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**HUMAN BIOLOGY**

**Unit 3**

**2016**



Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Teacher: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

***TIME ALLOWED FOR THIS PAPER***

Reading time before commencing work: Ten minutes

Working time for the paper: Three Hours

***MATERIALS REQUIRED/RECOMMENDED FOR THIS PAPER***

**To be provided by the supervisor:**

* This Question/Answer Booklet
* Multiple Choice Answer Sheet

**To be provided by the candidate:**

* Standard items: Pens, pencils, eraser or correction fluid, ruler, highlighter, ruler.
* Special items: Calculators satisfying the conditions set by the Schools

Curriculum and standards authority for this subject.

***IMPORTANT NOTE TO CANDIDATES***

* No other items may be taken into the examination room. It is **your** responsibility to ensure that you do not have any unauthorised notes or other items of a non-personal nature in the examination room. If you have any unauthorised material with you, hand it to the supervisor **before** reading any further.

***Structure of this paper***

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Section | Suggested working time | Number of questions available | Number of questions to be attempted | Marks | Percentage |
| SECTION ONE:  Multiple-choice | 50 minutes | 30 | All | 30 | 30 |
| SECTION TWO:  Short answers | 90 minutes | 8 | All | 100 | 50 |
| SECTION THREE:  Extended answers | 40 minutes | 3 | 2 | 40 | 20 |
|  |  |  | Total marks | 170 | 100 |

**Instructions to candidates**

1. The rules for the conduct of Western Australian external examinations are detailed in the *Year 12 Information Handbook 2016.* Sitting this examination implies that you agree to abide by these rules.

2. Answer the questions according to the following instructions.

Section One: Answer all questions on the separate Multiple-choice Answer Sheet provided. For each question shade the box to indicate your answer. Use only a blue or black pen to shade the boxes. If you make a mistake, place a cross through that square, do not erase or use correction fluid, and shade your new answer. Marks will not be deducted for incorrect answers. No marks will be given if more than one answer is completed for any question.

Sections Two and Three: Write your answers in this Question/Answer Booklet.

3. You must be careful to confine your responses to the specific questions asked and to follow any instructions that are specific to a particular question.

4. Spare pages are included at the end of this booklet. They can be used for planning your responses and/or as additional space if required to continue an answer.

* Planning: If you use the spare pages for planning, indicate this clearly at the top of the page.
* Continuing an answer: If you need to use the space to continue an answer, indicate in the original answer space where the answer is continued, i.e. give the page number. Fill in the number of the question(s) that you are continuing to answer at the top of the page.

**Section One: Multiple-choice 30% (30 Marks)**

This section has **30** questions. Answer **all** questions on the separate Multiple-choice Answer Sheet provided. For each question shade the box to indicate your answer. Use only a **blue or black pen** to shade the boxes. If you make a mistake, place a cross through that square, do not erase or use correction fluid, and shade your new answer. Marks will not be deducted for incorrect answers. No marks will be given if more than one answer is completed for any question.

Suggested working time: 50 minutes.

1. The pineal gland is a pea size gland found deep inside the brain. Its function is thought to be:
2. control of metabolism.
3. control of emotions.
4. control of sleep patterns.
5. control of puberty.
6. Thymosins influence the maturation of T cells and are secreted by the:
7. stomach glands.
8. adrenal cortex.
9. liver.
10. thymus gland.
11. The largest proportion of total body fluid is found in:
12. the plasma.
13. the cytosol.
14. the intercellular fluid.
15. the lymph.

Use the diagram below to answer question 4.



C

B

A

C

1. Which of the following correctly labels the structural types of neurons shown above.

|  |  |  |  |
| --- | --- | --- | --- |
|  | A | B | C |
| (a) | multipolar | bipolar | unipolar |
| (b) | bipolar | multipolar | unipolar |
| (c) | unipolar | bipolar | multipolar |
| (d) | multipolar | Unipolar | bipolar |

1. The difference between white and grey matter within the spinal cord is that:
2. the white matter is far away from the nerve tracts within the spinal cord whilst the grey matter is closer.
3. the grey matter contains the unmyelinated nerve fibres and the white matter contains the cell bodies.
4. the white matter contains the dendrites of neurons, the grey matter contains the nerve fibres.
5. the grey matter contains the cell bodies of neurons the white matter contains the myelinated nerve fibres.
6. A reduction in the amount of parathyroid hormone secreted could result in:
7. osteomyelitis.
8. osteoarthritis.
9. poor nerve impulse transmission.
10. kidney stones.
11. Which of the following is not part of the first line of defence against microorganisms?
12. The lining of the respiratory tract.
13. The eyelashes.
14. The lining of the intestinal tract.
15. The inflammatory response.
16. A substance that triggers an immune response is called an:
17. Antiviral.
18. Antibody.
19. Antigen.
20. Antihistamine.
21. Which of the following will result from the stimulation of chemoreceptors in the periphery?
22. A reduction in the glucose levels of the blood.
23. An increase in the concentration of CO2 in the blood.
24. An increase in body temperature.
25. An increase in the water concentration of the blood.
26. Cell replacement therapy can be used when a disorder causes loss of, or injury to, normal cells. Which of the following disorders could be treated with this kind of therapy?
27. Parkinson’s disease.
28. Sickle cell anaemia.
29. Hypothyroidism.
30. Cystic fibrosis.
31. Which of the following ions will stimulate the release of a neurotransmitter from an axon terminal?
32. Potassium ion
33. Calcium ion.
34. Sodium ion.
35. Chloride ion.
36. Target cells respond to specific hormones when the hormone binds to:
37. specific binding sites on the enzymes within the cell.
38. receptor proteins in the plasma membrane.
39. carrier proteins in the plasma membrane.
40. specific binding sites on the nucleus.
41. The nervous and endocrine systems differ in how they control body functions. Which of the following describes one of the differences?
42. Nervous system has greater speed than endocrine system.
43. Nervous impulses have greater duration of action compared with endocrine secretions.
44. Nerve impulses are transmitted through the blood.
45. Endocrine secretions are electrochemical.
46. The Corpus Callosum is found between the cerebral hemispheres and its function is to:
47. enable communication between the cerebrum and the cerebellum.
48. protect the hypothalamus.
49. enable the hypothalamus to connect with the pituitary.
50. enable the two sides of the cerebrum to communicate with each other.
51. Viruses:
52. contain organelles.
53. can reproduce inside a host cell.
54. are considered to be living organisms.
55. have a well defined nucleus.
56. The growth of cells in skeletal muscle is stimulated by:
57. Growth hormone.
58. Thyroid stimulating hormone.
59. ACTH.
60. Gonadotropins.
61. Type II Diabetes is a disorder:
62. caused by a deficiency in glucagon secretion.
63. that can be diagnosed by decreased glucose levels in the urine.
64. caused by damage to the alpha cells in the pancreas.
65. where body cells cannot respond to the insulin it produces.
66. What is the function of the connector or relay neuron in a reflex arc?
67. To transmit the message from the receptor to the sensory neuron.
68. To connect the motor neuron to the motor end plates.
69. To bypass the nerve tracts in the spinal cord.
70. To connect the sensory neuron to the motor neuron in the grey matter.
71. Bactericidal antibiotics are effective at killing bacterial infections because they:
72. stop bacteria from reproducing.
73. disrupt protein synthesis by the bacteria.
74. disrupt the action of essential enzymes within the bacteria.
75. prevent the bacteria from growing.
76. The role of heparin in the inflammatory response is to:
77. prevent clotting of blood.
78. make the walls of the blood capillaries more permeable.
79. increase the blood flow to the infected area.
80. attract phagocytes to the infected area.
81. The purpose of “Herd Immunity” is to:
82. provide immunity for a small portion of the population who are susceptible to infection.
83. prevent outbreaks of deadly diseases such as influenza and whooping cough.
84. eradicate a disease such as smallpox from the world population.
85. vaccinate a large proportion of the population making it difficult for an infectious disease to spread.
86. Transmission of a communicable disease such as influenza and the common cold is most likely to occur by:
87. ingestion of contaminated food.
88. transfer of bodily fluids.
89. vectors such as mosquitoes.
90. infection by droplets.
91. Which of the following statements **correctly** presents a difference between macrophages and lymphocytes?
92. Macrophages only give specific protection but lymphocytes give non-specific immunity.
93. Macrophages can undergo phagocytosis, lymphocytes do not.
94. Macrophages are generally smaller than lymphocytes.
95. Macrophages are produced in the bone marrow where lymphocytes are produced in the lymph nodes.
96. Whilst exercising during the heat of the day the body is cooled by sweating which can lead to dehydration. If the body becomes too dehydrated:
97. osmotic pressure of the blood decreases.
98. chemoreceptors in the hypothalamus will be stimulated.
99. ADH secretion will be increased.
100. the permeability of the distal convoluted tubule to water will be reduced.
101. Which of the following comparisons of the autonomic and somatic divisions of the peripheral nervous system are **incorrect**?
102. Somatic division affects the skeletal muscle, autonomic affects the involuntary and cardiac muscle.
103. The efferent pathway of the autonomic division has a one neuron chain, whereas the somatic division has a two neuron chain.
104. Somatic division releases acetylcholine at its synapses and autonomic division releases noradrenaline, adrenaline and acetylcholine at its synapses.
105. Autonomic division’s general function is homeostasis whereas the somatic division’s function is to respond to the external environment.
106. Passive immunity can be obtained by:
107. antibodies entering the blood stream across the placenta.
108. antigens being injected into the blood stream.
109. manufacturing antibodies after being given a vaccination.
110. receiving a vaccination of dead microorganisms.
111. Antiviral drugs are now being manufactured to treat specific viral infections, and work by:
112. destroying the protein coat surrounding the virus.
113. changing the structure of the cell membrane.
114. inhibiting the development of the virus.
115. killing the host cell.
116. Gas concentrations in the blood are constantly being monitored and controlled. Which of the following parts of the body are responsible for the control of gas concentrations in the blood.
117. Cerebellum and the medulla oblongata.
118. Medulla oblongata and the autonomic nervous system.
119. Cerebellum and the autonomic nervous system.
120. Hypothalamus and the medulla oblongata.
121. Most experiments have a control group and an experimental group. Which of the following is a true statement regarding these groups?
122. There can be more than one difference between the control group and experimental groups, but not several differences otherwise the experiment will be invalid.
123. The control group must be half the size of the experimental group.
124. The control group and the experimental groups may have several differences between them.
125. The control group is identical to the experimental group except for the one variable that is being tested.
126. Vitamin C is commonly believed to prevent colds. To test this 10 000 volunteers were divided into groups. Each person took a dose every evening for one year. The results were as follows:

|  |  |  |  |
| --- | --- | --- | --- |
| **Group** | **Number in group** | **Contents of dose** | **Percentage who developed colds** |
| 1 | 2500 | Sugar | 20 |
| 2 | 2500 | Sugar and 1g of vitamin C | 19 |
| 3 | 2500 | Sugar and 3g of vitamin C | 21 |
| 4 | 2500 | Sugar and 9g of vitamin C | 10 |

What can be concluded from the results of this experiment?

1. Sugar reduced the percentage of cold suffered.
2. 9 grams of vitamin C is effective against colds.
3. Sugar increased the percentage of colds suffered.
4. Sugar and 3 grams of vitamin C proved ineffective against the prevention of colds.

**Section Two: Short answer 50% (100 Marks)**

This section has **eight (8)** questions. Answer **all** questions. Write your answers in the spaces provided.

Spare pages are included at the end of this booklet. They can be used for planning your responses and/or as additional space if required to continue an answer.

* + Planning: If you use the spare pages for planning, indicate this clearly at the top of the page.
  + Continuing an answer: If you need to use the space to continue an answer, indicate in the original answer space where the answer is continued, i.e. give the page number. Fill in the number of the question(s) that you are continuing to answer at the top of the page.

Suggested working time: 90 minutes.

**Question 31 (18 marks)**

Ebola Virus Disease, EVD, is a complex zoonosis that is highly virulent in humans. It was first detected in 1976, with the largest ongoing outbreak being in West Africa. Development of a marketable vaccine has yet to be achieved, with VSV-EDOV still in phase III of development.

1. Why can’t scientists grow Ebola in order to study it to make a vaccine? (1 mark)

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1. State three non-specific external defences that a human has and describe how they could prevent entry of the Ebola virus into the bloodstream. (3 marks)

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1. Viruses act in different ways to bacteria when they infect the human body. Describe how a pathogenic virus, such as Ebola, acts after entering the body to cause the disease.

(3 marks)

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1. To diagnose a person with Ebola, an antigen-capture detection test can be used.
2. What is an antigen? (1 mark)

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1. Explain why identifying the Ebola antigen could help the World Health Organisation develop a vaccine for Ebola. (1 mark)

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1. In recent outbreaks of Ebola some people have survived an infection and made a full recovery. This has occurred because their body has reacted by producing an antibody against the virus.
2. Describe three ways an antibody can work to provide resistance to infection.

(3 marks)

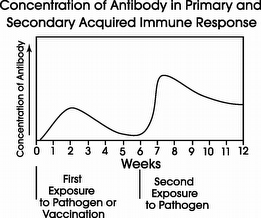
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1. State the type of immunity that occurs if a person who has Ebola is given antibodies directly into their blood stream. (2 marks)

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The graph below shows how the body responds to two successive infections of the same viral disease. Use this information to answer the next question.



<http://shawmst.org/biology/appendix/extended-responses/>

1. Using the information in the graph, discuss why it is unlikely that a person that has had Ebola and has recovered is unlikely to suffer from the disease again. (4 marks)

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**Question 32 (13 marks)**

The standard treatment for hypothyroidism is daily use of synthetic thyroid hormone levothyroxine (T4). This medication restores adequate hormone levels for the individual to lead a normal life. One to two weeks after starting the treatment, symptoms should start to reduce. The medication gradually lowers cholesterol levels (LDL – low density lipoproteins) and may reverse weight gain.

Trials were carried out on 60 test subjects, all with similar severity of hypothyroidism, to see if there was any evidence that levothyroxine reduced LDL-cholesterol in the blood stream. 30 patients were given levothyroxine and the other 30 were given a placebo in a blind experiment. Patients were asked to take the drug daily for 8 weeks, and at the end of each week their blood LDL-cholesterol levels were measured.

Below are the average results for the two different groups:

|  |  |  |
| --- | --- | --- |
| Number of weeks | Average Blood cholesterol levels in mg/dL | |
| Patients taking levothyroxine | Patients taking the placebo |
| 0 | 190 | 191 |
| 1 | 190 | 191 |
| 2 | 189 | 190 |
| 3 | 180 | 187 |
| 4 | 173 | 189 |
| 5 | 171 | 179 |
| 6 | 168 | 188 |
| 7 | 153 | 189 |
| 8 | 147 | 187 |

1. Write a suitable hypothesis for this experiment. (1 mark)

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1. State two variables that would need to be controlled that are not mentioned. (2 marks)

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1. What is a placebo? (1 mark)

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1. Plot a graph of the data contained in the table. (5 marks)

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1. What conclusion can be drawn from the results? (2 marks)

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1. How could this experiment be made more reliable? (2 marks)

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**Question 33 (11 marks)**

Below is a diagram of a neuron.



**B**

**C**

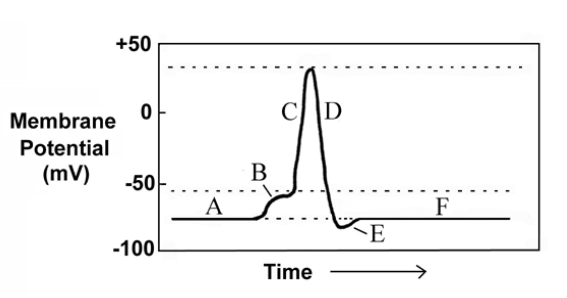
**A**

1. Describe the role of the structure labelled “A”. (1 mark)

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1. What is the function of the cells labelled “B”? (1 mark)

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Use the graph below, showing a nerve action potential, to answer the following questions.

1. Describe what is occurring during the phase indicated by the letter ”C”. (3 marks)

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1. Discuss the differences between nerve impulse conduction along a myelinated and unmyelinated nerve fibre. (4 marks)

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1. A nerve impulse is described as an “all or nothing” action. If this is correct, explain why a person can tell the difference between a lump of heavy metal and a bread roll being dropped on their foot. (2 marks)

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

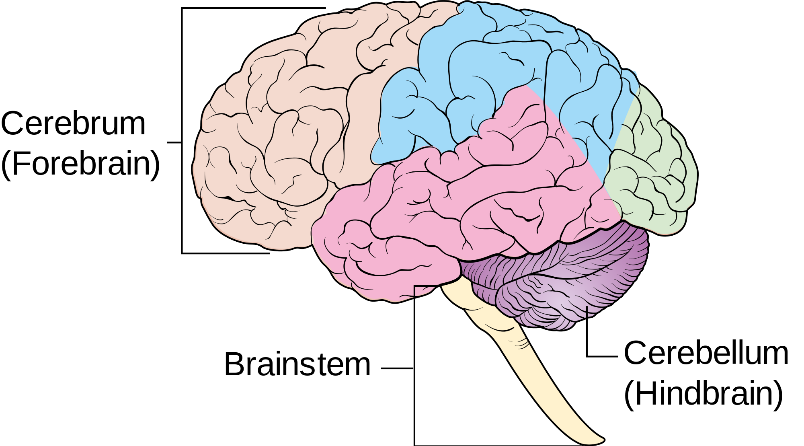
**Question 34 (13 marks)**

1. The nervous system has several different subdivisions which have quite specific functions. Using the table below, state one functional difference between the following parts of the nervous system.

(3 marks)

|  |  |
| --- | --- |
| **Two systems to compare** | **Main difference** |
| Afferent division vs efferent division of the peripheral nervous system |  |
| Central nervous system compared to the peripheral nervous system |  |
| Somatic sensory nervous system compared to the visceral sensory nervous system |  |

The diagram below is of the human brain.



1. On the diagram, label the following areas: (2 marks)
2. the occipital lobe.
3. the medulla oblongata.
4. The brain and the spinal cord are very delicate and, as they are vital to human survival, they must be protected. One structure that provides protection for these two parts are the meninges.
5. Describe the general structure of the meninges. (1 mark)

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1. Explain the role of the cerebrospinal fluid. (2 marks)

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d) The human brain is divided up into several sections, each with its own set of specific functions. Complete the table below by summarising ONE function of each area shown. (3 marks)

|  |  |
| --- | --- |
| **Structure** | **Function** |
| Cerebral Cortex |  |
| Hypothalamus |  |
| Medulla oblongata |  |

1. During a mining accident, a man received substantial damage to his cerebellum when a metal pipe hit him from behind.

Describe two symptoms the man might experience as a result of this damage. (2 marks)

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Question 35 (14 marks)**

Many retired soldiers have made the trip to Papua New Guinea to walk the Kokoda Track in memory of the Kokoda Trail campaign fought during World War II. The track is considered very difficult due to the extreme humidity and heat, but if people look after themselves properly during the trek, it is manageable.

1. Describe two problems that extreme heat and humidity could cause for individuals walking the track. (2 marks)

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1. The control of the body’s internal environment is essential if the person is going to be able to function properly and respond to the demands of such an arduous task of walking the track.

Complete the feedback loop shown below to show how heat loss from the body can be physiologically increased to prevent overheating. (5 marks)

**Response/s**

**Effector/s**

**Receptor/s**

**Modulator**

**Negative Feedback**

**Stimulus**

High Body temperature

1. State why sweating might not be very useful at decreasing the body temperature in this environment. (1 mark)

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1. The steady state control system outlined on the previous page is an effective mechanism for maintaining the body’s core temperature. It was found, however, that those attempting the track were becoming very dehydrated.
2. What would be the cause of their dehydration?

(1 mark)

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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1. Explain how the body would voluntarily respond to try and combat the problem stated in part (i). (3 marks)

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1. Explain the difference between a positive feedback loop and a negative feedback. (2 marks)

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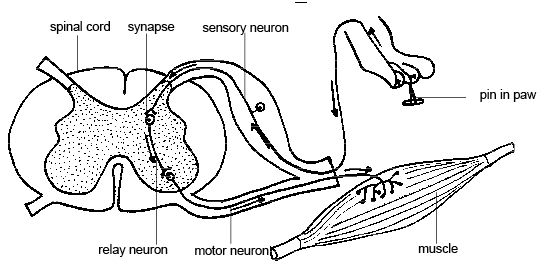
**Question 36 (7 marks)**

A reflex is a rapid response to a change in the internal and external environment.

The diagram below shows the main components of a reflex arc.

2.

3.



4.

1. Stimulus

5.

6.

By Ruth Lawson Otago Polytechnic - https://commons.wikimedia.org/w/index.php?curid=8831185

1. Identify the main components of the reflex arc indicated by the arrows by filling in the boxes on the diagram above. Number 1 has been done for you. (5 marks)
2. Explain why the reflex arc is considered to be protective. (2 marks)

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**Question 37 (11 marks)**

1. The endocrine system is essential for the maintenance of homeostasis. The pituitary gland in the brain secretes many hormones that control several body functions and is known as the “master gland”.

The posterior pituitary gland is structurally different when compared with the anterior pituitary gland. Describe the main structural difference between the two “glands”. (2 marks)

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1. The posterior pituitary gland secretes only two hormones. Name them. (2 marks)

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1. The hypothalamus controls the secretions of the pituitary gland.

Describe the relationship between the hypothalamus and the posterior pituitary gland. (4 marks)

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Testosterone is a steroid hormone.

Explain how steroid hormones have an effect on their target cells.

(3 marks)

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**Question 38 (13 marks)**

Type I diabetes affects around 120,000 Australians. It is caused when the body’s immune system attacks its own cells and prevents parts of the endocrine system from functioning normally.

1. Insulin is a protein based hormone. Explain how these types of hormones work. (3 marks)

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1. Describe how insulin controls glucose levels in the body. (3 marks)

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1. In the past, insulin was extracted from the pancreas cells of pigs and cows. Now with the advances in biotechnologies most insulin is produced by recombinant DNA technology.

Explain how this process of producing insulin is more beneficial to people suffering from Type I diabetes.

(2 marks)

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1. One of the major concerns for a person suffering from Type I diabetes is becoming hyperglycaemic if they consume too much sugar.
2. Describe two symptoms that a person would exhibit if they were hyperglycaemic. (2 marks)

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1. Explain how blood glucose levels would be maintained if a non-diabetic person had not eaten a meal for over 12 hours. (3 marks)

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**Section Three: Extended answer 20% (40 Marks)**

This section contains **three (3)** questions. You must answer **two (2)** questions. Make sure you clearly indicate which question you are answering and write your answers in the space provided.

Spare pages are included at the end of this booklet. They can be used for planning your responses and/or as additional space if required to continue an answer.

* Planning: If you use the spare pages for planning, indicate this clearly at the top of the page.
  + Continuing an answer: If you need to use more space to continue an answer, indicate in the original answer space where the answer is continued, i.e. give the page number. Write the number of the question(s) that you are continuing to answer at the top of the additional space page.

Responses could include clearly labelled diagrams with explanatory notes; lists of points with linking sentences; clearly labelled tables and graphs; and annotated flow diagrams with introductory notes.

Suggested working time: 40 minutes.

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**Question 39 (20 marks)**

Nerve agents are often used as chemical weapons during times of war. Nerve agents work by preventing the action of acetylcholinesterase, an enzyme that destroys acetylcholine at the synapse after the nerve impulse has been transmitted. Nerve gas poisoning results in acetylcholine building up in the synaptic gap which drastically affects impulse transmission.

1. Explain how a nerve impulse is transmitted across a synaptic gap. (8 marks)
2. Discuss how a nerve gas would affect the transmission the nerve impulses and the side effects a person would experience from nerve gas poisoning. (4 marks)
3. The sympathetic and parasympathetic nervous systems are vital parts of the peripheral nervous system. Compare and contrast the structure and function of the two systems. (8 marks)

**Question 40 (20 Marks)**

Graves’ disease is an autoimmune disease that attacks the cells in the thyroid gland. As a result a person can suffer from hyperthyroidism, a condition that can be treated by removal of some of the thyroid.

1. The common symptoms of hyperthyroidism are weight loss, increased appetite, fatigue, sweating and restlessness. Using your understanding of the functioning of the thyroid gland, explain why these symptoms occur. (10 marks)

Some teenage boys were at a pool party and were trying to see who could swim the furthest underwater. Some of them were using hyperventilation to get rid of carbon dioxide from their lungs to allow them to hold their breath for longer. There can be serious consequences of this particular technique, including drowning.

1. Using a feedback loop, explain how this practise allows the boys to stay underwater for longer and how it can lead to drowning. (10 marks)

**Question 41 (20 marks)**

The World Health Organisation is currently working on trying to eliminate polio by using a range of vaccination programs. Vaccinations are used to develop immunity in a population. However traditional vaccines can come with associated risks and ethical concerns so more modern techniques are being tested to produce vaccines that are more effective and have less associated risks

a) Describe one traditional type and one modern type of vaccine, and discuss some of the risks and ethical concerns that are associated with vaccines. (6 marks)

1. Viruses such as polio enter the body and cause both a humoral and cell-mediated response. Describe the steps that occur during a cell-mediated immune response.

(8 marks)

1. During a game of soccer, one of the female players is pushed and falls to the ground. She cuts her knee open on a piece of old glass. By the time she reached home her knee had become warm, red and swollen. Her Mum told her not to worry about that because it was all part of her body’s way of stopping the spread of pathogens that may have been on the glass.

Name and describe the response that is occurring, making reference to the symptoms that the girl was demonstrating on her knee. (6 marks)

Question number: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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Additional working space

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Additional working space

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Spare graph for question 32

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Multichoice question 4

Picture of neurons from - <https://learnzoology.wordpress.com/2013/10/29/nervous-tissue/>

Question 31f

Graph of primary and secondary infection - <http://shawmst.org/biology/appendix/extended-responses/>

Question 33

Diagram of neuron – <http://www.clker.com/clipart-neuron.html>

Diagram of nerve impulse - <http://biology.stackexchange.com/questions/14618/refractory-period-in-action-potential>

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Question 34

diagram of brain - <http://www.clker.com/clipart-brain-clipart-without-eye.html>

Question 36

reflex diagram - By By Ruth Lawson Otago Polytechnic - originally uploaded at en.wikibooks. original description page is/was here[1], CC BY 3.0, <https://commons.wikimedia.org/w/index.php?curid=8831185>