Student Name: _____

TSSM™
Creating VCE Success

BIOLOGY 2017

Unit 3
Key Topic Test 8 – Responding to antigens

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

Materials supplied

- Question book of 12 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

Answer **all** questions.

Choose the response that is **correct** for the question.

A correct answer scores 1, an incorrect answer scores 0.

Marks will **not** be deducted for incorrect answers.

No marks will be given if more than one answer is completed for any question.

Question 1

Kuru, also called "the laughing death", is a rare disease found only in Papua New Guinea. It is caused by prions. A prion is a pathogenic agent composed of:

A. DNA.

B. lipid.

C. protein.

D. RNA.

Question 2

A function of all lymph nodes is:

A. to secrete hormones involved in the immune system.

B. to initiate the inflammatory response.

C. to filter lymph as it flows through lymph vessels.

D. to clean the blood as it flows through lymph vessels.

Question 3

As part of the body's specific immune response, human cells infected by viruses may be killed by

A. antibodies.

B. helper T-cells.

C. complement proteins.

D. cytotoxic T-cells.

Question 4

Lymphocytes

A. are responsible for cell mediated immunity but not humoral immunity.

B. develop in the thymus.

C. circulate in the blood but not the lymph.

D. develop from bone marrow cells.

Question 5

Non-specific defences in mammals includes

A. the mucus lining in the respiratory tract.

B. the production of memory cells.

C. attachment of cytotoxic T cells to infected cells.

D. the production of antibody molecules by plasma cells.

Question 6

Diarrhoea is a common symptom of infection in the intestine. Intestines may be infected by viruses, bacteria or protozoa such as *Giardia* or *Amoeba*. Which of the following sets of test results would support a diagnosis of viral infection?

	Organisms observed in faeces	**Blood test results**
A.	No organisms observed	Elevated T and B lymphocytes
B.	Organisms of diameter 0.8 mm	Elevated T and B lymphocytes
C.	Organisms of diameter 0.8 mm	Elevated B lymphocytes
D.	Organisms of diameter 10 mm	Elevated B lymphocytes

Question 7

The inflammatory response is a defence mechanism that evolved in higher organisms to protect them from infection and injury.

This response

A. includes phagocyte migration to the site of injury.

B. is part of the specific immune response.

C. is specific to the type of foreign body.

D. involves the production of memory cells.

Question 8

In humans specific immune responses include

A. production of antibodies by plasma cells.

B. production of histamine by mast cells.

C. phagocytosis by monocytes.

D. lysing of bacterial cell walls by complement proteins.

Question 9

Which of the following roles best describes the function of cytotoxic T-cells?

A. They produce antibodies which circulate and bind with foreign antibodies.

B. They are key cells in the body's cellular immune response.

C. They are important in the inflammatory response.

D. They are required to activate B-cells.

Question 10

Chemical barriers that are involved in the resistance of plants to pathogens include

A. the vertical alignment of leaves.

B. a secondary cell wall.

C. a thick cuticle.

D. compounds which interfere with pathogen nutrition.

SECTION B - Short-answer questions

Instructions for Section B

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

Question 1

Meningococcal disease is caused by the bacterium *Neisseria meningitides. N. meningitides* is found in the throat and nasal passages of about 10% of the population. These carriers of *N. meningitides* suffer no disease symptoms. In susceptible individuals however, the bacteria can pass into the bloodstream and cause disease.

a. There are many strains of meningococci.

i. Is the organism *N. meningitides* prokaryotic or eukaryotic?

_____

ii. Name two features which distinguish prokaryotic from eukaryotic cells.

_____

_____

1 + 2 = 3 marks

b. Children and young adults are now routinely vaccinated against one strain of *N. meningitides.* Meningococcal C vaccine is effective in providing protection against bacteria in what is known as serogroup C. An effective vaccine against serogroup B bacteria has not yet been produced. In serogroup B bacteria, the key polysaccharide is identical to polysaccharides found in the body and so is recognized as self by the body's immune system.

i. What term is used to describe molecules such as polysaccharides identified by the immune system?

_____

ii. What property of cells enables the body to distinguish self from non-self?

_____

_____

1 + 1 = 2 marks

c. Outline the primary response of B lymphocytes to the serogroup B bacteria if they enter the bloodstream and what occurs in any subsequent reinfections.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

5 marks
Total 10 marks

Question 2

The defence barriers erected by plants are a co-ordinated system of molecular, cellular and tissue-based responses to pathogen attack. Protection from a pathogen's initial invasion is achieved via passive defences, such as physical and/or chemical barriers.

a. What name is given to protection that prevents initial invasion of pathogens via passive defences?

_____

1 mark

b. Name two physical barriers which protect the plant from invasion.

_____

_____

2 marks

c. Name and outline the action of two chemical barriers which protect the plant from invasion.

_____

_____

_____

_____

2 marks

d. When would the cellular and tissue-based responses to pathogen attack be activated?

_____

1 mark

e. Animals also have passive defences that prevent the initial invasion of pathogens. Name and outline the action of two barriers which protect animals from invasion.

_____

_____

_____

_____

2 marks

f. Identify two cells that are involved in the secondary immune response of animal cells once a bacterial pathogen passes through the initial physical and chemical barriers.

_____

_____

2 marks

Total 10 marks

Question 3

Complement proteins are a group of 20 proteins present in body fluids. They may be activated to fight infection by the presence of the pathogen itself or when antigens and antibodies combine. Activated complement molecules may disrupt the cell wall of pathogens making them easier for phagocytes to ingest. They also attract leukocytes to the site of infection and stimulate the release of histamine.

a. What part of the pathogen does the body detect?

_____

1 mark

b. What part of the immune system is being used when complement is being activated?

_____

1 mark

c. Where are the complement proteins found in the body?

_____

1 mark

d. What two changes would be observed in tissue exhibiting the effect of complement?

_____

_____

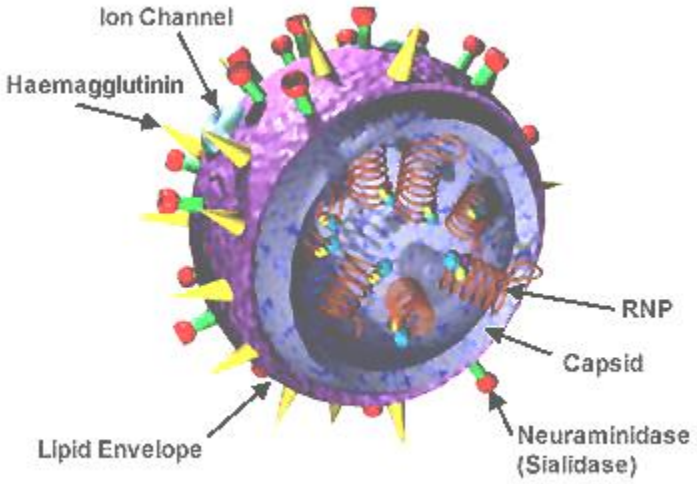
2 marks

Total 5 marks

Question 4

This diagram below represents a virus of the type which causes influenza. In response to the presence of a virus, interferons are synthesised and secreted into the tissue fluid by many different cell types, including macrophages and lymphocytes.

The viral core contains nucleic acid. The outer layer is composed of a lipid studded with protein molecules of two types, neuraminidase and haemagglutinin. These proteins trigger an immune response in humans and other vertebrates.



a. Why are interferons considered to be part of the non-specific immune system?

_____

_____

1 mark

b. How do interferons act to limit the spread of viruses in the body?

_____

_____

_____

_____

1 mark

c. Viruses trigger a specific immune response. What is the advantage of having interferons as well?

_____

_____

_____

_____

1 mark

d. What name is given to molecules which trigger an immune response?

_____

1 mark

New strains of influenza appear almost every year. These new strains are distinguished by changes in the viral nucleic acid which leads to changes in the structure of the surface protein molecules. Small changes result in proteins which some immune cells are still able to recognise and respond to. If re-infected with the new strain, previously infected individuals may still get influenza but it will be milder. Occasionally, however the virus' proteins undergo major structural change. Severe pandemics (world-wide outbreaks) of influenza result.

e. How would significant structural change in viral neuraminidase lead to an influenza pandemic?

_____

_____

_____

_____

_____

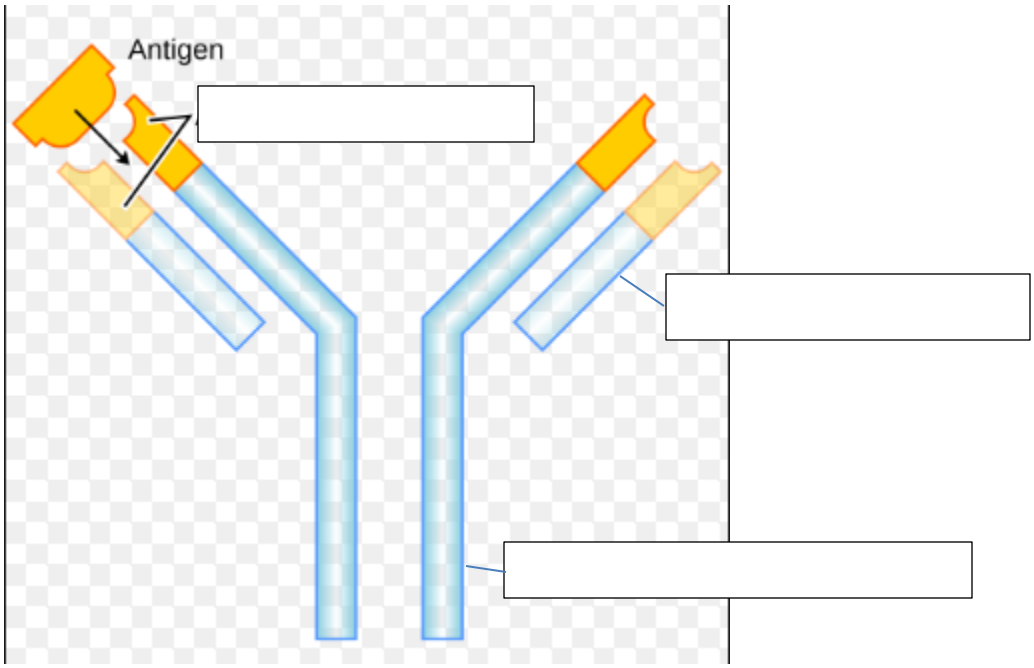
_____

_____

_____

3 marks

The diagram below shows the viral protein neuraminidase bonded to an antibody molecule.



f. Fill in the gaps in the diagram above

3 marks
Total 10 marks

END OF KEY TOPIC TEST