# VCE BIOLOGY 2017

## Year 12 Unit 3 – Topic Test 2

## How do cells communicate?



## 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 2017 Year 12 Topic Test 2 Unit 3

# How do cells maintain life?

## Area of Study 2: How do cells communicate?

**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 2017 Year 12 Topic Test 2 Unit 3

# How do cells maintain life?

## Area of Study 2: How do cells communicate?

## SECTION A – Multiple Choice Questions

**Question 1**
Some specialised cells like the T cell produce a hormone that can bind to receptors on the surface of the cell itself and signal a further response. These types of hormones are known as
**A.** autocrine hormones.
**B.** paracrine hormones.
**C.** endocrine hormones.
**D.** exocrine hormones.

**Question 2**
Which of the following does **not** involve the action of a ligand?
**A.** An antigen binding to a T cell receptor.
**B.** Salt being detected by taste buds.
**C.** A photon of light hitting a photoreceptor in the eye.
**D.** Acetylcholine diffusing through a synapse and binding with post-synaptic receptors.

**Question 3**
Of the different pathogens listed below, which would be smallest in size?
**A.** Tapeworm.
**B.** *Haemophilus influenza* bacteria.
**C.** *Plasmodium malariae* (malaria).
**D.** Ebola virus.

**Question 4**
Which of the following classes of hormones would bind to an intracellular receptor?
**A.** Protein.
**B.** Peptide.
**C.** Steroid.
**D.** Amino acid derivative.

**Question 5**
The plant growth regulator responsible for fruit ripening is
**A.** auxin.
**B.** ethylene.
**C.** cytokinins.
**D.** abscisic acid.

**Question 6**
An example which forms part of the second line of defence against disease in humans would be
**A.** salt in tears.
**B.** interferon released by a virally infected cell.
**C.** B cells differentiating into plasma cells.
**D.** mucus trapping pathogens in the throat.

**Question 7**
An infective agent that does not contain any nucleic acid would be classed as a
**A.** bacterium.
**B.** virus.
**C.** viroid.
**D.** prion.

**Question 8**
**Figure 1** shows a bacterial cell with antigens on its outside surface.

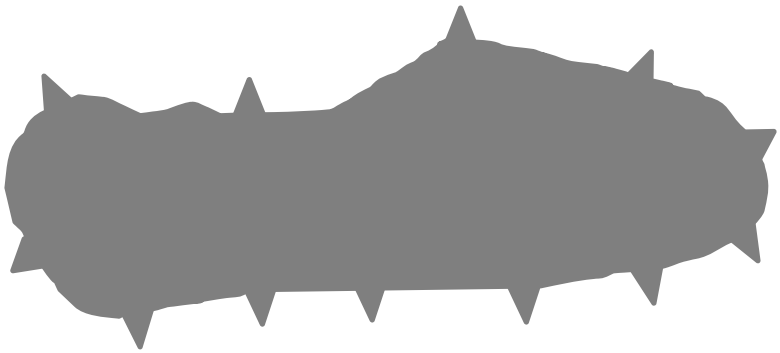


**Figure 1**

The correct antibody which would be able to fight the bacterium in **Figure 1** would be

**A.** 

**B.** 

**C.** 

**D.** 

**Question 9**
Class 1 HLA markers, also known as Class 1 MHC markers, exist
**A.** on all cells of the body and identify 'self'.
**B.** on all cells of the body and determine 'non self'.
**C.** only on B and T cells and identify 'self'.
**D.** only on B and T cells and determine 'non self'.

**Question 10**
Cells involved in the adaptive immune response in humans would include
**A.** helper T cells.
**B.** epithelial cells.
**C.** natural killer cells.
**D.** dendritic cells.

**Question 11**
An allergic response involves the release of
**A.** cytokines.
**B.** adrenalin.
**C.** histamine.
**D.** caspases.

**Question 12**

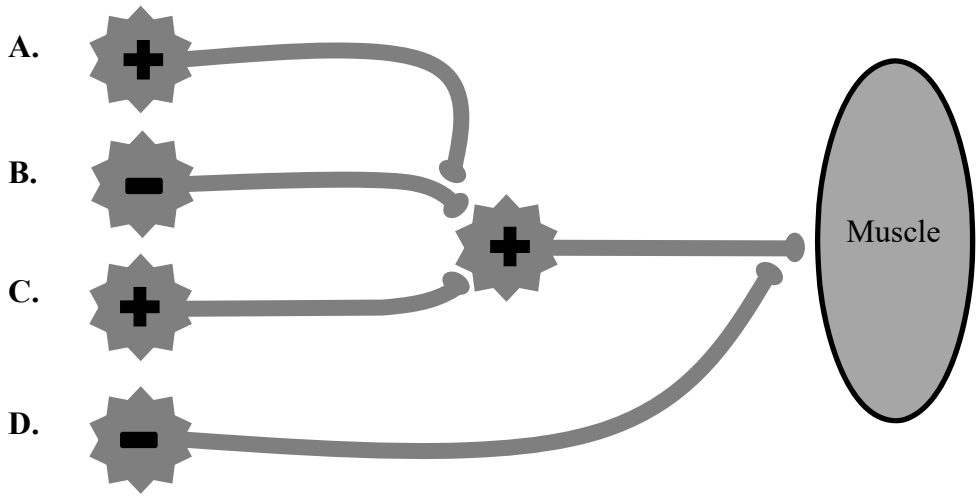



**Figure 2**

Key to Figure 2: + represents an excitatory neuron
– represents an inhibitory neuron

For the nerve impulse pathway shown in **Figure 2**, the nerve stimulation which would result in the muscle contracting would be
**A.** A, B and C.
**B.** C only.
**C.** A only.
**D.** A, C and D.

**Question 13**
The front of a bee hive often has bees facing downwards and fanning their wings. As they do this, these bees release a chemical which aids forager bees in relocating the hive. In this example the released chemical would be considered a

**A.** pathogen.
**B.** pheromone.
**C.** endocrine hormone.
**D.** neurotransmitter.

**Question 14**
In the combinations listed below, which two individuals would have the greatest chance of having matching HLA markers?

**A.** Mother and son.
**B.** Next-door neighbours.
**C.** Brother and sister.
**D.** Identical twins.

## End of Section A

# VCE Biology 2017 Year 12 Topic Test 2 Unit 3

# How do cells maintain life?

## Area of Study 2: How do cells communicate?

## SECTION B – Short Answer Questions

*The diagrams in **Figure 3** relate to Question 1.*

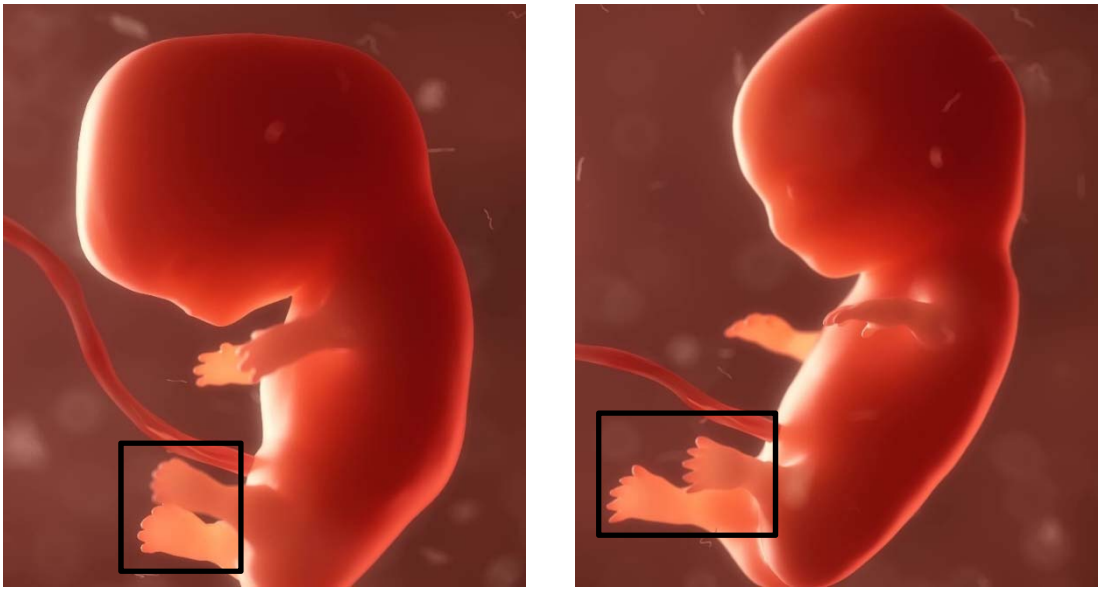


**Figure 3**

**Question 1 (6 marks)**
As a human foetus develops in the womb, as shown in **Figure 3**, a layer of cells forms between the developing digits in the hands and feet. This 'webbing' layer of cells is later removed when chemical messages initiated by factors external to the cells triggers them to self-destruct.

**a.** What is the biological term given to this 'self-destruct' process of the webbing cells? **1 mark**

_____

**b.** Describe clearly the main events which occur during this process. **3 marks**

_____

_____

_____

_____

**c.** The death-signalling molecule in this situation binds with a receptor on the plasma membrane of the cells in the webbing tissue. Explain what this means in terms of the biochemical nature of the death-signalling molecule. Justify your answer. **2 marks**

_____

_____

**Question 2 (8 marks)**

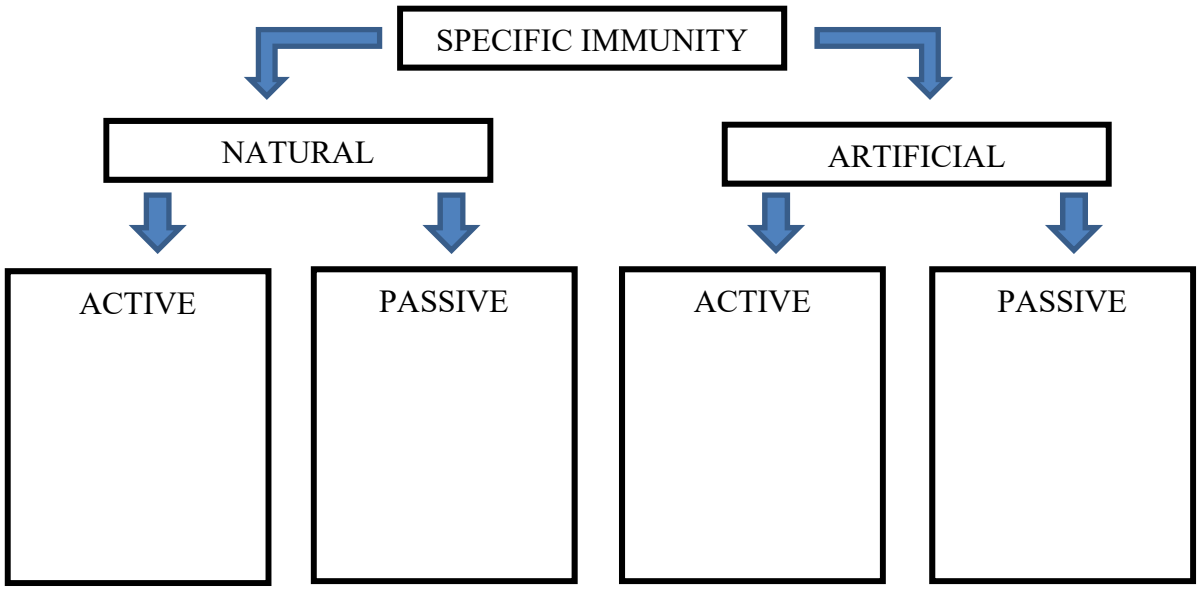



**Figure 4**

**a.** Give an example of each form of immunity outlined in the boxes provided in **Figure 4**. **4 marks**

**b.** Name a cell product that is produced, released and involved in all four forms of specific immunity outlined in **Figure 4**. **1 mark**

_____

**c.** Draw and label a diagram of this cell product. **3 marks**

**Question 3 (6 marks)**
Chagas disease is a tropical disease caused by the protozoan *Trypanosoma cruzi*. Early symptoms may include fever and swollen lymph nodes. In 30-40% of Chagas disease cases, enlarged heart ventricles may eventually occur, leading to heart failure. These symptoms may take up to 30 years to develop.
It is estimated that over 8 million people in Central and South America have Chagas disease and it is responsible for over 12,500 deaths per year.
The protozoan responsible for Chagas disease is often spread via the actions of a 'kissing bug'. This 'kissing bug' will bite the softer skin of a person's lips in order to feed on their blood. After a blood meal the 'kissing bug' will defecate and the protozoan that was present in the 'kissing bug's' gut will make its way into a person's bloodstream. Once inside a host the protozoan *Trypanosoma cruzi* will invade cells and replicate.

**a.** What term is given to an organism like the 'kissing bug' that is able to transfer the protozoan into another host without being affected by it? **1 mark**

_____

**b.** Explain why the body's first line of defence was unable to stop the protozoan's entry into the bloodstream. **2 marks**

_____

_____

_____

**c.** What name is given to an organism like the *Trypanosoma cruzi* protozoan that is reliant on a host for survival? **1 mark**

_____

**d.** Suggest a reason why the body's third line of defence is ineffective against the *Trypanosoma cruzi* protozoan in 30-40% of cases. **2 marks**

_____

_____

_____

**Question 4 (6 marks)**

**a.** Explain, with the aid of an illustrated, labelled diagram, the steps that would be involved in someone developing an allergy to cat hair. **4 marks**

_____

_____

_____

_____

_____

**b.** An allergic reaction is usually indicated by heat, redness and swelling of the affected area. This is the same response to infection. Explain how these symptoms may benefit the body in combatting an infective agent or pathogenic organism. **2 marks**

_____

_____

_____

_____

## End of Section B

## End of Topic Test 2

# Suggested Answers

# VCE Biology 2017 Year 12 Topic Test 2 Unit 3

# How do cells maintain life?

## Area of Study 2: How do cells communicate?

## SECTION A – Multiple Choice Questions

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

## SECTION B – Short Answer (Answers)

**Question 1 (6 marks)**

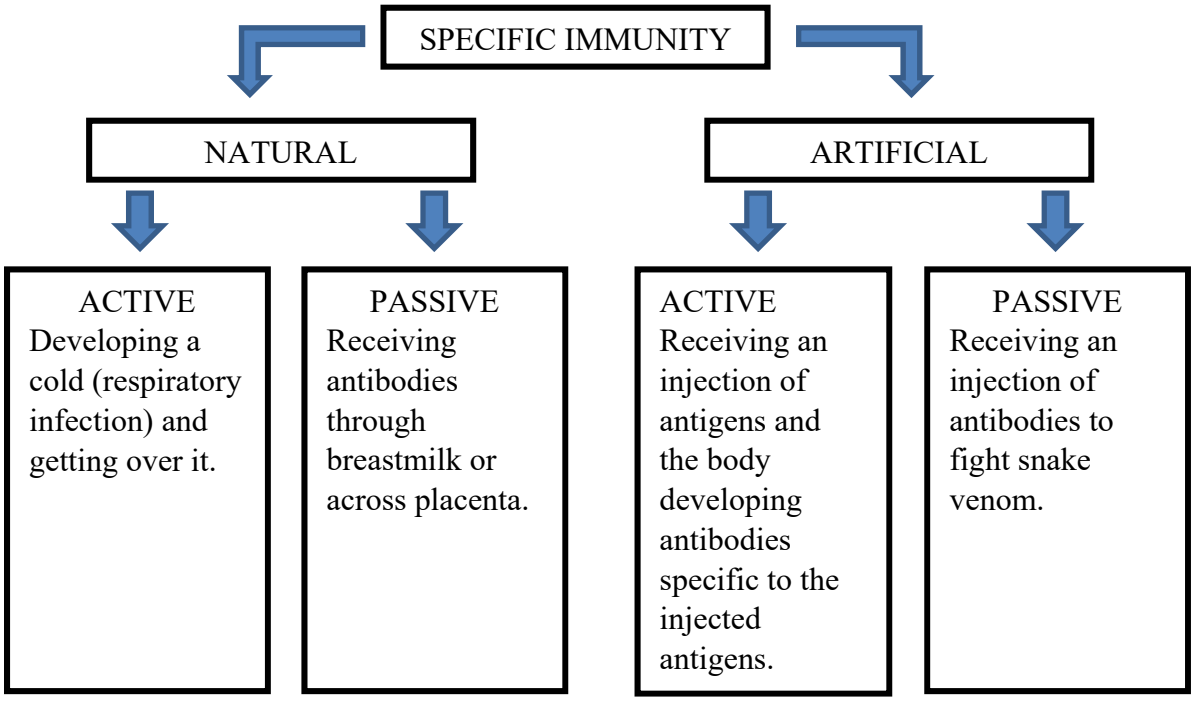
**a.** Apoptosis **(1 mark)**.

**b.** A death-signalling molecule binds to a/the receptor on or within cells and signals the release of caspases which initiate apoptosis **(1 mark)**.
The nucleus fragments, cell breaks up and bubbles (blebs) form **(1 mark)**.
Apoptotic bodies are engulfed by phagocytes **(1 mark)**.

**c.** The death-signalling molecule is not a steroid but must be peptide or protein-based **(1 mark)**. The death-signalling molecule is hydrophilic and therefore unable to pass through the phospholipid bilayer barrier **(1 mark)**.

**Question 2 (8 marks)**

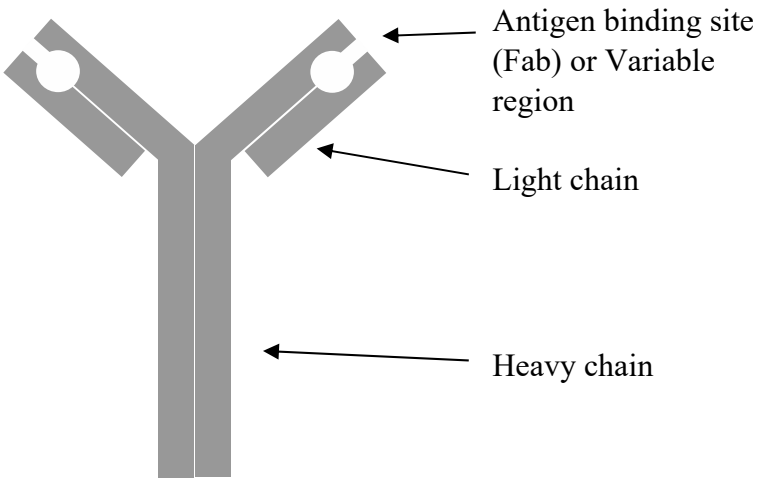
**a.**




(or any other reasonable example) **(1 mark each - 4 marks in total)**.

**b.** Antibody or immunoglobulin **(1 mark)**.

**c.**




**(1 mark)** for drawing.
**(1 mark)** for antigen binding site.
**(1 mark)** for heavy/light chain.

**Question 3 (6 marks)**

**a.** Vector or reservoir host **(1 mark)**.

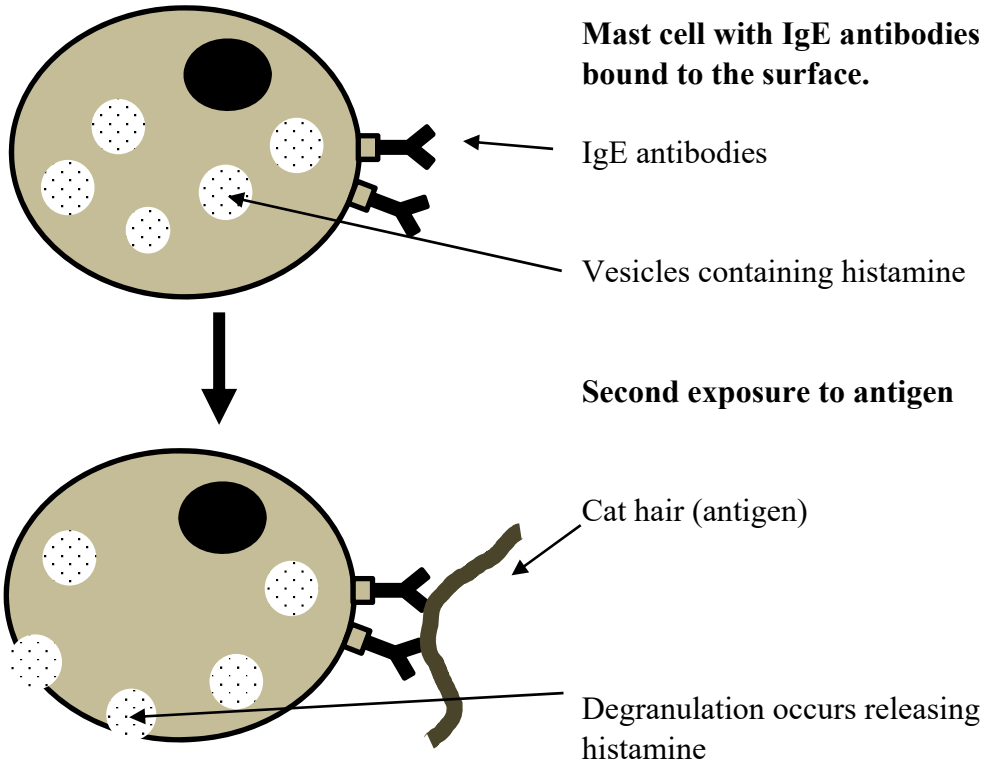
**b.** Skin is no longer intact due to the bite of the kissing bug **(1 mark)**.
Protozoan can gain entry into the body via the break in the skin **(1 mark)**.

**c.** Parasite **(1 mark)**.

**d.** The *Trypanosoma cruzi* protozoan hides within the host's cells **(1 mark)**, therefore, is protected by the cells' self-markers *or alternative reason* which leaves no foreign antigen outside of a cell for the body to detect **(1 mark)**.

**Question 4 (6 marks)**

**a.** The body is exposed to cat hair. Cat hair antigen specific B cell produces plasma cells which produce IgE antibodies **(1 mark)**.
IgE antibodies bind to mast cells **(1 mark)**.
On the second exposure to cat hair, primed mast cells bind to antigen via membrane–bound IgE antibodies and release histamine **(1 mark)**.




**(1 mark)** for any appropriate illustration.

**b.** Heat may kill some pathogens.
Vasodilation increases the number of white blood cells moving to the area of infection, resulting in swelling and increased phagocytosis.
Swelling limits movement of pathogens, preventing its spread and may work towards moving pathogens back out of the body if the wound is not yet closed.
**(any two appropriate answers – 1 mark each)**

## End of Suggested Answers