom is the best remedy. Antibodies from the tiger snake will not work because the venom is considered ‘self’ molecules to the snake and so by definition will not attack and destroy its own molecules. Injecting snake antigens may work as a crude vaccine but it must be carefully researched to select the best candidate molecules. Injecting rabbit antibodies will not work unless they are specific to tiger snake venom.

**Question 14**      **D**

Whilst all the other factors increase the chances of spreading the disease, AIDS is caused by the HIV virus.

**Question 15** C

A severe peanut allergic reaction is the immune system overreacting to peanut antigens by releasing immune chemicals such as histamine to all parts of the body. If these are released in the throat and lung area they can cause swelling and block breathing. Having small doses of peanut antigens may desensitise this overreaction, but is not an effective treatment. Avoiding peanuts is a preventative, not a treatment. Antihistamines are not as effective as adrenalin in severe cases.

**SECTION B – SHORT-ANSWER QUESTIONS**

**Question 1** (2 marks)

Vaccines are antigenic material, either attenuated virus or bacteria or part of a toxin, that are administered to stimulate the immune system to produce specific antibodies and B memory cells to give long-term immunity against the specific antigen. 1 mark

Vaccines are important as they prevent deaths, illness, and disabilities by vaccine-preventable diseases. 1 mark

**Question 2** (1 mark)

Natural immunity is immunity gained by exposure to a live pathogen and development of a primary immune response, which leads to immunological memory (production of B memory cells). It is natural, as deliberate exposure, such as a vaccination, does not induce it.

Acquired immunity is not present at birth. It is a learned response. The immune system encounters foreign substances/antigens due to vaccination and the immune system learns the best way to attack/respond to each antigen and begin to develop B memory cells for that antigen. This is active immunity.

**Question 3** (1 mark)

Vaccines promote an immune response to give immunity. Toxins may promote an immune response, but are poisonous substances that are produced by living cells or organisms and can cause disease when introduced into the body tissues. Toxins may neutralise antibodies or antitoxins.

**Question 4** (2 marks)

false 1 mark

Autoimmune diseases are where the immune system cells detect self as foreign, thus attacking self cells.

Immune deficiency diseases are where part of the immune system is defective, thus preventing the immune system from functioning effectively. 1 mark

**Question 5** (1 mark)

Passive immunity does not involve the production of memory cells as antibodies are provided, therefore is short-term only, as antibodies have a short lifespan.

**Question 6** (2 marks)

- a. Tissue typing is the process of testing the tissues of donors and recipients for compatibility prior to transplantation. The test identifies markers that may be identified as foreign by the recipient. Thus, tissue typing aims to reduce the chance of rejection of the transplanted material. 1 mark

- b. Rejection of donor tissue is overcome by crossmatching as many HLA markers as possible during tissue typing and using drugs to suppress the immune system so killer T cells do not attack the transplanted tissue.

1 mark

**Question 7** (1 mark)

Some people have better immune systems than others.

**Question 8** (1 mark)

Hypersensitivity is where the immune response is not wanted and is an overreaction. The response may be only mildly uncomfortable, lead to tissue damage or induce an anaphylactic response which can occasionally be fatal. Hypersensitivity reactions require a series of steps where the person has been sensitised the first time they encountered the antigen.

**Question 9** (2 marks)

- a. AIDS is an immune deficiency disease, where the HIV virus has invaded the T cells and they can no longer function efficiently.

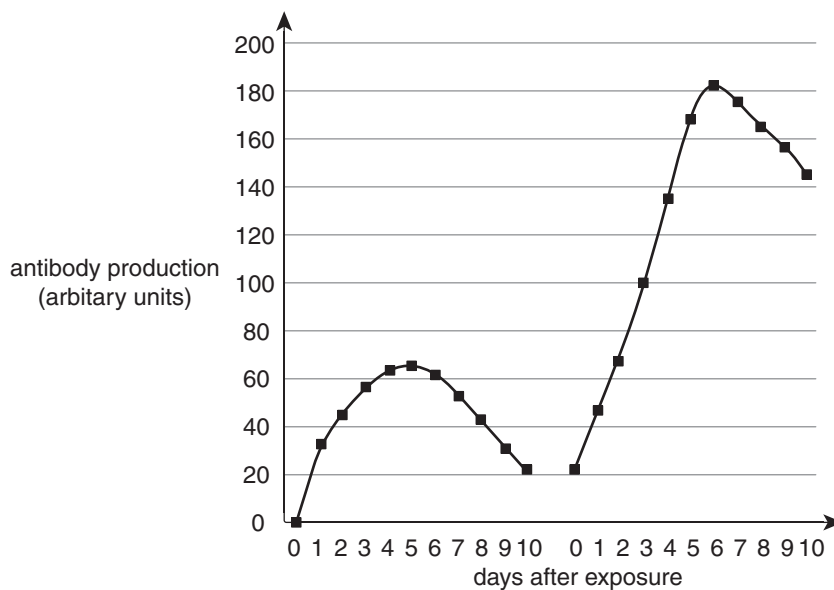
1 mark

- b. As the virus has entered immune system cells, it has compromised the immune system. Trying to kill the virus may result in killing the host cells.

1 mark

**Question 10** (8 marks)

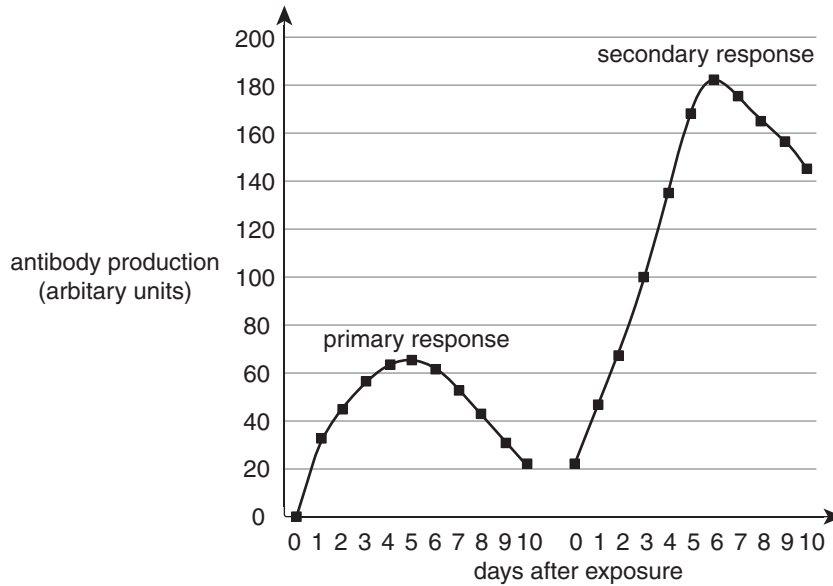
a.



4 marks

- 1 mark for correct response A.  
1 mark for correct response B.  
1 mark for correct y-axis label.  
1 mark for correct x-axis label.*

b.



1 mark

*Note: Award 1 mark for both labels.*

- c. In the primary response, there are no memory cells initially. Therefore, response is slower due to the time needed for identification of foreign measles virus and humoral response cloning plasma cells to produce specific antibodies to fight the virus.

1 mark

1 mark

In the secondary response, the body already has B memory cells to the measles virus, therefore when the virus is exposed to Anna again, the B memory cells recognise the antigen quickly, and initiate the rapid cloning of B plasma cells which then secrete large amounts of specific antibodies.

1 mark

**Question 11** (4 marks)

- a. Antibodies are produced by the mother and are supplied to the baby in the breast milk.

1 mark

1 mark

- b. natural passive immunity

1 mark

- c. no

B memory cells are produced by the baby so the immunity is short-term and lasts only as long as there are circulating antibodies from the mother.

1 mark