



# **BIOLOGY 2020**

## **Unit 3**

### **Key Topic Test 9 – Immunity**

Recommended writing time\*: 45 minutes

Total number of marks available: 45 marks

## **SOLUTIONS**

**SECTION A: Multiple-choice questions (1 mark each)**

**Question 1**

*Answer: C*

*Explanation:*

A is incorrect as antibodies don't initiate an immune response rather, they are a result of an immune response. B is incorrect as while active immunity uses more energy to build antibodies and differentiate cells this is not an advantage. D is incorrect as antibodies can be passed through mothers' milk, but this is a passive response as B memory cells are not formed

**Question 2**

*Answer: B*

*Explanation:*

This type of immunisation is artificial as the antibodies are made using horses to produce them, and passive immunity involving receiving antibodies (Immunoglobins) without developing an immune response and memory cells.

**Question 3**

*Answer: D*

*Explanation:*

This type of immunisation is artificial as the antibodies in the antivenom are made by injecting the funnel web venom into the rabbit. Active immunity involves developing plasma cells to produce the antibodies and B memory cells.

**Question 4**

*Answer: C*

*Explanation:*

Mothers milk contains antibodies from the mother's exposure to antigens. A baby's immune system is not fully developed until approximately 3 months. The mother provides passive immunity in the interim.

**Question 5**

*Answer: B*

*Explanation:*

Antigen presenting cells are dendritic or macrophage cells that present an antigen to a Th cell to initiate an immune response in adaptive immunity resulting in B memory cells

**Question 6**

*Answer: B*

*Explanation:*

A is incorrect as 95% immunity refers to individuals not having 100% immunity. Herd immunity decrease the likelihood of transmitting a disease protecting immune compromised individuals like babies and the elderly

**Question 7**

*Answer: B*

*Explanation:*

People affected by HIV have an immunodeficient immune system and so may have lost previous vaccination protection.

**Question 8**

*Answer: B*

*Explanation:*

Booster shots are intended to increase the immune response and produce more B memory cells in cases where the individual's initial immune response may be inadequate, or a faster larger response is needed.

**Question 9**

*Answer: A*

*Explanation:*

As tetanus is not spread between people (not contagious) but rather picked up from the environment herd immunity will not protect individuals

**Question 10**

*Answer: D*

*Explanation:*

Autoimmune diseases are an abnormal response to a normal body part where the immune system produces autoantibodies to attack the self-cells.

**Question 11**

*Answer: D*

*Explanation:*

An immune response occurs where the myelin cell proteins are identified as non-self, initiating an immune response that includes the production of autoantibodies that attach to myelin cells opsonising them.

**Question 12**

*Answer: C*

*Explanation:*

HIV infects immune cells including Th cells. Th cells initiate humoral and cell mediated responses, so infection of the Th cells reduces their ability to initiate a response reducing the immune systems effectiveness.

**Question 13**

*Answer: D*

*Explanation:*

A is incorrect as the IgE antibodies attach to mast cells after the first exposure not during it. B is incorrect as IgE antibodies do not produce memory cells. C is incorrect as antigen presenting cells do not carry IgE antibodies

**Question 14**

*Answer: A*

*Explanation:*

Monoclonal antibodies are produced in response to a unique antigen taken from a cancer cell that initiates a response in a mouse's immune system. This leads to the production of a hybridoma that supplies the specific antibody that will attach to the cancer cell opsonising it for the body's immune system.

**Question 15**

*Answer: C*

*Explanation:*

Hybridomas are cells which multiply indefinitely so that they can continuously produce antibodies allowing for the ongoing treatment of the cancer.

**SECTION B: Short-answer questions**

**Question 1**

- a. Herd immunity ensures that there are many people who are immune to pertussis therefore an infected person is less likely to encounter an affected individual (1) Babies with an underdeveloped immune system are less likely to come in contact and contract pertussis (1)  
2 marks
- b. Passive immunity (1) the mother has an active immune response that includes the production of antibodies for pertussis which are passed to the child through breast milk (1)  
2 marks
- c. Booster shots occur when the immune system decreases effectiveness due to the length of time from the initial vaccination or poor vaccination scheduling (1) Pertussis is a disease where memory cells decreases over time so a booster is required. (1)  
2 marks
- d. Attenuated means that the virus has been modified to be weakened or reduced in effect. (1) Attenuated vaccinations still produce an effective immune response without the individual contracting a disease (1)  
2 marks
- e. Individuals with compromised immune systems (1) such as elderly people, people undertaking cancer treatments, people with HIV or immune deficient diseases (1)  
2 marks
- f. The pertussis vaccine uses antigen found on the pertussis virus. As the virus mutates the viral antigen changes shape (1) and can no longer be recognized by the vaccinated immune system so B memory cells cannot initiate a response to the modified antigen (1)  
2 marks

**Question 2**

- a. 1994  
1 mark
- b. After the virus was introduced in 1994 the number of cases decreases (1) from 4750 to 1250 in 1995 and then 500 in 1996 (1)  
2 marks
- c. 2002, 2005, 2007  
1 mark
- d. Cases increased from 0 to 100 (1) People not vaccinating their children so herd immunity is not being achieved (1)  
2 marks

**Question 3**

- a. ART would best be administered at 12 weeks (1) as at this time the maximum number of CD4 cells are available to fight infection (1) resulting in the ability of the immune system to rebound (1)  
3 marks
- b. A level of 200 CD4 count (1) This is a stage where there are not enough CD4 cells to produce an effective response to infection (1) meaning that AIDs can occur (1)  
3 marks

- c. HIV reproduces inside the CD4 cells (1) To infect other cells HIV buds off from the infected cell (1) As ART blocks the release of HIV further infection cannot occur controlling the progress of the disease (1)

3 marks

**Question 4**

- a. On first exposure to an allergen an immune response occurs which produces IgE antibodies which attach to mast cells (1) As the IgE antibodies were not present already crosslinking did not occur and histamine was not released (1)

2 marks

- b. Each subsequent exposure increases the amount of IgE antibodies that are attached to mast cells and the amount of mast cells that have IgE antibodies (1) Therefore on exposure ever greater amounts of histamine are released and greater inflammation response occurs (1)

2 marks

- c. Antihistamines reduce the effect of histamine and so reduce the inflammation response

1 mark

Total 45 marks