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| C:\Users\s.kanakis\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.Word\ACC Logo_L_rgb_lrg.jpg | **Aranmore Catholic College**  **Semester 1 Examination, 2016**  **Question/Answer Booklet** |

HUMAN BIOLOGICAL SCIENCE YEAR 12

Student Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Student’s Teacher \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

#### Time allowed for this paper

Reading time before commencing work: ten minutes

Working time for 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, correction fluid, ruler, highlighters

Special items: non-programmable calculators satisfying the conditions set by the Curriculum Council for this course

***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: 40 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. The concentration of blood plasma and tissue fluid is monitored by:
7. Thermoreceptors.
8. Baroreceptors.
9. Osmoreceptors.
10. Photorecptors.
11. Cytosol is:
12. the fluid found in plasma.
13. the fluid found inside the cells.
14. the fluid found between cells.
15. the fluid found in 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:
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 would 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?
22. Osmotic potential of the blood.
23. An increase in the concentration of CO2 in the blood.
24. An increase in blood pressure.
25. An increase in the core body temperature.
26. Which of the following is not broken down in Gluconeogenesis?
27. Amino acids.
28. Glucose.
29. Fatty acids.
30. Glycerol.
31. Which of the following ions will stimulate the release of a neurotransmitter from an axon terminal?
32. Positive potassium ion
33. Positive calcium ion.
34. Positive Sodium ion.
35. Negative chlorine ion.
36. Target cells work by responding 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 golgi body.
41. The nervous and endocrine systems differ in many ways in how they control body functions. Which of the following does not describe a difference?
42. speed.
43. duration of action.
44. intensity of response.
45. type of signal.
46. The Corpus Callosum is found just under the cerebrum, 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. Enables the two hemispheres of the cerebrum to communicate with each other.
51. Viruses:
52. contain organelles.
53. can reproduce inside a host cell.
54. are considered a living organisms.
55. have a protein coat.
56. The growth of cells in the 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 your body cells do not respond to the insulin produced.
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.
71. Antibiotics are effective at killing:
72. Viruses.
73. Bacteria.
74. Vectors of infection.
75. Insects.
76. The role of Glucagon is to:
77. prevent clotting.
78. make the walls of the blood capillaries more permeable.
79. increase the blood flow glucose levels.
80. Increase glycogen in the liver.
81. As a result of disease, a male has suffered damage to his brain. This damage has caused him to be unable to feel full when eating. He eats such large amounts that he is now classified as being obese. The part of his brain most likely to have been damaged is his

(a) hypothalamus.

(b) cerebral cortex.

(c) medulla oblongata.

(d) cerebellum.

1. Look at the graph below. Given the information in the graph, describe what would be occurring in the kidney at a blood plasma osmotic pressure of 285 mOsm:



a) Increased permeability in the distal convoluted tubule of the nephron and less movement of water out of the filtrate. The filtrate in turn becoming more dilute.

b) Increased permeability in the distal convoluted tubule of the nephron and greater movement of water out of the filtrate. The filtrate in turn becoming more concentrated.

c) Decreased permeability in the distal convoluted tubule of the nephron and less movement of water out of the filtrate. The filtrate in turn becoming more dilute.

d) Decreased permeability in the distal convoluted tubule of the nephron and less movement of water out of the filtrate. The filtrate in turn becoming more concentrated.

1. Transmission of a communicable disease can occur by:
2. physical contact.
3. transfer of bodily fluids.
4. the use of vectors.
5. all of the above.
6. Macrophages are:
7. Leucocytes that can carry out phagocytosis.
8. Leucocytes found only in lymph glands.
9. Only effective against bacteria.
10. Erythrocytes found all tissues.
11. Whilst exercising during the heat of the day the body tries to cool itself by sweating which can lead to dehydration. If the body becomes too dehydrated:
12. osmotic pressure of the blood decreases.
13. chemoreceptors in the hypothalamus will be stimulated.
14. ADH will be increased.
15. the permeability of the distal convoluted tubule to water will be reduced.
16. Which of the following best describes blood plasma after vigorous exercise?
17. Increased acidity and pH.
18. Increased acidity and decreased pH.
19. Decreased acidity and pH.
20. Decreased acidity and increased pH.
21. Which of the following comparisons of the autonomic and somatic divisions of the peripheral nervous system are incorrect?
22. Somatic division effects the skeletal muscle, autonomic effects the involuntary and cardiac muscle.
23. The efferent pathway of the autonomic division has a one neuron chain, whereas the somatic division has a two neuron chain.
24. Somatic division releases acetylcholine at its synapses and autonomic division releases norepinephrine, epinephrine and acetylcholine at its synapses.
25. Autonomic division’s general function is homeostasis whereas the somatic division’s function is to respond to the external environment.
26. Passive immunity can be obtained by:
27. by antibodies entering the blood stream across the placenta.
28. antigens being injected into the blood stream.
29. learning how to manufacture antibodies after being given a vaccination.
30. by receiving a vaccination of dead microorganisms.
31. 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 levels in the blood.
32. Cerebellum and the medulla oblongata.
33. Medulla oblongata and the autonomic nervous system.
34. Cerebellum and the autonomic nervous system.
35. Hypothalamus and the medulla oblongata.
36. If you have a control group for your experiment, which of the following is true?
37. There can be more than one difference between the control group and experimental groups, but not several differences or else the experiment is invalid.
38. The control group must be half the size of the experimental group.
39. The control group and the experimental groups may have several differences between them.
40. The control group is identical to the experimental group except for the one variable that is being tested.

**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 (21 marks)**

Ebola Virus Disease, EVD, 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. If Ebola is a virus, can it be treated with antibiotics? (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. (3 marks)

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1. Viruses act in different ways to bacteria when they enter the human body. Explain how a pathogenic virus such as Ebola acts after entering the body to cause a 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 learnt how to make the correct antibody against the virus.
2. Describe three ways an antibody can work to provide resistance to infection. Use any scientific names used.

(6 marks)

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1. Explain why a person who has recovered from Ebola can give blood to a person with Ebola and it may help them survive. (2 marks)

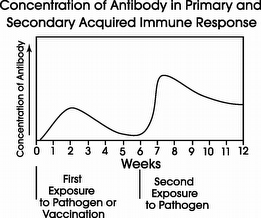
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The graph below shows how the body responds to two successive infections of a viral disease. Use this information to answer the next question.



<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 get 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 bad-cholesterol levels (LDL – low density lipoproteins) and may reverse weight gain.

Trials were carried out on 60 test subjects, all with similar levels 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 a placebo in a blind experiment. Patients were asked to take the drug daily for 8 weeks, 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 information 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. Is this conclusion valid? Explain your answer. (2 marks)

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**Question 33 (11 marks)**

Below is a diagram of a neuron.



**B**

**C**

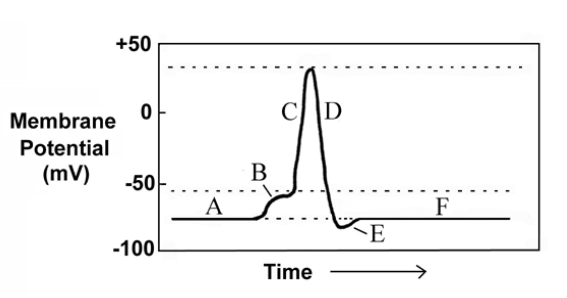
**A**

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

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1. Name and state the functions of the cells labelled “B”? (3 mark)

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Use the graph below to answer the following questions.

1. Explain what is occurring at the phase indicated by the letter ”C” on the graph in terms of ion movement and membrane potential. (3 marks)

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

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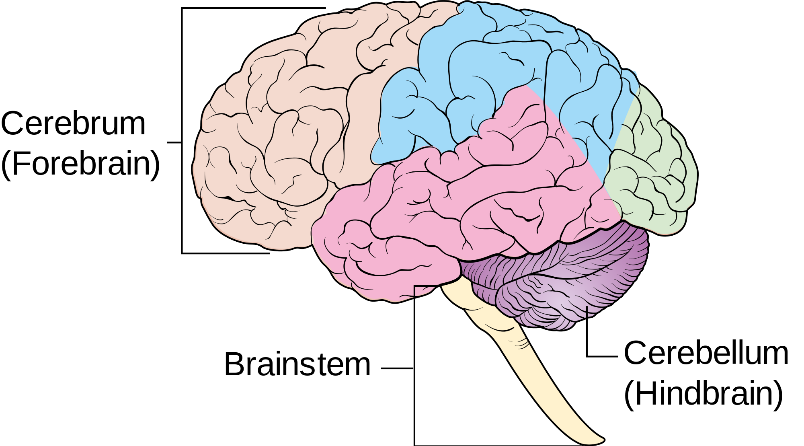
**Question 34 (12 marks)**

1. The nervous system has several different systems which all have quite specific functions. Using the table below, state one comparison between the following nervous systems.

(2 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 |  |

The diagram below is of the human brain.



1. On the diagram, label the occipital lobe. (1 mark)
2. 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 is the meninges.
3. Name the structure other than the meninges that helps protect the brain. (2 mark)

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1. Name and explain the role of the fluid within the meninges. (3 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 the main function of each area shown. (2 marks)

|  |  |
| --- | --- |
| **Structure** | **Function** |
| Cerebral Cortex |  |
| Cerebellum |  |

1. During a mining accident, a gentleman received substantial damage to his medulla oblongata when a metal pipe hit him from behind.

Describe one difficulty the man might experience as a result of this damage to the medulla oblongata and explain why. (2 marks)

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**Question 35 (9 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, the track is manageable.

1. Describe one problem that extreme humidity could cause for individuals walking the track. (1 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 can be increased from the body to prevent overheating. Do not include the behavioural response. (5 marks)

**Response**

**Effector**

**Receptor**

**Modulator**

**Negative Feedback**

**Stimulus**

High Body temperature

1. The feedback loop is an effective mechanism for maintaining the body’s core temperature. However the process of sweating initiated by the effector can cause other problems for the body.
2. Name one problem the processes brought about by the effector could produce?

(1 mark)

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

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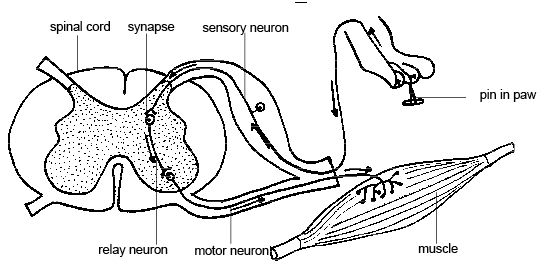
**Question 36 (5 marks)**

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.

5.

6.

By 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 on the diagram above. (3 marks)
2. A reflex is classed as part of a human’s non-specific defence system. Explain the reasoning for this. (2 marks)

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**Question 37 (12 marks)**

1. Pathogens are disease causing organisms. The most common types of pathogens are bacteria and viruses.

State one other type of organism that can act as a pathogen.

(1 marks)

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1. Malaria is caused by the plasmodium parasite. The parasite is spread by the female Anopheles mosquitoes, which are known as "night-biting" mosquitoes because they most commonly bite between dusk and dawn. What is this type of transfer called?

(1 mark)

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1. List 3 purposes for the Inflammatory response

(3 marks)

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1. Name and state the function of the two chemicals released during the Inflammatory response.

(4 marks)

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1. The vomiting reflex helps remove pathogens and potential pathogens from the digestive tract. State the stimulus for this reflex and the body structures involved in bringing it about.

(3 marks)

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**Question 38 (17 marks)**

Type II diabetes affects around 120,000 Australians. It is caused when the body’s own 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. (2 marks)

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1. What type of cells produce insulin and where can they be found? (1 mark)

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1. Describe how insulin controls glucose levels in the body. (2 marks)

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1. Which hormone causes Glycogenolysis. Also state where it is produced and its target organ.

(3 marks)

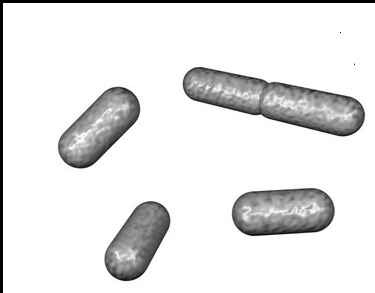
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1. Type 2 diabetes is often referred to as a lifestyle disease. What is meant by a lifestyle disease and state two factors that might increase a person’s chances of developing type 2 diabetes.

(3 marks)

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1. The microorganism shown below was found to be pathogenic. The investigators stated that the microorganism were bacteria and not viruses.



1. Which characteristics would the investigators use to distinguish this as a bacteria and not a virus?

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(3 marks)

1. As the microorganism has already been classified as a bacteria, how could the bacteria be further classified? Giving a reason for your choice, which bacterial group would you classify this microorganism as?

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(3 marks)

**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 production of acetylcholinesterase (AChE), a chemical that destroys acetylcholine after the nerve impulse has been transmitted. Nerve gas poisoning results in acetylcholine building up in the synaptic gap which drastically effects 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 both part of the bodies peripheral nervous system. Discuss the differences and similarities between the structure and function of the two systems. (8 marks)

**Question 40 (20 Marks)**

Graves’ disease is the result of a person’s autoimmune system attacking 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 anxiety. Using your understanding of the functioning of the thyroid gland, explain how these symptoms are brought about. (8 marks)
2. A rapid heart rate is also a symptom of hyperthyroidism and this can subsequently lead to an increase in blood pressure. Normally these two factors are controlled by negative feedback systems.

Describe how the body would normally bring the heart rate and blood pressure back to normal and explain how hyperthyroidism affects these systems. (12 marks)

**Question 41 (20 marks)**

The World Health Organisation are currently working on trying to eliminate the viral disease Polio by using a range of vaccination programs. Vaccinations are used to develop immunity in a population.

a) Describe three types of vaccine. (6 marks)

b) Viruses such as polio when they enter the body can cause both a humoral and cell-mediated response. Describe the steps that occur during a cell-mediated immune response, including how the response was instigated and carried out. (8 marks)

c) Influenza, the flu, affects up to 500 million people each year. The flu has a significant economic impact in terms of days off work and lost productivity, and can also lead to death in the elderly or infirm. In a typical Australian winter, around 1,500 deaths are attributed to the flu. Relenza is a drug that works to reduce the impact of influenza infection.  It works by attacking the flu particle to keep it from multiplying in your body and reducing the symptoms of the flu.

I) What type of drug would Relenza be classified as? Give a reason for your answer.

(2 marks)

II) What happens when a flu particle enters the body?

(4 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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