

Student Name: _____



BIOLOGY 2017

Unit 3

Key Topic Test 7 – Cellular signals

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 10 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

When cells respond to an extracellular signal, they most often convert the information from one form to another. This process is called:

- A. signal transformation.
- B. signal transduction.
- C. signal interference.
- D. signal amplification.

Question 2

What does a target cell require to respond to an extracellular signal molecule?

- A. access to the signal molecule.
- B. the presence of an appropriate receptor for the signal molecule.
- C. appropriate intracellular signalling pathways.
- D. all of the above.

Question 3

Which type of receptors do steroid hormones employ?

- A. cell-surface receptor.
- B. ion-channel-coupled receptors.
- C. nuclear receptors.
- D. they do not require receptors.

Question 4

Synaptic signalling involves

- A. endocrine signals.
- B. paracrine signals.
- C. autocrine signals.
- D. neurotransmitters.

Question 5

Receptors that are utilised by the immune system are

- A. immunoglobulins.
- B. T receptors.
- C. B receptors.
- D. all of the above.

Question 6

When a cell undergoes apoptosis:

- A. cytokines produced by phagocytes protect surrounding cells by reducing inflammation.
- B. it swells until it bursts.
- C. it is as a result of being seriously damaged by chemical or mechanical trauma.
- D. its mitochondria are destroyed along with all other organelles.

Question 7

Which is the best representation of the stimulus-response pathway?

- A. receptor → stimulus → control centre → response → effector
- B. stimulus → receptor → control centre → effector → response
- C. control centre → stimulus → receptor → effector → response
- D. effector → control centre → receptor → stimulus → response

Question 8

Feedback mechanisms are important in the homeostatic control of the body's internal conditions. In a feedback system of control which of the following is true?

- A. the stimulus alters the original effect of the stimulus..
- B. the response alters the original effect of the stimulus.
- C. the response reduces the effect of the original stimulus.
- D. the response increases the effect of the original stimulus.

Question 9

At puberty, an adolescent female body changes in both structure and function of several organ systems, primarily under the influence of changing concentrations of estrogens and other steroid hormones. How can one hormone, such as estrogen, mediate so many effects?

- A. Estrogen has specific receptors inside several cell types, but each cell responds in the same way to its binding.
- B. Estrogen is kept away from the surface of any cells not able to bind it at the surface
- C. Estrogen binds to specific receptors inside many kinds of cells, each of which have different responses to its binding.
- D. Estrogen has different shaped receptors for each of several cell types.

Question 10

Auxin promotes growth in plants by

- A. increasing the plasticity of plant cell walls.
- B. stimulating the uptake of water by seeds.
- C. causing elongation of cells in the stem.
- D. increasing the rate of photosynthesis.

SECTION B - Short-answer questions

Instructions for Section B
Answer **all** questions in the spaces provided. Write using black or blue pen.

Question 1

Hormones are signalling molecules that have a wide variety of effects on their target cells. They can be classified according to the how far away their target cell is.

a. Complete the following table.

Classification	Location of target cell
Autocrine	
Paracrine	
Endocrine	

3 marks

Question 2

Plant hormones (also known as phytohormones) are chemicals that regulate plant growth. They can be classified into different groups depending on their action.

a. Complete the following table.

Plant Hormone	Function
Auxin	
Cytokinins	
Gibberellins	
Absciscic acid	
Ethylene	

5 marks

b. Plant stress hormones activate cellular responses including cell death in response to diverse stress situations in plants. Researchers have found that some plant stress hormones have the ability to affect human cancer cells. For example, sodium salicylate has been found to suppress proliferation of lymphoblastic leukemia, prostate, breast, and melanoma human cancer cells. Jasmonic acid, a plant stress hormone that belongs to the jasmonate family, induces death in lymphoblastic leukemia cells, and methyl jasmonate has been found to induce cell death in a number of cancer cell lines.

i. What is the name given to the process that induces cell death?

ii. This process is initiated after a cell receives a signal from inside the cell (mitochondrial pathway) or from outside (death receptor pathway). If this process is initiated by plant stress hormones, which pathway has been activated? Justify your response.

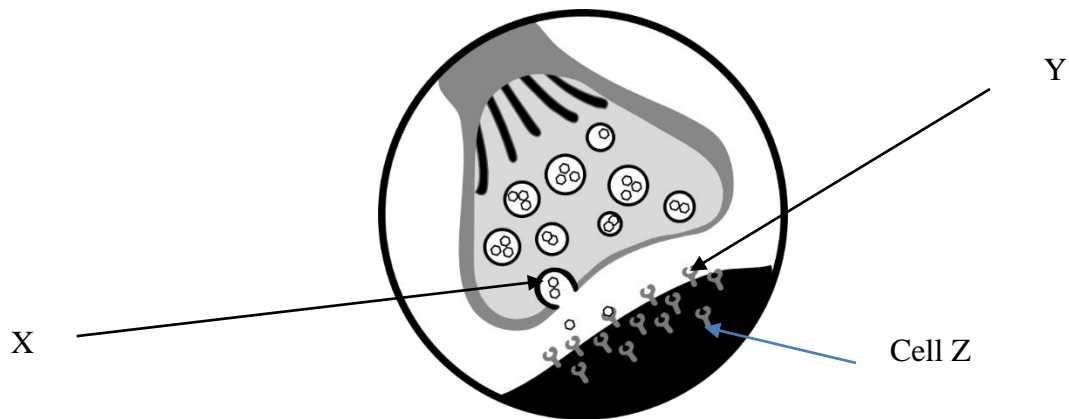
1 + 2 = 3 marks

- c. Malfunctions in the process identified above can result in deviant cell behavior leading to diseases including cancer. Describe how malfunctions in the process can result in increased cell proliferation.

2 marks
Total 10 marks

Question 3

Nerves use chemical signalling to send messages to target cells. This is shown in the image below.



- a. Identify the following.

- i. Molecule X

- ii. Structure Y

- iii. Describe how X can induce a change in target cell Z.

1 + 1 + 1 = 3 marks

- b. The nervous system uses chemicals to respond to a stimulus. A simple example of this is when you touch something hot you retract your hand. Using the terms reception, transduction and response describe what is happening in this stimulus-response model.

3 marks
Total 6 marks

Question 4

Two systems of the body, the nervous system and the endocrine system, are responsible for monitoring changes and coordinating responses in complex animals. The two systems differ in the way a message is transferred to an effector.

- a. Complete the following table.

Feature	Nervous system	Endocrine system
Speed of transmission		
Method of transmission		
Duration of response		
Example		

8 marks
Total 8 marks

END OF KEY TOPIC TEST