BIOLOGY 2020

Unit 3
Key Topic Test 8 – Responding to antigens

Recommended writing time*: 45 minutes
Total number of marks available: 45 marks

SOLUTIONS

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

Question 1

Answer: A

Explanation:
Antigens are found on both self and non self cells and are used by the body's immune system to distinguish between the two. B is incorrect as all body cells have the same self antigens. C is incorrect as antigens are not signalling molecules. D is incorrect as necrosis is not a part of a body's immune response.

Question 2

Answer: D

Explanation:
A is incorrect as pathogens do not have self-antigens for humans. B is incorrect as a self-antigen is not an allergen. C is incorrect as the first line of defence acts as barriers and does not use antigens

Question 3

Answer: D

Explanation:
An allergic response occurs because IgE attaches to mast cells causing the release of large amounts of histamine upon further exposure initiating an inflammation response

Question 4

Answer: B

Explanation:
Non-cellular pathogens are viruses, prions and viroids all of which are non-living as they do not have cellular features

Question 5

Answer: A

Explanation:
Ear wax acts as a physical barrier trapping pathogens before they can enter the ear. The other responses do not act as physical barriers

Question 6

Answer: B

Explanation:
Tannins are chemicals that act as a chemical barrier. The other answers all act as physical barriers.

Question 7

Answer: B

Explanation:
Complement proteins do not release antibodies (this is done by plasma cells). Antibodies do opsonise pathogens and may activate complement proteins

Question 8

Answer: B

Explanation:
The innate immune response is part of the first and second line of defence which are both non-specific meaning that the response is the same for all non self

Question 9

Answer: C

Explanation:
White blood cells move to the inflammation site through the release of histamines from mast cells which release cytokines to attract more monocytes (macrophages or dendritic cells)

Question 10

Answer: B
Explanation:
Crosslinking of the IgE antibodies on the mast cell releases large amounts of histamine, a protein that causes vasodilation, via exocytosis. Lyse refers to pores being created in cell membranes which allow cell contents to leak out

Question 11

Answer: B

Explanation:
Lymph nodes have one-way valves to stop pathogens and lymph fluid moving back to the site of infection. The other answers are immune responses not response of the lymphatic system.

Question 12

Answer: A

Explanation:
Antigen presenting cells place antigens on their MHCII markers and present them to Th cells. The Th cell then release cytokines to activate the humoral response.

Question 13

Answer: A

Explanation:
Clonal selection occurs when specific antigen receptors are present on lymphocytes such as Th cells and B cells prior to being presented with an antigen. After antigen presentation these cells undergo clonal expansion and B cells differentiate into plasma cells and B memory cells

Question 14

Answer: C

Explanation:
Humoral immunity refers to the activation and differentiation of B cells into plasma cells (to produce specific antibodies) and B memory cells through the presentation of a specific antigen

Question 15

Answer: C

Explanation:
Before a B cell can differentiate it must encounter a Th cell that has come in contact with the same specific antigen that the B cell has come in contact with.

SECTION B: Short-answer questions

Question 1

a. Self antigens are proteins found on the plasma membrane of an organism's own cells that do not initiate an immune response (1) while non-self antigens do not originate in the body and cause an immune response (1)

2 marks

b. An antigen is a foreign substance (usually a protein or polysaccharide) (1) that causes an immune response and specifically binds to antibodies (1)

2 marks

Question 2

a. Toxins in fruit, sour tasting chemicals in leaves, tannins in stems, antibacterial sap (any 2)

2 marks

b. Thorns, Waxy cuticle, hairs around stomata or on leaf surface, silica, intact bark (any 2)

2 marks

c. Skin surface or intestinal tract (1) Bacteria compete with invasive bacteria for resources and space controlling growth and acting as a barrier to invasion (1)

2 marks

Question 3

a. Histamine released from mast cells (1) causes the blood vessels to widen (1) allowing plasma to move into tissue surrounding cells at pathogens point of entry (1) causing heat, swelling and itchiness (1) WBCs like neutrophils, macrophages or dendritic cells move to the site due to the vasodilation, (1) engulfing pathogens through phagocytosis. (1) Macrophages release cytokines to signal for more phagocytes to move to the site of infection (1) increasing the chance of removing the pathogen (1)

8 marks

b. Lymph vessels have valves to stop lymph fluid moving backwards (1) as lymph moves passively. This also ensures pathogens in the lymph cannot move back to the site of infection (1)

2 marks

c. When a pathogen enters a lymph node, the pathogen and any APCs initiate an immune response (1) leading to the activation and proliferation of immune cells like plasma cells, Th cells and B memory cells increasing the amount of cells in the lymph node and therefore its size (1)

2 marks

d. An adaptive immune response occurs after exposure to an antigen (1) where the response is highly specific to the antigen (1)

2 marks

Question 4

a. A = variable region or antigen binding site, B = light chain, C = heavy chain

3 marks

b. Antibodies attach to antigen and make it easier for phagocytes find and engulf pathogens

1 mark

c. Yes, antibodies do (1) Even though viruses reproduce inside a cell when viruses move outside of a cell, antibodies attach to viral proteins and enhance phagocytosis (1)

2 marks

Total 45 marks