VCE BIOLOGY 2016

YEAR 12 UNIT 3

Topic Test 2 – Detecting & Responding

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Time allowed: 50 minutes
Total marks: 40

14 Multiple Choice Questions
4 Short Answer Questions

An Answer Sheet is provided for Section A.
Answer all questions in Section B in the space provided.

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STUDENT NUMBER

										Letter
Figures										
Words										

Student Name.....…….....

VCE Biology 2016 Year 12 Topic Test 2 Unit 3

Detecting & Responding

Student Answer Sheet

There are **14 Multiple Choice** questions to be answered by circling the correct letter in the table below. Use only a 2B pencil. If you make a mistake, erase and enter the correct answer. Marks will not be deducted for incorrect answers.

Question 1	A	B	C	D	*Question 2*	A	B	C	D
Question 3	A	B	C	D	*Question 4*	A	B	C	D
Question 5	A	B	C	D	*Question 6*	A	B	C	D
Question 7	A	B	C	D	*Question 8*	A	B	C	D
Question 9	A	B	C	D	*Question 10*	A	B	C	D
Question 11	A	B	C	D	*Question 12*	A	B	C	D
Question 13	A	B	C	D	*Question 14*	A	B	C	D

VCE Biology 2016 Year 12 Topic Test 2 Unit 3

Detecting & Responding

SECTION A – Multiple Choice Questions

*Questions 1 and 2 refer to the diagram in **Figure 1**.*

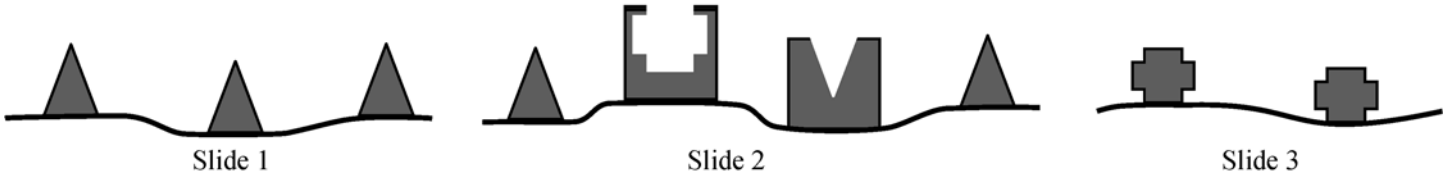

Figure 1

Question 1
Gina was working in the pathology laboratory looking at a variety of cells through the electron microscope. Unfortunately, the labels from three of the slides had fallen off. She knew from the files however, that these slides were supposed to be a sample of a person's red blood cells, the same person's white blood cells and cells from a liver fluke, a parasitic worm. Using the electron microscope, Gina made the above diagram of the plasma membrane of each cell type examined. With the aid of your understanding of cell membranes and the above sketches, which label would you give to each of the slides?

	Slide 1	**Slide 2**	**Slide 3**
A.	Red blood cell.	White blood cell.	Liver fluke.
B.	Liver fluke.	White blood cell.	Red blood cell.
C.	White Blood cell.	Red blood cell.	Liver fluke.
D.	White blood cell.	Liver fluke.	Red blood cell.

Question 2
Which of the shapes in **Figure 1** would be considered to have come from a pathogen?

A.

B.

C.

D.

Question 3
Prions are believed to be derived from naturally occuring proteins that have been warped into a stable but different structural conformation. These prions then warp other proteins with the same amino acid sequencing, in turn creating new prions. The level of structure of the protein that is **least** likely to be affected by the warping process would be

A. primary structure.
B. secondary structure.
C. tertiary structure.
D. quaternary structure.

Question 4
In gardening stores like Bunnings, you can now buy chemical traps for the Queensland fruit fly. However, these only attract the male insects.
This would be an example of what form of chemical signal?
A. Endocrine.
B. Exocrine.
C. Pheromone.
D. Paracrine.

Question 5
New forms of body washes have recently gone on sale at supermarkets that are specially designed to reduce body odour by killing the bacteria that live on the skin and under your armpits. This may inadvertently weaken the body's natural defences because it will harm the body's
A. second line of defence.
B. natural flora.
C. mucus.
D. interferon.

Question 6
The optic nerve is responsible for sending information from the eye to the brain for processing. It would be considered part of the
A. afferent pathway.
B. efferent pathway.
C. motor neuron.
D. endocrine system.

Question 7
As a natural part of a body's development and growth, certain cells can be given a signal to destroy themselves when they are no longer needed**.** However, cells can also be damaged and killed by accident or, in some cases, by opportunistic infection. This unintentional cell death is known as
A. apoptosis.
B. necrosis.
C. mutation.
D. accidental.

Question 8
A cell that produces a specific hormone was found to have a receptor for the same hormone on the surface of its cell membrane. With regards to this cell, the hormone would be
A. an amino acid based autocrine hormone.
B. an amino acid based paracrine hormone.
C. a steroid based autocrine hormone.
D. a steroid based paracrine hormone.

Question 9
As the digestive system breaks down a meal, cells lining the villi of the intestine absorb the products of digestion. Glucose is one such product that is absorbed and so its levels in the blood rise. This rise is detected by specialised cells in the islets of Langerhans of the pancreas. These signal other cells in the pancreas called beta cells to produce the hormone insulin which travels around the body to most body cells, causing them to increase glucose uptake from the blood**.**
The effector cells in relation to a higher than normal blood glucose level would be the
A. cells lining the villi of the intestines.
B. islets of Langerhans.
C. beta cells in the pancreas.
D. most body cells.

Question 10

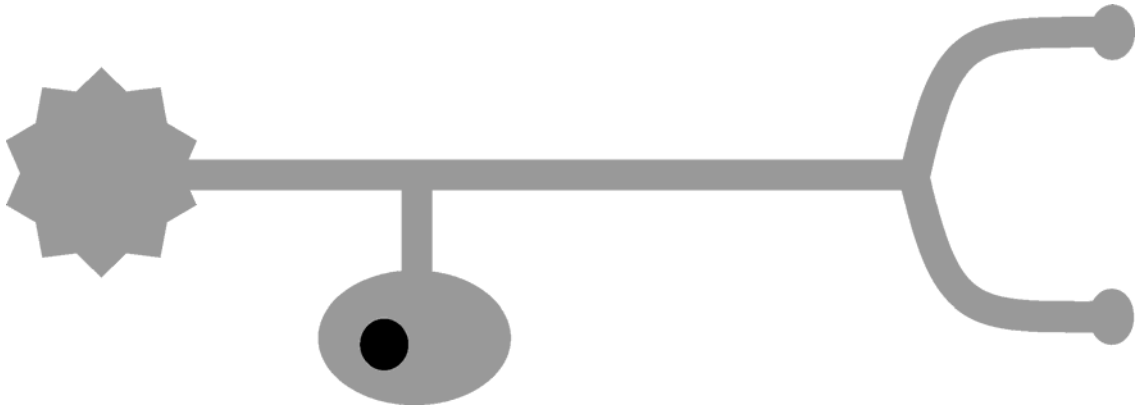

Figure 2 – (a drawing of a nerve cell)

Figure 2 above would represent a(n)
A. brain cell.
B. interneuron.
C. sensory neuron.
D. motor neuron.

Question 11
A baby absorbing antibodies to influenza through their mother's breastmilk would be receiving a form of
A. natural active immunity.
B. natural passive immunity.
C. induced active immunity.
D. induced passive immunity.

Question 12
Natural killer cells will destroy normal body cells when they have been infected with a virus. This action is most likely in response to
A. interferon.
B. complement proteins.
C. histamine.
D. platelets.

Question 13
Unripe apples can be ripened at an accelerated rate by placing them with some apples that are already ripe. This increase in speed of ripening is due to

A. decreased levels of ethylene.
B. increased levels of ethylene.
C. increased levels of gibberellin.
D. decreased levels of gibberellin.

Question 14
A chemical company was trialling a new antibiotic chemical. They incubated bacteria on agar plates before adding small squares of cloth soaked in the chemical to the centre of the plates. In **Figure 3**, which of the following plates shows the most effective antibiotic chemical?

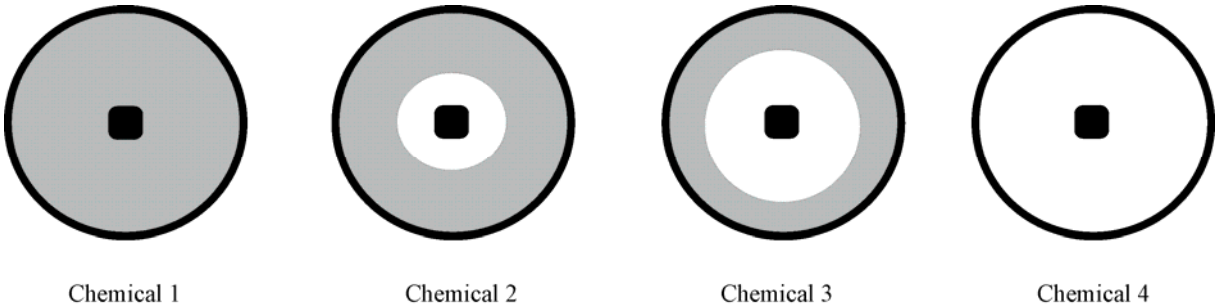

Figure 3

A. Chemical 1.
B. Chemical 2.
C. Chemical 3.
D. Chemical 4.

End of Section A

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Detecting & Responding

SECTION B – Short Answer Questions

Question 1 (5 marks)

Rhodnius prolixus is an insect whose development is triggered by the drinking of blood from its host organism.

a. What term is given to an organism that survives by consuming part of a larger host organism? **1 mark**

_____

After a blood meal, the juvenile *Rhodnius prolixus* will moult and develop into an adult.

Figure 4 – Stages of development of *Rhodnius prolixus*

Another unusual feature of *Rhodnius prolixus* is that, after having its head removed, the insect will continue to survive for several months. However, it will not grow or moult.

Scientists researching the insect's development have discovered that if a *Rhodnius prolixus* is decapitated **an hour** after ingesting a blood meal, it will not moult to form an adult, but if *Rhodnius prolixus* is decapitated **a week** after ingesting a blood meal, moulting into the adult stage occurs.

b. Propose a possible hypothesis to explain why a *Rhodnius prolixus* insect decapitated a week after ingesting blood will still moult, while one decapitated an hour after ingesting blood will not. **1 mark**

_____

_____

_____

c. Design an experiment that you would use to test this hypothesis. Include the results that would support your original hypothesis. **3 marks**

_____

_____

_____

_____

_____

_____

_____

_____

Question 2 (7 marks)
Myasthenia gravis is a non-contagious disease. It is caused by the body's own immune system and produces antibodies that block the acetylcholine receptors in the neuromuscular junction. This results in muscle weakness and fatigue.

a. What term is given to a disease that is caused by the body attacking itself rather than by a pathogenic agent? **1 mark**

_____

b. Name the cell responsible for the production of these antibodies. **1 mark**

_____

c. **Figure 5** shows a diagram of a neuromuscular junction. On the diagram circle an acetylcholine receptor. **1 mark**

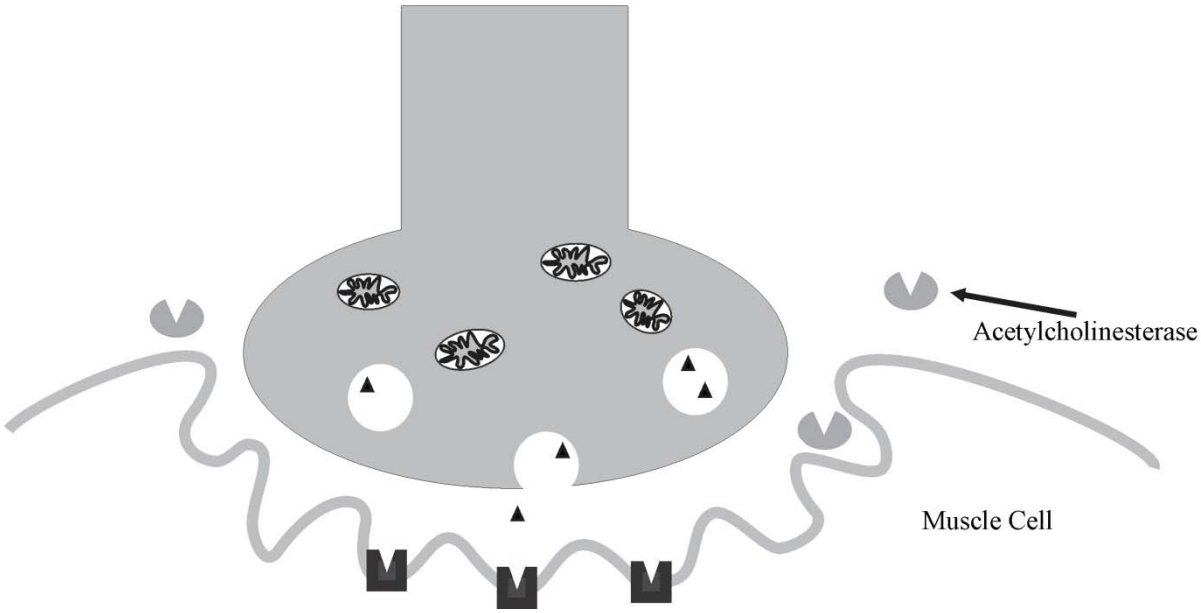

Figure 5 – Neuromuscular junction

d. One form of treatment for Myasthenia gravis is to supply drugs that inhibit the action of the acetylcholinesterase enzyme. Explain how this would be of benefit to a person suffering from Myasthenia gravis. **2 marks**

_____

_____

_____

_____

e. In some cases of Myasthenia gravis, the thymus needs to be removed. An unfortunate side effect of this procedure is that a person's immune system will be weakened as a result of the surgery. Explain why. **2 marks**

_____

_____

_____

_____

Question 3 (9 marks)
Hepatitis B is an infectious disease that affects the liver. It is currently believed that nearly a third of the world's population has been infected with the Hepatitis B virus (HBV) during their lifetime. Though rarely fatal, Hepatitis B can lead to jaundice, a yellowing of the skin, abdominal pain and often liver damage.

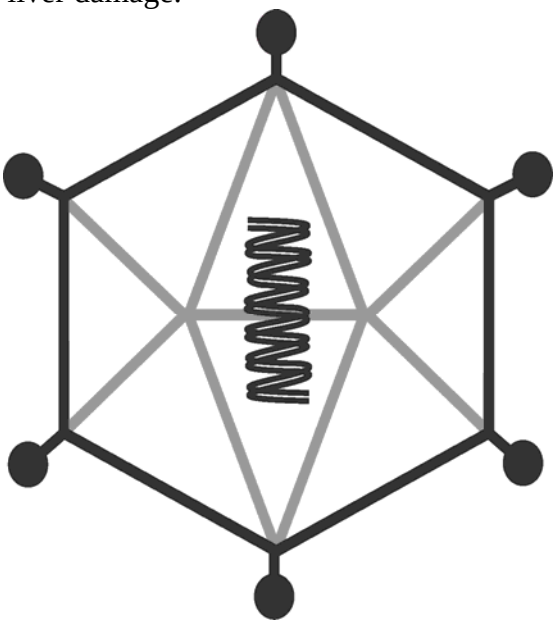

Figure 6 – Hepatitis B viral particle

a. Name the organic molecule that the outer shell of the virus is composed of. **1 mark**

_____

b. Explain why viruses are considered to be pathogenic agents rather than pathogenic organisms. **2 marks**

_____

_____

c. Why does the Hepatitis B virus infect only liver cells rather than a variety of cells in the body like the lungs and brain? **1 mark**

_____

_____

Since 1982 a vaccine for Hepatitis B has been available and the incidence of Hepatitis B worldwide has dropped dramatically.

d. What materials is the vaccine to Hepatitis B likely to be made up of? **1 mark**

_____

e. Explain how the vaccine works with the body to create an immunity to Hepatitis B. **2 marks**

_____

_____

_____

_____

f. Draw the shape of the antibody that would eventually be produced by the body to combat the Hepatitis B virus as shown in **Figure 6**. **2 marks**

Question 4 (5 marks)
In the atria of the heart there are specialised mechanoreceptors that detect the pressure of the blood called stretch receptors. When a drop in blood pressure is detected, they signal the adrenal glands to produce the steroid hormone aldosterone. Aldosterone acts on the cells that make up the nephrons of the kidneys causing them to reabsorb more salt from the waste fluid that they are filtering.

a. Name the molecule, common in animal cells, which aldosterone would be synthesised from. **1 mark**

_____

b. Is the receptor to aldosterone likely to be inside the cell or on the surface of the cell? Explain why. **2 marks**

_____

_____

_____

c. Explain why reabsorbing salt will help to increase blood pressure. **1 mark**

_____

_____

d. Cells in the nephron of a kidney have a far greater salt concentration than that found in neighbouring cells. By what process is salt most likely to be moving into cells in the nephron? **1 mark**

_____

_____

End of Section B

End of Topic Test 2

Suggested Answers

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Detecting & Responding

SECTION A – Multiple Choice Answers

1. A	**2.** D	**3.** A	**4.** C	**5.** B	**6.** A	**7.** B
8. A	**9.** D	**10.** C	**11.** B	**12.** A	**13.** B	**14.** D

SECTION B – Short Answer (Answers)

Question 1 (5 marks)

a. Parasite **(1 mark)**.

b. Hormones produced in the head of the *Rhodnius prolixus* insect will diffuse through the body and initiate moulting **(1 mark)**.

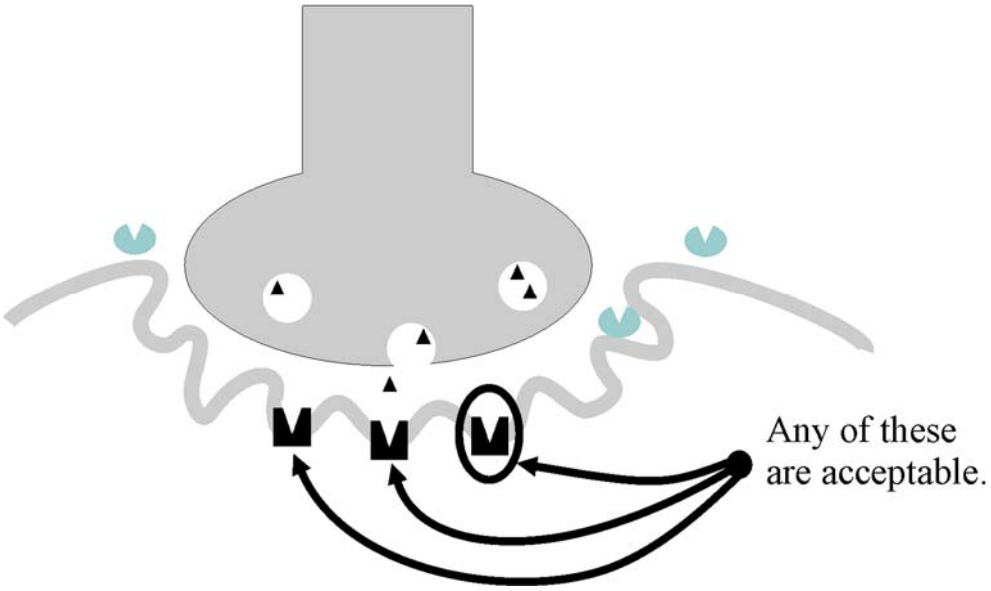
c. Decapitate one insect a week after it had ingested blood and another insect that had ingested blood an hour ago (**1 mark for using both types of insects**).
Connect the bodies of the two decapitated insects with a tube that allows fluids to diffuse from one insect to another (**1 mark for allowing hormones to transfer)**.
If both bodies moult and develop into adults, it shows that a hormone produced in the head is responsible **(1 mark)**.
Any other reasonable experiment is fine.
E.g. decapitate an insect that had ingested a blood meal the previous day and place the head on a block of agar jelly. After a week place the agar block on the body of a decapitated insect that had **NOT** ingested a blood meal. If the body of the insect, then develops into an adult, it is due to hormones that were produced in the head of the other insect.

Question 2 (7 marks)

a. Autoimmune disease **(1 mark)**.

b. Plasma cells or Plasma B cells **(1 mark)**.

c.



(1 mark)

d. Acetylcholinesterase breaks down the acetylcholine molecule. Inhibiting acetylcholinesterase would result in greater levels of acetylcholine in the neuromuscular junction **(1 mark)**. This would benefit sufferers of Myasthenia gravis by supplying the muscles with higher levels of the acetylcholine to help negate the effect of antibodies blocking the receptors **(1 mark)**.

e. T cells mature in the thymus **(1 mark)**.
Without active T cells, the body is less able to respond to specific pathogens **(1 mark)** (weakens the third line of defence).
or
T cells respond to cells that have become potentially cancerous. Without T cells harmful cancers may develop **(1 mark)**.

Question 3 (9 marks)

a. Protein **(1 mark)**.

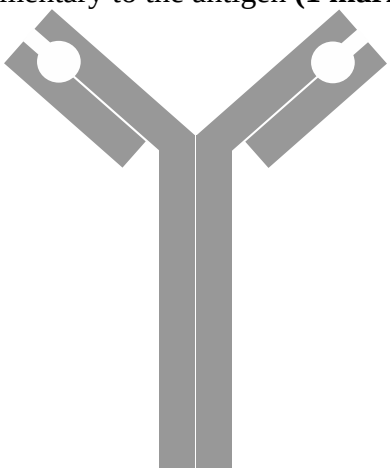
b. Organisms are living, and composed of cells **(1 mark)**. A virus is considered non-living since it is non-cellular and cannot replicate without a host **(1 mark)** (or is inert when found outside of a host cell).

c. Only liver cells have the correct molecules on their surface that Hepatitis B viral proteins can latch onto in order to gain entry into the cell **(1 mark)**.

d. The vaccine is likely to be part or all of the protein shell of the virus **(1 mark)** (also allow an attenuated / weaker strain of the virus.)

e. The body detects the viral antigen and finds a B cell with the complementary structure to lock onto the antigen **(1 mark)**. The B cell then produces plasma cells which flood the body with the correct antibodies and memory B cells which are retained during a person's lifetime in case of subsequent reinfections **(1 mark)**.

f. Correct shape for antibody **(1 mark)**
Both active sites complementary to the antigen **(1 mark)**



Question 4 (5 marks)

a. Cholesterol **(1 mark)**.

b. The receptor to aldosterone is inside the cell **(1 mark)**.
This is because aldosterone is a steroid which is lipid based and can easily pass through the plasma membrane **(1 mark)**.

c. Absorbing greater levels of salt will in turn attract more water back into the nephrons due to osmosis **(1 mark)**.

d. Active transport **(1 mark)**.

End of Suggested Answers