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**Semester One Examination 2019**

**Question/Answer Booklet**

**NAME:**

**HUMAN BIOLOGY**

**ATHBY Unit 3**

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

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**Student number**  **In figures:**

**In words:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**Time allowed for this paper**

Reading time before commencing work: 10 minutes

Working time: 3 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 (blue/black preferred), pencils (including coloured), sharpener, eraser, correction fluid/tape, ruler, highlighters

Special items: non-programmable calculators approved for the use in this examination

**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 the Western Australian Certificate of Education ATAR course examinations are detailed in the Year 12 Information Handbook 2019. 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 then shade your new answer. Do no erase or use correction fluid/tape. Marks will not be deducted for incorrect answers. No marks will be given if more than one answer is completed for any question.

Section Two: Write your answers in this Question/Answer booklet. Whenever possible, confine your answers to the line spaces provided.

Section Three: Consists of three questions. You must answer two questions.

Tick the box next to the question you are answering.

1. You must be careful to confine your answers to the specific questions asked and to follow any instructions that are specific to a particular question.
2. Additional working space pages at the end of this Question/Answer booklet are for planning or continuing an answer. If you use these pages, indicate at the original answer, the page number it is planned/continued on and write the question number being planned/continued on the additional working space 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 box through that square then shade your new answer. Do not erase or use correction fluid/tape. No marks will be given if more than one answer is completed for any question.

Suggested working time: 40 minutes.

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1. Which of the following hormones does not effect blood glucose levels?

(a) Thyroxine

(b) Cortisol

(c) Aldosterone

(d) Adrenaline

2. The purpose of “Herd Immunity” is to:

(a) provide immunity for a small portion of the population.

(b) vaccinate a large proportion of the population making it difficult for an

infectious disease to spread.

(c) prevent outbreaks of deadly diseases.

(d) eradiate a disease from the World.

3. If you have a control group in your experiment, which of the following is true?

(a) There can be more than one difference between the control group and experimental groups, but not several differences or else the experiment is invalid.

(b) The control group must be half the size of the experimental group.

(c) The control group and the experimental groups may have several differences between them.

(d) The control group is identical to the experimental group except for the one variable that is being tested.

4. The peripheral chemoreceptors are located in the:

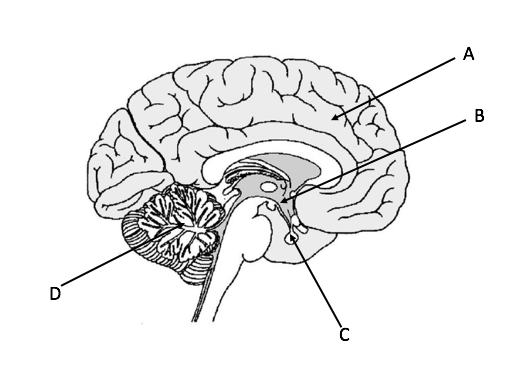
(a) carotid artery and aorta.

(b) hypothalamus.

(c) medulla oblongata.

(d) adrenal medulla.

Questions 5-7 refer to the diagram below.



5. Osmoreceptors are located in structure:

(a) A

(b) B

(c) C

(d) D

6. The main function of structure D is:

(a) conscious thought.

(b) osmoregulation.

(c) balance and coordination.

(d) language.

7. A person makes the voluntary decision to take a drink of water. The structure involved in this decision making process is:

(a) A

(b) B

(c) C

(d) D

8. In cold temperatures, a person may curl up into a ball. This purpose of this action is to:

(a) reduce the surface area, losing heat via radiation.

(b) reduce the surface area, decreasing heat loss via radiation.

(c) reduce the surface area, increasing the metabolic rate.

(d) reduce the surface area, decreasing the metabolic rate.

9. Which of the following correctly identifies an effect of the parasympathetic division of the nervous system?

(a) Dilation of bronchioles.

(b) Decreasing saliva production.

(c) Increasing sweat production.

(d) Constricting pupils of the eye.

10. The element involved the release of neurotransmitters into the synaptic cleft is:

(a) sodium.

(b) potassium.

(c) calcium.

(d) iron.

11. Antidiuretic hormone is produced in the:

(a) anterior pituitary gland.

(b) posterior pituitary gland.

(c) hypothalamus.

(d) medualla oblongata.

12. The pineal gland is a pea sized gland found deep inside the brain, its function is thought to be:

(a) control of metabolism.

(b) control of emotions.

(c) control of puberty.

(d) control of sleep patterns.

13. Which of the following statements correctly describes an action of protein hormones?

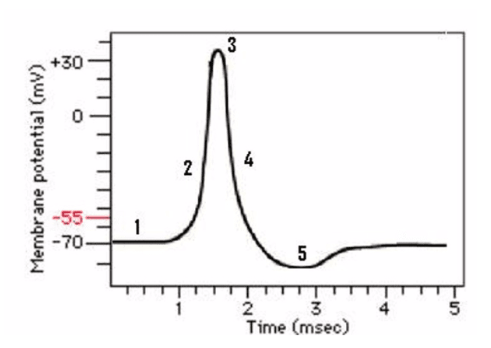
(a) Pass directly across the cell membrane.

(b) Bind with a receptor inside the cell.

(c) Activates a secondary messenger within the cell.

(d) Binds with an enzyme on the cell membrane.

Questions 14-16 refer to the diagram below.



14. At point 2 on the graph:

(a) sodium ions are moving into the cell.

(b) sodium ions are moving out of the cell

(c) potassium ions are moving into the cell.

(d) potassium ions are moving out of the cell

15. At which point on the graph is the neuron at rest?

(a) 1

(b) 3

(c) 4

(d) 5

16. The point on the graph marked 55mV is referred to as:

(a) hyperpolarisation.

(b) refractory period.

(c) repolarisation.

(d) threshold.

17. A bacteriophage is:

(a) a bacterium which requires a virus to reproduce.

(b) a bacterium which reuires other bacteria to reproduce.

(c) a virus which requires a bacterium to reproduce.

(d) a virus which does not require a host to reproduce.

18. While travelling on a crowded train, a person suffering with a cold sneezes in your direction without covering their mouth. This type of transmission of pathogen is referred to as:

(a) transmission by vector.

(b) transmission by water droplets.

(c) airbourne transmission.

(d) transmission by body fluids.

19. Autoimmunity is best described as:

(a) an automatic immune response.

(b) an immune response controlled by the autonomic nervous system.

(c) an immune response caused by the presence of ‘self’antigens.

(d) an immune response against the body’s own healthy tissue.

20. An antigen is:

1. an activated T-helper cell.
2. any substance capable of producing an immune response.
3. a protein produced by lympoocytes to enhance macrophage activity.
4. a disease causing organism.

21. A reduction in the amout of parathyroid hormone would result in:

(a) osteomyelitis.

(b) osteoarthritis.

(c) kidney stones.

(d) poor nerve impulse transmission.

22. Damage to the corpus callosum would cause:

(a) lack of coordination between the left and right hemispheres.

(b) lack of balance, coordination and fine motor skills.

(c) an increase in the rate of contraction of respiratory muscles.

(d) an increase in the production of hormones.

23. Which of the following correctly describes the function of mucus in the respiratory tract?

(a) Dissolve microorganisms.

(b) Prevent microorganisms entering the stomach.

(c) Trap any microorgamisms you breath in.

(d) Move microorganisms upwards towards the throat.

24. Antiviral drugs are now being manufactured to treat specific viral infections. Antivirals work by:

(a) destroying the protein coat surrounding the virus.  
(b) inhibiting the development of the virus.  
(c) changing the structure of the cell membrane.  
(d) killing the host cell.

25. Target cells work by responding to specific hormones when the hormone binds to:

(a) receptor proteins in the plasma membrane.  
(b) specific binding sites on the enzymes within the cell.  
(c) carrier proteins in the plasma membrane.  
(d) specific binding sites on the golgi body.

26. A vaccine created by reducing the virulence of a pathogen is referred to as:

(a) an attenuated vaccine.

(b) a toxoid vaccine.

(c) a sub-unit vaccine.

(d) a dead vaccine.

27. Which row in the table below correctly identifies a hormone involved in controlling blood sugar and the structure that secretes it.

|  |  |  |
| --- | --- | --- |
|  | ***Hormone*** | ***Secreted by*** |
| (a) | Insulin | Alpha cells |
| (b) | Glycogen | Beta cells |
| (c) | Insulin | Liver |
| (d) | Glucagon | Pancreas |

28. Which of the following is not a function of antibodies?

(a) Dissolve pathogen

(b) Make soluble substances insoluble

(c) Produce cytokines

(d) Coat pathogens to stimulate cell removal

29. Lysosyme is an enzyme found in tears. A function of lysozyme is to:

(a) break down bacteria on the eye.

(b) trap bacteria on the eye.

(c) flush out bacteria from the eyes.

(d) lubricate surface of the eyes.

30. A person with type 1 diabetes:

(a) can produce insulin but can not respond to it.

(b) can not produce insulin but can respond to it.

(c) can produce insulin and can respond to it.

(d) can not produce insulin and can not repond to it.

**End of Section One**

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

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

Additional working space pages at the end of this Question/Answer booklet are for planning or continuing an answer. If you use these pages, indicate at the original answer, the page number it is planned/continued on and write the question number being planned/continued on the additional working space page.

Suggested working time: 90 minutes

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**Question 31 (8 marks)**

A group of backpackers travelled from Australia to South America. During their stay they camped in some remote areas in order to experience the essence of this part of the world. Each of the backpackers was bitten by mosquitos despite taking precautions such as sleeping under mosquito nets and using mosquito repellent.

Upon return to Australia, one of the backpackers felt unwell. He experienced joint pain, swollen glands and vomitting. After a series of blood tests, his doctor diagnosed him with a virus named Dengue fever.

(a) Identify the mode of transmission by which the backpacker contracted Dengue fever. (1 mark)

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The doctor recommended the backpacker take paracetamol for his pain, increase his fluid intake and get plenty of rest.

(b) Explain why the doctor did not prescribe an antibiotic for the backpacker. (2 marks)

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Four types of Dengue fever have been identified so far.

(c) If the backpacker came into contact with the same type of Dengue fever upon subsequent trips to South America, would he develop Dengue fever? Explain your answer. (3 marks)

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(d) What type of immunity has the backpacker developed? (2 marks)

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**Question 32 (16 marks)**

While baking for the school bake sale, Mrs Smith accidently touched a hot tray inside an oven with her thumb. She was able to move her hand away from the tray very quickly. After a few seconds she felt throbbing in her thumb and it became very painful.

(a) Name and describe the action which caused Mrs Smith to move her hand away from the hot tray. (6 marks)

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(b) Explain why it took a few seconds for Mrs Smith to be aware of the sensation of pain. (2 marks)

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One hour after touching the hot tray, the skin on Mrs Smith’s thumb was red, painful and swollen.

(c) (i) Describe what is happening to cause Mrs Smith’s thumb to become red,

swollen and painful. (5 marks)

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(ii) Explain the purpose of this process. (3 marks)

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**Question 33 (15 marks)**

Many children experience an ear infection during childhood. This can cause pain accompanied by a fever. A fever can cause anxiety in parents despite the fact that it can be beneficial in the healing process. Most parents will give their child medication to take away the pain caused by the ear infection and bring down the fever. Two commonly used medications are ibuprofen and paracetamol.

The information in the table below shows the effect of paracetamol and ibuprofen on a child’s fever when given separately, as well as the effect of paracetamol and ibuprofen when given at the same time.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | Percentage of children with temperatures greater than 37.2oC over a 24hour period | | | | | | |
|  | 0 | 4 | 8 | 12 | 16 | 20 | 24 |
| Paracetamol | 81 | 29 | 19 | 19 | 17 | 14 | 12 |
| Ibuprofen | 85 | 15 | 12 | 10 | 10 | 8 | 6 |
| Paracetamol plus ibuprofen | 73 | 12 | 13 | 6 | 6 | 2 | 2 |

(a) Write a suitable hypothesis for this study. (2 marks)

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(b) Using the results table above, describe the trends of the data. (2 marks)

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(c) Describe the stages of a fever from its onset to crisis point. (4 marks)

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(d) Graph the Paracetamol plus Ibuprofen results ONLY in the grid provided below. (5 marks)

*A spare grid is provided at the end of this Question/ Answer booklet. If you need to use it, cross out this attempt.*

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(e) Explain why a low grade fever of 39.5oC may be beneficial during a time of infection. (2 marks)

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**Question 34 (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, the track is manageable.

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.

1. These individuals experience an increase in core body temperature during this walk.
2. Complete the following based on this stimulus. (3 marks)

Receptor: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Modulator: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
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1. Name **one** physical heat exchange process that is being used by the body during the feedback loop for part (i), include where it is occurring.

(1 mark)

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1. Describe a problem that extreme humidity could cause for individuals walking the track. (2 marks)

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1. Extreme heat can often lead to heat exhaustion, which results in the body being unable to maintain homeostasis.
2. Describe what occurs in the body to result in heat exhaustion. (2 marks)

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1. Explain how the body would respond to combat this problem. (6 marks)

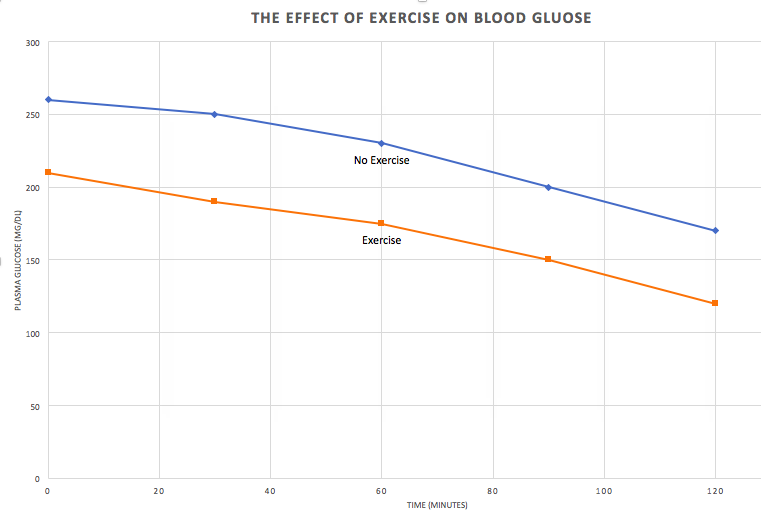
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**Question 35 (14 marks)**

The graph below compares the effect exercise has on blood glucose levels compared to no exercise.



0 50 100 150 200 250 300

0 20 40 60 80 100 120

Plasma Glucose (mg/dL)

Time (Minutes)

(a) Explain why a person’s blood glucose would be lower during exercise than a time of no exercise. (2 marks)

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(b) Describe how a person’s blood glucose is controlled while exercising. (5 marks)

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People who have been diagnosed with Type 2 Diabetes are advised to exercise as part of their treatment.

(c) (i) Explain why health professionals may advise this treatment. (3 marks)

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(ii) Suggest a second treatment that may also be a suitable treatment for a person with type 2 diabetes. (1 mark)

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(iii) Explain why exercise alone would not be a suitable treatment for a person diagnosed with type 1 diabetes. (3 marks)

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**Question 36 (15 marks)**

Lidocaine is a common local anaesthetic used by dentists. Lidocaine causes a numbing sensation in the local area without causing the patient to lose consciousness. To do this, lidocaine blocks the sodium channels, preventing sodium ions from moving into a nerve cell.

(a) Explain why blocking the entry of sodium into a nerve cell would prevent the patient from feeling pain while having dental procedures. (4 marks)

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Lidocaine injections are often a combination of lidocaine and adrenaline. The addition of adrenaline causes blood vessels to vasoconstrict and slows down the absorption of lidocaine into the blood stream.

(b) Suggest two (2) reasons why the addition of adrenaline to a lidocaine injection would be useful during tooth extraction. (2 marks)

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Dentists occasionally report that patients choose to not receive a local anaesthetic while undergoing dental procedures. Patients who make this choice may will feel some pain and discomfort.

(c) If the size of a nerve impulse is the same regardless of the size of the stimulus, explain why the patient experiences a range of sensations from mild discomfort to severe pain. (4 marks)

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(d) When a nerve impulse reaches the end of a neuron it it must cross to the adjacent neuron. Explain how the nerve impulse crosses from one neuron to the next. (5 marks)

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**Question 37 (11 marks)**

The endocrine and nervous systems regulate bodily functions and help maintain homeostasis. The structure of each of these systems allows them to carry out their function efficiently.

The hypothalamus and pituitary gland are two structures that are involved in the regulation of some basic body functions.

(a) Describe the structure of the pituitary gland and how it is connected to the hypothalamus. (3 marks)

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Hormones and neurotransmitters are chemicals that are involved in the coordination of our body systems.

(b) Outline four (4) differences between hormones and neutrotransmitters. (4 marks)

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Tumours can form on the pituitary gland and in rare cases, cause the oversecretion of hormones.

(c) A person develops a pituitary tumour which causes the oversecretion of Thyroid Stimulating Hormone (TSH). Describe the effect this will have on the person and suggest what condition they may be diagnosed with. (4 marks)

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**Question 38 (7 marks)**

The diagram below illustrates a type of neuron.



X

(a) Identify the functional type of neuron pictured above. (1 mark)

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(b) Name structure X and briefly describe its function. (2 marks)

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Multiple Sclerosis is an autoimmune disease that causes the degeneration of structure X.

(c) Explain how the degeneration of structure X would affect a person who has been diagnosed with Multiple Sclerosis. (2 marks)

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(d) Name and describe two (2) structures that protect the nervous system from damage. (2 marks)

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**End of Section Two**

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

This section has **three (3)** questions. You must answer **two (2)** questions. Write your answers on the lined pages provided.

Additional working space pages at the end of this Question/ Answer booklet are for planning or continuing an answer. If you use these pages, indicate at the original answer, the page number it is planned/ continued on and write the question number being planned/ continued on the additional working 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: 50 minutes.

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Answer any **two (2)** questions from Questions 39-41 below.

**Question 39 (20 marks)**

John has been feeling stressed due to increased pressure at work. He has also recently gained some weight. He discussed his feelings and recent weight gain with his doctor. His doctor suggested increasing the amount of exercise he does to help with both stress and weight loss.

(a) The doctor explained to John that an increase in the hormone cortisol may have contributed to his recent weight fluctuations.

Describe how cortisol is released into the blood and explain why it may be a contributing factor in John’s weight. (9 marks)

John takes his doctor’s advice and starts jogging during his lunch hour. At the end of the first week, he feels less stressed but notices at the end of each run, his breathing rate has increased significantly.

(b) Explain why John’s breathing rate has increased while he runs. (7 marks)

After four weeks of his new exercise routine John goes back to the doctor. The doctor suggests John attend a weekly yoga class to compliment his running and provide him with another way to relieve stress.

John feels very relaxed after the yoga session and notices a substantial difference in his heart rate compared to his post run heart rate.

(c) Identify the division of the nervous system that would be in control during a relaxing yoga session and describe three (3) other effects it would have on the body. (4 marks)

**Question 40 (20 marks)**

When pathogens enter the body, specific immune responses are launched in order to quickly remove the pathogen and minimise further harm.

(a) Describe the sequence of events that take place in the body during a cell mediated response. Include in your answer the name and description of the four (4) types of cell that are developed through this process. (14 marks)

Immunisation programs are widely available in developed countries however, some parents still choose not to have their children vaccinated.

(b) Discuss the social and cultural reasons for and against vaccination. (6 marks)

**Question 41 (20 marks)**

The number of people suffering from Parkinson’s and Alzheimer’s has increased in recent years. This has led to an enormous amount of research and development into treatments and potential cures for these diseases.

(a) Describe how the cause of Alzheimer’s and Parkinson’s differs and explain how cell replacement therapy may be a suitable treatment for peple who suffer from these disorders. (10 marks)

Hashimoto’s Disease is an autoimmune disease which may cause the thyroid gland to be damaged and fail to function normally. The common symptoms of this condition are weight gain, fatigue, increased sensitivity to cold, muscle weakness and depression/low mood.   
  
(b) Provide another name for the condition which results in these symptoms and

use your understanding of the functioning of the thyroid gland to explain how these symptoms are bought about. (10 marks)

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