

Student Name: _____



BIOLOGY 2020

Unit 3

Key Topic Test 9 – Immunity

Recommended writing time*: 45 minutes

Total number of marks available: 45 marks

QUESTION BOOK

* The recommended writing time is a guide to the time students should take to complete this test. Teachers may wish to alter this time and can do so at their own discretion.

Conditions and restrictions

- Students are permitted to bring into the room for this test: pens, pencils, highlighters, erasers, sharpeners and rulers.
- Students are NOT permitted to bring into the room for this test: blank sheets of paper and/or white out liquid/tape.
- No calculator is allowed in this test

Materials supplied

- Question and answer book of 11 pages.

Instructions

- Print your name in the space provided on the top of the front page.
- All written responses must be in English.

Students are NOT permitted to bring mobile phones and/or any other unauthorised electronic communication devices into the room for this test.

SECTION A – Multiple-choice questions

Instructions for Section A

Select the response that is **correct** for the question. A correct answer scores 1; an incorrect answer scores 0. Marks are not deducted for incorrect answers. If more than 1 answer is completed for any question, no mark will be given.

Question 1

Vaccination attempts to produce active immunity through introducing an antigen into an organism. The advantage of active immunity is that

- A. active immunity uses antibodies to initiate an immune response
- B. active immunity uses more energy than passive immunity
- C. active immunity creates memory cells
- D. active immunity can be passed through mothers milk

Question 2

Snake antivenom is produced by injecting horses with snake venom, waiting for an immune response and then extracting the antibodies that are produced from the blood of the horse. These antibodies are then injected into a person that has been bitten by a snake. This process of injecting the envenomed human with antibodies is

- A. natural and passive immunity
- B. artificial and passive immunity
- C. natural and active immunity
- D. artificial and active immunity

Question 3

Rabbits are used to produce funnel web spider antivenom. In the rabbit the process of making the antivenom is

- A. natural passive immunity
- B. artificial passive immunity
- C. natural active immunity
- D. artificial active immunity

Question 4

After a mammal baby is born the mother usually feeds the baby from mammary glands. This confers the baby with a level of passive immunity as antibodies from the mother are passed to the baby. Mammalian babies need this form of immunity as

- A. milk contains B memory cells
- B. the baby's immune system will start to work once it is exposed to antibodies
- C. the baby's immune system is not fully developed
- D. the baby immune system will shut down if milk is not available

Question 5

Active immunity is the result of exposure to an antigen which triggers an immune response. The cell involved in the initiation of that response is

- A. antibodies
- B. antigen presenting cells
- C. helper B cells
- D. plasma cells

Question 6

Byron Bay has the lowest vaccination rates in Australia with only 65% of individuals who could be vaccinated being vaccinated. Herd immunity requires 95% of individuals to be vaccinated and exhibit an immune response. What is herd immunity?

- A. most of the population having 95% immunity
- B. as most people are vaccinated the likelihood of transmitting a disease is decreased
- C. herds are more likely to have similar immune responses
- D. where a disease does not affect the fittest individuals, so they don't need to be vaccinated

Question 7

Herd immunity is meant to protect individuals who may have a compromised immune system which makes vaccination unreliable. This group includes

- A. 5-year old's
- B. people infected with HIV
- C. people who live on their own
- D. antivaxxers

Question 8

Recently a group of Australians was identified as requiring a booster shot for measles as they had not had the two initial vaccinations in the 70's. Why are booster shots required?

- A. to ensure the individuals contract measles so they can develop active immunity
- B. it increases the number of B memory cells to the pathogen
- C. it increases the number of antibodies produced by the vaccination
- D. it ensures adults don't take risks at children's parties

Question 9

Tetanus is a disease caused by the *Clostridium tetani* bacteria which can infect cuts or wounds that are exposed to soil, manure or dust. Herd immunity is not possible for tetanus because

- A. tetanus is not contagious
- B. the bacteria are easily killed by washing hands
- C. the vaccination for tetanus is not effective
- D. booster shots are not available for tetanus

Question 10

Autoimmune diseases are caused by

- A. the automatic response of the body to pathogen entry that causes apoptosis
- B. infection of the autonomic nervous system
- C. the immune system not producing enough autoantibodies
- D. the immune system attacking self-cells

Question 11

Multiple sclerosis is an example of an auto immune disease that affects the myelin cells that insulate neurons. An effect of multiple sclerosis would be

- A. myelin cells increasing in thickness due to defending against B cell attack
- B. macrophages identifying the myelin cells as self and causing phagocytosis
- C. Th cells recognising the myelin cells as non-self and causing apoptosis
- D. autoantibodies being produced that opsonise the myelin cells

Question 12

AIDS is the result of infection with HIV. AIDS occurs because the body becomes immune deficient. Immune deficiency in AIDS is caused by

- A. the virus infecting body cells and causing apoptosis
- B. the viral infected cells clumping together and blocking blood vessels
- C. infection of Th cells reducing the immune response
- D. the entire immune system being destroyed by the virus

Question 13

Allergies are increasing in western society and although the cause for the increase is not well known one theory suggests that young children are not being exposed to pathogens and so the immune system is not being activated sufficiently. The response of the body to an allergen is

- A. IgE antibodies attaching to mast cells during the first exposure
- B. IgE antibodies being released into the bloodstream producing memory B cells
- C. antigen presenting cells carrying the IgE antibodies
- D. cross linking of the allergen between mast cells causing histamine release

Question 14

Cancer occurs when body cells grow out of control making the cell difficult to treat as cancer cells have self-antigens on the cancer cell membrane that cannot be identified as non-self by the body's immune system. Monoclonal antibody production attempts to solve this problem by

- A. taking a unique antigen from a cancer cell and producing antibodies for it
- B. making single antibodies that attach to hybridomas
- C. making monoclonal antibodies for one type of T cell
- D. producing clones of antibodies from mice antigens

Question 15

Monoclonal antibody production requires fusing antibody forming cells with tumour cells to form hybridomas. Then advantage of this process is that

- A. the hybridomas attach to the tumour and kill it
- B. the hybrid cells produce antibodies specific to the cancer cells antibodies
- C. the hybridoma multiply indefinitely and continue producing antibodies
- D. the specific antibodies produced are part human and part mouse

SECTION B - Short-answer questions

Instructions for Section B

Answer **all** questions in the space provided. Write using a blue or black pen.

Question 1

Pertussis or whooping cough is a deadly disease caused by the pertussis bacteria that mainly affects young children. There are two vaccine types; whole cell or attenuated. Vaccinating mothers during pregnancy leads to protection for the baby at birth. In Australia it is recommended that vaccinated people who are in contact with young children should get a booster shot every 5 to 10 years. Herd immunity is used to try and control pertussis and prevent infection in babies in Australia

- a. Explain how herd immunity can protect babies from pertussis

2 marks

- b. Babies under 2 months of age are not vaccinated for pertussis however when tested, show antibodies for the pertussis antigen if their mother had been vaccinated during pregnancy. What is this type of immunity and how is it possible?

2 marks

- c. Why do people need a booster shot for pertussis after they have been vaccinated?

2 marks

- d. One version of the pertussis vaccination contains attenuated antigens. What is an attenuated vaccine and why is it used?

2 marks

- e. While the pertussis vaccine is recommended for people who work with children which other groups would also be protected by herd immunity?

2 marks

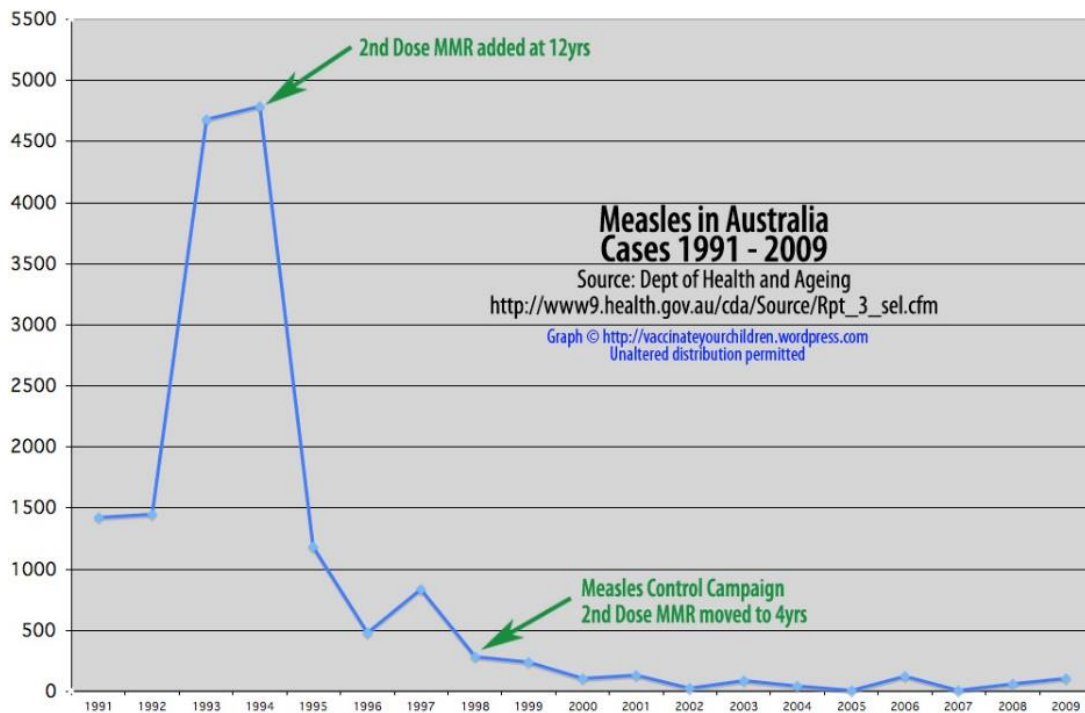
- f. It was found that even though people had been vaccinated for pertussis after time the vaccine became less effective as the bacteria mutated and changed. Why would the vaccine be less effective?

2 marks

Total 10 marks

Question 2

Below is a graph showing the changes in measles cases in Australia between 1991 and 2009



- a. In what year was the measles vaccine introduced?

1 mark

- b. Describe using data from the graph how measles cases changed after the vaccine was introduced.

1 mark

c. In what years were there no measles cases?

1 mark

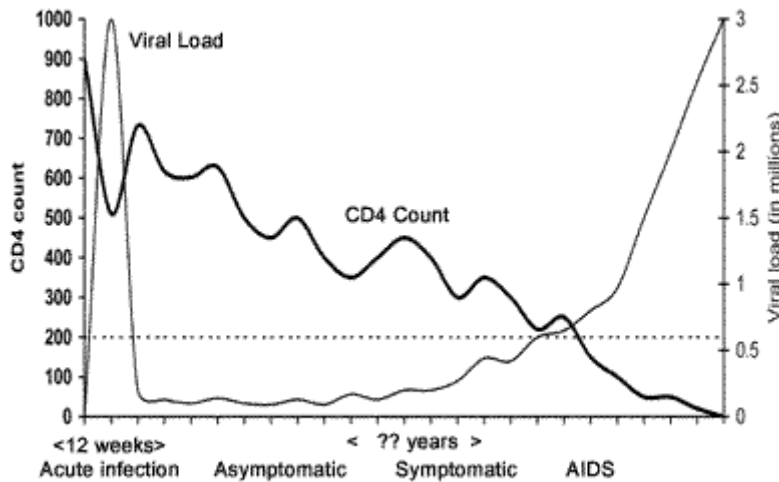
d. Describe what has occurred between 2007 and 2009. What may have caused this change?

2 marks

Total 6 marks

Question 3

HIV is a virus that disrupts the immune system resulting in an immune deficiency disorder. The result of this is that infected individuals' immune system and CD4 cells such as Th cells and macrophages is so suppressed that it cannot respond adequately to diseases that would normally be controlled by an immune response leading to death. In recent years a treatment for HIV has been developed called Anti-Retroviral treatment (ART) where the virus is stopped from exiting CD4 cells so that continued infection is not possible, and the immune system can rebound.



a. Considering the graph at what stage would the ART treatment be best administered? Explain why?

3 marks

- b. CD4 cells gradually decrease over time if untreated however AIDS does not occur until the CD4 count is below what level? Explain why

3 marks

- c. How does the blocking of the virus leaving the CD4 cells using ART cause HIV to be controlled?

3 marks

Total 9 marks

Question 4

Allergic responses occur where an allergen causes an over reactive immune response.

- a. The first time the immune system is exposed to an allergen an allergic response does not occur. Explain why?

2 marks

- b. Often the allergic response increases with subsequent exposure to the allergen sometimes becoming so severe it causes anaphylactic shock and potentially death. Explain why secondary exposure causes a larger allergic response

2 marks

- c. Antihistamines are used where allergic responses are mild, for example with hay fever. Why might antihistamines be used in these cases?

1 mark

Total 5 marks

END OF KEY TOPIC TEST